Biological sciences
Article

VISUALIZATION OF PROTEIN STRUCTURES INTERACTION
Gilmiyarova F.N., Koloteva N.A., Timchenko P.E., Timchenko E.V., Potekhina V.I. 3

Economic sciences
Article

ANALYSIS OF THE USE OF RENEWABLE ENERGY SOURCES IN KAZAKHSTAN AND FOREIGN COUNTRIES
Aidarova A.B. 7

THE FORMATION OF A NEW MECHANISM OF VENTURE FINANCING OF INNOVATIVE PROJECTS IN RUSSIA
Arhipov I.P., Arutyunov Yu.A., Chaschin E.A., Glinskih V.A., Rudoj A.A. 12

WEBER M. ABOUT BUREAUCRACY: TO THE PROBLEM OF THE PROBLEM
Belova T.A. 17

THE DEVELOPMENT OF NEW TECHNOLOGIES IN THE TOURISM INDUSTRY
Pendyurin E., Kolesnikova I., Turanina N. 19

Ecological technologies
Article

NEW CONCEPTION OF CREATION OF "ZERO" ECOBUILDINGS AND ECOCITIES ON BASE OF ECOLOGICAL INFRASTRUCTURE
Tetior A. 22

Medical sciences
Article

THE JUSTIFICATION OF APPLICATION OF MAGNETOSONIC WATER FOR ORAL CAVITY'S HYGIENE AND TREATMENT
Britova A.A., Kirillova A.V. 27

FATTY ACID COMPOSITION OF EXHALED MOISTURE VAPORS IN CHILDREN WITH BRONCHIAL ASTHMA
Solovieva N.V., Zenkova T.L. 31

Philosophy
Article

BIBLIOMETRICAL ANALYSIS OF SAMPLING FRACTIONS OF THE NUMBER OF PUBLISHED WORKS WITH APPLICATION OF MICROWAVE RADIATION, CARRIED OUT ON NEUROPHYSIOLOGICAL OBJECTS OF DIFFERENT KINDS
Chizhenkova R.A. 34

COMPUTERS AND HUMANS: WHOSE SOLUTION TO CHOOSE?
Shestakova I. 37

CONCEPT OF PLURAL EVOLUTION AND DEVOLUTION OF NATURE ON BASE OF PHILOSOPHICAL COMPREHENSION OF PLURAL WORLD
Tetior A. 41

Short Reports

ART AND MEDICINE
Zahovaeva A.G. 51

CONTENTS

Pedagogical sciences
Article

DEVELOPMENT OF CRITICAL THINKING
Abdrakhmanova S.T., Bazarbayeva L.T., Sidikova G.B. 52

CLINICAL PRACTICE AND INNOVATIVE METHODS OF STUDENT'S PROGRESS EVALUATION
Alpyssova A.R., Ilahi M. 56

Technical sciences
Article

FEATURES OF DESIGNING CONVEYOR SCRAPERS AND CHAIN TURN ZONE DURING VIBRATION
Zhetessova G.S., Beisembayev K.M., Mendikenov K.K., Malybayev N.S., Madikhanova A.B. 61

Psychological sciences
Materials of Conferences

THE PROBLEM OF PERSONAL HELPPLESSNESS IN THE CONTEXT OF THE IDEAS ABOUT THE FEATURES OF THE FAMILY FUNCTIONING AS A SYSTEM
Bozadzhiev V.L., Petrich A.V. 67

Philological sciences
Short Reports

EXPLICATION OF THE ZONE OF HYBRID, ADJECTIVAL-MODAL STRUCTURES IN THE CONTEXT OF MODALATION
Shigurov V.V., Shigurova T.A. 69

VISUALIZATION OF PROTEIN STRUCTURES INTERACTION

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The aim of this study is the visualization and quantitative evaluation of the effect on the minor component of metabolism – lactate – on the interaction of protein structures using laser scanning confocal microscopy. The object of the study is the molecular model AB0 blood groups system. We used experimental stand on the basis of the confocal optical microscope and a laser harvester company ANDOR computer software Andor IQ. We evaluated the changes caused by lactate and its introduction into the experimental system.

Keywords: protein-protein interactions, confocal microscopy, glycoproteins and lactate

Nowadays in the arsenal of biomedical science researches we can find methods which allow us to obtain information about basic metabolic pathways in the body, however, there is virtually no data system to assess the molecular basis of metabolism, the endogenous nature of factors that determine the physiological level of the pathways and the specifics of the individual reactions. Over the last ten years the study of protein interactions with small molecules, natural metabolites in particular, was delayed compared to the study of other types of interactions such as protein-protein, protein-DNA and protein-RNA [1]. For a long time lactate was considered only as a dead-end metabolite of anaerobic catabolism of glucose [6]. However, changes of the level of lactate in liquids of the organism are typical for many syndromes [2, 7]. In earlier studies we have shown the role of such low molecular weight metabolites as pyruvate, ethanol and lactate in metabolism and their effects on protein-protein interactions [3, 4].

Laser scanning confocal microscopy is one of the promising methods that allows to study objects at the cellular, subcellular levels. In the surveyed literature there are no data describing the use of confocal microscopy in studying and visualizing the interaction of protein structures. All the above defined the purpose of our study: to visualize and quantitatively evaluate the effect of the minor metabolism component – lactate – on the process of intermolecular interactions using laser scanning confocal microscopy.

Materials and methods of research

Visualization of protein-protein interaction was carried out using an experimental stand, which was implemented on the basis of a confocal optical microscope and a laser harvester company ANDOR (scanning speed up to 25 layers per second). This stand allows to perform microphotograping in two modes: the mode of confocal microscopy in visible light and the mode of laser fluorescence. In the first case, as the source of radiation we used a broadband source (halogen lamp), in the second case we used laser emitters with a power of 100 mW at wavelengths of 488 nm and 561 nm.

Additionally the processing of noise pixels of the collected microphotographs was carried out. To reduce noise and increase the contrast of microphotographies we used a filter with a threshold of about 5% of the maximum intensity of the frame and replace it with a null signal. Evaluation of image area occupied by aggregates was performed using Andor IQ.

The object of the study was the molecular AB0 blood groups model with subsequent study the effect of the small molecule lactate on the antigen-antibody interaction (patent for invention № 2484480 of 10.06.2013). We studied the spatial structure of AB0 blood system antigens: on the erythrocyte membrane of A(II) blood group there is A-antigen – a glycoprotein with terminal N-acetylgalactosamine, on the membrane of erythrocytes of B(III) blood group there is B-antigen – glycoprotein with terminal galactose[1, 8]. After counting the number of red blood cells in the hematology analyzer, whole blood was diluted with a solution of FAX flow up to the approximate red blood cells content $1x10^6$/l. The composition of the salt solution FAX flow: KH2PO4 – 0,02%, Na2H PO4 – 0,21%, NaCl – 0.8%, And KCl And 0.01%, Na2EDTA – 0,03%, H2O – 98,9%. Before the reaction of hemagglutination, 100 µl of erythrocytes were incubated with 20 µl of lactate at a final concentration of 2 mm for 5 minutes. Then the reaction of antigen-antibody with specific monoclonal conjugated antibodies Blood group A antigen (Z2A), Blood group B antigen (89-F) labeled with fluorescein isothiocyanate (FITC) Santa Cruz biotechnology, Inc. (USA) in vitro for 20 minutes in a dark place was carried out, after that it was thoroughly mixed by vortex, and 2 ml FAX flow was added and the registration of images in a model environment was performed. We used conjugated with marker antibodies and glycoproteins A and B incubated with a solution of lactate in a dilution of 1:5, diluted glycoproteins A and B without lactate were used as the control probes.

Results of research and their discussion

During the study, we obtained electron micrographs in the primary dispersion. We evaluated the results of the intermolecular interaction: the amount of square frame and the

square formed by the aggregates. At the first couple of photos we can see the result of antigen-antibody interaction with A glycoprotein without the introduction of lactate (Fig. 1, A) and after the addition of lactate (Fig. 1, B). At the figure 1B it shows the active formation of complexes that are superior in number and value of conglomerates formed without the influence of lactate. We can notice an increase of the frame occupied by aggregate 4.7% in the control group to 19.4% in the experimental group when adding lactate. Along with increasing the frame size the area of formed aggregates also increases: for the control group this size was 67.4 μm^2, while for the experimental group it was 152 μm^2. The introduction of lactate in the antigen-antibody system exerts an activating influence on the processes of protein-protein interactions that can be explained by the peculiarities of the interaction of lactate with the antigenic determinant of the red blood cells of the first group of blood.

Adding lactate to the system with the glycoprotein B (Fig. 1 C, D) shows less tendency to form complexes. Not-interacting with monoclonal antibodies single red blood cells dominated in the picture. The volume of the frame occupied by the aggregates of erythrocytes in the control group amounted to 14.1%, while the introduction of lactate in the experiment resulted to decreasing the formation of complexes to 2.9% of the total frame, respectively. We also observed a slight decrease in the area of the formed aggregates under the influence of lactate: 44,8 μm^2 in the control group compared to 42.2 μm^2 for the experimental group.

Comparing complexes obtained by the interaction of lactate with the glycoproteins A and B showed a difference in the size and shape of the complexes (Fig. 1 B, D). The complexes formed by lactate with antigen A were characterized by large size (average value of the complex 152 μm^2), complex shape, high number of subunits in each complex, while the complexes formed with antigen B were characterized by fewer complexes of small magnitude (middle value of the complex of 42.2 μm^2) with a small number of subunits.

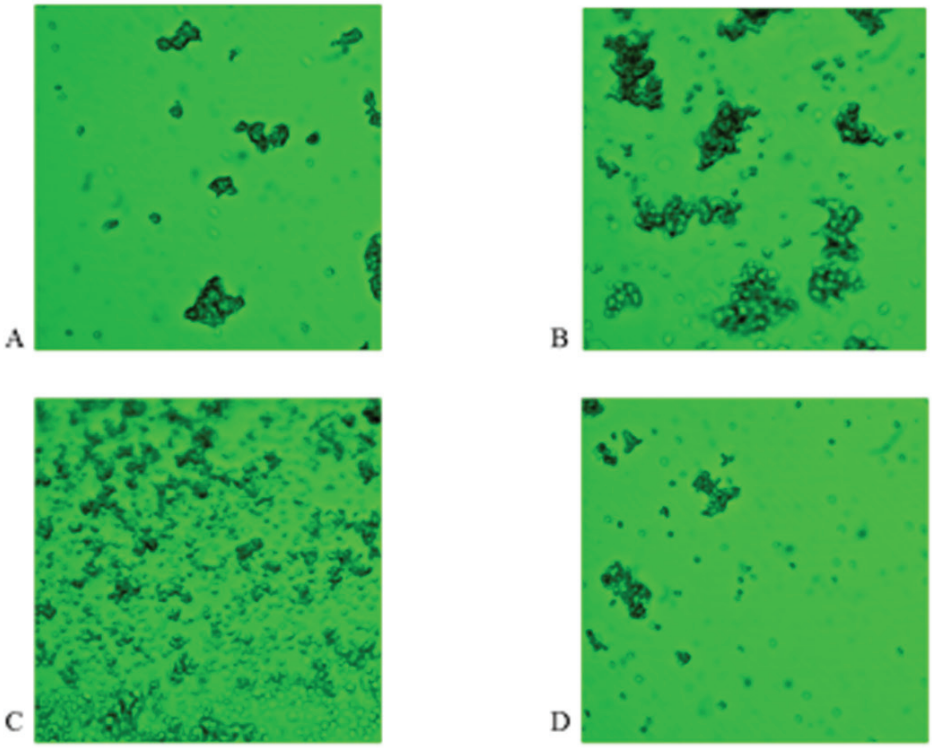

Fig. 1. Electron micrograph of the glycoproteins A and B interaction with monoclonal antibodies in native mode dispersion (magnification 400). A – glycoprotein A (control sample); B – glycoprotein A after incubation with lactate; C – glycoprotein B (control sample); D – glycoprotein B after incubation with lactate

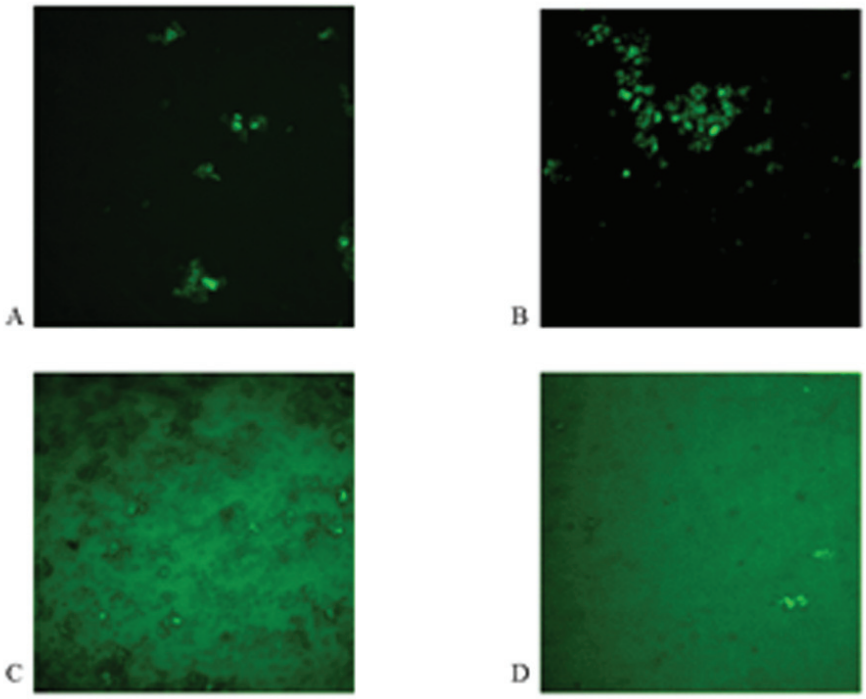

Fig. 2. Photomicrographs of complexes formation of antigen-antibody glycoproteins A and B in the regime of fluorescence (400x). A – glycoprotein A (control sample); B – glycoproteins A after incubation with lactate; C – glycoprotein B (control sample); D – B glycoproteins after incubation with lactate

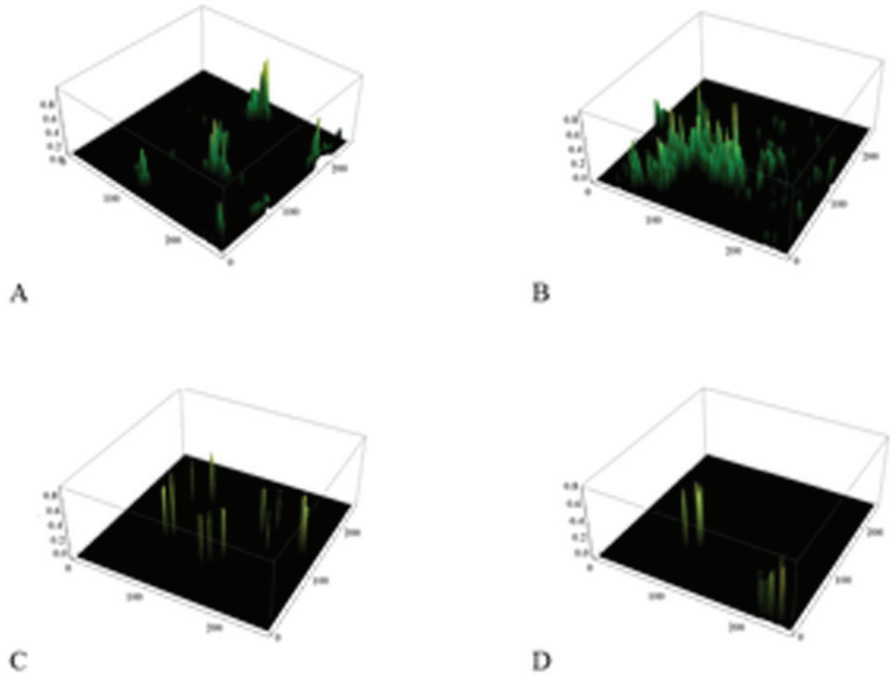

Fig. 3. Diagrams of the spatial distribution of the fluorescence intensity in the complexes antigen – antibody. A – control red blood cells of A(II) blood group; B – red blood cells of A(II) blood group after incubation with lactate; C – control erythrocytes of B(III) blood group; D – erythrocytes of B(III) blood group after incubation with lactate

Confocal microscopy in the fluorescence mode is an important stage of the research, as it allows us to fully explore the processes of specific antigen-antibody interaction, excluding cases of non-specific interactions. On the photomicrographs, made in the fluorescence mode (Fig. 2), we can see complexes consisting of subunits with FITC emitting glow. Analysis of the data indicates a significant increase in the formation of antigen-antibody complexes for A glycoprotein in the experimental probe with the addition of lactate (Fig. 2, B). While the introduction of lactate in the antigen-antibody system with glycoprotein B leads to a decrease in complex formation (Fig. 2, D). Net frame containing complexes of glycoproteins with addition of lactate was 6.7 % for antigens A and 0.3 % for B antigens, respectively. Conducting a comparison of the surface area of the obtained complexes we can notice the predominance of the complexes formed by the introduction of lactate to glycoprotein A 50.4 per μm^2 in comparison with the results obtained by the introduction of lactate to glycoprotein B – the average size of the conglomerate amounted to 17.7 μm^2.

The study of the spatial fluorescence intensity distribution of fluorochrome luminescence in the complexes of antigen-antibody (Fig. 3) shows a significant increase of the fluorescence peaks in A glycoprotein with lactate incubation (Fig. 3, B). It can be assumed that in the structure of the antigen A there is an area responsible for binding with lactate, so its accession to the antigen does not compete for binding with other ligands. Moreover, binding lactate in the active site, appears to be capable of changing the conformation of the glycoprotein increasing the efficiency of antigen-antibody interaction. At the same time, the introduction of lactate in the system with the glycoprotein B (Fig. 3, D) causes a decrease of the fluorescence peaks. This may be due to differences in the structure of structure of the antigen B. Probably lactate competes for the active sites of a given antigenic determinants, leading to inefficient conformational rearrangements and reducing the amount of complexes antigen-antibody formation.

Conclusions

Thus, using the technique of laser scanning confocal microscopy, it is possible not only to visualize protein structures but also to quantify the changes caused by lactate with its introduction into the experimental system. Applying natural intermediates as molecular probes allows us to determine the biological effects of these compounds and the molecular nature of the regulated relations. Glycoprotein A leads to probably high sensitivity A(II) blood group to external factors that appears to be the molecular background of the frequent infectious diseases occurrence in this group. Glycoprotein B is less susceptible to the influence of lactate that reveals the molecular mechanism of the B(III) blood groups stability in the perception of foreign substances and explains the high stability of the persons in the group of blood to the viruses and infectious agents. The data reveal causes of individual reactions to exogenous and endogenous factors associated with different blood groups. This is important for preventive medicine and it contributes to our understanding the processes of reception, intermolecular recognition in health and disease, in terms of the accumulation of oxidized products of metabolism, and it may also allow patients to adequately assess the laboratory studies on the basis of ligand technology.

1. With laser scanning confocal microscopy we managed to visualize protein-protein interaction and to evaluate the influence of lactate.

2. The opposite influence of the natural metabolite to the glycoproteins A and B was established.

3. Lactacidemia in a number of diseases can cause pathochemical changes of metabolism.

4. When performing high-tech sensitive methods (ELISA, immunofluorescence) it is important to take into account the possibility of results distortions in the blood analysis in case of elevated minor components of metabolism level.

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ANALYSIS OF THE USE OF RENEWABLE ENERGY SOURCES IN KAZAKHSTAN AND FOREIGN COUNTRIES

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In this article, research and analysis of comparative indicators of the use of renewable energy sources in Kazakhstan and foreign countries, as well as the identification of methods for effective use and prospects for the development of non-traditional energy sources in the Republic of Kazakhstan. Renewable energy sources (RES) have been positioned by Kazakhstan in recent years as one of the vectors for the development of the energy complex. This is evidenced by increased attention to the process of their implementation by the state and a number of business structures. However, the formation of a sustainable RES complex in Kazakhstan causes significant financial and technological infusions with the direct participation of the state, without which renewable energy will remain virtually zero. The research was based on the following general scientific methods: abstract-logical, computational-constructive, forecasting, and generalization. Priority directions for the use of renewable energy sources and implementation of energy conservation policies have been established.

Keywords: investment, renewable energy sources, energy stability, non-traditional energy sources, energy saving

The electric power industry, being one of the basic branches of the economy, plays an important role in the political, economic and social spheres of any state. In the next ten years, serious structural and technological changes are coming in the world electric power sector, which will be accompanied by unprecedented investments in the development of renewable energy technologies and effective energy saving policies [1].

Purpose of the study

The purpose of the study was to develop priority areas for the use of renewable energy sources.

Materials and methods of research

Theoretical and experimental methods of research are used in the work. The research was based on the following general scientific methods: abstract-logical, computational-constructive, forecasting and generalization. Experimental studies were conducted in the production conditions of renewable energy sources.

Results of the study and their discussion

World production of electricity is about 13.5 trillion. KWh. Most of the world's electricity production falls on a small group of countries, including the United States (3.6 billion kWh), Japan (930), China (900), Russia (845), Canada, Germany, France (about 500 billion kW / h).

The gap in electricity production between developed and developing countries is great: developed countries account for about 65% of all output, developing – 22%, transition countries – 13%.

In general, more than 60% of all electricity in the world is generated by thermal power plants (TPPs), about 20% by hydroelectric power stations (HPPs), about 17% by nuclear power plants (NPPs) and about 1% by geothermal, tidal, solar, Wind power stations. However, in this respect, there are great differences in the countries of the world.

For example, in Norway, Brazil, Canada and New Zealand, almost all electricity is generated at the HPP. In Poland, the Netherlands and South Africa, on the contrary, almost all power generation is provided by thermal power plants, and in France, Sweden, Belgium, Switzerland, Finland, and the Republic of Korea, electricity is mainly based on nuclear power plants.

One of the priority areas for the development of the electric power industry and the solution of environmental problems in the world is the use of renewable energy resources.

In recent years, alternative energy has become the subject of intense interest and bitter discussions. Under the threat of climate change and the fact that average world temperatures continue to grow every year, the desire to find forms of energy that will reduce dependence on fossil fuels, coal and other environmental polluting processes naturally grew.

While most of the concepts of alternative energy are not new, only in the last few decades this issue has become topical. Thanks to improvements in technology and production, the cost of most forms of alternative energy was lowered, while efficiency was growing.

At present, alternative energy is still not developed rapidly. But this picture is rapidly changing under the influence of processes of political pressure, worldwide environmental disasters (droughts, famine, floods) and improvements in renewable energy technologies.

Some countries have become leaders in the development of alternative energy (Table 1).

Table 1

TOP-10 Leading Countries in the Production of Alternative Energy

№	countries	From the Sible sources of bln kW / hr	share,%				
			hydro Electro energy	Wind	Bio fuel	Sun, wave and tidal energy	Geothermal energy
1	China	800	87	9	4	-	-
2	USA	527	61	23	13	-	3
3	Brasil	459	92	1	7	-	-
4	Canada	398	93	5	2	-	-
5	Russia	168	98	-	2	-	-
6	India	160	14	37	36	13	-
7	Germany	126	99	-	1		-
8	Norway	121	81	16	2	1	-
9	Japan	116	71	4	20	3	2
10	Spain	87	39	45	6	10	-

Table 2

Investments in RES projects, ($ bn)

	2012	2013	2014	2015	Overall
RES	238	210	247	266	961
Hydrocarbon energy	129	100	125	130	484
Hydroelectric power station	33	33	46,3	42,8	155
Nuclear energy	12	13	17	20	62

One of the most important factors affecting the development of alternative energy in the world, including in Kazakhstan, is investment.

China officially became the world leader in the use of alternative energy sources. Only in the first half of 2016, China installed 20 GW of new capacity for the processing of solar energy, for the entire 2015-about 45 GW. As for the wind, in 2015 China introduced about 145 GW. Slightly less capacity to obtain alternative energy was introduced by the United States, Germany, India, Spain. In 2015, the amount of funds allocated by the Chinese government for the development and installation of renewable energy sources exceeded the US investments ($ 44.1 billion) and European countries ($ 48.8 billion) combined [2].

The volume of investments in the development of renewable energy sources is growing in the world. In 2015, alternative energy projects created more than half (53.6%) of the new generation capacity in the world, according to the Ranking.kz analytical service.

Investments in renewable energy (RES) projects amount to $ 266 billion, while in hydrocarbon projects only $ 130 billion (Table 2).

Global investment in R & D research and development amounted to almost $ 1 trillion over four years (2012-2015). During the same period, investments in fossil fuels (oil, gas, coal) amounted to only 484 billion dollars, which is 2 times less than investments in RES.

Against the backdrop of post-crisis stagnation in the world economy, investments in the development of renewable energy are growing, and for 4 years they exceed investments in other energy sources by 2 or more times. Including in 2015, the growth was 5%, or $ 20 billion to the level of the previous year, according to a report by Bloomberg New Energy Finance (BNEF).

For the first time in 2015, RES (excluding HPPs) created more than half (53.6%) of all new power generation capacity (Table 3). A huge flow of investment has made it possible to achieve such indicators, and growth is everywhere.

In Kazakhstan, too, there is a shift in the field of renewable energy sources, for the period from the beginning of 2015 to the second quarter of 2016 installed capacity increased by 42% to 252.3 MW. In Kazakhstan, at the end of the second quarter of 2016, RES enterprises were commissioned at 252.3 mW.

Table 3

Renewable sources of electricity and capacity production in the form of a share from the global market, %

	2007	2008	2009	2010	2011	2012	2013	2014	2015
The share of renewable energy sources from the world electricity production (net)	19,5	27,3	41,7	31,6	39,8	48,6	40,2	49,0	53,6
The share of renewable energy sources from global capacity	7,5	8,2	9,2	10,2	11,4	12,7	13,8	15,2	16,2
The share of renewable energy sources from the world production of electricity	5,2	5,3	5,9	6,1	6,9	7,8	8,5	9,1	10,3

Table 4

General generating capacities in the world electric power industry and RK

	World	Kazakhstan
RES	134	0,2357
Coal	42	0,0500
Natural gas	40	0,1000
Hydroelectric power station	22	0,1500
Nuclear energy	15	0,0000

Table 5

Dynamics of renewable energy shares in the total electricity consumption in the Republic of Kazakhstan

Indicator	Unit of measurement	Years							
		2008	2009	2010	2011	2012	2013	2014	2015
Share of renewable energy in total electricity consumption	%	0,39	0,48	0,48	0,48	0,5	0,56	0,6	1,0

Electricity production for this period increased by 204% to 250.6 million kW / h. In Kazakhstan, the total generating capacity in 2015 was 0.2357 GW (0.17% of the world's generating capacity) (Table 4).

The share of electricity production from the energy producing organizations using renewable energy in the total volume of electricity production in the Republic of Kazakhstan is 1.21% for the second quarter of 2016. In 2015, the amount of input of generating capacities (in GW) in the Republic of Kazakhstan amounted to 44% of the total volume of input of generating capacities in the republic.

In his message to the people of the RK "Kazakhstan-2050 Strategy", President Nursultan Nazarbayev, as one of the main tasks facing the society, has set the task of developing alternative and renewable energy production, which will ensure by 2050 not less than half of total energy consumption [1].

The dynamics of the share of electricity produced by RES in the total amount of electricity consumption is shown in Table 5.

As can be seen from Table 5, the share of RES in the total amount of electricity consumption for the period from 2008 to 2015 increased by almost 2.56 times.

In accordance with the Strategic Development Plan of the Republic of Kazakhstan until 2020, the share of alternative energy sources in the total energy consumption should reach at least 3% by 2020 [3]. For comparison, the share of alternative energy sources in the total electricity consumption in EU countries is 20%, in Russia – 4.5%.

The increase in the share of renewable energy use in Kazakhstan as a whole up to 20–30% of the total energy balance, and subsequently the increase in this indicator, could play a huge role in the full exhaustion of mineral resources.

Table 6

The list of wind farms, according to the Plan for 2013-2020

№	Name of event	Terms of implementation	Estimated costs, mln. USD
1	Constructionof SES inKapchagai Almaty region with a capacity of 2 MW	2014	11,33
2	Construction of a SES in the Zhambyl region of the Zhambyl region with a capacity of 24 MW	2015	57,67
3	Construction of a SES in the Kyzylorda region with a capacity of 50 MW	2017	96,80
4	The project for the introduction of clean ecological energy using the solar photovoltaic system in the Republic of Kazakhstan	2014	10,00
	Overall		176,00

By the decree of the Head of the state N. Nazarbayev "Concept of the transition of the Republic of Kazakhstan to the green economy" was approved, in which the development of RES is considered as one of the effective mechanisms for the formation of the "green" economy [4]. For the development of RES based on the best practices of developed countries, the Law "On Amendments and Additions to Some Legislative Acts of the Republic of Kazakhstan on Support and Use of Renewable Energy Sources" was adopted [5]. It provides support for both investors and consumers. The law provides for the allocation of rural areas for the construction of renewable energy facilities, the need to develop fixed tariffs, create a clearing and financial center, and provide targeted assistance.

For the successful development of renewable energy, the state will reimburse 50 percent of the costs of an unauthorized user who is not connected to electric grids, for purchasing renewable energy sources of no more than 5 kW. This state measure will give impetus to the increase in the number of renewable energy sources in Kazakhstan and will protect the market of domestic energy producers. It will support users living in rural areas and rural commodity producers. This will contribute to the development of rural areas and will ensure broad user access to electricity. The law will also create conditions for the sale by autonomous users of surplus electrical energy generated from RES in the public network.

Wind, solar and etheric energies are perfectly ecological, as they do not pollute the environment at all. In addition, with proper organization, solar power plants can improve the insolation balance of the surface under arid reinsolution in the south, and thereby create a microclimate for more efficient agricultural land use. The ether energy has unlimited resources and is anti-entropic, fundamentally improving microclimatic parameters. Despite serious resistance on the part of academic circles, nuclear scientists and oil producers, in Kazakhstan, as well as in other countries, developments are being made in the field of etheric energy, that is, the extraction of energy from space air. There are successful examples of the realization of cold nuclear reactions using gravity and similar physical phenomena.

By 2020, it is planned to commission about 31 renewable energy sources with a total installed capacity of 1040 MW, including: 4 SES – 77 MW (Table 6) [6].

Conclusions

Ensuring energy and environmental efficiency are priority areas for the development of Kazakhstan, expanding the use of renewable energy is one of the ways the country moves in this direction. One of the main functions of renewable energy sources should be energy supply to consumers in areas with low energy density. Renewable energy should become a key factor in the development of remote regions of the country. The development of renewable energy in Kazakhstan requires a number of measures to support this activity, including:

– it is planned to work out the issues related to the support of renewable energy sources, including: reservation and priority in the provision of land for the construction of renewable energy sources;

– Obligations of the energy transmission organizations on the purchase of electricity produced using renewable energy sources;

– release of renewable energy sources from payment for transport of electricity through networks; Support for the connection of facilities for

the use of renewable energy sources to the networks of the energy transmission organization.

In conclusion, it should be noted that significant reserves of energy resources will help Kazakhstan to ensure further economic development. Today, the republic, which already has a strong oil and gas sector, is expanding the range of tasks in the energy sector, including the development of nuclear and green energy.

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THE FORMATION OF A NEW MECHANISM OF VENTURE FINANCING OF INNOVATIVE PROJECTS IN RUSSIA

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The article discusses development of the real economy and its underlying entities. It is shown that in modern conditions of economic development of particular relevance is the problem of justification of the production of innovative products. The analysis of the schemes of venture capital financing of innovative projects in Russia. Shows the features of venture investment in Russia. Also it is shown that in recent years there has been a significant rise in the value of assets. However, domestic venture capital firms are unable to fully solve the problem of financing of innovative projects. The authors propose a financing program local innovation centers.

Keywords: capital, venture investment, venture financing, innovation centre, Bank lending, venture capital Fund

Statement of the problem. Given the limited state financial resources, the problem of finding additional sources of financing becomes especially topical in order to activate the development of innovative activities in Russia. The mechanism of venture financing and related services can be: loans, credit, leasing, joint (joint) activity, financial investment. State financial institutions ensure the implementation of the state policy to support innovation in priority areas of scientific and technological development by financing innovation projects on preferential terms for the return of provided financing.

The analysis of recent researches and publications. The problems of financing innovative activity and increasing its activity during the last decade are widely studied by modern scientists. Certain aspects of venture investment of innovative projects in Russia and the role of venture capital in this process have been studied by such scientists as G. Birman, S. Schmidt, L.P. Goncharenko, Yu.A. Arutyunov, S.A. Filin, B.T. Kuznetsov, V.N. Sidorova, A.E. Shklyaev, I.R. Fatyanova, S.Yu. Panarina, V.P. Savchuk, K.N. Petrov, and others. Despite the existence of a significant number of publications on this subject, taking into account the current state of the national economy and the need to overcome the consequences of the financial crisis, there is a growing need for further scientific research in this direction.

In our opinion, the issues of the formation of a specific mechanism for financing the activities of local innovation centers have not been solved yet. Methods and instruments of such financing, as well as the mechanisms for the implementation of bank lending, the investment of such centers, their advantages for the subjects of such cooperation need to be specified.

The main goal of the work is to identify alternative ways to activate new venture financing mechanisms for innovation projects in Russia and to identify prospects for further cooperation between local innovation centers and other business entities.

The statement of the main material. The analysis of the world experience of using such forms of activation of innovation activity in the US, Japan, Western Europe, CIS and other countries proves their relevance and prospects for Russia. At the same time, the effectiveness of the functioning of local innovation centers is largely determined by the proper level of financing of their activities, especially at the initial stage.

For working out alternative schemes of financing of local innovative centers, it is expedient to describe this mechanism by the creating special state programs.

When creating such programs, it is useful to take advantage of the experience of the United States as one of the leading countries with an innovative type of economy and the most effective mechanism for the formation of an innovation strategy. Adapting such American programs as the "Innovative Research Program", "Transatmosphere of Technologies" program, "Small Business Technology Transfer Program" and "The Latest Technologies Program" [10] to the Russian conditions for the development of local innovation centers, the authors proposed two new programs: "The program of joint financing of the development of local innovation centers"

(based on public-private partnerships), "The cooperation Program – "University – Local Innovation Centers".

"The program of joint financing of the development of local innovation centers" provides:

1) establishment of the Public-Private Partnership Agency;

2) implementation of co-financing programs for the implementation of:

– joint research and development in important industries for the state;

– transfer of research results to enterprises;

– innovative projects of local innovation centers.

3) creation of venture funds by applying public-private partnership mechanisms and mobilizing public and private financial resources to finance the operation of local innovation centers.

The proposed program provides for strengthening the interrelationships of the state-science-business triangle in the context of the development of local innovation centers. The conception of the program should be based on a harmonious combination of public and private interests. Regulation is due to the optimal balance of regulatory and market levers. At the same time, the role of the state is emphasized:

– in the financing of fundamental science (priority, including its socially important areas);

– in public-private partnerships to mobilize venture financing for private sector investment;

– in the creation of a system of interaction between business and science.

Private business and entrepreneurial initiative should play a leading role. The role of the state in innovative relations are also changing. The state acts in relations not only as a subject of power, but as an equal partner, as an entrepreneur who is ready to share risks from the innovation activity.

"The program of joint financing of the development of local innovation centers" should be implemented at the following levels:

– at the strategic level – The Agency of public-private partnership, which should include representatives of the public and private sectors. The powers of the Agency should primarily include forecasting the needs of the national economy, individual industries from the standpoint of ensuring the technological advantages of their competitive development, selecting innovative projects on a competitive basis, creating or facilitating the creation of new and high-tech industries, information and marketing support for innovation activities;

– at the level of science – local innovative centers (technological parks, industrial parks, science parks, innovation centers, research and development institutions, business incubators) that will assess the innovation ability (market orientation) of scientific research results, qualify innovation objects, assist with accounting and taxation, patent support and registration of intellectual property rights to small innovative firms;

– at the level of the commissioning – commercial partnerships on the basis of research institutions for the purpose of innovation (commercialization of developments) in which public research institutions will enter with intellectual property rights, and private investors with financial contributions;

– at the level of financing – the Innovative Fund for joint public-private investment, which should be created in the form of a private company. It will consist of a holding company and subsidiaries, 50% of the capital of which is owned by the state, and the rest – to private investors [1].

With the aim of forming effective mechanisms of venture financial support for innovation and economic growth in Russia, it is advisable to introduce a separate structural element within the state financial system – the Innovation Bank. This will help increase the aggregate turnover of venture financing of innovation projects of local innovation centers. The state should own a controlling stake in this bank at the initial stage of activity. Other national cofounders of the bank will be large enterprises and any other interested economic entities, subsequently non-residents of the country.

In order to protect against risk and guarantee the return of private capital to the investor in the event of a risky event, it is advisable to authorize the insurance company chosen by the executive authorities to insure investment in innovation [6]. This company should closely cooperate with all institutional structures, first of all, with the Innovation Bank and the Innovation Fund.

To ensure co-financing, the program uses the following mechanisms:

– Provision of direct loans by the Innovation Bank to those persons who can not avail themselves of the usual channels for attracting credit resources. It will make possible:

– Provision of investment from the Innovation Fund for joint public-private investment in the implementation of those projects that were selected by the Public-Private Partnership Agency. This mechanism provides for the possibility of promoting the development

of strategically important developments and areas of scientific research for the country;

– Financial support for residents of industrial parks, who invest in innovation: joint financing of labor remuneration for staff involved in research (50% financed by the Innovation Fund);

– Joint financing of projects, transfer to industrial production parks with higher added value (up to 40% is financed from the Innovation Fund). It would increase the attractiveness of Russian industrial parks, open a business case for private investment for the construction and registration of parks in the national registry, and it would stimulate the transfer of more high-tech industries to the country;

– Financing of projects selected on a competitive basis by the Agency of Public-Private Partnership, initiators of creation of local innovation centers: budget financing – 30% of the project cost, the rest – private companies or local authorities [7].

It is advisable to apply the experience of Israel and the United Kingdom. The share participation of specially created state investment funds in regional venture funds has become a catalyst for the development of venture investment and is already actively being introduced [4]. Both funds are created in the organizational and legal form of a limited partnership, operate under the guidance of private management companies (usually foreign). State funds are usually not more than 50% of each regional fund, the rest should be attracted from private investors. With regard to payments, the first victim's rule applies to the benefit of the private investor [2].

The general scheme of interaction of subjects on the "The program of joint financing of the development of local innovation centers" is presented in Fig. 1.

The advantages of this mechanism are: firstly, for business it is direct state support of innovations and the possibility of investing under state guarantees; secondly, for the state, this is a reduction in budget expenditures due to raised funds in the sphere of innovation, an increase in the innovative activity of priority sectors of the economy and the distribution of innovative risks.

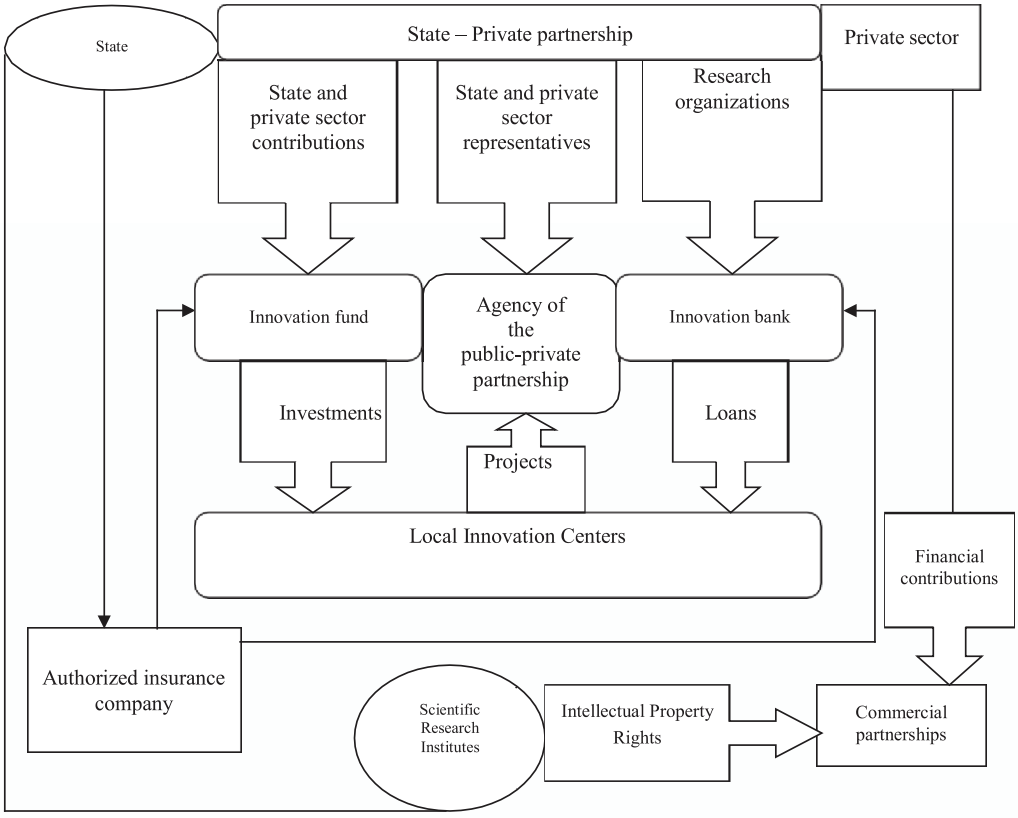

Fig. 1. The general scheme of interaction of subjects under "The program of joint financing of the development of local innovation centers"

"The cooperation Program – "University – Local Innovation Centers" is aimed at bridging the gap between education and the introduction of knowledge in the creation of innovations. Within the framework of this program, two basic programs are key: the programs of joint research centers "university-industry" and the program of creating youth innovation centers. When creating the first program, it is advisable to take the US experience as a prototype.

Along with strategic business alliances, the university-industry partnership has been actively developed over the last 30 years in the United States. Financing in such cases is carried out on a contract basis, and the owner of the research results is a financing company. The system "university-industry" has become so widespread that in many educational institutions special centers (more than 1000 throughout the USA) were established that serve such projects [3]. In our opinion, the stimulation of such cooperation contributes to the acceleration of the emergence of various types of local innovation centers (LIC) by combining the innovative potential of education and commercial progress, and therefore, the commercialization of innovation as the achievement of the goal of creating LIC.

The program of joint research "university-industry" centers provides for two options for funding mechanisms for such centers. The first option is based on the formation of a research center in the form of a corporation, which may include universities, private investors, local authorities, other sponsors and stakeholders. Each corporate member of the Center contributes an annual fixed membership fee to the general fund. This contribution is directed to financing of fundamental research, the themes of which are determined by the Council of the Center.

The next stage is the introduction of scientific developments in production by creating a spin-off company [5]. In case of its successful functioning, the Center's fund should distribute the revenues received among the participants. Universities and institutions need to report on revenues from licensing, investments from outside investors in research and development and spin-off companies, income from spin-off activities, the number of jobs created or developed social products to the Council of the Center. The basic scheme of the functioning mechanism of the University-Industry Research Center in the form of a corporation is presented in Fig. 2.

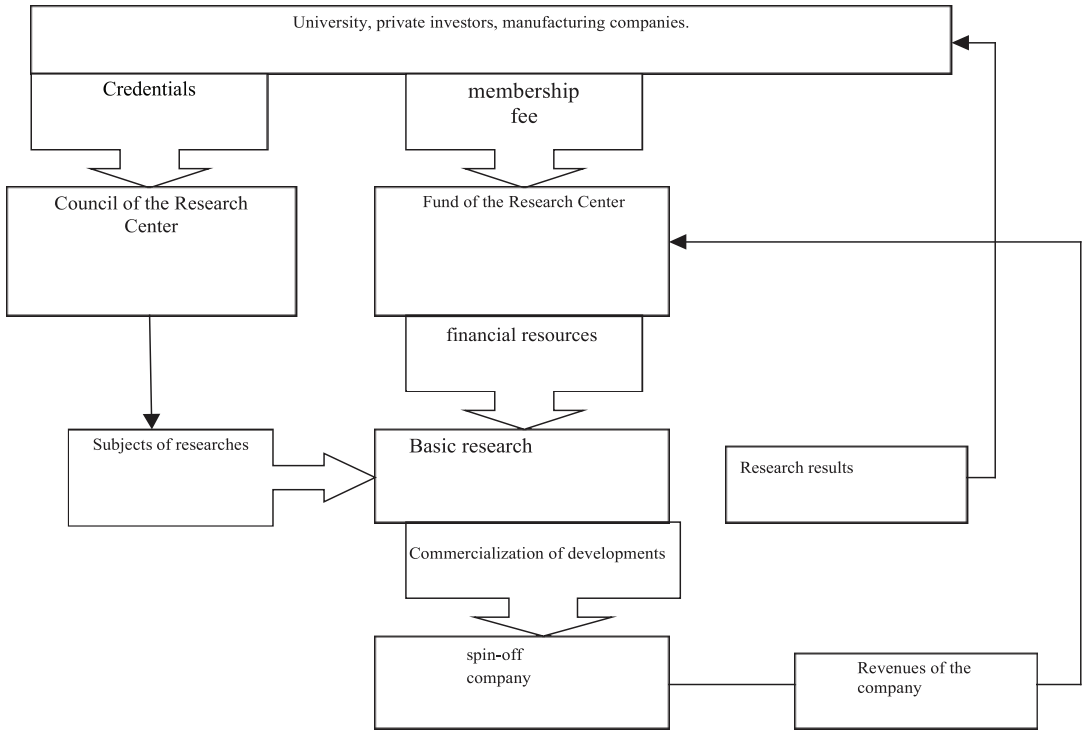

Fig. 2. The basic scheme of the functioning mechanism of the "University-Industry" Research Center in the form of a corporation. *Source: developed by the authors on the basis of sources [8, 9]*

The second option involves participation in the financing of an innovative non-banking financial and credit institution "Small Innovation Business Support Fund". The Small Innovation Business Support Fund provides relatively small financial support to the centers – 20% [10]. At the same time, 80% of financing comes from other industrial companies. If the center can prove its ability to carry out serious research, the Small Innovative Business Support Fund provides a grant for five years, which can be extended for another five years, but for a smaller amount. The aim is to help start the work of the center, as well as support at the stage of formation, but in future the centers should be supported by universities and industry.

The partnership of the parties in the center is formalized through the adoption of joint decisions by the Consultative Industrial Council of the Center, representatives of the university and the business of carrying out scientific research. Indicator of success according to the criteria of the Fund, should be the volume of research carried out by the Center on contracts with industry.

It is also determined that an important task for the state is to search for promising ideas in universities and research centers, ensure investment financing in the early stages of the development of companies, finance the development of business plans and research activities, expand international cooperation of research organizations.

To ensure funding, the following mechanisms can be applied:

– financing of projects at the level of up to 30% through direct subsidies;

– the allocation of grants of the company to half of the costs, if it does not only develop a new product, but also research in cooperation with the university;

– the allocation of risky loans to the company up to 60-70% of the cost to develop a new product or process. The company is obliged to repay the loan if the development was successfully introduced into the market;

– financing of projects for a period of up to two years, and in case of favorable results of the development of a new product is extended for another 2-3 years in the form of a risk loan. Such measures can be entrusted to the Fund for Support of Small Innovation Business, since it does not contradict its charter and the goals of creation.

Conclusions and offers. The proposed measures to improve the mechanisms of venture financing of innovation projects in Russia and the financial support of local innovation centers are implemented through two state programs. These programs provide for a combination in a single system of interaction: local innovation centers, financial and credit institutions, industrial enterprises, higher education institutions and private investors through indirect instruments of the state influence. The implementation of these programs will ensure the transition of the economy to a new innovative level, will promote positive changes in the field of education, increase employment of the population and, as a result, will enhance the development of the national economy as a whole.

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WEBER M. ABOUT BUREAUCRACY: TO THE PROBLEM OF THE PROBLEM

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The article deals with the concept of "bureaucracy" in the understanding of M. Weber. It was he who led this term into scientific circulation. However, the concept of "bureaucracy" originates still in the ancient world, and the term appeared in the middle of the XVIII century. M. Weber distinguished two types of bureaucracy: patrimonial and rational. In the article the author gives a characterization of these two types of bureaucracy. In conclusion, the author notes that the bureaucracy (just rational) is characterized by M. Weber purely theoretically – as an ideal type, having the character of a "model", with which reality must then be compared.

Keywords: bureaucracy, type of bureaucracy, official

First, we must determine the meaning of the concept of "bureaucracy". In the beginning, of course, we should draw our attention to the Western experience of research on this problem [1, P. 5-8.] According to a sociological comment by Bruder: "When considering the phenomenon of bureaucracy, it is necessary to draw a clear line between the mass consciousness perceiving it mainly critically – as a mechanism of public administration, and, on the other hand, sociological and political approaches. In accordance with these approaches, bureaucracy is characterized as a specific form of social organization, not limited solely to the official sphere of social life" [2, P. 142].

The term "bureaucracy" is given many meanings. We will only present some of the meaning of this term: government officials, public administration, the system of professional administration, organizational effectiveness, etc.

The concept of "bureaucracy" dates back to the ancient world. In ancient Rome, coarse wool called "byurra". This word has been borrowed by the French – "byurr" and then became "bureau" as a kind of woolen cloth. In the XVI century table designated by this word which was covered with a cloth, and in XVII century. They began to call the office, where there were tables. The term "bureaucracy" first appeared in the middle of the XVIII century. thanks to the French Economist de Vincennes Gurnay [5, P. 77]. He added the word "bureau", which meant that as an institution, as well as a desk, part, derived from "manage" the Greek verb. "Bureaucracy" means power officials. Initially, this word was used only in relation to government agencies, but its importance is gradually extended and now applies to all large organizations. The scientific revolution, the term "bureaucracy" came thanks to the work of Max Weber. However, the term "bureaucracy" has purchased from Weber positive nature and attitude to the organization in general. The main difficulty, which presents the theory of bureaucracy, Max Weber, is primarily the work of "Economy and Society", which describes the system of government in Germany in the early XX century.

Sociologists distinguish two types of bureaucracy: patrimonial and rational. The term "patrimonialism" was taken from ancient Rome, where it literally means "personal treasury of the emperor". For patrimonial bureaucracy is characterized by insufficient development of rational features and the personal character of the relations of power in the governance structures. Power base patrimonial bureaucracy, above all, leaves the assignment of officials positions of wealth and privilege. However, the trend towards the assignment of officials controls leads to the gradual disintegration of the bureaucratic organizations. At the same patrimonial bureaucracy is converted to the rule of "class" type, which is already a non-bureaucratic.

According to Max Weber, but in the West as a result of optimizing the management process develops a patrimonial nature of the relationship between monarch and officials. Western bureaucracy of the absolutist state acquires the power not as a result of the decentralization of the political regime, and due to the presence of officials from professional abilities. Therefore, it is in the West for the first time there is a transition from a patrimonial management to the bureaucracy of the modern type. Thus, M. Weber, patrimonial bureaucracy is seen as regressive, negative element of society. Weber also quite actively uses the example of the Russian bureaucracy when characterizes patrimonial type of bureaucracy. According to him, Russia before and after the reforms of Peter the Great was the patrimonial state. The bureaucratic apparatus of the XVIII century in Russia. Weber compares with the Chinese bureaucracy, both in Russia and in China, the public service and was a source of political power, and also made

it possible to enrich the material. Differences is that the nobility in Russia are not only government officials, as well as masters of their estates. But, despite this, the occupied status in Russia is directly dependent on the civil servant. Weber notes, "Peter the Great abolished the previous titles and privileges of the Russian nobility in favor of two simple principles: 1) Chin appropriated only for the service on the patrimonial-bureaucratic positions (civil or military), and it is dependent on the relative position of the person in the patrimonial-bureaucratic hierarchy fourteen ranks. Since the nobility did not have a monopoly on the post, and for their occupation is not required mandatory possession of landed property, but was required – at least – in theory – a certain level of education, there is, apparently, there is a similarity with the situation in China. 2) the nobility right is ineffective in two generations, if their owners did not receive the service. It is also reminiscent of the situation in China. But the rights of the Russian nobility included, among other privileges, the exclusive right to own land, populated by serfs. Therefore, the nobility was associated with the prerogatives of the manor patrimonialism of this kind, which was completely alien to China. Practice noble title deprivation in the absence of a ceased service reign Peter III and Catherine II. But the rank remained the basis of social prestige, and at least a temporary service in public office is a status convention for young nobles" [4]. Weber does not characterize the transition from patrimonial management system to the bureaucracy of the modern type in Russia. In "Economy and Society" description "of the tsarist patrimonialism" brought only before the end of the XVIII century.

The second type of bureaucratic organization Max Weber presented an ideal model of rational bureaucracy. Ideal type – this is an abstract description, which strengthened some of the features inherent to real cases. The main characteristics of a rational bureaucracy are such indicators as, for example, submission to official duties, availability of service competencies, professional qualifications and monetary maintenance, etc.

So, Weber pointed out that in bureaucratic organizations the ability to rationalizing activities, clear separation of functions, hierarchical system of relations and control over the activities of officials, submission of work to the formal rules, the ability to implement a professional selection of applicants the public service. "The true profession of the official ... should not be a politician. He must "manage" primarily impartially ... Sine ira et studio – without anger and passion he has to administer affairs. So ... the official should not do exactly what has always and necessarily must make policies – as the leader and his entourage – to fight" [3, P. 666].

According to the researcher bureaucracy G.V. Pushkarevoy: "Weber formulated the basic principles of bureaucratic organization and dichotomy "politics – management" were those methodological premises, which have provided a special niche in the bureaucracy of social and political knowledge. Thanks to these premises bureaucracy was relatively easy to isolate from the political elite, from other social groups, thereby turning into an independent object of study" [5, P. 79].

Thus, bureaucracy (namely rational) characterized M. Weber theoretically – as an ideal type having a character of "model", which should then be compared reality. However, according to the just remark of modern domestic researcher of M. Weber M.V. Maslovskogo "... ideal-typical model of rational bureaucracy ... is only one element of a more general theory of bureaucracy, developed by the German sociologist. Only in the 70th years, with the beginning of "Weber renaissance" begins a series of Western authors attach greater importance to those aspects of the sociology of Weber's bureaucracy, which had hitherto been in the shadows.

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THE DEVELOPMENT OF NEW TECHNOLOGIES IN THE TOURISM INDUSTRY

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The Tourism industry is the most promising direction of development of the region. The Belgorod region has a fairly high tourist and recreational potential. Ecological tourism is the most popular and essential type of tourism. Belgorod region is Chernozem recreational area. The climate of an area is relatively favorable for tourism and is characterized as moderately comfortable. The region has a rich recreational potential, stable political environment, diversity of historical and cultural heritage, which contributes to the development of ecological tourism. In this work a new technology in the travel industry. The author proposes designed and engineered, a new weekend tour, in borders of especially protected natural territories in this article.

Keywords: ecological tourism, designing tours, Belgorod region, weekend tours

For most people, tourism is associated with relaxation, new experiences, fun. He is firmly entrenched in human life with its natural desire to discover and learn different places, monuments of nature, history and culture, customs and traditions of different peoples. The last decades marked intensive development of tourism and recreation sphere, due to economic, environmental and social needs of society. A high profitability of this direction, the possibility of obtaining investments during starting a business, small costs of opening new work places determine the economic component; need to restore health, vitality of people in a clean environment through the reduction of dangerous living space determine ecological component; the population growth of the planet, its cultural level, prosperity, expansion of the range of needs that include the desire for a healthy lifestyle, active recreation determine social component [1].

Different kind of presupposition preceded the birth and development of ecological tourism. Among them increasing due to mass tourism anthropogenic stress on natural, cultural and historical tourist resources is the leading role.

Ecological tourism is a complex, interdisciplinary field, which integrates the interests of tourism, conservation and culture, and its role can be substantial [2].

One of the problems of ecological tourism is to teach people, to love and respect nature, to understand its laws, to treat it consciously and carefully. Tourist hotels, campsites, resorts that are situated among untouched nature and where people attend ecological problems attention, preservation of natural landscape and cultural heritage, are becoming more popular and attract new, eco-conscious and experienced travelers.

Ecological tourism appeared on the basis of the demand for untouched corners of nature with a purpose without violating the integrity of ecosystems to get an idea of the natural, cultural and ethnographic features of this territory, must be created such economic conditions in which nature conservation is beneficial to the local population.

Ecological tourism includes several key criteria: the main attracting tourists attractions are natural sight (flora, fauna, geological features). The features of the cultural environment are the next most important component. the emphasis is on the study and understanding of resources per se, and the activities of tourists and other participants has a mild effect on the physical and cultural environment in the visited region. Ecological tourism must be interconnected with the concept of sustainable tourism without exceeding recreational capacity of the visited areas, and must be acceptable to local communities and supporting them. The ecological tourism must satisfy wish and stimulate communication with nature, prevent negative impacts on nature and culture and encourage tour operators and tourists to promote the protection of nature and social and economic development [3].

Ecological tourism became an independent type of tourism. It is based on natural, historical and cultural potential of country or region, including natural features, socio-cultural environment with traditions and customs, peculiarities of everyday activities.

Methods and methodology of research

Belgorod region is Chernozem recreational area. The climate in general is relatively favourable for tourism and is characterized as moderately comfortable. The region has a rich recreational potential, stable political environment, a variety of historical and cultural heritage, which contributes to the development of ecological tourism.

The program of weekend tour in the reserve "Natural and antropogenic territory of the region"

Day	Measures
1st Day	– ingathering group; – the road (2 – 2.5 hours) – preparation of equipment, instruction; – dinner; – encamping; – Hiking popular scientific excursion through the nature reserve "Belogorye" plot "Yamskaya steppe"; – supper, evening bonfire, discussion about visiting reserve.
2nd Day	– breakfast; – excursion on mining and processing plant; – examination of the pit of Lebedinsky GOK; – a visiting to the active tailing pit of the Lebedinsky GOK; – supper, discussion about anthropogenic impact of human activities.
3rd Day	– breakfast; – ingathering camps; – return route to Belgorod.

The Belgorod region has a fairly high tourist and recreational potential. There are unique natural and recreational resources, objects of national cultural and historical heritage are an important economic, cultural, social and sporting events. Analyzing resources for the development of tourism in the Belgorod region, we note the enormous potential of this opportunity in the region. Belgorod region has the richest sources of spiritual, moral, aesthetic and artistic culture. Cultural heritage was created over many centuries, cultivated, enriched, passed down from generation to generation. The region is one of the most attractive tourist regions of Russia. There are 2000 thousand monuments of history and culture, including 908 archaeological, 245 monuments of architecture, 745 monuments of military glory in the Belgorod region. There are 35 monuments of history and culture of Federal value. Unique natural areas of the region combined in the state nature reserve "Belogorie" [4–6].

Tourists can visit the tour ecological paths and trails On territory of the Belgorod region. Modern techniques to create training and educational ecological paths and routes can be used for the design and justification of ecological routes. In the development and design of environmental routes takes into account various factors: physical-geographical and social and historical properties of the site which develop tourism product, age, professional, ethno-psychological nature of the group that directed tourism product, qualification of guides, investment opportunities development ecological tourism. In the region there are a number of popular ecotourism routes, which, unfortunately, have little demand and poor informational cover [7–9].

Results of research and their discussion

In this article we want to propose a new weekend tour, in borders of especially protected natural territories of the nature reserve "Belogorye", "Yamskaya steppe". This tour is one of the types of ecological tourism, which is called "Tour of natural and antropogenic territory of the region". It is a journey associated with knowledge of the natural environment (Table).

Typically, such a developed tour represent a set of educational, popular scientific and thematic tours through the specially equipped ecological trails. Designed tour does not require much time and special skills, This tour is for the unprepared traveler with an active lifestyle aged 18 – 45 years.

The number of tourists in the group is about 15 people. It is anticipated that this weekend tour will be in the spring and summer season. The price includes: transfer by bus from the Belgorod and back, rent of tourist equipment (tent, sleeping bag), meals, services of guides, cooks and medical insurance.

Conclusion

Weekend tour "Natural and antropogenic territory of the region" will contribute to the development of ecological tourism in the region, tourists can learn about the unique natural and human territories, and the travel agency will be able to increase the efficiency of its activities. the travel agency now offers a variety of routes. Our offer includes a full ecological and popular science weekend tour that covers all the natural splendor of the Belgorod region, where the journey will be an unforgettable trip, a discovery which will stimulate the development of tourism industry in the region and solve the problem of the narrow orientation of travel companies.

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NEW CONCEPTION OF CREATION OF "ZERO" ECOBUILDINGS AND ECOCITIES ON BASE OF ECOLOGICAL INFRASTRUCTURE

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New science "ecocitylogy" as new conception of creation of "zero" ecobuildings and ecocities is based on three principles: "zero" interference in the nature, "zero" consumption of consumable resources from state networks, "zero" emission of pollution. The basis of "zero" ecobuildings and ecocities creation is new branch in building ecology – ecological infrastructure (it is complex of natural resources, constructions and systems, providing support of environment of human life at all levels – from the whole country up to cities and to separate buildings). Environment of life and environments of "zero" buildings and cities must be subject to all-embracing ecologization. All-embracing ecologization is system of upbringing of ecological thinking for respective activity and for use of ecological decisions based on ecological postulates, ecological philosophy and ethics, principles of sustainable building, adoption into account ethnical and geographical traits, social-psychological and social-economical features of inhabitants in city.

Keywords: ecocitylogy, conception, ecological infrastructure

Three principles of new conception of "zero" ecobuildings and of "zero" ecocities creation include the following important parts of positive interaction of humanity with nature: "zero" interference in the nature; "zero" consumption of consumable resources from city networks; "zero" emission of pollution. Every part consists of several factors (table 1). One of the most important factors is preservation of landscapes with soil – vegetative layer from buildings and engineering structures. The surface of the ground in ecocity should be free; it may be filled by natural and cultural landscapes, and exempted from transport (fig. 1). This problem can be solved by overground and underground construction.

Zero" ecocities with ecobuildings may include all components of natural landscapes; all complex of protected natural territories; all technosphere, all directions of human activity – architecture, construction, industry, power, transport, water supply, removal and processing of waste products; socio – psychological and socio – economic environment; ecological satisfaction of needs of inhabitants. Ideological base of "zero" ecocities creation should be ecological postulates.

Results of research and their discussion

It is possible to believe, that the "zero" ecocities with ecobuildings with equality between their citizens can be created by help of new scientific complex inclusive urban ecology, architectural ecology, building ecology, ecological infrastructure, resilience of life in city, sensory ecology, ecological philosophy, ecological ethics, socio-psychological and socio-economic decisions [1-5]. This new scientific complex and its usage will allow creating ecological healthy cities and settlements, to stop retreat of nature, and to achieve a state of ecological equilibrium. Urban, architectural and building ecology is interconnected sciences about making of settlements and buildings, which are in balance with nature, and allow creating high-quality environment in region, cities and in buildings. These purposes are achieved by ecological decision of territorial, planning, geological, geographical, biological, hygienic, architectural, technical and aesthetic problems starting with general town planning scheme and ending with construction of biopositive buildings. Solution set includes many directions of ecological construction, from biopositive buildings for preservation of soil-vegetable layer with flora and fauna, to backing of flora and fauna by help of creation of ecological framework, etc. (table 2) The new scientific complex should help to solve problems of "zero" ecocity and ecobuildings creation, including at gradual ecological reconstruction of any city. This complex consists of three principal directions: ecological environment, ecological activity, and ecological society. All these directions are equally important for forming of "zero" ecocity and ecobuildings.

New complex of interconnected sciences for healthy cities creation includes the sciences about ecological, healthy, sustainable and beauty cities with high-quality environment of person's life and with environmental technologies: urban ecology, architectural ecology, building ecology, ecological infrastructure, sensory ecology, and ecological ethics. Creation of "zero" ecocity is based on inculcation of ecological thinking, ecological culture, ecophilosophy, and ecological ethics. It is possible to assert, that ecological compatibility,

biopositivity of "zero" ecocity, their life in harmony with the natural environment as allied component is the good way of the development, allowing carrying out eternal humanity's dream of unity with nature.

The fundamental concept of ecocities will be invariable: they will be in ecological equilibrium with nature, and thus to create ecologically well-founded high quality environment life for inhabitants. But they will differ essentially from each other by set of individual decisions – from the size of city up to a degree of use of renewable resources, from a degree of preservation of the natural environment up to use of local materials, from a degree of equality of inhabitants up to a level of satisfaction of needs of inhabitants, etc. A base of new scientific complex is ecological infrastructure (table 3). Ecological infrastructure is complex of natural resources, constructions and systems, providing support of environment of human life at all levels – from the whole country up to cities, to separate buildings and engineering constructions. Ecological infrastructure includes interactive among themselves completely natural environment, quasi-natural cultural environment – cultural landscapes etc., artificial technical environment of cities, socio – psychological and socio – economic medium (table 3). Ecological infrastructure is the interactive among themselves mastered and natural territories, ecological framework of city and green corridors, soil – vegetative layer, biopositive and "clever" buildings, systems of phyto-melioration and permaculture, ecologically restored landscapes and ecologically reconstructed buildings, favourable perceptible city environment, favourable conditions of life.

Table 1

Principles of creation of "zero" ecocities and ecobuildings

Three principles of creation of "zero" ecocities and ecobuildings		
"Zero" interference in the nature	"Zero" consumption of consumable resources from city networks	"Zero" emission of pollution
"Zero" built-up area of buildings	Use of natural technologies in lighting, ventilation, conditioning, etc.	Use of ecological life cycle by creation and maintenance of buildings and cities
Overground and underground buildings	Energy-active buildings	Use of ecological and recycled building materials
Sensory likeness of built-up territory to nature	Energy-efficient buildings	Use of systems of renewable energy from bio-waste
Minimal interference to natural circulation of matter	Reduction of water consumption	Use of systems of biological purification of waste
Planting of greenery of all artificial surfaces of buildings	Renewable thermal energy generation	"Zero" water drain
Support of being of small animals and birds	Utilization of thermal waste	Utilization of all waste
Creation of green corridors for support of biovariety	Use of intelligent (clever) systems in building and city for achievement of "zero" effect	

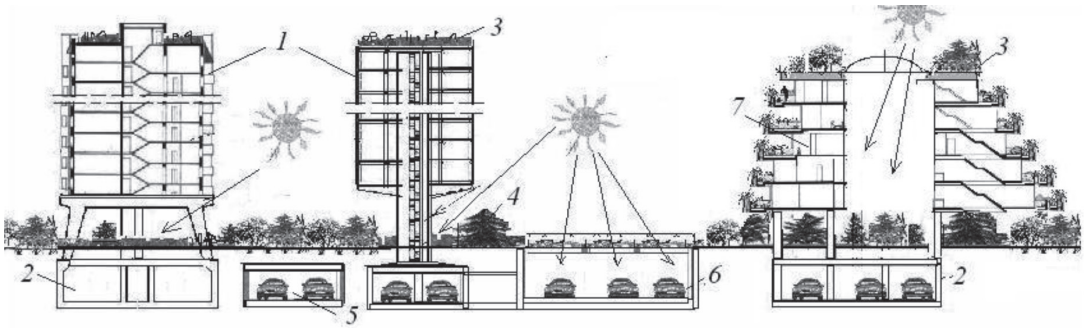

Fig. 1. Scheme of "zero" ecocity with ecobuildings: 1 – overground buildings: 2 – underground parts of buildings; 3 – green roof; 4 – soil-vegetable layer; 5 – underground structures; 6 – underground street with sun lighting; 7 – "green hill"

Table 2

Scientific complex for "zero" ecocity and ecobuildings creation

Ecological environment	Ecological activity	Ecological society
All-embracing ecologization of environment	All-embracing ecologization of all activity	Support of equality
Support of ecological balance between city and nature	Resilience of socio-ecological system of city	Support of equal rights in free access to all world resources
Creation of ecological framework of city and region	Resilience of social component of system	Ecological upbringing and education
Creation and support of well-founded ecological infrastructure	Resilience of ecological component of city. Support of well-founded ecofootprint	Eco-philosophy, ecological ethics of inhabitants
Support of well-founded volume of nature	Urban ecology. Phyto-melioration.	Maintenance of ecological rights of inhabitants
Maintenance of flora and fauna by help of human activity	Architectural-constructive ecology. Sensory ecology (visual, smell, sound)	Ecological rights and duties. Participation in support of healthy environment
Restoration of all components of landscapes	All-embracing ecologization of industry, transport, etc.	Upbringing with help of beauty environment. Love to city

Table 3

Frame of ecological infrastructure

Artificial environment with all-embracing ecologization	Completely natural environment	Quasi-natural (cultural) environment
Technological systems with their ecologization	All natural territories with natural flora and fauna	Created by the person green areas
Traditional infrastructure with ecologization	All natural resources	Ecological built environment
Systems warning and liquidating adverse phenomena	Natural ecological framework with ecological corridors	Ecological cities and towns. Ecological buildings
Socio-economic and socio-psychological medium		

Urban ecology is most general science for ecological design of territories of cities and towns. It includes the decisions of ecological problems of big territories. The major problem of urban ecology is creation of the ecological framework of big territory. Ecological framework of Earth is system of large natural territories, which are interconnected by ecological corridors, indissoluble interrelation of which allows supporting ecological equilibrium, environment of life, and biovariety.

"Zero" ecobuildings should be multifunctional, and alongside with the basic function (apartment house, industrial building, see shore construction etc.) can carry out one or several nature protection functions. "Zero" ecobuildings can use the renewable energy; they can clean polluted air and water through surfaces of buildings contacting with air and underground water by way of setting on all surfaces of walls of filters with compulsory circulation of polluted air and water (fig. 2).

Natural and improved cultural landscapes are the basis of ecological framework of city, united by "green corridors", "green wedges" sites of nature of various areas. The ideal ecological framework of city should look like a network with "cells" of nature including all components of natural and cultural landscapes in regular intervals distributed on the area – forests, parks, rivers, lakes, meadows, hollows, heights, squares, gardens and so forth. At their absence, it is necessary to create cultural green corridors that can be accompanied by formation of new "cells" of framework if their area on territory of city is small or if their number is insignificant. Architecturally – constructive ecology contains two complexes of ecology knowledge's: complex of general knowledge that allows forming the ecological thinking of builders, and complex of special ecology thinking for ecologization of building. Resilient environment of life of person presupposes a presence of conditions providing long, practically endless, satisfaction of essential (prime) and other ecologically well-founded

needs necessary for human life, raising quality of the life, forming the harmonious social environment. For achievement of ecological equilibrium and high quality environment of life, it is necessary to keep ecologically well-founded territory of nature in all its biodiversity, to change interaction of person and technologies with nature. In "zero" ecocity may be used intelligent ("clever") buildings, patent of A. Tetior, Russia, № 2033126) (fig. 3).

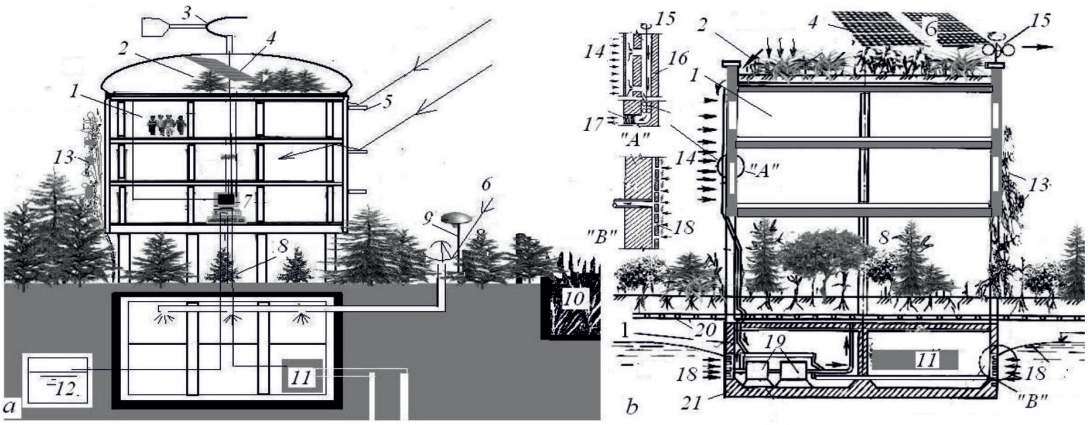

Fig. 2. "Zero" buildings: a – with use of renewable energy; b – with cleaning of polluted air and water: 1 – overground building;2 – winter garden; 3 – natural ventilation (such as a hood); 4 – solar battery; 5 – receipt of light due to reflecting a venetian blind; 6 – daylight into basement; 7 – computers for receipt of the data from devices (sensors); 8 – trees under building; 9 – solar energy for night illumination; 10 –"living machine" for black water cleaning; 11- thermal pump of system of geothermal heating; 12 – collection of "grey" water; 13 – vertical greenery; 14 – polluted air; 15 – wind turbine; 16 – canal for air;17 – filter; 18 – polluted water; 19 – pump; 20 – perforated pipe; 21 – underground part of building; "A", "B" – details

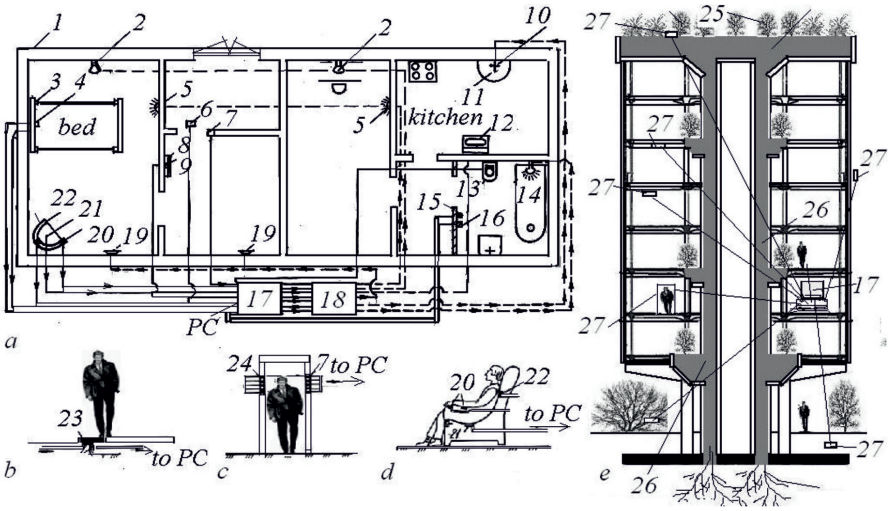

Fig. 3. Plan of intellectual home with the indication of the locations of detectors (sensors) and effectors (executive mechanisms) (a); details (b-d); soil-filled building (e): 1 – external wall; 2 – spray for supply of aerosols; 3 – resistive-strain sensors on bed; 4 – sensor (receiver) of exhaled air; 5 – lighter with color filters; 6 – sensors of weight of body in floor; 7 – photo-resistors in a jamb of door; 8 – mirror; 9 – transmitting color TV camera; 10 – supply of medicinal additives in potable water; 11 – wash-bowl; 12 – display with conclusion of the data on a recommended diet and a healthy way of life; 13 – the sensors in "clever" toilet; 14 – tube for introduction of medicinal additives in water in douche and in bath; 15 – thermovision camera; 16 – equipment for control by method Kirlian – effect; 17 – system of executive mechanisms; 18 – microprocessor; 19 – loudspeaker; 20 – sensors of blood pressure and heartbeat; 21 – resistive-strain sensors in sitting of armchair; 22 – microphone; 23 – sensors of shuffling in floor; 24 – sources of light; 25 – green roof; 26 – soil in vertical canals; 27 – various sensors on floors

The intelligent ("clever") buildings supervise constantly through system of sensors the condition of the external and internal environment and at deviation of parameters from norm includes the effectors clearing, for example, environment from pollution, or improving other parameters. The "clever" building should create optimum conditions for people, which are in it. Automatic sensors serve for support of normal physical and psychophysiological conditions of people environment. Such building contains sensors (converters), located in places of the best selection of the information on parameters of physical and psychophysiological conditions of people (they determine blood pressure, frequency of breath and heartbeat, a timbre and loudness of a voice, a condition and color of iris of the eyes, weight and growth of the person etc.). They transmit these parameters in the computer. The computer analyzes normal and current parameters based on medical expert system (MES) and at deviation from norm, it signals about the beginning of illnesses. The computer gives out signals on the executive mechanisms (on the basis of the data incorporated in memory) giving in rooms medical aerosols and the appropriate additives for smells; medicinal additives in potable water, in water for douche or bath; creating necessary (raised or lowered) temperature and humidity indoors; giving out on the monitor in kitchen the recommendation for a meal; cut-in appropriate (the soothing or stimulating) music, appropriate holographic or other pictures on walls; it allows to support in due time health of the person and to remove a psychological pressure.

Conclusion

The building of ecological cities, providing high-quality living environment, satisfying the environmentally well-founded needs and not polluting the nature is a centuries-old dream of humanity. A theory of ecocity creation is being developed now; its volume of realization limited in different regions of the World. Creation and implementation of the theory of ecocity ("ecocitylogy") is complicated by the development of global and local ecological crisis, traditional development of entropy engineering and technologies, continued pollution and displacement of nature, many undecided environmental and social problems. Ecocitylogy is science of future. Undoubtedly, the "zero" ecocities and ecobuildings are the attractive future of humanity. New scientific complex may help to form new ecological thinking of future specialists – authors of "zero" ecocities. All-embracing ecologization of all directions of people activity may be the basis of creation of future realistic ecocities.

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THE JUSTIFICATION OF APPLICATION OF MAGNETOSONIC WATER FOR ORAL CAVITY'S HYGIENE AND TREATMENT

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A microscopy of the preparations of dried oral liquid revealed turbidity of the background, the presence of the peeled epithelium of the oral mucosa, microflora, in a small quantity fragments of the dental plaque and tartar, crystals. The crystals were deformed, thinned, varied in size and location. The basis of crystals is a calcium phosphate. Contaminated oral liquid contributes to the formation of tooth decay and inflammation of the gums. The distilled water used for scaling of the teeth, activated by low-frequency sound and, in addition, by energy of a constant magnetic field, cleans oral liquid better and initiates a more perfect crystal formation than just sound water. The crystallography of a dried oral liquid visualized the effect of transformation of water after its activation by sound, that was slowly increasing to the 3rd day and its extinction on the 6-7th day, the magnetosonic energy intensified and extended the effect of activation up to 10 days. Effective was a one-time activation procedure, especially the exposure of 9 minutes. Activated by low-frequency sound in the field of a permanent magnet water is recommended to use in order to prevent pathogenic mineral formation after basic scaling of the teeth in the form of rinses, irrigations, baths, for dental cleaning and preparation of medicines. The activated water is stored in a container wrapped in foil.

Keywords: oral liquid, water, low frequency sound, constant magnetic field, cleansing, crystals

The tartar is formed as a result of the inclusion in the dental plaque of chemical macro- and microelements from the oral liquid, which during drying forms crystals with the basis of calcium phosphate [1]. The tartar is mainly represented by three types of apatites, the stability of which decreases in sequence of: hydroxylapatite > fluorapatite > francolite [5]. Scaling of teeth is carried out using the energy of sound, that breaks intercrystalline and intermolecular bonds, and water due to cavitation and turbulence [7]. The energy of a permanent magnet increases the fluidity and purifying properties of water [8]. In the field of a permanent magnet, the blood becomes less viscous, the oedema of tissues decreases, and the pharmacological action of the drugs improves [6]. An electric sound toothbrush is used for teeth cleaning [4]. Water, activated by ultrasound energy, low-intensity laser radiation, their combination, preserves the effect of interaction with a biological fluid for more than 10 days, transforms it [2]. Sound scaling of teeth improves the properties of oral liquid [3]. The effect of magnetosonic water on the patient's oral fluid, crystal formation has not been investigated.

Goal. To study the properties of the oral liquid interacting with magnetic sound water in dynamics with the method of microcrystallography, to establish effects of impact, duration of the consequences, give recommendations for the use of activated water for the prevention of pathogenic mineralization, oral hygiene and the treatment of dental patients.

Materials and methods of research

Oral liquid of 9 patients aged 19-22 years, men (n = 5) and women (n = 4) was examined. The oral fluid intake was done with the help of a sterile syringe from the bottom of the oral cavity in 3-4 hours after eating. Oral liquid (V = 1.0-1.5 ml) was placed in test tubes. Preparations of smears for microscopy on the subject glasses were prepared by dehydration method (t = 24 °C). Water during the scaling of the teeth was activated, sprayed with a low-frequency sound from the scaler, AS 2000 (Japan), f 6200 – 6450 cycles / second, the dental unit GNATUS (Brazil). Magnetic voiced water was formed, passing through a ring magnet, B 40 mT, put on the sound scaler's nozzle. The water from the working scaling's nozzle was collected into tubes, wrapped in foil, stored for 10 days for the further research. Water, activated by sound or activated by sound in the field of a permanent magnet, was dripped (V = 0.05 ml) by a smear of dried oral liquid, which was the basic background, the control for comparison. The drop formed a spot (d = 10 mm) in the center of the preparation from a mixture of oral liquid and water. The preparations were dried in the air (t = 24 °C).

Two series of experiments were performed. In the first series, micro-preparations (n = 36) of the oral liquid interacting with distilled sound water were analyzed. The time of a single activation by sound was 1, 3, 6, 9 minutes. Samples of water were taken for the study in 1, 3, 6, 10 days after activation. In the second series, micro-preparations of the oral liquid interacting with distilled sound magnetic water (n = 36) were analyzed. An exposure of a single activation and the period of the studying after it were the same as in the first series. Analysis and description of oral fluid preparations were performed with a BI MAM R-13 microscope, an increase of 10x40, and a PC, displaying the image on a monitor.

Results of research and their discussion

The microscopy of preparations, controlled, without effects, showed that the oral liquid is muddy, contained the disintegrated epithelium of the oral mucosa, microflora, in a small number fragments of plaque and tartar, crystals. The crystals were different in shape and size, disposition, were thin, curved, fig. 1. A distinction between the background of the

oral liquid and the light spot of the mixture of oral liquid and water was made. The contours of the spot and the features of the formation of crystals were determined by the experimental conditions.

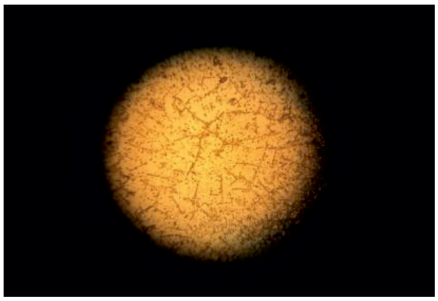

Fig.1. Oreparatus of oral fluid. Control. The background is muddy. Crystals are thin, deformed, peeled epithelium of the oral mucosa

The analysis and description of the selected micro-preparations of the patient F., 21 years old, illustrating the typical interaction of oral liquid and modifications of activated distilled water were given. *Series 1.* Preparation: a mixture of oral liquid and distilled water, sounded during the 1 minute and taken for the research on the next day from the beginning of the experiment. The spot of the mixture is lighter than the surrounding muddy main background, the crystals were more structured. *Series 1.* Preparation: a mixture of oral liquid and distilled water, sounded for 3 minutes and taken for analysis on the 3rd day after activation. The oral fluid of the main background was turbid, there were small crystals and their fragments. The mixture of oral liquid and activated water was light, purified, and large crystals were formed. *Series 1.* Preparation: a mixture of oral liquid and distilled water sounded for 6 minutes were taken for the research on the 3rd day after activation. In the spot the background was light, sound waves have moved impurities to the periphery, forming a belt without crystals between the liquids. Crystallization in the mixture was more intense than the crystallization of the oral liquid of the main, turbid background. *Series 1.* Preparation: a mixture of oral liquid and distilled water, sounded for 9 minutes and examined on the 3rd day after activation. Activated water cleared and improved the formation of saliva's crystals, sound waves shifted the impurities, forming a border belt of homogeneous mass that separated the liquids. Oral liquid of the main background was turbid with fragments of crystals. Activated by sound for 9 minutes, the water cleared the oral fluid more qualitatively in comparison with the exposures of 3 and 6 minutes, Fig. 2. *Series 1.* Preparation: a mixture of oral liquid and distilled water, sounded for 6 minutes and examined on the 10th day after activation. The differences were barely noticeable between the main background (darker) of the oral liquid and the background of the mixture of oral liquid with sounded water, there is no liquid separation belt. In the mixture the crystals were more structured. The extinction of the structural-modifying effect of the low frequency sound in distilled water to the 10th day after activation was observed, Fig. 3.

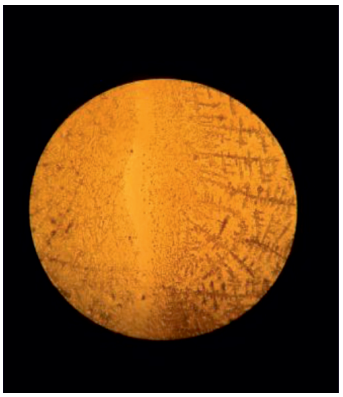

Fig. 2. Micro preparation. Series 1. Mixture of oral fluid and distilled water, sounded for 9 minutes and examined on the 3rd day after activation. On the right: background is light, obvious crystallization. On the left: the background is muddy, the crystals are located chaotically, thinned. In the center: a belt without crystals between the liquids, formed as a result of the displacement of impurities by sound waves on the periphery of the spot

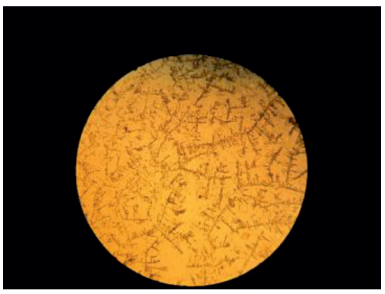

Fig. 3. Micro preparation. Series 1. Mixture of oral fluid and distilled water, voiced for 6 minutes and examined on the 10th day after activation. On the right: background is light, the crystals are long, thin, curved. On the left: the decomposition of oral fluid crystals. There is no belt between the liquids. The effect of water transformation by low-frequency sound on the 10th day of observation almost disappeared

Series 2. Preparation: a mixture of oral liquid and distilled magnetic sounded for 3 minutes water taken for the study on the 3rd day after activation. Magnetosonic water purified the oral liquid better than the preparations of the 1st series, the background of the mixture was light, a large number of crystals was formed. Oral liquid of the main background was turbid and included elements of crystals. *Series 2.* Preparation: a mixture of oral liquid and distilled magnetic sounded during 6 minutes water, examined on the 3rd day after activation. Activated water purified the oral liquid, crystallization was restored. Magnetosonic waves shifted impurities to the periphery, compressed, a strip without crystals between the liquids appeared. Oral liquid of the main background became more turbid, included particles of crystals, Fig. 4. *Series 2.* Preparation: a mixture of oral liquid and magnetic distilled water, sounded for 9 minutes, examined on the 3rd day after activation. Longer activation of water cleared the oral liquid better. Structured crystals appeared. The main background around the spot became more turbid and included small fragments of crystals. The magnetosonic shock wave pressed the impurities into the sediment, shifted spots to the periphery, formed a wide belt without crystals between the liquids, Fig. 5. *Series 2.* Preparation: a mixture of oral liquid and magnetic distilled water, sounded for 9 minutes and examined on the 10th day after activation. Oral liquid was purified by activated water, the background was light, the crystals were small, structured, there was not belt between the liquids. The main background of the oral liquid is muddy, dark, and included fragments of crystals. The effect of transformation by magnetosonic energy of water has significantly decreased on the 10th day after activation, Fig. 6.

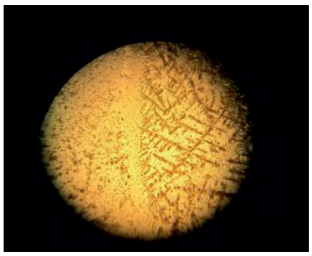

Fig. 4. Micro preparation. Series 2. Mixture of oral fluid and distilled magnetic sounded during 6 minutes water, examined on the 3rd day after activation. On the right: background is light, obvious crystallization. On the left: oral fluid is muddy, fragments of crystals. In the center: a belt is without crystals between liquids, formed as a result of the shift of impurities by magnetosonic waves to the periphery of the spot

Fig. 5. Micro preparation. Series 2. Mixture of oral fluid and distilled magnetic sounded during 9 minutes water, examined on the 3rd day after activation. On the right: background is light, obvious, perfect crystallization. On the left: background is muddy with fragments of crystals. In the center: a wide belt of separation without crystals between liquids was formed, the impurities were shifted by magnetosonic waves to the periphery of the spot. Exposure activation for 9 minutes is more effective than 3 and 6 minutes

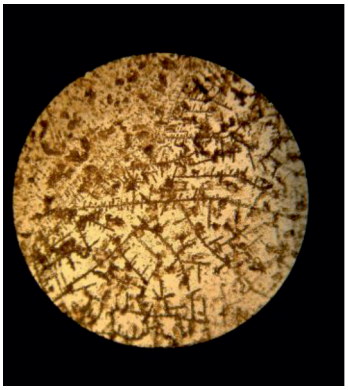

Fig. 6. Micro preparation. Series 2. Mixture of oral fluid and distilled magnetic sounded during 9 minutes water, examined on the 10th day after activation. On the right: background is light, the crystals are long, thin. On the left: background is dark, fragments of crystals. There is no belt between the liquids. The effect of magnetosonic water activation significantly decreased on the 10th day of observation

Contaminated oral liquid lost its physiological properties, the ability to form qualitative crystals, turned into a factor capable to initiate the development of tooth decay, inflammation of the gums. The effect of water transformation by sound energy, magnetosonic impact, its transmission of the oral liquid was visualized by crystallography. The effect of water activation by low-frequency sound increased by 3rd and decreased on the 6th day after exposure. Magnetosonic energy showed a synergy of

interaction, strengthening and increase in the duration of the activation effect up to 10 days. Effective were single exposures, taken for the research, especially 9 minutes. Activated water purified the oral liquid, crystallization was restored, sound or magnetosonic waves shifted the impurities to the periphery with the formation of a compressed sediment. The patient's scaling of the teeth lasted from 2-3 to 60 minutes. Sound, magnetosonic energy through water were transmitted to biological fluids, penetrated into the tissue fluid, saliva, blood, lymph, and spread throughout the organism. Trace reactions should be taken into account in indications for scaling of teeth with the use of physical factors. Basic scaling of the teeth is recommended to indirectly support with the rinsing of the mouth with activated water to prevent the formation of plaque and tartar, before and after a night's sleep and meal. For those who are working in enterprises with harmful working conditions is recommended to rinse the cavity more often, each 2-3 hours. It is recommended to brush your teeth with an electric sound toothbrush, using magnetic water once per day, toothpaste or tooth powder is not required, or can be taken in a minimal amount. Magnetosonic water can be used for procedures in hydrotherapy and phytotherapy, should be stored in a container wrapped in foil.

Conclusion

Contaminated oral liquid loses its physiological properties and the ability to form high-quality crystals. Crystallography of a mixture of oral liquid and water visualized the effects, the duration of water transformation by sound energy and magnetosonic impact, and its translation to other liquids. Magnetosonic water retained new properties for a longer time, it cleaned the oral liquid better, restoring the formation of crystals than only sound distilled water. It is recommended to use activated water for cleaning the oral cavity, supporting effect of basic scaling of the teeth, for the prevention of pathogenic mineralization, for the treatment of gingivitis, periodontal diseases and oral mucosa, using in the form of irrigation, applications, baths, rinses, add to medicinal liquids.

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FATTY ACID COMPOSITION OF EXHALED MOISTURE VAPORS IN CHILDREN WITH BRONCHIAL ASTHMA

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The article is devoted to the fatty acid composition of exhaled moisture vapors in children with bronchial asthma. The problem of bronchopulmonary pathology in children living in the sharply continental climate of Transbaikalia is discussed in the article. Numerous factors that contribute to the development of bronchial asthma are indicated. A special role among these factors belongs to the intensification of lipid peroxidation and antiradical protection in "the large biological membrane of the lungs". The parameters of the processes of lipid peroxidation in the vapor of exhaled air and blood serum in children suffering from bronchial asthma are studied [8, 9]. Particular attention is paid to the study of the values of saturated and unsaturated fatty acids and also total lipids in these biological fluids without exacerbation and at the height of the disease. The main attention is focused on new methods of diagnosis. It is recommended to use a simple, atraumatic and non-invasive method – a condensate of exhaled moisture vapors. Studies of the condensate of exhaled air vapors as a medium reflecting metabolism in the respiratory tract and in the body as a whole are widely used in clinical practice including pediatrics [2,11]. That's why the spectrum of fatty acids in blood plasma and expirate in children with bronchial asthma (BA) is studied. It was revealed that changes in the vapor condensate are more specific in comparison with blood plasma [4, 5, 6].

Keywords: condensate of exhaled air vapors, lipid peroxidation, spectrum of fatty acids, bronchial asthma

Over the past decades the urgency of the problem of bronchial asthma as one of the most frequent and severe allergic diseases has increased significantly. In recent years there is a tendency to the increase morbidity of children with bronchial asthma and its more severe course all over the world including Russia. The number of young children suffering from bronchial asthma is increasing rapidly.

Bronchial asthma (BA) is a chronic disease that causes a significant limitation of life activity and decrease in social and physical activity. The constant attention to the problem of BA is due to the fact that insufficiently effective treatment and frequent exacerbations of the disease may lead to the reduced quality of patients' life and their limited vital activity. Severe forms of bronchial asthma are accompanied by dysfunctions of the respiratory system and other body systems. Disability develops in 7% of officially registered patients with bronchial asthma. Nowadays this problem has not only medical but also socio-economic importance.

At present scientists of most countries in the world have the same views on the main problems of bronchial asthma. For example the Russian national program "Bronchial asthma in children: A treatment strategy and prevention" (1997, 2006) was based on the official WHO report "Bronchial asthma. Global strategy" (GINA project).

Bronchial asthma is a chronic disease mostly based on allergic inflammation. In children with bronchial asthma in the vast majority of cases the development of allergic inflammation is due to atopy. Allergic inflammation is a factor largely determining the relapsing and chronic course of bronchial asthma. Inflamed tissues have an increased sensitivity of bronchial receptors not only to allergens but also to external influences including viral infection and pollutants which may significantly increase bronchospasm development.

The inflammation in bronchial asthma is the main pathogenetic link in the development of bronchial obstruction mechanisms such as bronchospasm, hypersecretion of viscous mucus and edema of the bronchial mucosa. Modern pathologic physiology is based on the key role of intensification of lipid peroxidation processes.

Various environmental factors and inflammation stimulate the activation of lipid peroxidation processes and antiradical protection in the surface-active substances of the lungs. The lung surfactant is a "large biological membrane" including a bilipid layer with phospholipids and cholesterol. Structural components of phospholipids are saturated and unsaturated fatty acids. The role of these structures increases in the pathogenesis of the development of bronchial asthma because polyunsaturated fatty acids of phospholipids of the lung surfactant serve as substrates for peroxide oxidation of lipids.

At the same time the regulation of bronchial tonus is controlled by several physiological mechanisms including complex interactions of the receptor-cell link and the mediator system. These include cholinergic, adrenergic and neuro-humoral systems of regulation.

Respiratory tract injuries are the main causes of childhood morbidity. This pathology has a particular prevalence and frequency

of manifestations especially for Transbaikal region due to its natural and climatic factors. The direct contact of the respiratory mucous membrane and the environment with a large number of damaging factors stimulates the development of various reactions – inflammatory, allergic, irritative, etc.

Based on the pathogenesis of bronchial asthma modern therapy is aimed at eliminating allergic inflammation of the bronchial mucosa, reducing hyper-reactivity of the bronchi, restoring bronchial patency and preventing structural rearrangement of the bronchial wall. Untimely diagnosis and inadequate therapy are the main causes of severe illness and mortality in patients with bronchial asthma.

Materials and methods of research

We examined 168 children with nonspecific respiratory diseases at the age of 3 to 15 years (there were no significant differences in age groups). 28 children had bronchial asthma. The control group consisted of 49 children with the same age, sex and without respiratory disorders.

Materials of the study were expirate and blood serum. The collection of CEAV was performed by method of G.I. Sidorenko [3]. The methyl esters analysis of fatty acids (FA) condensate and blood serum was carried out in general lipid extract of the corresponding samples [4] by means of gas-liquid chromatography (gas chromatograph "Chrom-4") with a flame ionization detector. The instrument was calibrated with the standard mixtures of methyl esters of FA. The FA content was estimated by area peaks. The processing of the results was carried out by the method of variational statistics with the determination of the reliability of the differences by the Student's criterion.

In the blood serum the composition of FA and total lipids were studied by means of "Bio-Lachema-Test".

Results of research and their discussion

The presence of non-respiratory functions in the lungs proves their intensive involvement in the processes of lipid metabolism. We established the discharge of total lipids with the exhaled air vapors in bronchial asthma to be increased by 88.0% ($p < 0.001$) in comparison with the control findings. It means that the activation of the destruction processes in the surface-active phospholipids in the alveolar lining takes place.

The fatty acid composition analysis of the expirate and blood serum in children with BA is presented in Table.

The pathochemical essence of inflammation which is the key link in the pathogenesis of infectious but allergic diseases is largely determined by the mechanisms of mediation. Nowadays a significant role is assigned to highly active substances – lipid mediators such as leukotrienes. Their synthesis processes are associated with activation of phospholipase A2 releasing arachidonic acid from the β-position of glycerophosphatides with the following metabolization along the lipoxygenase pathway. Reduction of the concentration of unsaturated fatty acids is due to the intensification of free radical processes. These representatives of lipids are believed to have a high metabolic activity, energy intensity and a short half-life in comparison with other classes of fatty acids. But hypoxia accompanying all forms of respiratory diseases aggravates their utilization in this direction [1, 6, 7].

The content of fatty acids of total lipids of CEAV and blood serum in children with bronchial asthma (in rel. %, M ± m)

FA call number	Condensate		Blood serum	
	Control	BA	Control	BA
C 14:0	9,52±0,48	11,08±0,83	1,74 ± 0,15	1,27 ± 0,09
C 15:0	8,45 ± 0,59	9,44 ± 0,61	-	-
C 16:0	24,66 ± 0,89	26,10 ± 1,84	26,10 ± 0,72	25,59 ± 0,75
C 16:1	2,94 ± 0,38	3,78 ± 0,82	5,17 ± 0,32	5,40 ± 0,46
C 17:0	8,82 ± 0,50	7,61 ± 0,59	-	-
C 18:0	14,19 ± 0,72	9,08 ± 1,93	10,07 ± 0,30	9,90 ± 0,43
C 18:1	10,13 ± 1,05	10,53 ± 1,87	22,77 ± 0,61	27,97 ± 1,41*
C 18:2	7,72 ± 0,57	9,14 ± 1,53	27,75 ± 0,80	26,85 ± 0,85
C 18:3	4,34 ± 0,61	6,09 ± 1,01	0,64 ± 0,23	0,88 ± 0,29
C 20:0	3,71 ± 0,50	4,10 ± 0,68	-	-
C 20:4	5,55 ± 0,69	3,05 ± 1,82	5,76 ± 0,28	2,14 ± 0,55

Note: an asterisk means significant differences compared to the control. When analyzing the fatty acid composition of blood serum the class of limiting FA was unchanged. The increase of monoenoic acids (19.4%) due to C 18: 1 and the decrease of polyene acids (87.5%) relatively to healthy children were found.

A detailed review of higher fatty acids revealed an unreliable decrease in the concentrations of palmitate (C 16:0) and linoleate (C 18:2) on the background of increasing linolenate values (C 18: 3). It testifies to deep system rearrangements of lipid metabolism and free radical processes both at the level of the whole organism and in the surfactant membrane. It confirms the transition of metabolic pathways to a new level.

Studies of the condensation of exhaled moisture in patients with bronchial asthma were allowed to estimate (indirectly) the fatty acid composition of the surface active substances of the lungs at the height of the disease. The values of the saturated FA decreased to 93.4%. On the background of the relative growth of unsaturated FA they decreased to 14.2% in comparison with the control. The apparent decrease in the amount of stearate (C 18:0) in spite of unreliable increase in the figures of palmitate (C 16: 0) led to a general decrease in the level of saturated FA in children with bronchial asthma. Such fatty acids as C 14:0 and C 15:0 had multidirectional deviations with the unreliable decrease of C 17:0 levels and the increase of C 20:0. C 16:1 tended to the increase while the pool of monoenic compounds was relatively unchanged (C 18:1). There was a relative increase in the content of linoleate (C 18:2) which led to a corresponding trend of unsaturated FA. The imbalance in the ratio of the spectrum of fatty acids and the content of total lipids determines the functional and structural rearrangement of the mucous membrane of the bronchial in case of progression of this pathology.

Conclusions

Thus we can conclude that there is a decrease in the concentration of unsaturated fatty acids in children with a long course of bronchial asthma indicating an imbalance in the surfactants of the lungs. The interpretation of the received data proves the fact that prolonged respiratory failure and long-term infectious stress aggravate the state of the peroxide status of children suffering from chronic bronchopulmonary disease. The manifested deficit of antiradical protective factors testifies to their depletion in the alveolar lining. The deviations from the norm of metabolic parameters in the exhaled moisture are more significant and have a specific character. They can be widely used as a diagnostic criterion in future.

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BIBLIOMETRICAL ANALYSIS OF SAMPLING FRACTIONS OF THE NUMBER OF PUBLISHED WORKS WITH APPLICATION OF MICROWAVE RADIATION, CARRIED OUT ON NEUROPHYSIOLOGICAL OBJECTS OF DIFFERENT KINDS

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Bibliometrical data on neurophysiological published works with application of microwave radiation are presented. Quantitative characteristics of published works carried out on different neurophysiological objects (the brain, the cortex, neurons, nerves) during 35-year time interval (1966-2000) are considered. Among neurophysiological published works with application of this factor predominance of published works, carried out in the brain, was established. Positive dynamics of number of neurophysiological published works of these trends was observed. Conclusion about prospects of investigations of neurophysiological effects of microwave radiation is done.

Keywords: bibliometry, microwave radiation, neurophysiological effects, the brain, the cortex, neurons, nerves

It is known, that biological effects of non-ionizing radiation of different kinds interested humanity for many centuries [6]. In the middle XX-th century heightened attention of researchers on influence of these factors arisen.

The nervous system undoubtedly is of great significance in reactions of organism to non-ionizing radiation [1, 3, 7]. Nevertheless bibliometrical investigation of published material on neurophysiological aspects of action of such physical factors was not carried out up to now. Therefore we began bibliometrical analysis on this problem.

General quantitative characteristics of publications of above-mentioned trends were examined in our recent works. Information accumulated in world on neurophysiological effects of non-ionizing radiation during 35-year period in the later half of the XX-th century (1966-2000) was considered. The state of investigations of these trends was analyzed on the base of the database "Medline" and "Current Content System Search", accessible through Internet. Information on general results was presented in our another published works [2, 4-6, 8]. Quantitative characteristics of publications on neurophysiological effects of electromagnetic fields (EMF) were considered in our previous paper [8].

The present work is devoted to examination of quantitative characteristics of published works on neurophysiological effects of microwave radiation. Bibliometrical data were obtained according to chosen key words and concerned investigations performed in different neurophysiological objects (the brain, the cortex, neurons, nerves) with application of microwaves.

Materials and methods of research

Quantitative characteristics of published works in the field of neurophysiology in world during 35-year intervals in second half of the XX century (1966-2000) were considered. Investigations were carried out by means of mainly the database "Medline" accessible through Internet. Bibliometrical data concerned published works performed in different neurophysiological objects were studied: the whole brain, the cortex, neurons, nerves. Besides in addition published works with application microwave radiation were selected. The numbers of published works of observed trends were determined for every analyzed year with the aid of corresponding keywords.

The comparison of the parts of the numbers of published works, carried out on different neurophysiological objects, in general totality and the comparison of the numbers of published works in different time periods were performed as the comparison of two selective sampling fractions of variants.

Results of research and their discussion

It was found that the number of published works carried out in different neurophysiological objects reached 1401300 in 35-yaer period. The numbers of investigations performed in the brain, the cortex, neurons, nerves were 705259, 180602, 237160 and 278279 correspondingly. The total number of works with application of microwave radiation was 6920. Materials concerned investigations in different neurophysiological objects under action of microwave radiation were considered for every year during 35-yaer period.

General characteristics of received totalities are presented in Table 1. Sampling fractions of received data from the total number of works with application of microwaves and from the total number of works carried out in corresponding neurophysiological objects are shown in Table 2. Dynamics of the considered sampling fractions are demonstrated in Table 3.

Table 1 shows that investigations made on the whole brain with employment of microwave radiation predominate. Sampling fractions from total dada (1435) of neurophysiological works with microwaves were for the

brain – 62,65 %; for the cortex – 15,68 %; for neurons – 11,50 %; for nerves – 10,17 %. This phenomenon is the result of increased interest of specialists of applied sciences to investigation of effects of physical factors in the whole brain [6].

Table 2 demonstrates that among sampling fractions of neurophysilogical works with microwaves from total number data with microwave radiation (6920) those, carried out in the whole brain, prevail. These facts conform to above-mentioned supposition.

Table 1

General data on the number of published works carried out in different neurophysiological objects with application microwave radiation during 35-year period

Objects	Characteristics of totalities			
	Total number of papers in 35 years	Sampling variance	Average number of papers in 1 year	Standard deviation
1	899	234,22	25,69	2,59
2	225	22,66	6,43	0,81
3	165	17,09	4,71	0,70
4	146	11,26	4,17	0,58
5	1435	640,53	41,00	4,28

N o t e : 1 – the brain, 2 – the cortex, 3 – neurons, 4 – nerves, 5 – sum.

Table 2

Comparison of sampling fractions of the number of published works carried on different neurophysiological objects with application of microwave radiation and from the total number of these works during 35-year period

Factors	Parts from the total number of published works with microwave (6920)		Parts from the total number of published these neurophysiological works (705259, 180602, 237160, 278279)	
	Sampling fraction from these data (%)	Comparison with average quantity (U)	Sampling fraction from these data (%)	Comparison with average quantity (U)
1	12,.99	16,41	0,127	3,39
2	3,25	5,65	0,125	2,07
3	2,38	8,82	0,070	4,14
4	2,11	9,82	0,052	7,09
5	5,18		0,102	

N o t e : 1 – the brain, 2 – the cortex, 3 – neurons, 4 – nerves, 5 – average quantity; statistically significant distinctions are underlined (U > 2,58 corresponds to p < 0,01).

Table 3

Dynamics of sampling fractions of the number of published works carried on different neurophysiological objects out with application of microwave radiation during 35-year period (% from the total number of works with application of this factor)

Factors	Indices for different five-year periods						
	1966-70	1971-75	1976-80	1981-85	1986-90	1991-95	1996-2000
1	5,58	12,79	18,28	15,67	14,88	10,85	10,32
2	0,00	3,41	4,42	4,18	3,43	3,24	2.,32
3	0,00	1,92	1,47	2,56	2,59	2,93	2,52
4	1,29	2,56	1,96	1,33	2,68	2,50	1,87
5	6,87	20,68	26,14	23,74	23,58	10,.53	17,02
Comparison with the number of works in “average” five-year period (U)							
1	3,58	0,11	3.06	1,72	1,26	1,63	2,06
2	4,99	0,05	1.29	1,11	0,23	0,03	1,43
3	4,24	0,55	1.37	0,27	0,35	0,87	0,27
4	0,88	0,75	0.25	1,36	0,84	0,64	0,42
5	5,70	0,04	2.68	1,63	1,58	0,74	2,33

N o t e : the numbers of works in “average” five-year period were: 1 – 12,99 %; 2 – 3,25 %; 3 – 2,38 %; 4 – 2,11 %; 5 – 20,74 %. (U > 2,58 corresponds to p<0,01). Another applications as in Table 1.

Moreover similar effect is at the total number of all works of different kinds performed in neurophysiological objects (in the brain – 705259, the cortex – 180602, neurons – 237160, nerves – 278279). Marked increased sampling fraction from all works in neurophysiological objects was observed in investigations on the cortex too. However it is necessary to note, that relatively small part of the number of investigation on the cortex in general totality of neurophysiological works (12,89 % for the cortex comparative with 50,33 % for the whole brain), which can be reflect in obtained information.

The increase of the numbers of published works carried out in different neurophysiological objects with application microwaves developed during 35-year period. Dynamics of the sampling fractions (%) of published works carried out in different neurophysiological objects during 35-year period from the total number of works with application of microwaves displayed non-linear fluctuations (Table 3). The greatest values for works in the whole brain were in year periods 1976-1980, 1981-1985, and 1986-1990. It is interesting that the sampling fractions of the works on the cortex and neuronal level showed steady essential increase.

Conclusion

The results of the present bibliometrical investigations makes it possible to analyse quantitative characteristics of published works performed with application of microwave radiation in different neurophysiological objects during 35-year period of later half of XX-th century. The whole brain, the cortex, neurons and nerves were selected for examination on this trend. The total number of publications was considered for every year during period 1966-2000. Dynamics of the number of published works carried out in different neurophysiological objects and dynamics of the corresponding sampling fractions were studied.

It was established, that predominance of investigations of effects of microwaves on the whole brain existed. Such investigations are suitable for specialists of applied sciences. Second place belonged to works carried out in the cortex. Works on neuronal level have the slight number. The reason of this fact is their methodical complexities.

It was found that significant increase of the number investigations with application of microwaves during 35-year period and moreover the sampling fractions (%) of published neurophysiological works from the total number of works performed with this factor and those carried out in corresponding neurophysiological objects existed.

Obtained results on published works with microwaves is differ from data on works with electromagnetic fields considered in our previous paper [8]. First, the number of publications on microwave radiation was less than the number of publications on EMF: 1435 for microwave and 2151 for EMF, distinction in 1.5 time [6]. Secondly, dynamics of quantitative characteristics of publications of abovementioned trends is different. The number of works with EMF had steady increase during 35-year period [8]. However the number of works on microwaves had the greatest values in middle of considered time period, which is conditioned by their extensive employment in this part of period.

Fundamental investigations of neurophysiological effects of non-ionizing radiation are played no enough attention to. However, in the future they will hold a leading position in solution of the problem of biological action of these factors.

Unfortunately neurophysiological researches of effects of microwave radiation will have further development in XXI century [6].

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COMPUTERS AND HUMANS: WHOSE SOLUTION TO CHOOSE?

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This paper analyzes the issue of trusting the machine that, having been developed from the simplest device for land processing, has become able to make decisions. Since the machine has beaten the world champion in chess, more and more intense discussions arose around the question: should humans, realizing their defeat, continue to reserve their right to the "last word" or entrust the computer with the ultimate solution? This question also relates to both emergencies and events when humans have enough time to figure out the possible solutions. Despite the fact that ethics is a category not applicable to technology, if we entrust the machines with decision-making, this means that we have accepted the ethical guidelines on which they may ground their decisions. Perhaps, if we perform the "social contract" when programming robots, the machine will serve as ethical regulator able to make the humankind act in accordance with the categorical imperative and the highest standards.

Keywords: machine and man, artificial intelligence, ethics, Kant, robots, chess, Kasparov, Deep Blue, scientific and technological progress, computer

A set of issues of moral and ethical nature remains one of the most important areas of discussion related to scientific and technological progress. We have already addressed some of these issues in our papers [1, 2]. Now we would like to turn to the issue of trusting the machines when making decisions in case of emergencies like military attacks or natural disasters, as well as events when humans have enough time to figure out the possible solutions on their own.

The history of the machine: it is only a mechanical assistant

For a long time man has found artificial assistants, beginning with a stick-digger. At the same time throughout the history of technology development, mankind expresses fears about the negative impact of the new that enters into his life, up to fantasies about the end of the world. [2]. For example, at the beginning of the XVII century appears a legend (based on the more ancient Jewish mythology) about the clay giant Golem, who, according to the plan of the creators, had to fulfill the requirements of man, as from already an ancient time people dreamed of an assistant who can perform hard work. However, Golem, gradually gaining experience, began to exercise his will, becoming dangerous for the person himself [3]. The appearance of cinematography brings to the apotheosis the idea of an uprising of artificial intelligence [1]. But at some point the fantasies about the independent will of the machines begin to come true, at least approach it. A person delegates to mechanisms the possibility of making fundamental decisions.

From the moment of large-scale automation, a person implements its capabilities everywhere, trusting the computer part of its powers. The machine performs work, for which the person needed a long training, the presence of special qualities, such as the speed of the reaction. But it's still just a routine job. For example, in aviation, automatic control is activated when the aircraft has gained altitude. The pilot takes control on takeoff, in course determination, on landing, despite the fact that a modern autopilot can land an airplane. The man by inertia continues to be considered more reliable, therefore during the movement of the aircraft next to the autopilot sits a pilot to prevent unforeseen situations.

In this sense, the machine is still seen as a helpless helper. There is no question of ethics in relation to machines, because it only fulfills the will of man. This mechanism is in the hands of a person who can apply the machine in accordance with their ethical principles.

The computer grows to make important decisions

At some point, the computer in its ability to process information "grows" to making important decisions. And then the question arises about the need to recheck the decision of the automatic system and leave the possibility of a final solution for the person. When these decisions are made in a calm environment, the person has time to analyze the decision of the machine and proceed as the person deems appropriate. But there are cases of force majeure, that is, an emergency situation, when you need to respond instantly and there is no time for analysis. How to deal with this situation? Give control to a person or computer?

Until recently, there was full confidence that the human mind, of course, surpasses the ability of both the animal and artificial world, because the machine does everything only by searching for embedded programs, but the person acts incomprehensibly correctly, because it

contains the spark of God. The grain of doubt was dropped when the grandmaster lost the game as a representative of the intellectual elite to the chess computer. [4].

There is no doubt that, the human mind has long been surpassed mechanically: in counting speed, in the speed of reactions. The dramatic ending of Kasparov's game with Deep Blue [4] reveals that he is outnumbered in analytics, hitting in that great game of a man – to chess, which is a measure of intellect throughout history. It would seem, is it possible to find more intellectually powerful people in such parameters as memory and analytics than top-level chess players? At a time when machines started to play chess, there was an opinion that machines can only play at the level of the first category (pure combinatorics, when machines simply sort out the combinations they put in), and the real masters think creatively, but the machine is incapable of it.

Chess as a game of super-intellectuals, like the plot of human history, showing the superiority of man, has come to its dramatic end. It is destroyed. Mankind from this drama leaves with a sad face. With this victory, the computer struck a blow to the grounds for admiring people with themselves and their main property – the intellect. The computer has surpassed man not in a primitive account (with this man has long resigned himself), but on the very top of the chess game, where it was believed that only unique people occupy the first positions, because this game requires creative thinking, intuition and that's why people win against the computer. It was convinction that a man would never ever lose that game [5].

In this case it is important for us not only, that the superiority of the computer and the shaming of the human mind in its intellectual game, mean that it reconsiders the notion of the mind as a concept of a fundamental and inherent only to a person. It leads us to a situation where a person apparently needs to rethink their own role in this universe and develop a new vision of perspective on their superiority. What is important is that a chess loss undermines the basis of trust to human in comparison with a computer.

Moral and ethical casus. Metaphysical thinking

Thus, today there is no doubt that in the game the machine can make the optimal move, which will be either at the level of choice of the best chess player or even better. This understanding breeds metaphysical apprehension. From now on, the person is faced with the need to give an answer to the question of give the computer a vote of confidence, including in solving problems even, where the cost is the human life – in the event of a threat of military attack or natural disasters. The modern machine is a "social fact", and we need to recognize and accept this [6: 195].

The defeat of humanity in chess history forms an understanding that computer decisions are more correct and expedient. Man gradually gets used to the idea of imperfection of his analytical apparatus in comparison with a supercomputer. A person may disagree with a computer, but is already ready to put his superiority to doubt. The sophisticated person understands that the computer has long surpassed a person in the speed of analysis. The computer reacts much faster, so in a situation of force majeure, we must rely on artificial intelligence (Here, by artificial intelligence (AI), we mean the not the being described by Turing, in communication with which we cannot understand that we communicate with the machine, but the AI, the elements of which are already used practically with us, such as GPS navigator, Siri. They are helping us not only to find information, but also to read the text, recognize and translate speech into printing, etc. In this sense, each person can face such a dilemma).

But what if this decision, issued by a computer, from the point of view of a person leads to possible death? Do I need to interrupt the action? Or, perhaps, the computer has calculated all the risks, and any other solution contains an even greater percentage of probability of death? Should a person make their decision or trust the decision of the computer? How would a person act in this situation when making decisions?

The categorical imperative of Kant, or the question of justice

With regard to a given question, one of the most popular and, therefore, common tasks is the problem of choosing the actions of an autopilot in a car in a situation that puts machine before choosing (dilemma) the destruction of one (driver) or many. This is an important issue for automakers because they understand how difficult it will be to sell a car with an autopilot programmed for the "right" (The world annually the transport accidents kill 1 million 250 thousand people [8]. Taking all this complicated dilemmas into account, the introduction of unmanned vehicles reduce the mortality on the roads) choice [7].

This casus, of course, occurs right now, when it is a question of programming

the machine. But this question is also not new. This, in fact, is an eternal question of ethical choice. Every person at every moment of time is faced with a choice: what to do?

To this question, for example, Kant answers, deriving the famous categorical imperative: "Act according to such a maxim that it can become a universal law" [9, 10]. There is still much more ancient "Golden Rule of Morality", with slight variations in Buddha, Confucius, Christ, Mohammed, sounding like "Do to others what you would want them to do to you".

The answer to the question of trust in a computer is implicit in human instinct – the instinct of self-preservation. Self-preservation not only for itself, but humanity as a species. This instinct is given in the animal community. For example, a bee stings immediately when its instinct tells that there is a threat to the community to which it belongs – for its swarm. At the same time, she dies. She sacrifices herself to the life of her community. So in our case, the machine would choose the answer according to the moral and ethical code of the human community.

Philosophers of different ages expressed the opinion that slaves do not have ethics [see, for example, 11, 12, 13: 407-524]. But ethics are not applicable to robots. No tool in itself is neither evil nor good. Everything is poison, and everything is medicine. Ethics is not applied to robots, but to people – their creators. This is a question for social institutions. And if according to universal agreements, for example, the theory of a social contract, we would create a machine based on the "natural state", i.e. Programming cars, we use the categorical imperative of Kant, then everyone gets their advantages. The machine will work within the framework of a decision that is the result of a set of moral rules. People using the car, even if they are not disposed to good behavior, will not break the law, as they will not run over anyone on the crossings and even alcohol will not hurt them.

Such a machine is conceived as something impeccable and beautiful from the point of view of its actions, since it has long been noted that "a reasonable impartial observer can never be pleased even with the appearance of the constant prosperity of a man who is not adorned with a single feature of pure and good will; Thus, goodwill is, apparently, an indispensable condition" [9], and this "goodwill" will be inherent in the machine. In the moral sense, the machine will become perfection, because it will act not according to one's own convictions or from a sense of one's own selfishness, but according to universal imperatives (if properly programmed).

And if at this stage there is still skepticism about the possibility of full implementation of this project, soon the person will be cradled into the robotic environment and there is no longer any doubt about the correct choice that the machine will make, a person will not have. After calculating all the pros and cons, the public for safety reasons is likely to decide not to allow a human to drive the car, since this will endanger other participants in the movement.

Chess and military actions: Do we have to trust a machine?

If for the above problem we apply the concept of the categorical imperative of Kant, then there are tasks that go to the level of humanity, to a planetary level, where the price of choosing a machine is to destroy a huge territory, a group of the population or even the whole planet.

For example, imagine a local battle, in which two opposing armed groups participate. Military officers who build up a plateau of actions must take into account a huge number of facts: their own forces and the enemy, the presence of aviation, etc. However, the battle takes place according to known "rules", everything is as in the game, as in chess, where there are figures. For example, we have "horse" and we know how it can walk, and on the battlefield there is a tank, and we know how it can move. The question is whether it is possible in this situation to not turn to the machine, given that it is able to compare and analyze all data in the most optimal way. You enter the necessary conditions: geography, the availability of forces, etc., and ask which decision is correct.

You can consider the chessboard as a foreign policy life, turning at the same time to the historical reality: Cuba has placed our missiles, the Caribbean crisis is arising. This task of getting out of the complex political situation was solved without computers. Now the decision-making would have been done differently. On each side would use a supercomputer, in which all the data would be laid. It's no secret that the gun has been running for a long time from a computer. If in this situation the computer issues a decision according to which it is necessary to immediately press the "button", and the person responsible for the decision making knows an example about chess and has the understanding that the computer's response is always the best, then for all the reluctance of the disaster, a person still has to press "Button", because he realizes that another solution is even worse.

This example, we give because it is close to chess, to games. Such a dilemma of choice can be endlessly applied to any situation with business, etc.

Such collisions.

Thus, we increasingly trust the machine in making decisions. A large-scale experiment began. In the minds of the mankind for a long time, perhaps from the moment of chess defeat, the background is being formed, the created understanding that the person's decision is most likely not the most optimal one, and, perhaps, a more accurate solution, that which the computer gives out. Gradually begins to occur a shift of consciousness. "Today ICT has a tremendous revolutionizing influence on a person's consciousness, which without false pathos can be viewed as a revolution of the consciousness itself" [16]. There is every reason to assume that with further development, the artificial intelligence can gain an advantage in choosing the optimal action.

This is a fundamental change in views on the tasks of intellectual activity, as well as on the perception of decisions issued by artificial intelligence as something of the best.

Conclusion

It should be noted that when creating machines, very few people thought of them as a regulator of ethical relations in the human community.

The curiosity of the situation is especially attached to the fact that in the minds of most thinkers, scientific and technological progress, if relevant to ethics, is only with a minus sign. This negative attitude is especially aggravated by the development of the Internet. Reflections on robots generally end with apocalyptic predictions for humanity.

Contrary to all negative forecasts, a perspective is seen in which, most likely, everything will turn out in such a way that robots will make a person live according to the "golden rule" and the categorical imperative of Kant.

Realizing this, it is possible today to set the goal to predict the ethics of the future of a robotic society, trying to formulate it and create for it specific new conditions that humanity has never encountered.

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CONCEPT OF PLURAL EVOLUTION AND DEVOLUTION OF NATURE ON BASE OF PHILOSOPHICAL COMPREHENSION OF PLURAL WORLD

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The philosophy of binary plurality of the World with its branching evolution, and converging devolution is the most general concept of Universe, doctrine about Life. It is knowledge of binary plurality of subjects and of phenomena joining in different parities dual multitude of opposite qualities in existing with branching and convergences World. This promotes an explanation of an opportunity of more objective interaction of the person with the World. Author proposes the new representation of the binary plural ways of evolution with a balancing branching development, which fit into known forms of natural selection and evolution. Evolution has binary plural directions; natural animate organisms have greater adaptability, smaller adaptability, or bad adaptability. The world of nature is binary plural world, perfect and far from perfect, with many intermediate forms, and natural selection is diverse in its results.

Keywords: philosophy of plurality; binary plural evolution; plurality of selection ways; ethics of empathy; inexpediency of selection

New philosophy conforms partially to ancient myths, to some of positions of Daoism and of dialectics [7, 8]. Basis of this philosophy is prospective laws of the binary plurality, of branching development and of convergence, and of dynamical integrity of branching development and convergence as bases of existence of the World. A basis of life is development with a branching, with growth of plurality and complexity of subjects and phenomena, and the subsequent convergence with their reduction and simplification. The branching occur in anthropogenic World with subsequent equilibration of positive (initiated by the person) and of reciprocal negative (from the point of view of the person) branches. Binary plurality of all subjects and phenomena is characteristic for the Universe, for the Earth, nature, and for person, but simplified person's thinking is not inclined to perception of this feature of the World. Dynamical instability of development, bifurcation in a history, binary plural branching evolution of material and spiritual culture are inherent for humanity. The hierarchy and life of human community have animal sources; human qualities are binary plural. Full eradication of sins, creation of one-sided fine person, and the same society, according to the law of binary plurality, are unreal. Most common conception of Universe (doctrine about being), in our opinion, consists that the dynamical complete World consisting of binary (dual) multitude of subjects and phenomena with opposite properties; it develops with the branching growing multitude (there are examples: tree of evolution of the Universe from super-hadron to plural space; and tree of evolution of wildlife of the Earth). Branching evolution and growth of plurality cannot be infinitely: they should pass to delay, to the termination of growth, to stabilization, and to devolution of nature on the Earth. Devolution of nature on the Earth must be initiated also by anthropogenic influences. Devolution in space is determined by terms of life of cosmic objects.

Evolution of the Universe passes as development and growth from simple to complicated subjects and phenomena; it has the form of the branching conducting to plurality of subjects and of phenomena ("tree of growth"). Devolution of the Universe is phenomenon opposite to evolution, movement to the termination of its life, including galaxies and stars, with reduction of their luminosity, radius and temperature, with convergence and reduction of plurality. Evolution of the organic World is a process of branching development ("tree of evolution"), of growth of a variety from simple forms of life to more complex and highly organized forms, to growth of multitude of mutual relation, with continuation of life of simple forms. Devolution of the organic World is process, return to evolution, with convergence of branches and reduction of bio-variety and complexity, with degeneration, with reduction of the area and destruction of nature, with disappearance of species, growth of pollution and artificiality of environment. The form of evolution is the branching (tree), the form of devolution is the convergence; the form of life is the circle (circulation of substance); the spiral is one of forms of subjects and phenomena (from chromosomes up to galaxies) (Fig. 1). According to the law of dynamical integrity, the branching development and convergence realize at varying internal unity of the World, with chain reactions of the adaptation to new integrity. Dynamical integrity of the branching and converging World is an internal conditionality of its components including binary multitude of the parties and connections with balancing properties, including oppositions.

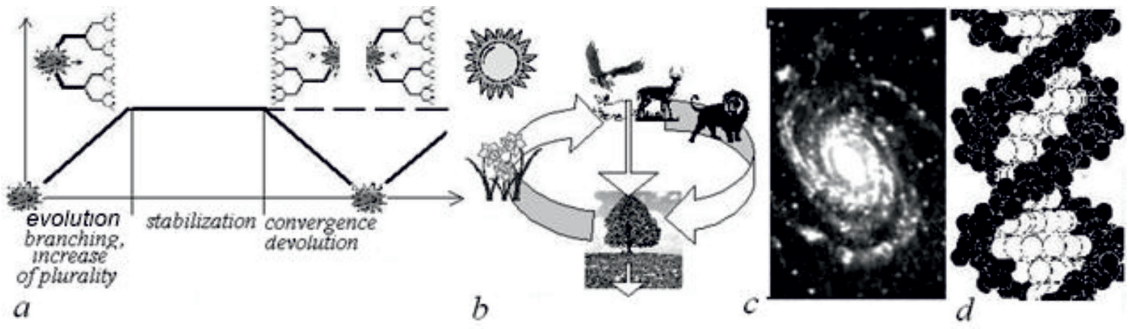

Fig. 1. The diagram of life of subjects (a); this diagram is real for model of the pulsating Universe, but its form is identical to all subjects; the dotted line shows a stop of devolution of nature of planet at duly intervention – ecologization, restoration of nature; circulation of substances (b), spirals of galaxies (c) and chromosomes (d)

The model of the pulsating Universe proves to be true, in opinion of the author, by conformity of a deadline of moving of electrons in orbits of atoms (then the matter should undergo basic negative changes; it may be in a 100 billion years) and of time from initial explosion and expansion to compression of the Universe in super-hadron. Thus, the matter essentially will not have time to change the properties because of delay of moving of electrons. This model corresponds also to the law of branching development and of subsequent convergence, common for subjects of the World, and to a cycle as to the form of existence of subjects in the World.

The outward things with all its objects and phenomena, and its parameters is multiple, not unilaterally and multilaterally. There are opposite qualities of things: living – non-living; heavy – light; hot – cold; hard – unsteady; plants – animals; long existing – transient; maximum (size, weight, speed) – minimum; active – passive; natural – artificial; loud – weak; multi-color – mono-color; located in symbiosis – antibiosis; positive, negative – neutral (from the point of view of the person), etc., with many intermediate qualities. The space of our existence lies between life and death, cold and heat, good and evil, virtue and sins, beauty and disgrace, meaning and meaninglessness, stability and volatility of development, etc. This is confirmation of the proposed by author of universal law of binary plurality of the World [7]. However, the cycle is usual form of development in nature, where death is the phase and the key to future development. If the binary multiple of Universe and cyclic development are dialectical (reflecting the most general laws) properties, then the unilateral development is impossible, and eternal pulsating developing Universe becomes real.

Integrity of binary plural World is expressed in a dynamical combination mutually balancing of subjects and of phenomena making the general picture of integrity. The person does not perceive determinism of binary plurality of the World, as a rule; a person has propensity to the simplified dual and emotionally painted perception of the World, to estimation of subjects and of phenomena from two sides ("good – bad", etc.).

One of the outstanding achievements of humanity was the identification of areas of the evolutionary process of the natural world, the establishment of the doctrine of speciation and natural selection [1]. Understanding on the evolution of nature and human is essential for both the natural world and for human beings. Concept of evolution and natural selection is constantly evolving. After studies of Ch. Darwin and A. Wallace, the theory of natural selection and evolution constantly widening. The synthetic theory of evolution was established [5, 9], new forms of selection – stabilizing and tearing selection – was opened; there was expanded form of speciation, was added positive and negative selection (from whose perspective?), the selection of genes, etc. However, features of simplified thinking and of perceiving of reality have an influence on analysis of the daunting process of man, as the evolution of the natural world. They limit the possible objective and multifactorial analysis of actual evolution. Simplified dual perception of reality is one of the most necessary mechanisms of survival, natural selection in nature: animal must react quickly

to danger; it should instantly choose a path of survival on a "yes – no", "danger – security", "run – stand", etc. This dual choice was not possible if the short-term memory was used to analyze large amounts of information. Simplified binary and even unipolar thinking was embedded in the natural evolution of the animal world; "innate starting devices", "memes" were created for rapid response, etc. Such simplistic thinking of humanity was created to help survive.

In accordance with the dual thinking, a person has created simplified laws of evolution and development based on dual representations (laws of negation of negation, of the unity and struggle of opposites, of change of the quantitative changes in quality, etc.). Everything that does not fit into these patterns was called as exceptions. In reality, all the rules and exceptions must be in binary plurality, complementing each other. Binary (dual) plurality includes the subsets of objects and phenomena, combining a variety of properties, and more rarely opposite (binary oppositions).

It is likely that the man knows not all exceptions (or rules). Exceptions highlight the incompleteness of laws, their limited field of action, and the possibility of including them as private laws in more general, which take into account the multiplicity of binary objects and phenomena and their relationships. In accordance with a simplified way of thinking is that the evolutionary process goes in two directions – biological advances (increase the adaptability of the environment) and regression (reducing the level of adaptability). Long aromorphosis, bringing new levels of organization of living organisms and is taking place on the basis of genetic variation and natural selection, the shorter idioadaptation, and total degeneration are the ways of biological progress [1, 10]. New researches reveal new trends of evolution; they strive to diversity, to plurality.

The real evolution of nature goes by complex interaction of the binary set of objects and phenomena [7] in the global "web of life" [4]. In view of simplified thinking and limited number of pieces of information, a man creates a simplified, as a rule, the dual concept of the world ("progress – regress", etc.). Reduction of binary multiplicity of objects and phenomena to duality and to bipolar (two subjects or phenomena with opposite properties) is most often a biased assessment of the world. From the beauty to ugliness are many transitional forms.

But such are the peculiarities of thinking and perception of the world by person. The binary plurality of cause-and-effect relationships is reduced, as a rule, to two or three. Probably discovered by person patterns of the natural world have particular view, they may not be the general laws, as do not take into account the complex multiplicity of interacting binary objects and phenomena. Those are probably, and natural selection and the theory of evolution based on dual conception (for example, biological progress and regress, aromorphosis and degeneration, etc.). Strikingly, but, as a rule, the number of determining factors addressed in laws, usually no more than 2-3 (!). This is particularly short-term memory, in which a person "lives".

Real world of nature is plural world. For example, I. Prigogine is noted: "our vision of nature has undergone radical changes in the direction of a plurality ... Today we acknowledge that we are living in a plural world" [3]. However, the world is not only plural, it is binary plural world, all of its objects and phenomena are subsets, each with different properties. The law of binary plurality of all objects and phenomena is probably one of the most general laws of being [6, 7]. The real binary multiple nature evolution takes place in a variety of directions, which, moreover, is dual. In line with this development often comes with branching, when each progressive step then is counterbalanced by "negative" from the point of view of the person. If we accept the action of the universal law of the binary plural objects and phenomena and branching development it can be assumed that the completely progressive evolution of the species does not exist, the seeming lack of the negative branch can be caused by either insufficient time observing or simplistic analysis. "Every progress of the organic evolution is the regress" (F. Engels). Every "progressive" direction in the evolution is simultaneously of the "regressive" direction. The human emotional evaluation of orientation of the evolution of nature is not legitimate. The binary plural world of nature was created during the evolution; it includes organisms with multiple, expedient and inexpedient, features (fig. 1). Only subset, much of the organic world, amazes by the expedient, beauty and harmony. In accordance with the doctrine of binary plurality, the evolution created many other properties and objects, horrific, unpleasant, and inappropriate from the point of view of the person. Among the extraordinary variety of inappropriate signs are the great number of roe, sperm, pollen in nature, strange process pairing of some animals, various nonfunctional organs, etc.

The evolutionary process has three main features (again 3!): the emergence of fitness of organisms, speciation (the constant emergence of new species) and permanent complication of life from primitive cellular forms to person [1]. Now, due to the heightened technogenic influence on the environment, this process varies. New process begins – the process of devolution, of convergence of multiple, disappearance of species; it is reverse to the process of natural evolution. How will go this process (unusual for nature of Earth) is still unknown. Some of its signs are already evident: the reduction of the natural environment, species extinction, deforestation, pollution, growing technical diversity, etc. Natural selection may ultimately disappear, like most species of flora and fauna. Binary multiplicity of evolution emphasizes by the many already discovered species selection (there are, apparently, and unknown types of selection): driving form of natural selection, gap and the rapid development of a small population, stabilizing selection, tearing selection. N. Vorontsov [9] proposed the destabilizing selection. All this is proof of the binary plurality of evolution. Does not match the concept of progress the overall degeneration – the simplification of the organization, accompanied by the disappearance of some systems, organs and their functions.

Dual separation of directions of evolution on the progressive and regressive is relative separation, as these concepts have a clear emotional meaning. At the same time in every living organism, and even more so in the system, there are signs of progressive, regressive and neutral development in their interaction. There are oft many signs of retrogression in the finest progressive living organism, in progressive population, Does the natural selection adapts each living form slowly and perfectly, as believed Ch. Darwin? Does the world of nature is perfect, as believed K. Timirjasev? No, the world of nature is binary plural world, perfect and far from perfect, with many intermediate forms, and natural selection is diverse in its results. Nature acts oft with the "blind eye"; it is a phenomenon called us a "passing" selection. Note the obvious contradictions of natural selection and evolution, not the relevant submission Ch. Darwin:

1. At the core of homeostasis underlies the universal eating that a person cannot recognize as the "improvement". This is a tragedy, but, apparently, forced, only to maintain the homeostasis of the solution nature with which humanity must submit.

The famous naturalist A. Fiedler described example of this tragedy, or "improvements" by Darwin: "some boiling pot lush, frenzied fertility frantic thirst for life, where frantic reproduce and devour [10]. You step out of the rainforest... overwhelmed by the hostile environment. I noticed in the black mass the ugly white insects… I grabbed one of them and discovered: unimaginable monster is nothing like the larva of flies. … flies-parasites… inside a convenient moment quietly to lay their eggs on appeared on the body. After a few days of such eggs, hatch the larva. It will slowly devour the ant ... until finally gets to the ant's head and not empty it. Then, securing by the mask, she brazenly walks along with ants until she turns into a chrysalis" [10]. Can live the nature and humanity without universal eating? Dream of man is autotrophic food, but this is an impossible dream.

2. The selection gives rise to slavery and insects-slaves: "... I well see what is happening in formic column. In the heart of it, I notice red bugs. Numerous tribe of bugs – slaves" [10]. The female "bloody ant-slave" breaks into the nest of another species of ants, killing all the attacking her Queen and worker ants ... When the worker ants will come from dollies, they become slaves in the nest of Slaveholders. Surprisingly, and the origins of slavery laid during the evolution of ancient wildlife. Slavery is not "perfection".

3. Mass parasitism of animals and plants cannot be the improvement. Although the role of parasites is difficult (most healthy Zebra have parasites), parasites in wildlife sometimes cause the death of plant or animal-owner. Types of parasites is very much. This is not improve "invention" of natural selection.

4. There are many pathogens and a huge number of animal diseases, including the human (fig. 2, 3). In accordance with the law of binary plurality complete removal of these microorganisms is impossible; it is not necessary, because, for example, within a human live dozens of microorganisms, without which a man cannot exist.

There are many ridiculous results of natural selection: large not flying birds, water ungulates-hippos, spending ¾ life elephants to food, not adapted for eating beaks of some birds, half-life for sleep in certain animals ("Sonia"), parasite sacculina becomes nonfunctional cancroid, horn rhinos, etc., etc. Natural selection "skips" many bed decisions, if they do not affect the possibility of existence.

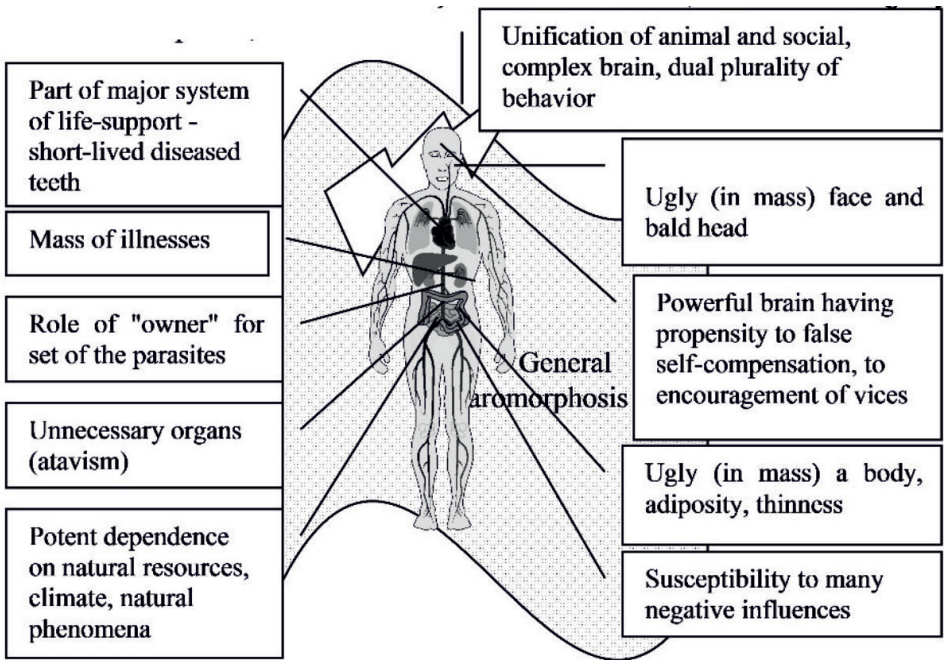

Fig. 2. The shortcomings of the selection for person

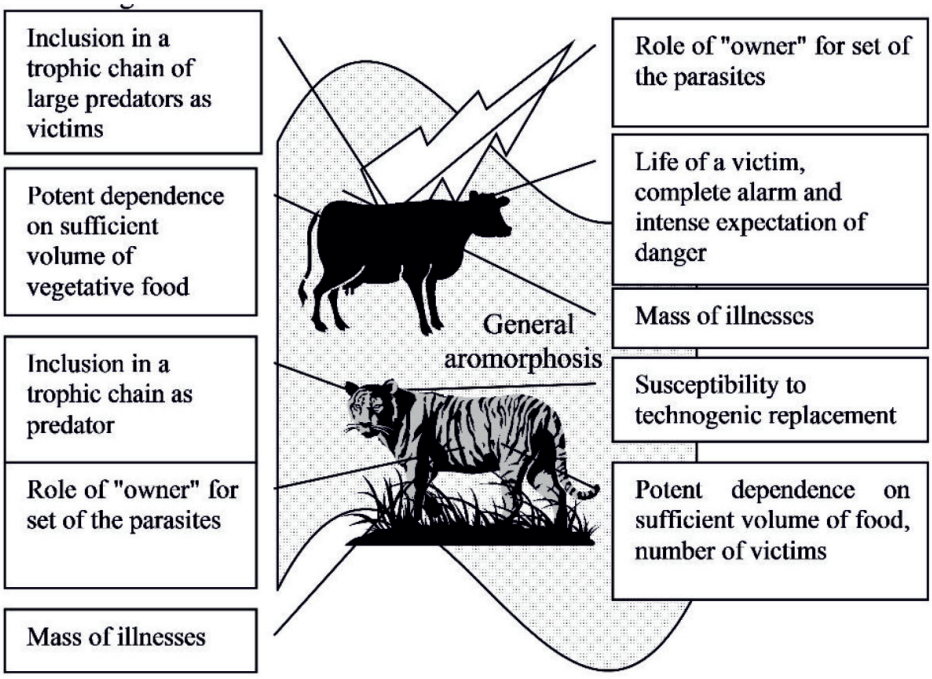

Fig. 3. The shortcomings of the selection for animals – herbivores and carnivores

5. There are negative solutions of natural selection, not changing during the course of life: for example, the teeth of many animals (including even the tusks of elephants), susceptible to disease and decay, causing severe pain and without trends towards improvement. The development path of any animal, including human, cannot include to aromorphosis if its individual organs develop along the path of degeneration, with deterioration of functioning.

A sign of the evolution must be development to higher forms, to raise the level of the organization, but also here there is devolution. In one organism manifests many directions not always positive development. A man have not fixed the sustainable preservation of scalp, although this trait is promoted by sexual selection. People have not developed the sustainable functioning of teeth, eyes, ears, the vital organs, providing food and timely response.

7. The result of evolution is unbearably hard life of many animals, such as deer, which are insect bloodsuckers, bringing animals to madness, etc. Indirect confirmation of an extremely hard life of animals is the 1:2 ratio of positive and negative emotions, inherited the man. It is necessary to understand (from a position of human morality and life) the complexity and difficulties of living creatures in their natural nature, compassion for life nature. A new environmental ethics of empathy differs from the others in that it is more objective. Empathy is the deep feeling, based on an understanding of other forms of life, their uses, and difficulties. Ethics of empathy will help a person to get unbiased interact with wildlife.

8. Saving once achieved, viable, but not the best, sometimes biologically unreasonable decisions (beak of kitoglav, floating ungulate, three-prong chameleon, jellyfish-killer, virus of AIDS, etc.).

9. Almost not studied the mass deaths of animals happens periodically, with some species (butterflies, squirrels, dolphins, whales, etc.).

10. Aggression and terrorism in animals secured ethologically. Natural selection encourages unjustified by nutritional standards the murder by victims predators (wolves, predatory fish, wandering ants, etc.).

11. In the structure of negative selection is the multiplicity of forms of interaction of living organisms in nature – from symbiosis to antibiosis, the existence of evil. Natural selection a number of insects encourages devoured by the female male after fertilization. This is "driving", but negative, untimely form. Natural selection, the positive of which admired Ch. Darwin, encourages and reinforces the irrationally, and negative ways, since it is binary multiple.

12. The highest achievement of natural selection and evolution – man – is most dangerous species for nature and for homeostasis; their actions have created the danger for the existence of the whole nature of the planet.

Tree of binary plural branching evolution is real plural development of natural world. However, with a limited number of determining factors of evolution, in which there are highs, opposites (driving form and total degeneration, devolution), and intermediate forms (stabilizing selection). Multiple paths of evolution and devolution is growing due to human interference, artificial selection, reduction of natural territories, ousting of nature, disappearance of species, the partial release of a person from the natural selection, intervention at the genetic level.

Sometimes plural signs are fasten, not only positive, but also not adaptable, and even harmful signs. Modern concept of ways of evolution is characterized by a number of features and rules [1, 5, 9], which brought us to table (in addition to the known forms of evolution author added more general binary multiple paths of evolution and a modern factors) (table 1). Speciation in presence or absence of branching is divided into filetic and divergent; filetic speciation in presence or absence of progressive change is divided into stasigenesis, kladogenesis and anagenesis. Divergent speciation on the presence or absence of spatial separation is divided into allopatric, sympatric (ecological, allochronical, polyploidical, hybrid, chromosomal).

The allopatric and sympatric forms act together. There is a multiplicity of forms of speciation; of course, not all forms are revealed and not all are clearly separated, and adds a technical effect, which not only limits the field of activity of natural evolution, but leads to technogenic evolution, including disappearance of species (in addition to the natural disappearance of species).

Natural selection did not always encourage improved signs for reasons of its plural ways. More often, the natural selection fastens signs, which allows existing to the organism, but are not optimal, and sometimes imperfect. Natural selection creates sometimes the fantastic shapes, far from expedient. Evidence of the binary of plurality in the annex to the areas of evolution, to the process of development of the various species, are very much. Among them are a lot of expedient and inexpedient, which created in nature [7].

Inexpedient in nature is shown as not the right material, construction, process, functions in order to achieve the goal. Perhaps inexpedient is organic property of the natural world, which is the engine for the process of evolution. There are in nature many inexpedient and absurd directions of evolution together with expedient. This is the binary plurality (table 1).

Table 1

The plurality of forms of speciation and disappearance of species

By Ch. Darwin, and phyletical			Simge-nesis	Trans-duction	Divergent	
Ana-ge-nesis	Clado-ge-nesis	Stasige-nesis			Allopatric	Sympatric
					Both forms act together	
Speciation and disappearance of species, conversion of organs and signs in time						
Gradual speciation	Technogenic complication of speciation	Sudden speciation	Inter-mittent speciation	Synchronous tempos of spe-ciation	Independence of tempos of specia-tion	Plurality of disappearance of species
Trend of evolution						
"Canalized" evolution			Binary plural evolution			
Degree of "progressiveness" of evolution						
Biological "progress"		Plural intermediate combinations			Biological "regress", devolution	
Well-known binary plural evolution and devolution (there are most likely unknown forms)						
Aromor-phosis	Idioadaptation	Total degeneration	Plural evolution	Natural devolution	Technogenic devolution	Plural devolution

Table 2

Structure of binary plural natural and man-caused selection

Plural variability			Multiple inheritance		Multiple survival			
Changes of environmental conditions (including man-caused)								
Differential response of species populations to environmental factors								
Complex impact of technogenic evolution and devolution of nature of Earth								
Interspecific and intra-specific aggression, fighting with the abiotic factors								
Mutation process that modifies the genotypes, and free interbreeding including man-caused factors								
Well-known plural natural and man-caused selection (there are most likely unknown forms)								
Driving form	Stabiliz-ing	Destabi-lizing	Tearing (disrupting)	Artificial	"Passing", (pervious), "gating"	"Positive and nega-tive"	Sexual; at level of genes	Plural
Selective elimination of loss-less adapted species, survival of some less adapted species; "gating" of species by selection								
Survival of the more adapted (sometimes less adapted) species and the creation of posterity from all surviving specimens; "gating" of species								
Multiple effects of natural selection through the functions on conversion of morphological structures of living organisms								
Rapid change in the highly specialized organs when changing their functions			Long absence changes			Slow changes of polyfunctional organ (for example, brain)		

Natural selection and speciation have binary plurality of forms (fig. 4). As noted by K. Lorenz, [2] "sometimes" selection looks through your fingers "and not simply misses the second-rate design, it reaches a deadlock ("gating" above). The complexity of evolution pointed out V. Solovyov: "our biological history is slow and painful birth. … convulsive shaking motion, blind groping; … There was many monstrous creatures and miscarriages"! [5]. As follows from this statement, there are usefulness (birth), and the apparent irrationality (monstrous brood). There are a lot of organs and functions, which may be more appropriate. Why in process of very important homeostasis all organisms must be eaten up? What is the form of natural selection among a number of insects, encouraging devoured by a female the male after fertilization? Why is incredibly wasteful pollination? Natural selection encourages and fastens and unnecessary and completely negative signs due their binary plurality. The structure of natural selection can be represented in binary plural form (table 2):

There is on fig. 5 binary multiplicity and variants of variability of signs "progress, regress" depending on the pressure of evolution or devolution. Is it possible to include the development of any animal, including humans, to aromorphosis if its separate bodies are far from

perfect functioning? The sign of evolution is the development to the higher forms, to raise the level of the organization. However, the nature introduced here the branching: the highest achievement of evolution – people – is the most dangerous species for nature and for homeostasis, created the danger for the existence of all nature. If the ramifications of the development process is real, nature must pay for the complexity and increased level of organization, level of fitness, by way of the "negative" branch. This branch realizes on the example of the nutrition of living organisms and food chains.

Some of the earliest and most primitive living creatures were organisms with photosynthesis, they used the reaction of photosynthesis, i.e. do not eat other living things and were not themselves food for other organisms. Highly organized animals feed on other living organisms, and are themselves a source of food; they are included in the food chain as necessary components. Thus, raising the level of the organization has led to the emergence of predation, parasitism, and unethical food chains (nutrition at the expense of other, sometimes highly organized, living organisms). Apparently, this development can be called as binary plural, with simultaneous action within a single animal or population of several lines of evolution, and in a variety of relationships. The evolution of the level of organization has the branching form

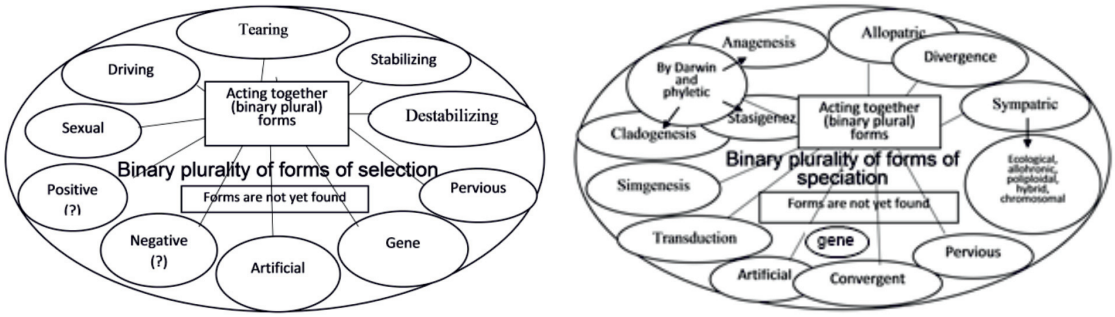

Fig. 4. Binary plurality of forms of natural selection and of speciation

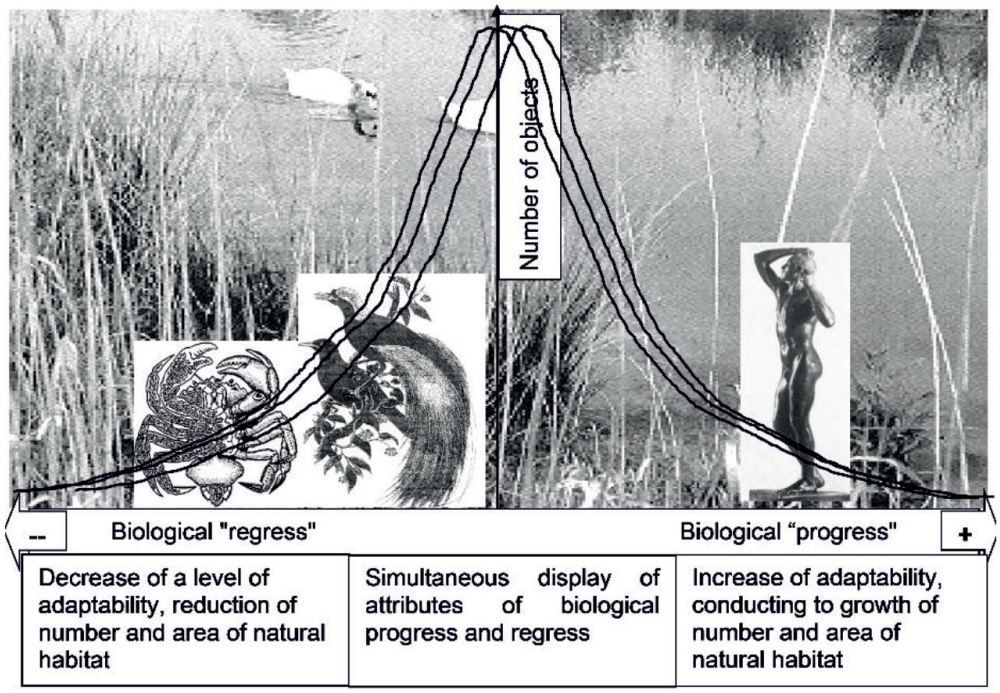

Fig. 5. Binary multiple paths of evolution and devolution: the curve can move slowly under the pressure of evolution or devolution

Each improvement, aromorphosis, entails a balancing negative branch of animal life. Upgrading the level of organization, the evolution reduces the degree of reliability, as the number of components and the relationships between them grows; organisms are more sensitive to environmental parameters. Many simple organisms, created during evolution, continue their being; their fast development is possible as a result of increased anthropogenic effects [7]. Life of good adapting highly organized species is supported as long as anthropogenic factors not narrowed or eliminated their ecological niche. For any living organism reality is binary evolution, which includes many positive and negative (from the point of view of the person) directions, growing with balancing branching. Wildlife and people evolve in the binary set of directions. The complex world was created as a result of evolution and natural selection, with positive and negative, expedient and inexpedient, beautiful and ugly, objects and phenomena.

Wildlife is developing in many objective directions, which are equally essential for development. The binary plurality of directions of evolution cannot be divided artificially into only progressive and retrogressive directions; they manifest itself in every living organism at the same time, in the organic unity of many areas. Multiple paths of evolution is increasing due to strong anthropogenic interference, artificial selection, reduction, ousting and suppression of nature, technogenic extinction, the transition to an intervention at the thin genetic level in evolution and natural selection. The natural evolution and natural selection are constantly shrinking, the loss of species and the breaks in global link networks of life lead to a rapid and unnatural for the evolution of the redistribution of the interaction of organisms with their environment. Binary plurality of evolution allows thinking that the multiplicity of ways the evolutionary process is optimal for reliability, stable flow and continuity of evolution, for homeostasis and the evolution of life on Earth. Due the binary plurality is supported the constant movement, development, evolution, and is excluded the stagnation, the cessation of motion. Binary multiple directions of evolution implies the possibility of directional displacement of curve of normal distribution characteristics by pressure of evolution and devolution; people can prevent the reduction of diversity, as a result of ecologization. However, anthropogenic interference in evolution and natural selection suggests that will occur the narrowing field of natural selection and the reduction of many evolutionary relationships and evolutionary paths. May be realize the significant change in the direction of natural evolution, including a massive artificial species extinction, the growth of artificial environment, not limited reproduction of some organisms (such as cyanobacteria) that may be harmful to the life of other organisms. These phenomena are technogenic devolution. The results of this process are unpredictable.

Devolution of wildlife runs in many directions; some of the devolution ways are due to natural selection, simplification of functions with the disappearance of the organs (degeneration), other are due human impacts. The critical question here: is there the end of the evolutionary process of wildlife; the growth of biodiversity cannot be infinite. It must be either stabilization or devolution. It is difficult to imagine a stabilizing selection or other form of long-term stable existence of wildlife on Earth. Most likely, there will be partial stabilization, a minor evolution, and then disappearance of species because of a reduction in area of natural environment and other technogenic influences. Human (simplified, emotional, built on the needs) assessment of the evolution, nature, life, can lead to unacceptable interference in the process of evolution, to the growth of artificiality, to promote the progress and related creatures of nature, and to eliminate the "regress", unpleasant, dangerous, seemingly useless landscapes, flora and fauna. People have the propensity to simplified dual and even the unipolar thinking. They will never cease to dream of paradise, about the fast artificial landscapes, universal including genetic health and beauty, of universal happiness, because this is one of their basic needs. But universal paradise landscapes, beautiful and useful nature, beautiful animals, ethical, intelligent, beautiful people, never will be in the real binary multiple reality [6-8].

Conclusion

The concept of plural evolution and devolution of plural World is created taking into account binary plurality of the World with its branching evolution and converging devolution; it is the most general concept of Universe, doctrine about Life. It is knowledge of binary plurality of subjects and of phenomena joining in different parities dual multitude of opposite qualities in existing with branching and convergences World. Natural evolution and natural selection have binary plural directions. Notion about slow evolution of binary plural World and man, about dialectical necessity of

all negative as an organic part of the World, about permanent interaction of all binary multiple objects and phenomena, about signs of a slow binary multiple devolution, of the need to reduce the anthropogenic impacts and the degree of artificiality of environment, of the necessity of all-embracing ecologization, will help to humanity to identify ways of a more balanced interaction between people and between man and nature.

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Short Reports

ART AND MEDICINE

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What is the meaning of art, what is its true purpose? Artists expresses their emotional world through art, and a spectator or a reader let "this world" pass through the realm of their sensuality. The specifics of art lie in perceptible and image-bearing nature. Art is a sphere of feelings and sentiments of a person in the form of their direct experience. The carriers of emotions in art are images and symbols, which are organized and visualized in material of certain forms. Art approaches the phenomena and objects, not merely for the purpose of representing them, but for raising emotions to stir up feelings a person's soul. All of its products, that is, works of art, are meant to be perceived by human organs of sense: eye or ear, and it is the senses that also help grasp the meaning and contents of an artistic work.

What art influences directly are feelings, and through the human feelings and soul it makes an impact on the personality itself. [1]

Through feelings, the art reaches the inner world of a human being, inspires him an makes us humane, creates a Personality within a person. Art can bring up and develop a personality and, as a result, solve pedagogical and psychological problems. Moreover, art is a psychotherapeutic remedy for a soul, a means of psychological and psychic relief. It is here that art can assist medicine.

The question of the relationship between art and medicine is not new. Now the science of bioaesthetics has arisen. Bioesthetics is a synthesis of biology, medicine and philosophy (aesthetics as a philosophy of beauty and art). There was a new paradigm of cognition, and from it we had to reconsider the fundamental categories of aesthetics. Art therapy is a part of bioesthetics. [2]

The object of art-therapy is human mind, that is, the emotional world of a human being, a human soul. Here one can clearly see the sensual and image-bearing nature of art. Art can purify the sensual world (catharsis), and correct its orientation. Through art-therapy, psychical and psychological disorders can be diagnosed and cured.

The therapeutic influence of visual arts is exercised through colour, lines and volume. The patient reproduces their feelings directly through the colour scale and shapes in their works. The viewing of a well-selected picture collection on a certain subject can raise the patient's spirits, make them optimistic, reduce nervous tension, relieve fatigue. F. Schelling, the German philosopher, asserted that geometrical forms influence a person's emotions. "A straight line can symbolize brutality, a curved line can stand for flexibility, an elliptic horizontal line – for tenderness, a wavy line – for life" [3, P. 230, 248]. But the strongest psychotherapeutic influence is achieved through colour. The colors chosen by the patient, can show the internal emotions. S. Rubinstein, a Russian psychologist, wrote about the influence of colour upon a person: "Red colour excite, tee are warm, lively, active, cheerful; yellow colour calm, they offer a comfortable feeling; blue is peaceful, sad, quiet" [4, P. 237.].Art helps decode symbols (colour, forms, perspective) so that one can find hidden meanings, interpret its "subconscious" aspects.

A special place in art-therapy is given to music. It is common-place that music appeals to the human feelings directly. Music therapy activates emotions in interpersonal relations, offers facilities for the patients social activity. B. Karvasarsky, a Russian psychiatrist, suggests a specific programmer of music psychotherapy [5, P. 126.]

The success of art-therapy owes to the fact that different kinds of art are connected with different functions of the brain. So, instrumental music activates the right cerebral hemisphere, reciting a poem sets the left hemisphere to work, and singing a song, consequently, is a task for both hemispheres. Knowing that depression attacks the left hemisphere, doctors can apply art-therapy to the patients who need it.

Libro-psychotherapy or "curing by means of reading" was introduced by a Russian physiologist B.M. Bekhterev. The use of specially selected books helps exert a considerable impact over the emotional state of a person while using minimal efforts. In some cases book draws the reader's attention away from bad influences and direct their energies to reaching positive goals, saves from boredom, arouse a thirst for knowledge. In other cases, books make the reader revise the whole life of their, not only change their attitude to certain things, but their behavior in general. For example, psychoasthenics are advised to read Chekhov, L. Tolstoy, and Pushkin, while works by G.Sand, Bunin are best for hysterical psychopaths. [6, P. 189]

To combat the effects of being over-strained, "theater-therapy" is recommended. The use of the "Stanislavsky system" methods in psychotherapy allows expansion of the human mind's domination over emotions and instincts.

Thus, art in art-therapy reforms psychic disorders of a person, without disturbing the individuality "the I" and still allowing indeed facilitating a means of forming a perfect personality. While influencing emotions, art, having a perceptible and image-bearing character, activates the thoughtful feeling, and enriches the emotional world of a person as well as their mind. Art does not solely have a therapeutic impact upon a human being it makes them humane and puts the chaos of their feelings into a system, where they become reasonable emotions.

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DEVELOPMENT OF CRITICAL THINKING

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The article reveals the technology of critical thinking. The authors suggest that the thought process begins with the emergence of a problem or problem that does not have a ready-made solution. Through the desire to understand something and to sort out something, thinking is born. The article reveals the essence of innovative thinking of critical thinking. Examples of critical thinking and their use in practice are considered.

Keywords: critical thinking, innovative technologies, semantic understanding, methods of teaching, expressing one's opinion, logical comment

The concept of modernization of Kazakhstan education for the period until 2020 determines the goals of general education at the present stage. It emphasizes the need for "orientation of education not only to assimilate a certain amount of knowledge to learners, but also to the development of his personality, his cognitive and creative abilities". The general education school must form an integral system of universal knowledge, skills and skills, as well as independent activity and personal responsibility of students, etc. the key competencies that determine the current quality of education. So, the priority task of the modern school is not to learn a certain set of knowledge, abilities, skills (which is certainly important), but bringing up the clever and internally free person who is able to formulate and reasonably defend own point of view, set goals and find effective ways to achieve them.

The aim of the technology is to develop critical thinking skills of students, which are necessary not only in education but also in everyday life (the ability to make informed decisions, work with information, analyze various aspects of phenomena, etc.). [1]

What is the "innovation" of the presented technology? This model going beyond the framework of the classical technology strategy, nevertheless represents the experience of practical implementation of the personality-oriented approach in teaching.

Specialists in the field of applied informatics should be able to develop various software products taking into account the requirements of the customer and effectively implement them in enterprises. One of the necessary conditions for the formation of these competences is the inclusion in the process of preparing students for innovative teaching methods. Innovative teaching methods are based on the use of new teaching methods and effective forms to ensure student self-fulfillment. Innovative methods involve the use of information resources that increase the effectiveness of training, specially developed tools and training systems [2]. Innovative methods are aimed at developing the creative abilities of the individual, through the interaction of students and teachers in the form of cooperation and mutual assistance [3].

The peculiarity of this pedagogical technology is that the student constructs this process in the process of learning, proceeding from real and specific goals, he tracks the directions of his development, determines the final result. On the other hand, the use of this strategy is focused on developing skills in thoughtful work with information.

"Tell me – I will forget,
Show me – I'll remember,
Involve me – I will understand".

Technology "Development of critical thinking" developed by American educators Ginny Style, Curtis Meredith, Charles Temple and Scott Walter.

Critical thinking is understood as the manifestation of children's curiosity, the development of one's own point of view on a certain issue, the ability to defend it with logical arguments, the use of research methods. [4]

The theory of intelligent learning through reading and writing is based on the technology of forming of critical thinking by L.S. Vygotsky "... all thinking is the result of an internal dispute, as if a person was repeating in relation to himself the forms and ways of behavior that he used earlier to others".

This technology involves the use of three stages on the lesson: challenge, semantic and the reflection.

1 – challenge

Tasks (functions) of the stage:

- update and analyze existing knowledge and views on the topic;
- awaken interest to it;
- to activate the learner, to give them the opportunity to think purposefully, expressing their thoughts in their own words;
- to structure the subsequent process of studying the material.

2 – comprehension – the search for a strategy to solve the problem and draw up a plan for specific activities; theoretical and practical work on the implementation of the worked out solution way.

Functions of the stage:

● obtaining new information;

● its comprehension (also you need to reread a part of the text if the student don't understand it and by perceiving the message asks questions or writes down what remains unclear to clarify this in the future);

● correlation of new information with own knowledge. Trainees consciously build bridges between old and new knowledge in order to create a new understanding;

● maintaining the activity, interest and inertia of the movement created during the challenge phase.

3 – reflection

Functions of the stage:

● expression of new ideas and information in one's own words;

● a holistic comprehension and generalization of the information received on the basis of an exchange of opinions between the trainees with each other and the teacher;

● analysis of the whole process of studying the material;

● development of own attitude to the studied material and its repeated problematization (a new "challenge").

The basic model (challenge-comprehension-reflection) specifies the logic of the construction of the lesson, the sequence and ways of combining specific technological methods.

The existence of an integral structure of knowledge significantly increases the effectiveness of the perception of new information, the level of use of knowledge, interest in learning, the skills of independent search and processing of information. The child finally receives an "instrument" that helps him to realize in practice the principle of his own activity as a subject of learning. The teacher gets the practical opportunity to become an equal partner of the child in his education.

Each stage has its own methodical techniques that aimed at accomplishing the tasks of the stage. By combining them, the teacher can plan lessons in accordance with the level of maturity of the students, the objectives of the lesson and the volume of the teaching material.

Let's consider some techniques.

Method –a table "I know – I want to know – I learned"

One of the methods of graphic organization and logical and semantic structuring of the material. The form is convenient, as it provides a comprehensive approach to the content of the topic. There are three columns in it: I know, I learned a new one, I want to know more. In each of the columns it is necessary to spread the information received during the reading. A special requirement – to write down information, concepts or facts only in your own words, without quoting a textbook or other text that you worked with. Method allows the teacher to control the work of each student with the text and put a mark for the work in the lesson.

Method "Cinquain"

It comes from the French word "cing" – five. This poem consists of five lines. Used as a method of synthesis of the material. The conciseness of form develops the ability to summarize information, expound a thought in several meaningful words, capacious and concise expressions.

Cinquain can be proposed as an individual independent task; For working in pairs; Less often as a collective creativity. The boundaries of the subject area depend on the flexibility of the teacher's imagination. Usually Cinquain is used at the stage of reflection, although it can also be given as an unconventional form in the stage of a call.

As experience shows, synclines can be useful as:

1) a tool for synthesizing complex information;

2) a way of assessing the students' concept baggage;

3) means of developing creative expressiveness.

Method "Basket of ideas"

This method organizes the individual and group work of students at the initial stage of the lesson, when the actual experience and knowledge is being updated. It allows you to find out everything that the students know or think about the topic of the lesson. On the board, you can draw a basket icon, in which everything that all students know about the topic being studied will be conventionally collected.

Method "Insert"

In literal translation, the insert from English means: an interactive recording system for effective reading and reflection. Method is carried out in several stages.

Method promotes the development of analytical thinking that is a means of tracking the understanding of the material.

Stages of INSERT correspond to three stages: challenge, comprehension, reflection.

Method "Reading with a stop"

Reading with stops and Bloom's questions

The conditional name of the methodical method of reading the organization using different types of questions.

Note: reading with stops is advisable to use at the stage of comprehension, supplementing this technique with other techniques of technology at the stage of challenge and reflection.

Method "Six Hats of Thinking"

Method "Six Hats of Thinking" is used at the stage of reflection, when summarizing the work in the lesson. Each student is asked to choose one of the hats in color. The color of the hat indicates the main points that need to be comprehended and generalized.

Method "Thick and subtle questions"

The table of "Thick" and "Subtle" questions can be used in any of the three phases of the lesson: at the stage of the call, these are questions before the study of the topic, at the stage of comprehension – the way of actively recording questions during reading, listening, and thinking – demonstrating an understanding of what has been done.

In the course of working with the table, questions that require a simple, monosyllabic answer are written in the right column. In the left column, detailed answers are written for required questions.

Critical thinking does not automatically appear as a side effect of conventional learning in some area. To achieve the expected effect, it is necessary to make systematic efforts to improve thinking. Teaching critical thinking must include a large number of examples from different spheres of life. The best way to solve this task is to develop critical thinking among students. [5] Critical thinking involves the ability to see problems, readiness to find non-standard solutions, the ability to reflect their own intellectual activity, analyze their actions and identify the mistakes. In addition, this type of thinking includes the willingness to abandon its decision in favor of more effective, openness to new ideas, the ability to draw objective conclusions which causes an understanding of the ambiguity of the world. A student, who knows how to think critically has various ways of interpreting and evaluating an information message, is able to distinguish in the text the contradictions and types of presented structures in it, to argue his point of view, relying not only on logic but also on the interlocutor's ideas.

To implement the goal and objectives of the study the following methods are used:

– theoretical (analysis and synthesis of psychological and educational literature on the problem of "Development of critical thinking");

– empirical (observations, questionnaires, testing, conversations, pedagogical experiment, mathematical data processing).

At the first stage, the initial theoretical position, the working apparatus of the study, was determined at the meetings of the teachers of primary schools; studied scientific and methodical literature, materials of advanced pedagogical experience. Defining the topic, purpose and objectives of the study, formulating a hypothesis.

At the second stage – preliminary experimental work was carried out. Specification of the methodology for carrying out experimental work, conducting practical activities (open lessons).

The third stage. Conducting an experimental work on the implementation of critical thinking in practice. Generalization and systematization of research materials.

And here is an example of practicing the language for expressing critical thinking.

Sometimes teachers think their students have no opinions because they are unable to express their opinions. In fact, students often do have strong and thoughtful opinions but they are not confident with the language they need to express themselves. This activity provides input and practice with the language they will need.

1. Before the lesson, you need to make copies of expressions below and cut them into slips of paper.

The main point is…	I agree because…
It's because…	In my opinion…
Another reason is…	I know because…
Also…	I disagree because…
Because…	In conclusion…

2. Make groups of three or four student and sit them in a circle around a table. Give each group one set of the cut-up expressions. They deal out the slips of paper so each player has the same amount. Put any extra slips to one side.

3. Write a topic for debate on the board. It could be something you have been discussing recently or a topic which doesn't need too much specialized knowledge.

4. Explain that the groups must discuss the topic but that they can only speak by using the words on one of their slips of paper and placing it in the middle of the table. One player begins and then the player on the left must continue with a logical comment. Then the next player on the left speaks so that the discussion moves anti-clockwise around the circle. The aim is for a player to use all his/her expressions and to get rid of all the slips of paper. If the group

thinks that a player uses an expression incorrectly, they can challenge the player and make him/her miss a turn.

5. When the groups finish, repeat the activity by writing a new discussion topic on the board and dealing the slips of paper again.

Once the students become more confident with the game, you can change the rules so that any player can speak in order to use up the expressions first. This version is more chaotic but it's a lot of fun.

The main results of the study are as follows: an optimal set of pedagogical conditions has been identified that ensure the formation of critical thinking of students in the classroom.

The more advanced the student, the better they should be able to understand meaning from context and offer reasonable responses to more obscure exercises. In many tasks they will be asked questions that don't have defined right or wrong answers, and so they will have to simply rely on thinking critically about the question, their opinion, and the reasons they have to have formed that opinion.

Success in studying subjects causes positive emotions, a positive attitude towards the subject, and a desire to develop in this direction. Developed speech, the ability to express thoughts in their own words, creative imagination contribute to the mastery of educational material, contribute to the formation of an intellectual personality. It is known that the process of social adaptation is most successfully carried out in the event that the cognitive and social activity of a person is formed, the independence of thinking, the ability to set and solve various problems.

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CLINICAL PRACTICE AND INNOVATIVE METHODS OF STUDENT'S PROGRESS EVALUATION

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The article highlights aspects that reflect the education of foreign students in the "General Medicine" specialty at the Department of Emergency and Ambulance Medical Care # 1 of the Karaganda State Medical University. During studying on the course, students of the foreign faculty acquire skills in clinical thinking, in particular, they study the definition of diseases, risk factors, the principles of syndromic diagnosis for the subsequent hospitalization of patients, the transportation skills of patients with emergency conditions; they gain experience as emergency doctors in practical classes. As a result of the application of innovative technologies of assessing knowledge within the curriculum, students become motivated to acquire more knowledge and practical skills. During practical classes, the students come to understand the importance of mastering practical skills during the practical training. The students aspire to establish themselves as highly qualified specialists.

Keywords: integrated curriculum; innovative methods of clinical teaching, Emergency and Ambulance Medical Care, active clinical training with medical education

The current situation in health care requires reforming the system of medical education, making new demands for the training of highly qualified professionals [1].

In according to modern requirements, there has been a need to initiate new methods of control, including such concepts as systemic, measurable results, objectivity of their evaluation, unification, manufacturability and reliability [2].

Clinical skills education in the undergraduate medical curriculum is fundamental to the development of basic clinical method and the lifelong achievement of excellence in clinical practice [3, 8].

Clinical studying process is proceeded by basic clinical skills curriculum enhancement required in emergency medical care.

Evaluation of the curriculum must not be overlooked, as it is a crucial component of successful curriculum implementation and efforts for continuous quality improvement of a curriculum over time. Done well, it provides essential information to guide learner's curriculum planners, faculty, and other stake holders such as those who allocate resources [4, 5, 6, 9, 10].

Learning around a patient helps to convey a holistic approach to medical care that combines the necessary knowledge, clinical skills and attitudes [7].

The additional benefit of an actual clinical setting is that it allows for procedure performance within clinical context including observation of student professionalism, and their ability to communicate with and provide comfort for the patient.

The purpose of our research is to report the teaching process and review concerning with foreign medical students that how they are learning particularly theoretical, practical and clinical based skills by applying innovative methods and further monitoring the student's progress and evaluation of their clinical knowledge by specific assessment and examination procedure.

During the course "Ambulance and Emergency medical care" the foreign students must learn the theoretical material, in particularly, identification, risk factors, guidelines for syndromic diagnosis and emergency at a prehospital stage indication for hospitalization, transportation conditions; to form skills in providing emergency care in an epidemic outbreak, in emergencies and disasters; to obtain practical skills working with physicians on emergency calls and in a hospital receptionist.

Learning to perform basic and common clinical procedures enables the student not only to understand and perform required clinical procedures, but also to begin to develop confidence and competence at a more advanced level of patient-doctor relation and communicative skills.

Implementation of curriculum development can be preceded by emergency calls and in a hospital receptionist, the student's participation in a clinical analytical sessions, and analysis of repeat station calls that can be related with sudden death or severe unconsciousness condition. Discussion about differential diagnoses medical card calls (form 110/u) and medical records in hospitals, the usage of communication skills to create an atmosphere of trust between patient and doctor and to obey the orders of establishment of ambulance services.

During the course "Ambulance and Emergency medical care", the foreign students work on specialized cardiac, neurological, paramedic ambulance crews, in emergency control station, study the principles of disaster medicine,

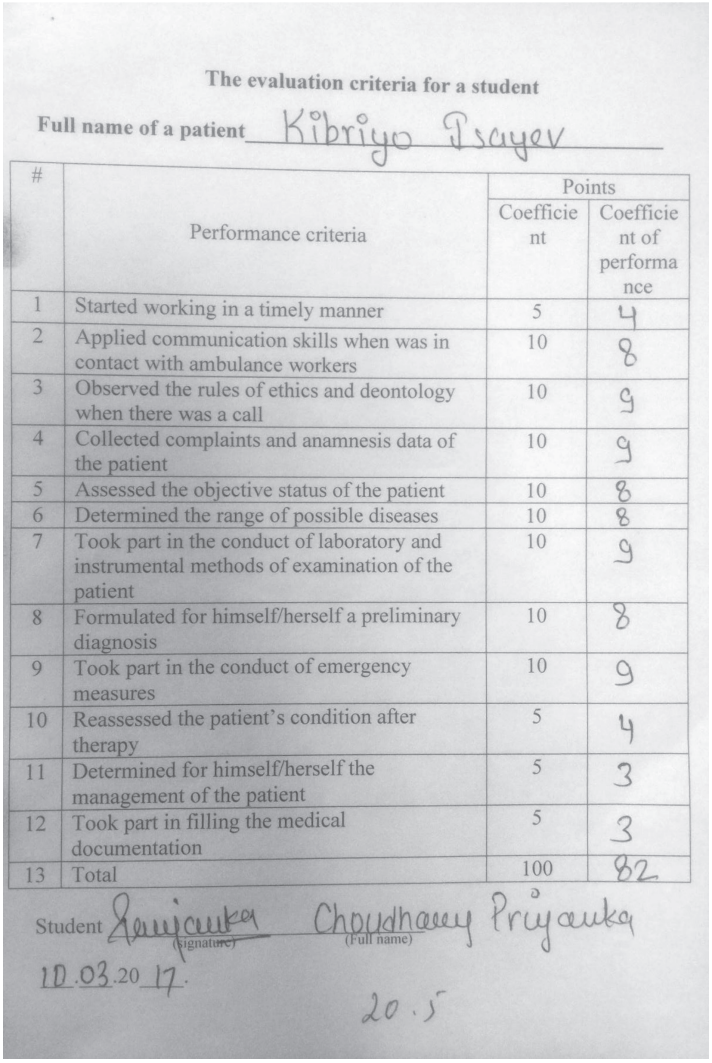
managing the medical records of ambulance and emergency care service.

For foreign students, in practical classes objective priority is that to focus the related topics under specific protocol for the purpose, in every practical class, discussion about related topics are preceded on urgent diagnostics and treatment.

In the respective field of emergency medicine the most important act is the concerning knowledge and time duration; that how in short time we can diagnose and treat the patient on urgent ambulatory call. Additionally, in self-individual work with teacher, they are advised to solve concerning topic tasks about clinical situations. In the duration, teacher's approaches to clarify the concerning tasks by which students can deal any emergency situations. During the period, there are given duties by department in ambulances in different stations to understand and practice of clinical skills. Students are going to ambulances with concerning staff including Emergency doctor or First aid man and nurse.

Students are advised by teacher to do physical examination for purpose of urgent diagnose by apply their clinical skills to treat the patient urgently.

Next day of ambulance duty teacher is asking about their work experience or progress; in that time asking about complaints, condition of patients and how student checked the patients and about student's observations during clinical propaedeutic or physical examination; at last, student's strategy in a very short period to diagnose and treatment of patient.



The evaluation criteria for a student

Full name of a patient Kibriyo Tsayev

#	Performance criteria	Points	
		Coefficient	Coefficient of performance
1	Started working in a timely manner	5	4
2	Applied communication skills when was in contact with ambulance workers	10	8
3	Observed the rules of ethics and deontology when there was a call	10	9
4	Collected complaints and anamnesis data of the patient	10	9
5	Assessed the objective status of the patient	10	8
6	Determined the range of possible diseases	10	8
7	Took part in the conduct of laboratory and instrumental methods of examination of the patient	10	9
8	Formulated for himself/herself a preliminary diagnosis	10	8
9	Took part in the conduct of emergency measures	10	9
10	Reassessed the patient's condition after therapy	5	4
11	Determined for himself/herself the management of the patient	5	3
12	Took part in filling the medical documentation	5	3
13	Total	100	82

Student Priyanka (signature) Choudhary Priyanka (Full name)

10.03.2017.

20.5

Fig. 1. The evaluation criteria for a student

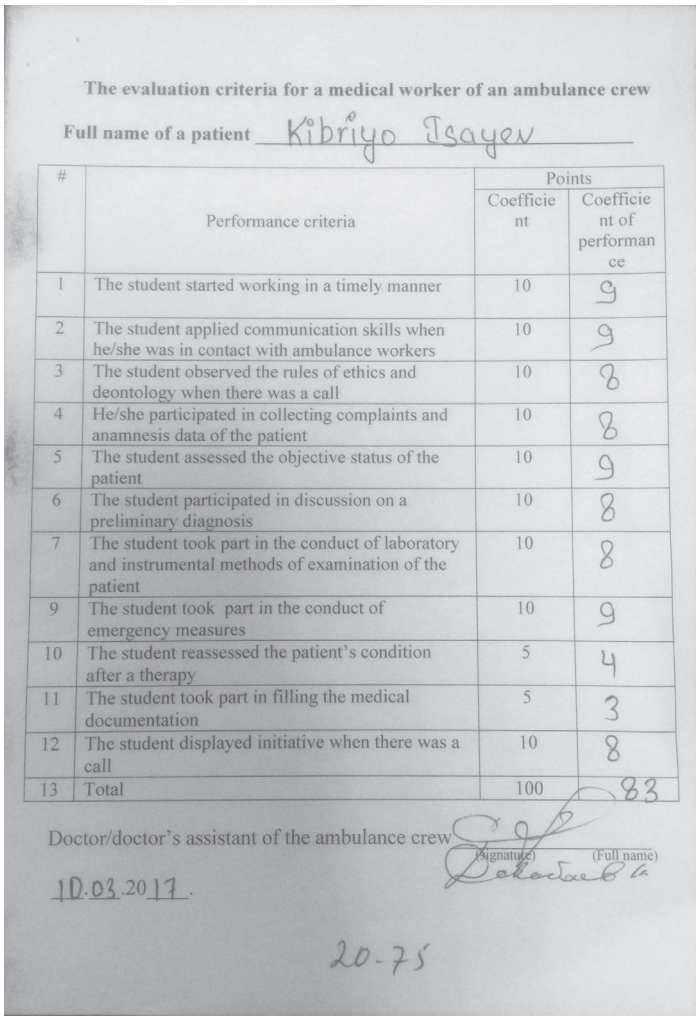
General disadvantages: during practical classes, has been observed language barrier of some foreign students on occasion of communication with crew and patients. The attitude and behaviour of crew of station are not so obligatory for foreign students. In ambulances the some doctors not allowed them to check the patients and not showed them practical skills (in form of electrocardiogram (ECG), glucometer results, sphinomanometer results).

The practical classes are mandatory for all students, including the foreign students.

During the period of studying the discipline in addition of practical lessons, the foreign students obtain practical knowledge in Centre of Practical Skills (CPS) of Karaganda State Medical University, like that cardiopulmonary resuscitation, in particularly the technique of chest compressions, methods of artificial respiration "by mouth to mouth", by mask, Ambo, and defibrillation technique; registration and interpretation of ECG; emergency assistance in cardiogenic shock, traumatic shock, relief of bronchial obstruction, hypertensive crises, hypoglycaemic states.

At the practical classes on the ambulatory call, in CPS, the foreign students have to be able to show the basic principles of diagnosis of emergency conditions, to render the first medical assistance for various emergency conditions and to improve skills of interpersonal communication and consultation of patients.

At the mid of practical lesson or at the last main control examination has been conducted in form of multiple choice questions (MCQS) to assess their performance while one mini-clinical exams is taken at the end of practical classes, its purpose is to do assessment individually of their clinical knowledge and skills; during mini-clinical exam, every steps have contain specific marks.



The evaluation criteria for a medical worker of an ambulance crew

Full name of a patient Kibriyo Isayev

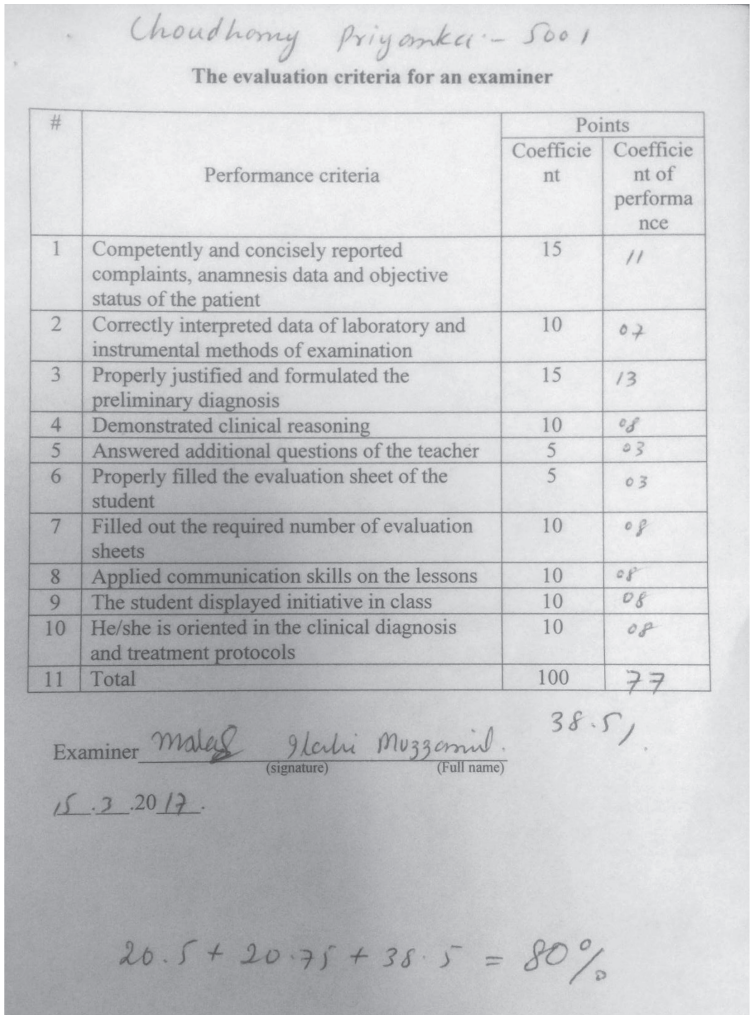
#	Performance criteria	Points	
		Coefficient	Coefficient of performance
1	The student started working in a timely manner	10	9
2	The student applied communication skills when he/she was in contact with ambulance workers	10	9
3	The student observed the rules of ethics and deontology when there was a call	10	8
4	He/she participated in collecting complaints and anamnesis data of the patient	10	8
5	The student assessed the objective status of the patient	10	9
6	The student participated in discussion on a preliminary diagnosis	10	8
7	The student took part in the conduct of laboratory and instrumental methods of examination of the patient	10	8
9	The student took part in the conduct of emergency measures	10	9
10	The student reassessed the patient's condition after a therapy	5	4
11	The student took part in filling the medical documentation	5	3
12	The student displayed initiative when there was a call	10	8
13	Total	100	83

Doctor/doctor's assistant of the ambulance crew (signature) (Full name)

10.03.2017.

20.75

Fig. 2. The evaluation criteria for a medical worker of an ambulance crew



Choudhary Priyanka - 5001

The evaluation criteria for an examiner

#	Performance criteria	Points	
		Coefficient	Coefficient of performance
1	Competently and concisely reported complaints, anamnesis data and objective status of the patient	15	11
2	Correctly interpreted data of laboratory and instrumental methods of examination	10	07
3	Properly justified and formulated the preliminary diagnosis	15	13
4	Demonstrated clinical reasoning	10	08
5	Answered additional questions of the teacher	5	03
6	Properly filled the evaluation sheet of the student	5	03
7	Filled out the required number of evaluation sheets	10	08
8	Applied communication skills on the lessons	10	08
9	The student displayed initiative in class	10	08
10	He/she is oriented in the clinical diagnosis and treatment protocols	10	08
11	Total	100	77

38.5

Examiner Malay Ilahi Muzzamil.
(signature) (Full name)

15.3.2017.

20.5 + 20.75 + 38.5 = 80%

Fig. 3. The evaluation criteria for an examiner

Mini-clinical exam held during the learning process. It is estimated in accordance with the 3 check lists: of medical workers, students and teachers (fig. 1, 2, 3).

Mini clinical examination, which is held at the Department of Ambulance and Emergency Medical Care #1, stimulates students to learn practical skills well, due to the fact that the students start to understand that practical skills are important part of the work in practical public health.

About evaluation of practical skills: in 2016 academic year, students of foreign department showed following results: marks of mini-clinical exam compiled 87,3%; work of CPS – 87,8%.

Conclusion

The foreign medical students are conveyed the all required aspects of theory and practical clinical skills on the basis of innovative methods of clinical skills assessment. There is conducted specific examination process to evaluate students that are declared their success according to their performance. Successful graduates can be beneficial for their clinical professional practice in the field of medicine.

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FEATURES OF DESIGNING CONVEYOR SCRAPERS AND CHAIN TURN ZONE DURING VIBRATION

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In the article there is considered modeling a scraper conveyor with turning the transportation direction for pillar mining of coal. There is shown the need of accounting vibration of the scrapers – traction chain system in their designing. Periodic changes of support reactions of scrapers, their speeds and accelerations in the turn zone are generally defined by the transportation angle of turning. There are developed methodological recommendations for modeling such devices taking into account geometry of the parts and their parameters (dimensions, inertial characteristics, types of hinge joints and their friction). The obtained results qualitatively coincide with the data of experimental observations, and are quantitatively defined generally by random factors of design and operation.

Keywords: scraper conveyor, vibration, instability, ADAMS software

For pillar mining of coal and potash salts in the USA there are used room technologies and there is developed a system with a rotary belt conveyor-train. Its industrial results are higher than the ones achieved in the traditional systems. Such a technology was developed in Karaganda in 1980-1987 (chief designer Ponomarev B.Ya.). Alongside with the belt conveyer there was also considered a chain scraper conveyor [1, 2]. Its testing showed great dynamism of the design, breakdown of the scrapers and the chain of the conveyor. The renewal of the designing works [4–6] required the analysis of the breakdown reasons.

Features of the design model

At the movement of the system consisting of several joint parts under the impact of the tractive force the transfer of forces from one part to another takes place successively. The parts experience multidirectional strains from the tractive force, the parts mass and the forces of interaction. There emerge consecutive multidirectional movements with inertia forces in the parts. Even in one separately taken part there emerge different areas which are displaced from each other with acceleration that leads to vibration. In mathematical models it becomes simpler. Some problems for scraper and belt conveyors are similar [3, 5–7]. Let us consider the movement of the conveyor scrapers. To each scraper there is attached a chain piece of 4…7 parts, Figure 1a (all the diagrams and images of scrapers in the movement are personal computer screen photocopies in the course of modeling). The average dimensions of scrapers are 0.3…0.8 m, the chain link to 0.1 m, weighing up to 10 percent of the weight of the scrapers, therefore their impact on the system movement should be considered. The scrapers can be supported at the end faces on the side surfaces of the troughs in which the scrapers move. There is considered the design providing turning the transportation direction due to the gradual turning of the trough at the angle from 6 to 20 degrees. For turning at 90° there are used from 4 to 10 troughs, Fig. 1, a. The study was begun with 2 scrapers connected among themselves by 4 chain links with the maximum angle of the troughs turning from each other. Modeling such a system requires making up a system of differential equations. Their solution is carried out by numerical methods. In Figure 1b there is shown an idealized diagram for designing the parameters of scrapers of the angular conveyor.

Basic systems of equations

Projection to the Y axis of the tractive force from the chain acting on the scraper with the number *n* in the hinge joint of the chain with the scraper to the right of O_2:

$$F_{ny} = Fn*Sin\ ((90^o + \theta)/2 - \alpha_n), \qquad (1)$$

the force of resistance of the part of weight G_0 on the scraper and the scraper itself (the friction coefficient f_{tp}):

$$F_{tp'y} = G_0*f_{tp} * Sin\ (90^o - \alpha_n), \qquad (2)$$

the scraper tractive force to the left of the scraper O_2:

$$F_{n\,y}' = F_n'*Sin\ ((90^o-\theta)/2 - \alpha_n), \qquad (3)$$

the centrifugal force of inertia from the rotary motion is directed from the center of the turn from the center of the weight O_2 of the scraper and the weight:

$$Pyi = mпр*(ds/dt)^2/R2. \qquad (4)$$

The weight displacement is interfered by the resistance force F_{tpi}. It is directed to the center of rotation:

$$F_{tpi} = G_0*f_{tp}. \qquad (5)$$

In the solution there is not considered the scraper end friction on the trough at the place of supporting. The tractive force:

$$F = x1 + x2 + ...xn + F', \quad (6)$$

$$F = y1 + y2 + ...yn + F', \quad (7)$$

where F' is the tractive force of the chain at the beginning of the turn.

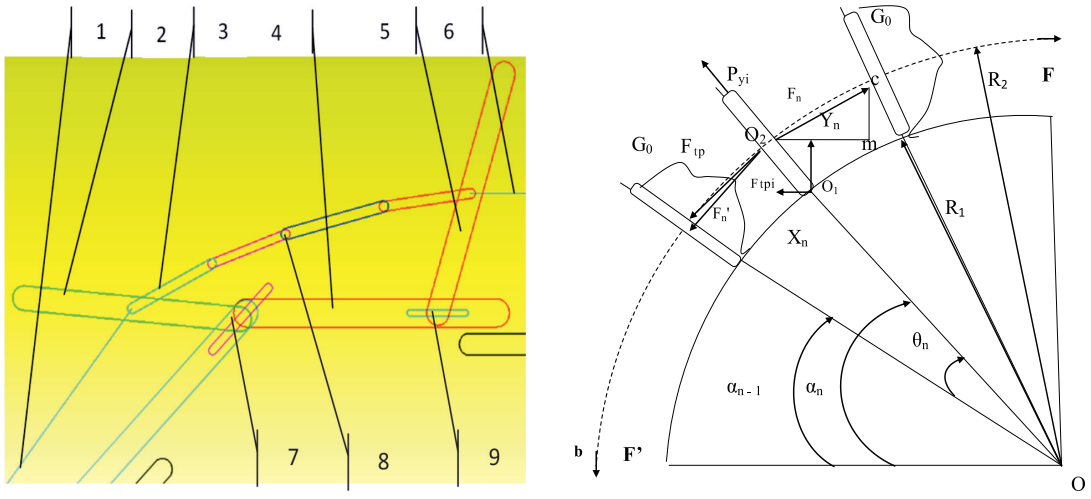
The equations are formed from the sums of projections of forces acting on the scrapers in the turn zone on the s X and Y axes. There are added the equations of the moments, for example, relative to the O1 point for each scraper and the chain link. The system of differential equations can be obtained similarly considering the scraper movements on the troughs plane parallel. Linear speeds (derivatives) can be obtained proceeding from the parameters of the rotary motion. The equations are made up on three axes.

Features of solution and results

Solution of such problems is known in packages where the dynamic volume problem is solved due to the linear sampling of differential equations (ADAMS).

The task gradually became complicated. At the beginning there were considered 2 scrapers connected by 4 links of the chain, and later on their number was increased, the types of hinges changed. The plane ones were replaced with the volume ones. The scrapers moved in their own troughs each. The designs are modeled by the Link links, with set dimensions, weight and axial moments of inertia. The troughs are connected with the basis and are not mobile, they are located at the angle to each other, Fig. 1, a. The scrapers and the chain links are connected by rotary spherical hinges. The scrapers from the side of the smaller radius of turn will be pressed to the troughs, therefore their kinematic connections are executed on one side. The scraper connection with the troughs is progressive. Then it will be added with a link connected progressively with the trough and the plane rotary hinge with the scraper. It will permit the scraper to rotate relative to the mounting axis to the chain hinge and to bend relative to the trough. At the beginning the angle is equal to 90°.

In Fig. 2 there is shown changing the forces of the support reactions in both boards of the troughs and hinge of the chain central link. Studies showed that in case of the gravitation action on the Y and Z axes the angular trough displacement in the turn zone will be the defining factor of vibration of the support reactions of the scrapers with the troughs. It determines the maximum amplitude of vibration of the support reactions, as well as vibration of the slave scraper relative to the hinge of the chain and the turning hinge with a slider, as well as vibration of the chain on the whole, Fig. 2.



a b

Fig. 1. Location of the scrapers and the chain links and their movement (a); an idealized diagram of loading on the rotary troughs (b): 1,6 – tractive forces direction; 2,5 – scrapers in the end of the run; 3 – the chain links; 4 – troughs;7,8 – hinges in the bottom and top troughs, 8 – spherical hinge of the chain central link

In the conditions of the abovementioned scrapers and chain dimensions and weigh, as well as the load of 500 kg applied to the first scraper and 350 kg applied to the last scraper, with directions parallel to the trough boards the vibration of loading are considerable and reach 400 %. The chain (links between the scrapers) within the scraper movement in one trough makes at least 2 full waves and in general the visual picture qualitatively matches that for the chain of the conveyor and the traction chain of the combined machine in case of their observation in the laboratory. Increasing the scrapers weight up to 55 kg for the purpose of imitating the weight transportation leads to increasing instability of the scraper movement, Fig. 1, a. When ensuring the scrapers rotation in the hinge joints to the chain and to the hinge of the pseudo-slide of the trough by the moment of the scraper approaching the end of the trough, the latter bends significantly (to 45 °), Fig. 1, a.

At the same time to model the weight by the scraper mass is not always correct, since in the inertial movement the scraper and the weight are not always connected and do not impact each other, though for a part of the weight that "runs down" the scraper the possibility of the "tripping" is real. However it is also possible in case of oversize materials getting onto the conveyor.

In the provided cases the reactions on the Z axis are not large in comparison with those acting in the turn plane. With increasing the weight their values increase a little, therefore, actually, the scrapers movement is considered in the XY plane. Studies permit to consider the problem that it is structurally possible to provide a hinge joint of the scraper in its middle with the chain. Here the chain link is usually fixed strictly by means of a threaded design. In reality the scraper has no special slide pair for connection with the trough, however the accepted simulation reflects correctly the work of the scraper pressed to the board and sliding on it. In visual pictures modeling vibration showed that the rotation hinge in the middle of the scraper within the accepted geometry leads to improving the situation. It is also promoted by elimination of the pivot-rotary connection in the progressive mechanism, in other words, the scraper support at the board could have the guides in the trough a board. The above-stated results are executed for flat hinges in the troughs therefore the reactions on the Z axis are minimum. Their replacement with spatial hinges shows that now instability of the scraper is possible in space that changes significantly the nature of vibration in the system, Fig. 3. In this case instability is reached quicker. With the scrapers movement the support reactions on the Z axis sharply increase, so that the third maximum of loading on Z is almost thrice higher than the second one that leads to the problem going out of the limits of the design opportunities. In the movement start there is possible the second scraper support sliding a little back before moving in the set direction. In terms of design the scraper support enters under the trough board. It limits the scraper displacement in the XZ plane, therefore there is no phenomenon corresponding to Fig. 3 at small gaps between the support and the board. However using spatial hinges here is justified and more precisely characterizes the movement at the initial stage, as well as permits to define more freely constructive gaps proceeding from the conditions of excluding these cavities filling with rock.

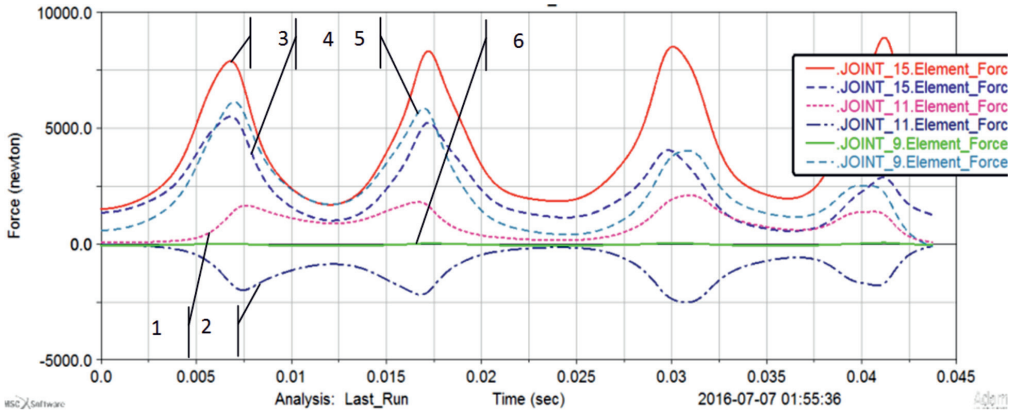


Fig. 2. Support reactions in the forces: 1 – on the Y axis, 2 – on the X axis of hinge 7 of the bottom trough; on the X and Y axes: 3, 4 – in the spherical hinge of the central link of chain 8; 5, 6 – on the Y and X axes in hinge 9 of the top trough (numbers of the design elements from Fig. 1, a)

Now let us consider the scrapers movement for the group increased in the quantity up to the close simulation of the entire turn zone, Fig. 4, a. The quantity of the chain links between the scrapers varied and did not practically effect the characteristic elemental motions of the system. In different combinations in the group there was a scraper which stability was questionable. At the moment of the movement start the load in the support on the trough was the greatest, Figure 4b, and later on, with increasing the angle of hade it decreased and became minimum. This permits to make the assumption that the scraper instability is explained by sharp acceleration at the moment of the movement start, therefore it is necessary to analyze the loads combinations acting on the scraper and slowing down its movement and causing accumulation of energy for its transferring to acceleration. In Fig. 4, b it is curve 3 that has the maximum peak near the Y axis, though in the zone of the steady movement this load is already 4 times less than on curve 4 on hinge 40. When accounting the friction forces between the scraper and the conveyor bed the maximum effect on this process would be caused by the forces pressing the scraper to the bed. Therefore it is possible to assume that even with a static solution those scrapers will be most pressed to the bed. For the troughs which angle of hade made near 45° for X and Y projections the support reactions were close to those in Fig. 2.

The scraper instability was most shown at increasing the force acting on the chain in the opposite direction between which the angle was considerable and ideally reached 90°. As usual at the initial moment of the movement the support reactions are pulsing and later on, after 0.05 sec., they are close to uniform (Fig. 4, b). Developing the entire rotary system does not lead to high-quality changes in loads. Modeling the complete turn zone shows that projections of the supporting forces change from the maximum to the minimum and vice versa on each scraper. On the length of the turn zone the projections to the X axis change from the minimum in the zone of the conveyor unloading to the maximum in the zone of binding the linear part of the conveyor. The analysis of the spectral density of the chain vibration shows that density of vibration of high and low frequencies on the rotary part with increasing the speed change but little with changes on the face part.

Conclusions

The studies carried out show that introducing a device with the transportation turning to 90° in the scraper conveyor mechanism makes basic changes to the dynamics of fluctuation processes and designing the scraper conveyor. The support reactions of the scrapers, speeds and accelerations arising in the turn zone, periodic changes of their values are generally defined by the transportation angle of rotation. There are developed methodological recommendations for modeling such devices taking into account geometry of real devices and their power parameters (dimensions, inertial characteristics, section, types of hinge joints and friction in them) [8]. The obtained results qualitatively coincide with the data of experimental observations and are quantitatively defined by random factors within designing and operation.

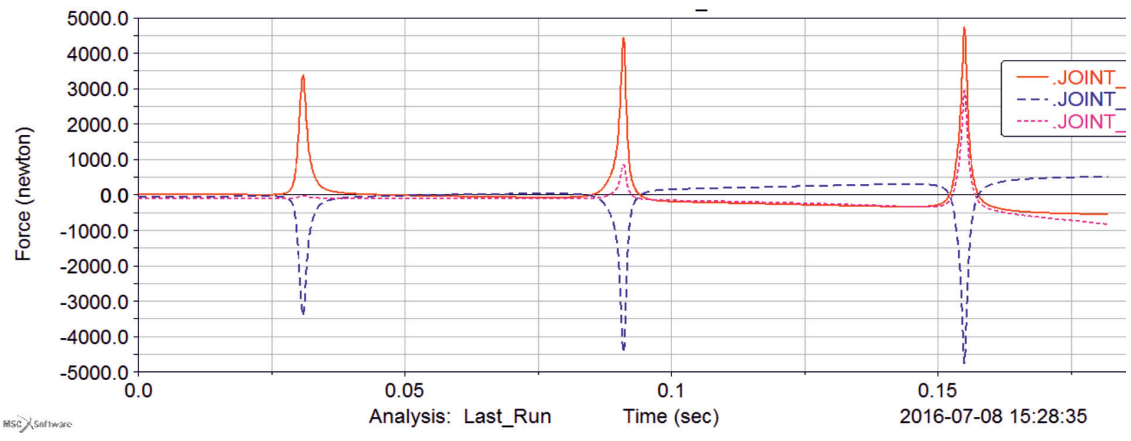
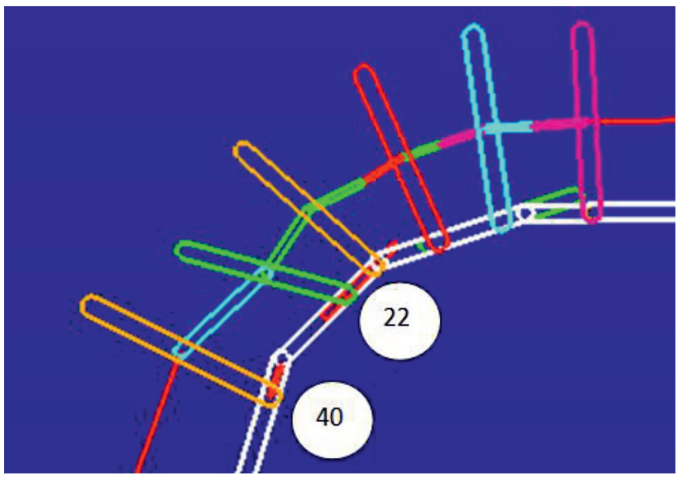


Fig. 3. Scraper instability with the spatial hinge in the trough support, maximum loads on Z: 1 – second; 2 – third



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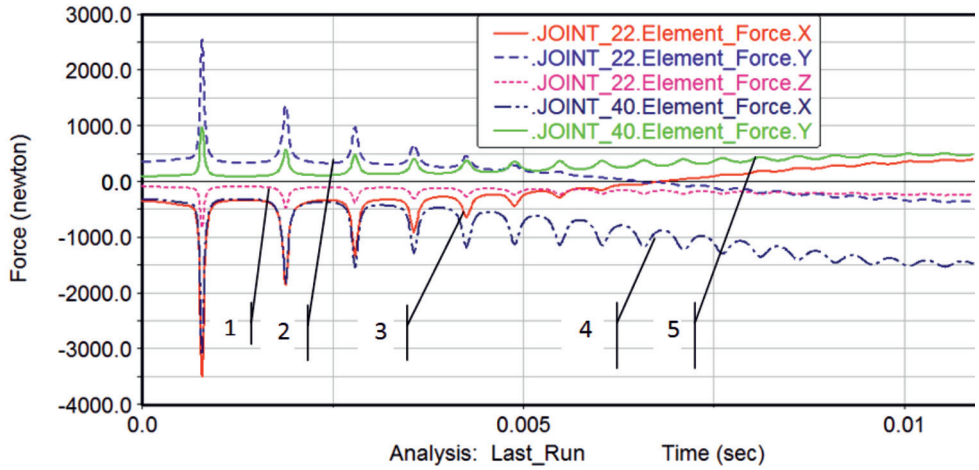

b

Fig. 4. Instability of one scraper in the group, rotation hinges 40 and 22 (hinges numbers in the model)

In the developed models of movement the vibration are caused by the absence of the friction forces of resistance to the scraper rotation relative to the central axis to which the chain is fixed. In reality the scraper rotation is interfered by the friction forces in hinges, scrapers on the elements of the troughs and due to their "dipping" in the transported weight. The friction force in the scraper support on the trough, on the contrary causes its inclination owing to the moment of the tractive force, but it can be interfered by the pair of forces developing the moment directed to the opposite side, arising due to the chain fixing to the scraper is really performed at two points, and when turning their inter-axial distance defines the shoulder of the pair of forces returning the scraper into the starting position. In the entire range the resultants of forces are generally identical, all the scrapers are pressed to the internal boards. The average load of the scraper support in the turn zone is defined by the number of scrapers. The obtained set of models and design expressions can consider all the stages of the scraper movement in the flexible system of the connected troughs that permits to establish dynamic differences of rotary scraper conveyors from conveyors for rectilinear transportation. So the number of scrapers on the length of the conveyor shall be increased not less than twice or thrice, scrapers shall be made stronger and have expanded supporting zones at the trough board. Supplying the system of the scrapers sliding and the troughs with the guides preventing large displacements of the scrapers in 3 planes would also be a univer-

sal solution. At the same time the constructive forces shall be directed to prevention of these zones of interface filling with rocks and free pass of the scrapers in the zones of the trough joints disclosure on the side that is remote from the center of the turn.

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Materials of Conferences

THE PROBLEM OF PERSONAL HELPPLESSNESS IN THE CONTEXT OF THE IDEAS ABOUT THE FEATURES OF THE FAMILY FUNCTIONING AS A SYSTEM

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This article is an attempt to theorize the problem of personal helplessness in the context of the family functioning as a system. There is a need to apply a system approach to the problem. Based on the theoretical analysis of the problem, there is an idea about personal helplessness as a complex of symptoms, the components of which create a single whole as a combination of the personal traits in combination with a pessimistic attributive style, depressiveness, anxiety, and certain behavioral characteristics. The necessity of understanding the family as a system with a certain structure and properties is characterized by the reproduction of the level of differentiation of personal helplessness and independence in subsequent generations is grounded.

In Russian psychology, primarily thanks to works of S. Rubinstein and B. Lomov, there is a conviction that human being is not something homogeneous. It has diversive, multi-level and multilayer system. B. Lomov, in particular, noted that the social system that serves as the basis for the social qualities of the individual is a complex entity that includes a multitude of subsystems of different levels. "A particular person is a component of a variety of such subsystems. Thus, he simultaneously acts as a family member ... as a state citizen, as a participant in various social institutions and processes..." [3, p. 33–34].

Taking into account this situation, and also analyzing a number of studies on the problem of personal helplessness and about the features of family functioning in modern society, we turned to the problem of personal helplessness in the context of ideas about the features of the functioning of the family as a system.

To begin with the concept of personal helplessness was first formulated by D.A. Tsiring in 2010. This phenomenon is defined as "the quality of the subject, which includes the unity of specific personal characteristics which are formed in the process of interaction of the internal conditions with external ones, due to the low ability to transform reality, coupled with the complexity of setting goals and achieving and managing life events" [7, p. 187].

Personal helplessness, being a characteristic which determines the characteristics of the subject's vital activity in all areas (behavior, activity, relationships with others), is expressed in such qualities as "the passivity of the subject, his inability to cope with difficulties, obstacles, his excessive dependence on others" [7 , p. 189]. By personal helplessness is understood a complex of symptoms, where individual components form a single whole in the entire interconnection of their elements, representing "a combination of personal characteristics combined with a pessimistic attributive style, depressiveness, anxiety and certain behavioral characteristics" [7, p. 187].

As for the system, it is a set of elements which are in relations and connections with each other, which forms a certain integrity, unity [2].

At the heart of the system approach, as a direction of the methodology of scientific knowledge, is the consideration of the object as a system: an integral complex of interrelated elements (I.V. Blauberg, B.F. Lomov, V.N. Sadovsky, E.G. Yudin); a set of interacting objects (L. Bertalanffy); a set of essences and relations (A.D. Hall, R.E. Feigin, late L. Bertalanffy) [1].

From the point of view of the system approach, the family is viewed as a system with a certain structure and properties. The family system, as it is commonly known, functions under the influence of two laws: the law of homeostasis and the law of development. The law of homeostasis is the desire of the system to preserve a certain state, to stability. The law of development operates simultaneously with the law of homeostasis, and in its turn it says that any system tends to go through a complete life cycle.

It should also be noted that in the study of the family in the context of the system approach, a specific way of perceiving objective reality that differs from the concept of the determinism of the world is assumed, that is, the linear causal logic is replaced by a circular one, in which the main question is "Why?" [4]. Thus, the systemic thinking is necessary for understanding the family, for analyzing its life and functioning, for specific work with the family, which concentrates first of all on determining the goal of the behavior of people, in particular, family members, and not on its causes [5].

Proceeding from the above, it seems logical to conclude that if there is at least one member with personal helplessness in the family, the family as a system will react in a certain way to this situation. In the mid-70's. The scientific research institute of the family, created in 1967 by M.S. Palazzoli, conducted a series of studies based on an analysis of work done with families involved in schizophrenic interaction. Quoting D. Haley, the authors of "Paradox and Counterparadox" emphasize the fact that such families have a specific form of resistance, in which none of the family member wants to recognize the influence of other family members on their behavior, nor their own impact on their behavior. From this, scientists first put forward and then subsequently proved the hypothesis that a family including a patient with schizophrenia is a natural group, an internally regulated symmetry which all

members of the family are hiding together by joint efforts [5].

In this regard, it makes sense again to turn to the point of view of D.A. Tsiring, who studies the family as a system which is characterized by the reproduction of the level of differentiation in subsequent generations. The author emphasizes that "in families where parents have a high level of differentiation, children grow up more independent. In those families where parents are distinguished by a low level of differentiation, children often grow up helpless, since personal helplessness is one of the possible manifestations of the low differentiation of personality. The level of differentiation is produced by the entire system of interactions between parents and children ..." [7, p. 281].

It has already been said that the mechanism of the family system has a circular rather than a linear sequence, that is, theoretically it can be concluded that a helpless person, being a product of a family with a low level of differentiation of parents, will itself influence the family system that functions under the influence of the law of homeostasis. According to the system approach developed by Murray Bowen [6], personality and interpersonal relationships in the family are interdependent, that is, they create a constantly reproducing homeostatic cycle. In accordance with this law, personal helplessness is not only conditioned by certain psychological characteristics of the family, but in its turn it continues to exert its influence on the family and all its members.

Analysis of the available studies allows us to say that, the problem of the influence of personal helplessness on the family system at the moment remains practically unexplored. And if, based on the data received by the researchers, there are already conclusions about the influence of the family on the formation of personal helplessness, then any conclusions about the features of the functioning of the family, in which there are already members with personal helplessness, can only be made theoretically based on the available data and require experimental confirmation.

The results of such studies, we believe, will allow, first, to carry out targeted preventive work with married couples in order to reduce the probability of children's inheritance of parents' behavior patterns with personal helplessness; secondly, they will help to understand the mechanisms and features of intra-family relations, where the partners have different levels of differentiation, and, therefore, will make it possible to clarify the goals, tasks, forms and methods of advisory and corrective work with families; and third, to develop better techniques of psychological impact on the family as a system.

As we see, even in the first approximation, the problem of personal helplessness acquires special significance when considering it in the context of ideas about the features of the functioning of the family as a system.

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Short Reports

EXPLICATION OF THE ZONE OF HYBRID, ADJECTIVAL-MODAL STRUCTURES IN THE CONTEXT OF MODALATION

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The authors establish the point about the gradual nature of linguistic units' modalation in the Russian language. In the focus of consideration are hybrid structures expressing a complex mode of interaction between adjectives and parenthetic modal words, as well as a certain reduction of adjectival lexical semantics caused by desemantisation of hybrids, development of pragmatic aspects of their meaning. Syncretism of categorical semantics is identified as combination of the reduced adjectival meaning of the subject's attribute with subjective-modal meaning of varying evaluation (assessment) of information but without parenthetic function. There is decategorisation of word forms, reduction of morphological and syntactic attributes of adjectives. At the same time it is prematurely to talk about the diminishment of grammar categories in respect to fixed use of forms of neutral gender, singular, positive degree of comparison of adjectives. Morphemic structure is being transformed: flexion *-o, -e* transforms into a syncretic morpheme – flexion-suffix.

The research on modalation of short adjectives demonstrates that this type of transposition has a gradual character (on various aspects of transposition see also: [1–7]). Adjectival word forms in typical contexts may exhibit a different degree of resemblance to parenthetic (introductory) modal words, revealing the nuclear zones of the source adjective and a derived parenthetic (introductory) modal word, as well as the zone of transition (syncretism), expressed by peripheral and hybrid structures. In this paper we will focus only on the zone of intermediate, hybrid formations on the transitivity scale.

The stage of hybridity is presented by a few contexts where adjectival-modal formations such as *it is certain (no doubt, surely, definitely), it seems (apparently, looks like), by accident (incidentally)* are used. They are asyndetic compound sentences where predicative parts are separated by colon, or – fewer – by dash. Hybrid structures are used here propositively functioning as a predicate of incomplete two-member part of asyndetic constructions, notably always with elliptical subject or object component, i.e. without grammatical subject (cf.: *No doubt that...*) or a complement (object) (cf.: *Looks like that...*).

The syntactic position of elliptic subject or object (complement) in the first incomplete part of the asyndetic compound sentence is compensated by a predicative unit that follows after it. This circumstance, namely, the use of hybrids of this kind in absolutive position without formal markers of relation with subsequent predicative unit within complex structures causes their perception as more independent components of the utterance (compared to peripheral short word-forms in compound sentences), which is, relatively speaking, the next stage in moving towards parenthetic modal words and expressions. Cf. contexts of use of the peripheral short adjective *certain* (1) and the intermediate adjectival-modal formation *no doubt* (2): (1) ***It is certain /No doubt*** that this approach is the only right under the circumstances. (2) ***There can be no doubt***: this approach is the only right under the circumstances.

The hybrid structures of this type manifest complex interactions between the original part of speech – adjective and inter-part-of-speech, semantic-syntactic category of parenthetic modal words and expressions, as well as some reduction of lexical semantics owing to desemantisation of hybrids, the development of pragmatic aspects of meaning. Syncretism on the level of categorical semantics reveals itself in such a way that the reduced adjectival meaning of the subject attribute combines itself with subjective modal meaning of evaluation (assessment) of the transferred information in terms of a categorical or problematic verification (authenticity) (*certainly, it seems*), as well as the degree of regularity / irregularity, predictability / unpredictability (randomness) (*accidentally*).

Along with that, the parenthetic function, which would be accompanied by detachment, i.e. a special prosodic-semantic highlighting of parenthetic modal component of the utterance, has nothing to do with the modalates such as *certainly (no doubt), it seems, by accident* in a hybridity zone. The morphological characteristics that short adjectives have, the hybrids like *it seems (looks like)* at the stage of hybridity are almost void of.

There is decategorisation of the above word forms, followed by reduction of morphological and syntactic characteristics of the original (source) class of adjectives. However, it is still to premature to talk about the loss of such categories as gender, number, degrees of comparison with fixed use of word forms of the neuter gender, the singular, positive degree of comparison in the given syntactic conditions. It is possible, apparently, to take note of the absence of paradigm categories at a given position, the impossibility of categories' grammemes swop. Morphemic structure of the hybrids such as *It seems (looks like)* is also transformable: flexion *-o, -e* degenerates into a suffix, becoming a syncretic morpheme – flection-suffix (2). The final change, i.e. its transformation into the suffix will be visible

in typical contexts where peripheral parenthetic modal units are used (3). Compare contexts of use of a hybrid, adjectival-modal word form *it looks like* and adjective-based parenthetic modal word *like* (3) ***Look very much alike****: a copy is almost indistinguishable from the original;* (4) ***Looks like*** *a copy is indistinguishable from the original without forensic tests.*

Modus framework and proposition are verbalised in different parts of the predicative asyndetic compound sentences with explanatory relations (3). Moreover the subjective modal meaning of the reported information, in terms of reliability, is expressed by a hybrid functioning as a predicate and used propositively in incomplete first predicative part of the asyndetic compound sentences (*Look very much alike*: ... – modus), and the evaluated state of affairs itself, proposition in the second, postpositive predicative part (*...the copy is almost indistinguishable from the original* – dictum).

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