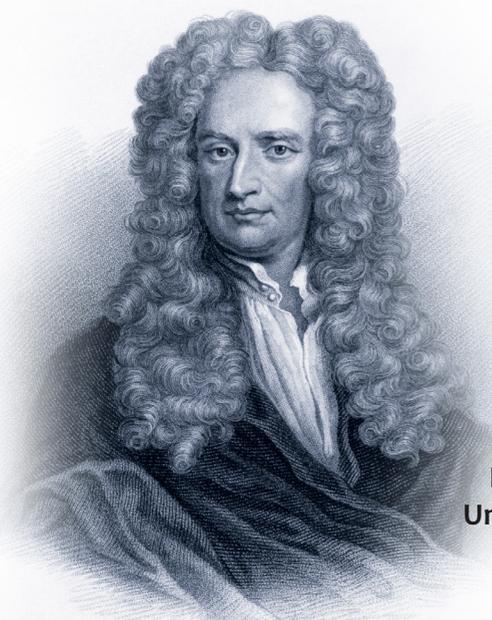




INTERNATIONAL CONFERENCE

**PROCESS  
MANAGEMENT AND  
SCIENTIFIC  
DEVELOPMENTS**



Birmingham  
United Kingdom



# **International Conference “Process Management and Scientific Developments”**

Birmingham, United Kingdom  
(Novotel Birmingham Centre, March 31, 2020)



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## THE ROLE OF INTELLECTUAL POTENTIAL IN ENSURING THE ECONOMIC AND INNOVATIVE SECURITY OF THE COUNTRY

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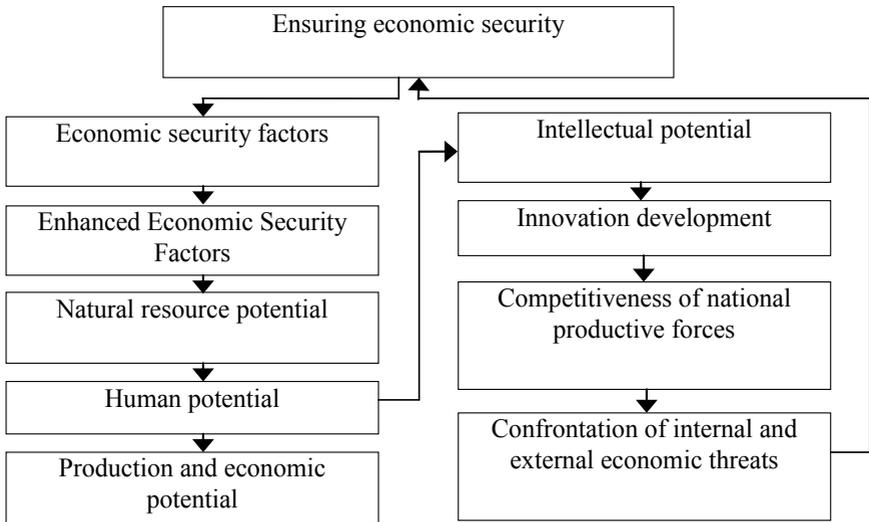
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In the context of the choice by many CIS countries of the policy of transition to an innovative economy, it is important to highlight the innovative component as a factor in ensuring economic security. Many scientists propose to make it as an independent object of research, and introduce such a concept as "innovative security" (Rakhimova, 2012). The relevance of this aspect is confirmed by the growing trends of global competition, integration interactions of economic systems.

When considering the term - innovative security, it should be noted that innovative processes are multifaceted and are a consequence of the functioning of aggregated factors of economic security:

- natural resource potential (quantity, quality and structure of natural resources);
- human potential (quantity, quality and structure of human resources);
- production and economic potential (quantity, quality and structure of the productive forces of society, fixed assets, including equipment and technologies).

Of all the above represented by the element, the locomotive link of innovation security is the human potential and its quality state, represented by intellectual potential, which is shown in Figure 1.



**Figure 1. The concept of the process of ensuring economic security of the state on the principles of development of intellectual potential.**

**Source: compiled by the authors according to the study.**

Based on the foregoing, it can be concluded that a high level of economic security is a consequence of the development of the country's intellectual potential, through the prism of innovation and the competitiveness of national productive forces.

World practice shows that, first of all, those countries, entrepreneurial structures that conduct research and development, have obtained results in the form of intellectual property objects with a high level of economic security and competitive advantage. Proof of this are developed countries that have entered the technological core, having timely chosen an innovation policy with an emphasis on the formation of scientific, intellectual potential. It should be noted that the consideration of intellectual potential through the prism of the innovation process will allow him to set the “tone” for further demand and involvement in the subsequent stages of the innovation process.

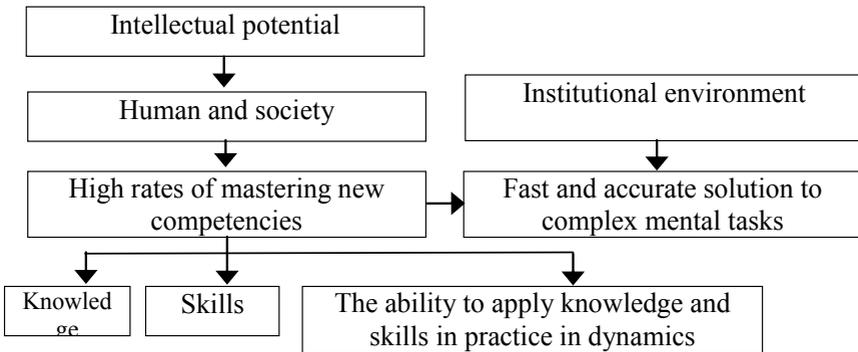
Thus, in order to scientifically search for strategic directions for ensuring economic security, special attention should be focused on the study of problems and priorities for the development of intellectual potential.

## Process Management and Scientific Developments

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In the framework of modern trends in scientific thought, there is no single and accurate definition - intellectual potential. Intellectual potential is the integration interaction of human intelligence with the potential of its possible use in constant dynamics.

So, in particular, in global Internet resources, the intellectual potential is interpreted as follows: “the potential ability of a person and society to quickly and accurately solve complex mental problems, taking into account the high and intensive rates of learning new knowledge, skills and abilities to apply them<sup>1</sup>. The constituent elements and intellectual potential can be represented in Figure 2.



**Figure 2 - The essence of intellectual potential and its components**  
**Source: Compiled by the authors based on the results of a study of intellectual potential and intense pace.**

It should be noted that the concepts of intelligence and intellectual potential are not identical concepts, although they have a direct correlation between themselves. Intelligence in the system of intellectual potential should be in a constant developing state under the influence of the existing institutional environment.

Intellectual potential can be investigated at the micro, meso and macro levels.

Institutional elements of intellectual potential are:

- The system of science and education, which covers state and non-state scientific institutions;
- human resources with certain competencies and multiplying them;
- information and communication infrastructure;

---

<sup>1</sup>Intellectual potential. Electronic resource: (<http://znanie.info/portal/ec-terms/24/238.html>).

- accumulated pool of intellectual property in the form of patents, licenses, know-how.

The intellectual potential in the functioning system of the classical market economy is involved in two areas:

- research (scientific research);
- development (development work).

To assess intellectual potential, the concept of “critical mass” is used - such a level of its maximum permissible minimum value, dropping below which the state is doomed to constant dependence on foreign material, financial, intellectual resources, loss of economic and political sovereignty (Marutyan, 2014a).

There are two indicators to determine the “critical mass”:

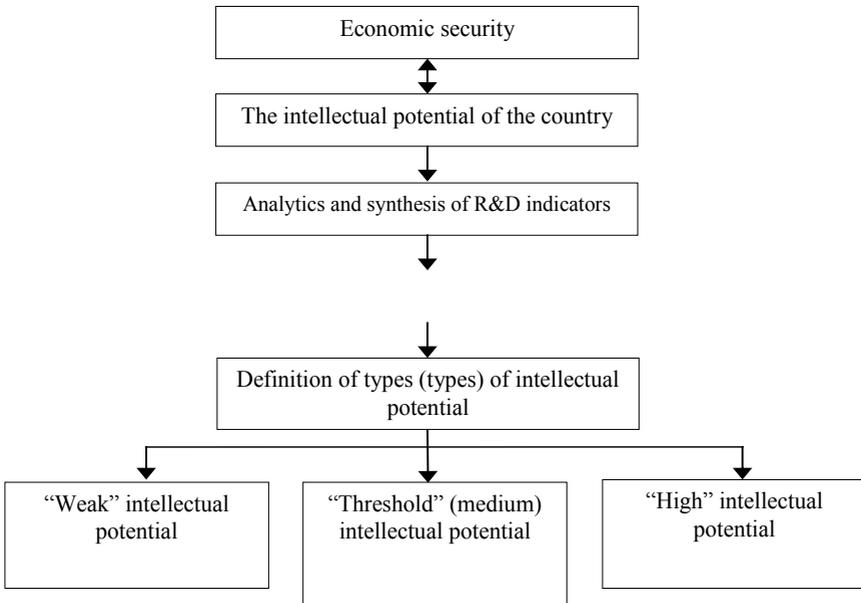
- through the presence of individuals with higher and postgraduate education, employed in the field of research and development and experimental work separately and in production;
- through an integral indicator - the share of research and development (R&D) expenditures in the country's GDP.

R&D indicators make it possible to determine intellectual potential and give its integral assessment at the macroeconomic level. At the same time, such particular indicators as can be analyzed and synthesized:

- The total number and proportion of human resources involved in research. In this aspect, highly qualified specialists should prevail;
- quantitative and qualitative growth of intellectual property;
- level of transfer of non-materialized technologies - the number of registered contracts for the use of inventions (license and assignment of a patent for an invention) from the number of patents registered annually.
- the growth of fundamental, applied, developmental research;
- the emergence of a portfolio or base of basic research, applied research, experimental development, intellectual property.

According to the results of research on R&D indicators, in the practice of a market economy, at the macroeconomic level, three types of intellectual potential can be distinguished:

- “weak” intellectual potential, when its value for a long time remains below the “critical mass”;
- “threshold” (medium) intellectual potential, characterized by the correspondence of its value to the indicator of “critical mass”, to fall below which is dangerous for economic security;
- “high” intellectual potential, when it exceeds the indicator of “critical mass”, society strives for constant renewal, has high innovative activity (Marutyan, 2014). In general, the priorities for assessing intellectual potential are presented in Figure 3.



**Figure 3 - Priorities for assessing intellectual potential.**

**Source: Compiled by the authors based on the results of a study assessing intellectual potential.**

Experts believe that the “destruction” of intellectual potential can occur when the amount of R&D expenditures in the country's GDP during the strategic period or more (5–7 years) does not exceed 1% per year, and also when the proportion of people with a higher science and engineering education in the total number of people employed in the national economy is decreasing with a corresponding temporary trend of 2 - 4% activity (Marutyan, 2014).

In world practice, various countries in order to remain competitive carry out decisive actions in three directions:

- science and technology;
- education, training and retraining of HR;
- development of the energy industry.

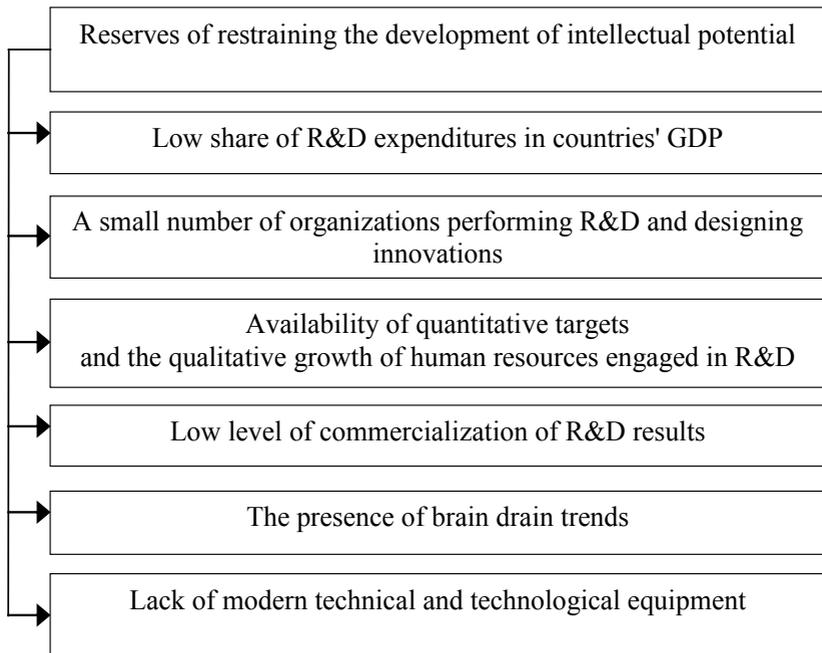
It is important to evaluate how much intellectual potential is formed and how much it will ensure the country's economic security.

The indicators characterizing the scientific and technical level of production and production, the development of science, and the qualifications of personnel reflecting the country's ability to develop independently in

technical terms are close in content to indicators of economic security to indicators of assessing intellectual potential;

A striking example of indicators that allow to interlink the two concepts of “economic security” and “intellectual potential” are: gross domestic product; research expenditures in% of GDP; the proportion of people with higher education per 1000 people, the number of students per 1000 people, the number of people working in science of the total employed population, %; educational expenses, innovative activity. All factors and indicators directly and/or indirectly correlate with each other and affect each other. After analyzing the indicators of economic security and intellectual potential in the relationship, we identified the main problems holding back the development of intellectual potential.

The main problems of the development of the intellectual potential of the Russian Federation and the Republic of Kazakhstan are presented in Figure 4.



**Figure 4 - The main problems of the development of the intellectual potential of the Russian Federation and the Republic of Kazakhstan. Source: compiled by the authors based on a study of statistical data of the Republic of Kazakhstan and the Russian Federation.**

In order to intensively develop intellectual potential and strengthen economic security, it is important to develop the education and science system in the light of modern requirements of the domestic and world markets, to improve its quality. It is necessary to develop the competitiveness of the economy. It is necessary to improve the state management system. It is important to carry out an innovative process with a focus on the R&D phase.

The Republic of Kazakhstan and the Russian Federation provide a strategic focus on new advanced production technologies, on the creation at the national level of a holistic system of supporting intellectual potential, its development and transformation into an intellectual resource, and, ultimately, intellectual capital. It is important that strategic documents and development guidelines quickly find implementation and become tangible on improving the performance of the main factors of ensuring economic security and enable states to become sustainable, competitive and intellectually independent. To achieve the latter, it is important: to develop and implement an economic and economic management mechanism; develop a program for the development of intellectual potential, including human potential, human resources, scientific potential. Monitoring of key indicators and factors affecting the provision of economic security is also necessary.

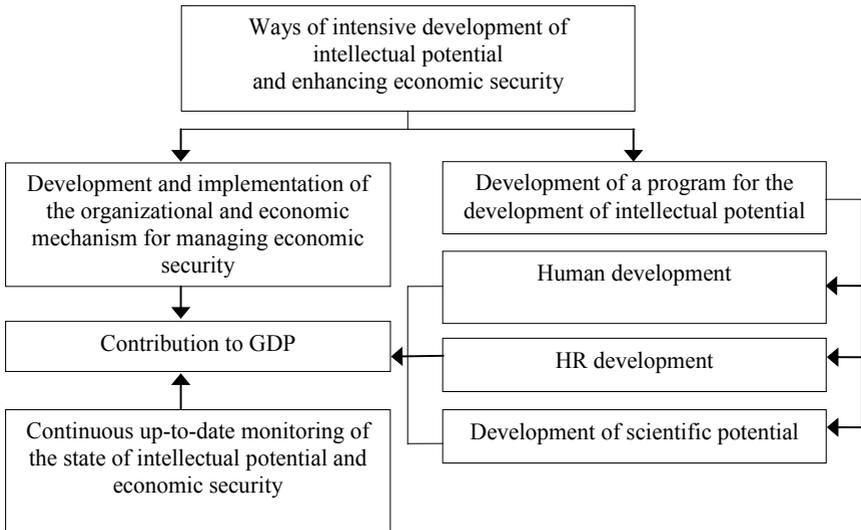
It is important to formulate and implement a strategy for managing intellectual potential in ensuring economic security at all levels, create favorable conditions and monitor indicators that serve as a signal for making correct management decisions.

In general terms, the ways of intensive development of intellectual potential and strengthening economic security at the macroeconomic level are presented in Figure 5.

The dynamic development of intellectual potential in the economic system of the state will be relevant given its development at the meso- and micro levels. Economic structures — small, medium and large enterprises, all types and forms of their associations should be comprehensively and comprehensively integrated into the system of developing intellectual potential and mechanisms for ensuring economic security. At the mesoscale, regional leading sectors of the economy should be involved in the development of intellectual potential.

In business entrepreneurship in the near strategic period, both in the Russian Federation and the Republic of Kazakhstan, an innovative concept of human resources development, called in the 21st century - human management (humanbeingmanagement) should be adopted. The main

philosophy of this concept: “Not people for enterprises, but enterprises - for people”<sup>2</sup>.



**Figure 5 - Ways of intensive development of intellectual potential and strengthening economic security at the macroeconomic level**  
**Source: compiled by the authors according to the results of the study.**

According to the innovative concept, human resources are the main strategic resource of the economic system, which forms its intellectual potential and ensures economic security.

At micro and mesoscale levels, the development of intellectual potential can be supported at the system level through the following mechanisms:

- budgeting of investments in the training and retraining of personnel at the industry level, the functioning levels of individual large, medium and small enterprises;
- Creation of regional universities of corporate and entrepreneurial type;
- Creation of regional centers for the development of human resources;
- implementation of a multidirectional social policy, including on the principles of creating large socio-entrepreneurial corporations.

A correctly chosen development path and the adoption of measures to ensure economic security, including on the principles of developing intel-

<sup>2</sup>What is Human Being Management. Electronic resource: (<https://www.kegcoach.nl/en/home-eng/human-being-management-eng/>)

lectual potential in the context of a transition to an innovative economy, will allow achieving sustainable sustainable development, achieving positive results, occupying a certain niche in the world market and a worthy place in the international ranking.

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## THE PRACTICE OF USING PUBLIC-PRIVATE PARTNERSHIP MECHANISMS IN THE US SPACE INDUSTRY FOR SATELLITE COMMUNICATIONS

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**Abstract.** The article reveals some areas of using public-private partnership mechanisms for the implementation of satellite communications in the US space industry. The participation of NASA in attracting private investment to conduct advanced research and reduce their cost by using public-private partnership mechanisms is shown. The main trends in the development of the global market for the provision of satellite communications services have been identified, which are to expand the spectrum and improve the quality of the services provided. In modern conditions, our country must make all the necessary efforts in order to consolidate its position and become one of the leaders in the global market for the provision of satellite communications services. Increased use of public-private partnership mechanisms to achieve this goal in the near future will contribute to increased budget revenues from the implementation of the full range of satellite communications services offered by domestic operators on the basis of public-private partnership mechanisms for consumers from other countries.

**Keywords:** US space industry, satellite communications services, market development, innovative technologies, private investments, public-private partnership mechanisms.

### Introduction

In modern conditions, outer space with its unique characteristics serves as an ideal environment for the development of all areas of diversification and commercialization of space activities. Space commercialization

is much faster than expected. The last two decades have witnessed the rapid and successful development of this commercial activity, and there is a much wider circle of participants in space activities, including small companies and entrepreneurs who require specific rules to manage these commercial activities and organizations. Many new legal issues have arisen for which there are no ready-made and simple solutions, such as licensing small satellites owned by private individuals, regulation of international and national radio frequencies and orbits, etc. [1].

States do not remain outside the space lawmaking process. Active development of the national space legislation is in full swing, which has an important role in view of the complexity of adopting binding norms at the international level. From the point of view of national regulation, along with the commercialization of outer space, issues such as licensing of commercial space activities (including conditions for space projects, qualifications of an organization for carrying out space activities and insurance requirements, etc.), responsibility and distribution of responsibility should be taken into account between the government and the private sector (including limiting the authority of the government to demand reimbursement from private individuals, which is crucial to alleviate the burden of space enterprises, especially small ones), liability insurance to third parties and the establishment of the mechanism of registration in accordance with the UN resolution on improving the practice of States in registering space objects (Res. of the UN № 62/101, 2008) [1].

### **Main part**

Among the most famous areas of commercialization of space activities are the following: launch of space equipment, direct satellite broadcasting, telecommunications, remote sensing of the Earth, space tourism, small satellites and digitization of information received from space [2]. Today, satellite communications provides vital data channels for the global economy, as well as for US national security.

There are three main forms of using satellites: telecommunications, remote sensing, and navigation.

The International Telecommunications Satellite Organization (INTELSAT) was first established as an intergovernmental organization and launched the first commercial global satellite communications system in 1965. Thus, the commercialization of telecommunication services has been carried out for more than 50 years [3]. INTELSAT was further reorganized and became a private company in 2001. This privatization process has also happened with other telecommunications companies, including the European Satellite Communications Organization (EUTELSAT) and

the International Satellite Communications Organization (INMARSAT). As such, telecommunication services provide an excellent example of the development of both commercialization and privatization of space [4].

Earth Remote Sensing (ERS) is no longer monopolized by states. Even those public or parastatal organizations that own remote sensing satellites provide remote sensing data on a commercial basis. At the same time, many commercial companies, such as Quick Bird in the United States and Rapid Eye in Germany, are already in the remote sensing market, offering products and services to individuals or states that do not have their own remote sensing capabilities [5].

The market of space navigation systems, the long-monopolized GPS and GLONASS, not so long ago allowed the entry of two other new systems - GALILEO [6] and BeiDou (Compass), to provide navigation services. Commercial use of navigation services in terms of access to additional data from navigation satellites is already carried out by the European Space Agency for Navigation Satellite Systems [7].

The continuous development of satellite technologies and the related provision of services through the use of public-private partnership mechanisms has led to a significant reduction in the costs of launching a satellite services market, reducing costs and all types of risks associated with launching satellites, and accelerating the development cycle. In this context, the production of small satellites is becoming more widespread, since they are designed to perform a limited number of individual tasks and can easily connect to a satellite communications network in space. Insignificant volumes of investments and a short development cycle of small satellites contributed to their widespread use in the commercial sector based on public-private partnership mechanisms. The scope of their use can be various civilian areas, such as communications, remote sensing of the Earth, meteorological observations, scientific research of the Earth's surface [8]. The rapid commercialization of outer space has attracted an increasing number of individuals in this area for financial participation and the provision of various services in the satellite communications market [9].

NASA made a significant contribution to the development of the satellite communications market in its early stages, initially developing capabilities designed to support various NASA missions. This contributed to a large extent to the nationwide recognition of the economic and political importance of the development of satellite communications. If in the late 1960s, NASA was a recognized leader in the field of satellite communications, then by the end of the 1970s its role was limited to the niche development of military technology. Today, NASA pays attention to satellite communications

to support its tasks and is working to improve its quality using advanced technologies [10]. NASA's existing satellite capabilities have a significant impact on the US telecommunications market. The development of public-private partnership (PPP) mechanisms in the telecommunications industry can significantly increase the US market share in the largest commercial satellite communications market while expanding NASA's space communications capabilities. Telecommunication services were the first successful experience in implementing public-private partnership mechanisms in the US space industry. They were followed by the commercialization of the Earth Remote Sensing Services (ERS) and global navigation system services.

Commercial telecommunication companies that have gained access to satellite communications through PPP mechanisms receive additional profit from the provision of telephony, television, data transmission (including the Internet) and radio signals through fixed satellite services (FSS). In addition, through mobile satellite services (MSS), cellular telephony and communications services are provided for maritime and aviation services. A promising direction for the development of the satellite communications market and attracting new private investors to it is laser communication technologies, which, due to higher data transfer rates and wider frequency reuse, can increase throughput by more than 1000 times, while avoiding the problems of strictly regulated radio frequency spectrum.

NASA uses satellite communications technology to transfer data between vehicles in space and ground objects for GEO, LEO, and deep space. Enhanced space communications using laser and radio frequency technologies can provide data transfer rates that are 10-100 times higher than modern radio frequency systems (for example, in the Ka band), while reducing both retransmissions and data loss. In addition, laser communications technology can reduce the total mass and power of a spacecraft, while improving tracking of interplanetary flights to within a centimeter level. NASA tested the first Lunar Laser Communication Demonstration (LLCD) laser communications system in 2013. A demo version of this system on a commercial platform was implemented in 2017 [10]. The use of innovative approaches and PPP mechanisms to reduce the cost of telecommunications helps to meet the needs of NASA in closed communication channels for intelligence purposes, as well as expanding activities in outer space.

At the end of 2016, the Satellite Industry Association (SIA) issued a report on the development of the satellite communications industry. Compared to 2015, total revenue grew by 2% and amounted to 260.4 billion

US dollars. Over 10 years, the revenues of the satellite communications industry have more than doubled: from 122 billion US dollars in 2007 to 261 billion US dollars in 2016. There are four main segments on the market: satellite communications and services, satellite launches, equipment and spacecraft manufacturing. The largest market growth was recorded in 2008 and 2012, respectively by 19% and 18%. Subsequently, there was a decline in growth rates to 7% in 2014, to 3% in 2015 and to 2% in 2016. At the same time, the revenues of the satellite industry were provided to the greatest extent by satellite communications and service. Their volume amounted to 127.7 billion US dollars, which corresponds to an increase of 0.2%. Of this amount, satellite communications and services account for 104.7 billion US dollars, fixed-line services - 17.4 billion US dollars, mobile services - 3.6 billion US dollars, and remote sensing services - 2 billion US dollars. It should be noted that satellite communication services and handling, although it bring the greatest income, but its growth rate in recent years has been declining. So, if in 2012-2015 the growth was 4-5%, then already in 2016 it fell to 0.2% [11].

The global demand for throughput of satellite communications services is constantly growing. It is expected that this trend will continue in the future. In 2002, suppliers provided throughput at 1.4 terabits per second, and by 2020 it was provided at more than 1000 terabits per second [10]. Due to the limited number of time intervals in GEO, a further increase in demand cannot be satisfied only by a significant increase in the number of launches; rather, it can be achieved through an increase in the functional, mainly innovative, characteristics of communication satellites.

Today in the world there are about 50 satellite operators. The Big Four operators include Intelsat, SES, Eutelsat and Telesat. They generate about 45% of all revenues from fixed-satellite services and 40% of the fixed and mobile services market [10]. Although government agencies are the main suppliers of space communications, commercial providers have long been providing satellite communications services under the LEO. Inmarsat offers a broadband global network service for LEO users at speeds from 500 to 1000 Mbit/s, and Global Express already has the ability to provide 5th generation satellite communications services at a level of from 50 to 100 Mbit/s [10].

As bandwidth demand increases, satellite service providers are exploring radio alternatives to increase bandwidth and ensure consistently high data rates. For example, NASA, the European Space Agency (ESA), the German Aerospace Center (DLR) and the American private company DoD are actively investing in the development of laser communications.

Planetary Resources, a non-government-owned company, has identified laser communications in deep space as the most important technology for the timely detection of asteroids and plans to increase investment in laser communications on the ARKYD satellite. Other companies interested in laser communications include service providers such as Inmarsat, and satellite manufacturers Ball Aerospace, Northrop Grumman, Lockheed Martin, Space Systems Loral and Boeing. Naturally, many of them, in collaboration with NASA, make extensive use of PPP mechanisms.

Europe also invests in laser communications. Back in 2001, ESA launched the ARTEMIS satellite for GEO, which included a laser communications system. It was used to communicate with the SPOT-4 remote sensing satellite and aircraft at cruising altitude. ARTEMIS is considered the forerunner of the European Data Relay Satellite (EDRS), which has a payload system in GEO orbits that will enable laser relay between satellites, aircraft and ground stations. The first EDRS payload was launched in 2014 aboard the Eutelsat Eurobird satellite. In partnership with ESA and CNES, Inmarsat launched Alphasat on July 25, 2013, built jointly by Thales Alenia and EADS Astrium, which has a laser communication payload system. In the USA, NASA LCRD was placed on the Space Systems Loral satellite in 2017, with the installation of a laser communication terminal [10]. Other space agencies in Russia, China, Canada, Europe and India regularly provide satellite communications services to their populations through telecommunications satellite manufacturers through the provision of financial support for PPP research and development.

### **Conclusion**

In conclusion, it should be noted that in the United States, the Government is the single largest buyer of satellite communications services, but its purchases account for less than 10% of revenues for satellite service providers. The needs and goals of NASA and commercial companies in the telecommunications industry do not fully coincide, which may make it difficult to expand the use of PPP mechanisms in this area.

At the same time, the experience of using PPP mechanisms in US space activities presented in the article can be useful for the development of similar structures in our country. The importance of this circumstance is determined by the following factors:

- 1) the global market for satellite communications services is of no small importance for Russia both in the military and in the civilian areas of its use, which makes it necessary to intensify all efforts to consolidate our country in this market;

2) the provision of satellite communications services to other counter-parties will ensure the attraction of extrabudgetary investments to further develop the spectrum and improve the quality of the services provided.

### Thanks

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## THE USE OF PUBLIC-PRIVATE PARTNERSHIP MECHANISMS FOR SERVICING SPACE SATELLITES (US EXPERIENCE)

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**Abstract.** The article, using the example of the United States, reveals the prospects for the use of public-private partnership mechanisms for joint interaction between NASA and industrial companies in the developing space satellite service market. Similar opportunities need to be developed and implemented by Russia in order to obtain new competitive advantages and maintain a leading position in the development of space activities. In modern Russian conditions, the use of public-private partnership mechanisms will help attract private investment to create innovative technologies for servicing satellites in low Earth orbit.

**Keywords:** space activities, innovative mechanisms, public-private partnerships.

### **Introduction**

The possibility of using public-private partnership (PPP) mechanisms for the development of space activities in the United States has been enshrined in law in 2010 in the National Space Policy. This document stipulates the terms for the joint implementation of a number of NASA's work with large industrial corporations and individual companies using PPP mechanisms to commercialize space activities [1]. A prerequisite for the application of PPP mechanisms for the development and realization of the potential of space activities in the USA was the satisfaction of the priority goals of various NASA missions, as well as the generation of economic benefits for the American economy.

### **Main part**

Initially, eight potential areas of application of PPP mechanisms were identified, which aroused the interest of private business representatives in terms of attracting investments, had the necessary conditions for cre-

ating innovative technologies and were consistent with NASA's goals. It was these factors that became decisive for stimulating the development of partnerships between private business representatives and NASA. Moreover, the use of PPP mechanisms involves the use of a wide range of modern methodologies for creating and implementing innovative products and technologies that are not intended to be transferred to the ownership of a private business.

The area of satellite and other spacecraft (SC) servicing was included in eight potentially promising areas of NASA's use in conjunction with private business representatives of PPP mechanisms for the commercialization of space activities. Currently, NASA is developing this area through the development and testing of modern technologies for serving SC. At the same time, PPP mechanisms and the development of partnerships with private business simultaneously serve as an economic justification for participation in the space activities of US industrial companies and provide NASA with new opportunities to become a world leader in satellite service.

A set of work on servicing satellites includes the ability of a robot or person to save, move, repair, check or refuel satellites in near-earth orbits. In this perspective, space debris removal work may be included in this set of activities. In other words, satellite service has significant potential for increasing the range of work performed, the life of satellites and SC in orbit, and saving costs by reducing the risk of such missions being performed by astronauts.

Near-Earth satellite service is today the recognized world's largest market. The operation of communication satellites for commercial space enterprises alone brings an annual income of 190 billion dollars. Significant amounts in satellite services were invested by two large companies - ATK and MDA Corporation. Four companies operate satellite constellations with a maximum SC weight of up to 150 kg. Two startups successfully mastered the launch of small satellites from 2013 to 2018: Skybox Imaging and Planet Labs. Over the past few years, small satellite companies have attracted more than \$ 100 million in venture capital and investments. More than \$ 1 million was raised through Kickstarter to develop new small satellite companies. 86 potential satellite service capabilities for 1990-2018 are identified.

However, in addition to real and potential revenues, the development of the satellite services market does not do without unforeseen expenses. So, in just ten years from 1997 to 2007, 2.2 billion US dollars were paid to various contractors in the form of lost revenue from launching satellites into incorrect orbits. Another about 700 billion US dollars was paid for insurance claims from 2008 to 2010 as a result of the placement of satellites in the wrong orbits or fuel leaks [1].

For the maintenance and repair of satellites in Earth orbit over the past 30 years, NASA has used crew members of spacecraft. Currently, a special unmanned Skylab spacecraft with remote control has been created to carry out repairs and extend the life of satellites. NASA's first hasty satellite mission was dated 1973 [1]. It consisted of a set of works on attaching a new heat shield, which replaced the previously lost during the launch, as well as the deployment of a jammed solar panel. In addition, the shield, which served as Skylab protection against micrometeorites and preventing overheating of the unmanned spacecraft, was replaced.

For commercial operators, the use of an unmanned spacecraft serving satellites may include a variety of tasks, namely: moving satellites into predetermined orbits; moving satellites into orbital slots or cemetery orbits; refueling satellites; checking the performance of satellites; deployment of solar panels and antennas in case of jamming; replacement of thermal blankets and outdoor cables; moving operating components of satellites that have exhausted their resources to existing satellites with their inclusion in operating system.

It is advisable to use satellite service systems as an upper stage proxy for delivering satellites to specified orbits with lower fuel costs, which can help reduce the cost of launching them. An unmanned spacecraft serving satellites in space will receive them in an intermediate orbit and deliver them to predetermined orbits. Another area of practical application of satellite services should be the removal of space debris from near-Earth orbit.

The U.S. Department of Defense is interested in servicing its NASA satellites in conjunction with the Defense Advanced Research Agency (DARPA). To achieve these goals, certain investments were attracted, designed to carry out several missions in the interests of the US military. Thus, the Air Force spent about 180 billion US dollars on two successful missions (XSS-10 in 2003 and XSS-11 in 2005) [1].

Led by DARPA, NASA, in collaboration with industrial corporations and companies, disassembled and reassemble the test space satellite called Phoenix, which was launched in 2017. The main purpose of the Phoenix satellite's work in orbit was to repurpose components from remote satellites and combine them with new elements to create new satellites in orbit. To develop this area, DARPA spent 36 billion US dollars on the implementation of contracts using PPP mechanisms. In addition, contracts have been signed with MacDonal, Dettwiler, and Associates, Limited (MDA) for 28 billion US dollars for the development of a satellite bus [2].

At the present stage of development of the space satellite services market, the MEV program has proven itself well, the main purpose of which is

to extend the life of the satellite and to fulfill the functional parameters of satellites operating in space by launching other satellites. Northrop Grumman implements this program through the use of PPP mechanisms. So, on February 25, 2020, the MEV-1 satellite successfully docked with the Intelsat 901 satellite, which was transferred to the disposal orbit due to the almost complete exhaustion of its own fuel reserves used to support the satellite's orientation and its retention in a given orbit. The docking of satellites will extend the life of the Intelsat 901 by several years [3].

After docking, the MEV-1 satellite as a service vehicle takes control of the position of the Intelsat 901 satellite in orbit. Specialists will check the satellites in this state for a certain period of time, and at the end of March MEV-1 using its engines will transfer Intelsat 901 back to its original geostationary orbit, where this satellite will continue to provide communication services in the Ku- and C-bands. It is expected that after transferring to the geostationary orbit, Intelsat 901 must work an additional five years at least [3].

After the Intelsat 901 satellite has been serviced in orbit, the MEV-1 satellite will undock from it and begin servicing another satellite that has not yet been determined. At the end of 2020, Northrop Grumman plans to launch the MEV-2 satellite, which is also designed to extend the life and functional parameters of another Intelsat satellite. In the future, Northrop Grumman intends to develop the MEV program, adding to its satellites the ability to refuel and repair other satellites in space orbit.

In 2019, the U.S. Defense Advanced Research Projects Agency (DARPA) initiated the RSGS (Robotic Servicing of Geostationary Satellites) project to create automatic spacecraft for serving satellites in geostationary orbit. At the end of July 2019, Space Systems/Loral (SSL) received a contract from DARPA to create a manipulator demonstrating the practical capabilities of RSGS technology. Then DARPA announced that RSGS is one of the priority programs for the next few years. At the end of 2019, NASA also selected SS/L to launch a new low-orbit satellite service project.

On June 28, 2019, the satellite operator SES and the space technology developer MDA entered into a contract for the orbital servicing of the spacecraft to increase its service life by refueling the correction engines. Thus, SES became the first commercial operator to conclude a contract for refueling a satellite in geostationary orbit. If the first experience is successful, then the contract provides for the extension and development of a number of new promising activities [4].

Currently, 1046 satellites are operating in low Earth orbit. Of these, 432 are in geosynchronous orbit (GEO) and 614 are in the mid-Earth orbit

(MEO or LEO). The greatest market potential for service is represented by satellites on GEO, because it is they who generate most of the added value through the provision of satellite services, such as television, telephone and mobile communications. In 2012 alone, these services brought about 190 billion US dollars in revenue to companies whose satellites operate on GEO. A typical GEO communications satellite with 48 transponders generates about 96 billion US dollars in annual revenue with a potential increase in total operating income to 480 billion US dollars for every five years of additional operation through satellite services.

The development of space activities is an important factor in strengthening the scientific and technological potential of the Russian economy. The results of space research of various directions are acquiring an important role in ensuring socio-economic development, strengthening the defense capability and security of our country. The use of PPP mechanisms in space activities is very promising for Russia, since it allows us to move from an excessively rigid level of state regulation of space activities with the determining influence of state enterprises and corporations of the industry, as well as state order, to a more market segment of the "new economy" with a softer balance ratio financial resources of the state budget and private business structures [5].

The budgetary effectiveness of the implementation of space programs is determined through tax revenues to the budget due to the economic activities of participating enterprises. However, in addition to "direct" budget revenues, the implementation of programs contributes to indirect economic effects by increasing the efficiency of enterprises, organizations and government at various levels when using the results of space activities.

The development of PPP mechanisms in the space sector of the Russian economy is also important because the resources of the orbiting constellation of satellites and ground-based infrastructure to ensure their operability, together with the functional and technical characteristics, as well as the competitiveness of the implementation of space programs, so far belong to the state's responsibility, and solvent demand space industry with the development of the "digital economy" is increasingly moving away from the direct influence of federal governments [6].

For this reason, the main task for the space sector of the Russian economy is to use PPP mechanisms not for government participation in financing market space exploration projects, but rather to attract the competencies and financial capabilities of private sector enterprises to solve state problems in this sector.

### Conclusion

Based on the above data, we can conclude that the development of the satellite services market in space has prospects not only for the United States, but also for our country. Using these prospects, Russia will be able to create additional competitive advantages for itself in maintaining leadership in the development of space activities through the development and practical implementation of innovative satellite services technologies.

In the short term, the main trends in the development of the satellite services market will be the implementation of a set of missions designed to prove the possibility of implementing the concept of reproducing methods that are ideal in a typical operating environment when used in outer space. In addition, it is necessary to create standardized satellite equipment, orbital protocols for performing specific procedures that will help reduce maintenance costs and eliminate possible damage to serviced satellites.

### Thanks

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## LEGALIZATION OF DIGITAL RIGHTS IN RUSSIAN LEGISLATION

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**Annotation.** The article discusses certain novelties in the reform of civil law - the emergence of digital rights as objects of civil legal relations. The author defines the features of the legal regulation of such objects, the positive and negative results of the reform, and also reveals the concept of electronic token and digital form of transactions.

**Keywords:** civil rights objects, electronic form of transactions, digital rights, financial assets, electronic token.

In October 2019, legislation was reformed, as a result of which a number of amendments were made to the Civil Code of the Russian Federation. One of the important short stories is the legalization of digital rights in Russia. Introduction to the Civil Code of the Russian Federation of a new Art. 141.1 "Digital Rights" indicates that the Russian legislator recognized the existence of digital rights as an independent object of civil law.

Article 141.1 states that the digital rights recognize the binding rights and other rights specified as such in the law, the content and conditions for the implementation of which are determined in accordance with the rules of the information system that meets the criteria established by law. The article provides that the implementation of the order, including the transfer, pledge, encumbrance of digital law in other ways or restrict the disposal of digital law is possible only in the information system without contacting a third party [1].

It is important to note that the concept of "digital rights" in the Civil Code of the Russian Federation does not cover all objects transformed for the purpose of transactions or the realization of other rights into digital form and used on technology platforms with different functionalities.

Firstly, we are talking only about rights, in respect of which the law expressly indicates that they can be created and circulated as digital. The Civil Code of the Russian Federation uses a similar design in relation to securities (securities must be named as such in the law or in the manner prescribed by it - paragraph 2 of article 142).

Secondly, these rights should initially be created (arise) in relation to a specific information system and exist (arise, transferred, terminate, etc.) only in the electronic environment.

It is significant that the norm under consideration does not contain technological descriptions of such a system, does not mention either its distributed nature, or the link to certain cryptotechnologies. Requirements for information systems should also be determined by law in relation to specific types of rights.

It is worth noting that when discussing the bill, the possibility of classifying digital rights as known types of objects, in particular securities (uncertified securities), was considered.

The similarity of these objects is difficult to deny, since securities are also a special superstructure, secondary object generated by commercial practice to reduce transaction costs and minimize risks that arise when using traditional methods of transferring the right (these are risks of execution to an improper person, double enforcement, invalidity of the assigned claim (especially in connection with the presence of objections of the debtor) and many others).

A security is not just rights enshrined in a document. We are talking about a special legal regime, which largely equates the transfer of a document (thing) to the transfer of the rights embodied in it and changes the risk sharing system.

When proposing to equate certain objects in the digital environment with securities, the authors of the project obviously had in mind uncertified securities, since classical securities are documents, tangible objects used for fixing and transferring property rights [4].

Digital law, as understood in Art. 141.1 of the Civil Code of the Russian Federation, similar to an uncertificated security in one of the properties: in both cases, property law (most often obligatory) is not tied to a tangible medium, and its ownership and disposal acts are recorded by making entries in a special accounting system. [1]

We encounter a phenomenon of the same nature when analyzing the category of “non-cash money”, when the means of payment are performed by data on the availability of funds in bank accounts (accounts of another central operator), and the transfer of property value is made by making entries in the account. The very right of a claim to a bank arising from a bank account agreement (or a contract similar in nature) is simultaneously considered as an independent object used as a means of payment along with cash - non-cash funds.

At the same time, accounting systems for non-documentary securities

and non-cash money require the presence of a person who keeps records and is responsible for his fidelity (bank, registrar, etc.). In digital rights accounting systems (in the understanding of the Civil Code) there is no such person.

At the same time, the new edition of articles 160, 309 and paragraph 2 of Art. 434 of the Civil Code of the Russian Federation allow the use of digital technologies in transactions, the conclusion of civil contracts. So, the new article 781.1 of the Civil Code of the Russian Federation defines the features of the contract for the provision of information services, by virtue of which the contractor agrees to take actions to provide certain information to the customer and which may stipulate the obligation of one of the parties or both parties not to perform during a certain period of action, as a result of which information may be disclosed by third parties [5].

In addition, the rules governing certain individual types of contracts are supplemented by an indication of the admissibility of the electronic form of such contracts:

1. At the conclusion of a retail contract of sale, an electronic check may be issued (changes to Article 493 of the Civil Code of the Russian Federation);

2. The display of goods on the Internet is recognized as a public offer of such goods as and when the goods are displayed at the place of sale (changes in Article 494 of the Civil Code of the Russian Federation);

3. In the form of an electronic document or by exchange of electronic documents, a nominal account agreement may be concluded (amendments to Article 860.2 of the Civil Code of the Russian Federation);

4. The provisions of the insurance contract are supplemented by a direct indication of the possibility of concluding an insurance contract in electronic form (amendments to Article 940 of the Civil Code of the Russian Federation) [2].

A feature of digital law highlighted by the Civil Code is that it arises directly in the digital environment, in conjunction with an electronic token (token) and on the initiative of an obligated person, who deliberately agrees that the law passes according to the rules of the information system. That is why paragraph 3 of Art. 141.1 of the Civil Code of the Russian Federation establishes that the transfer of digital law on the basis of a transaction does not require the consent of a person obligated under such digital law.

Of the positive aspects of the introduction of such an object of law, the following can be noted. Given the specifics of the Russian realities of law enforcement practice, the presence of a direct rule in the law that allows us to attribute a specific phenomenon to the category named therein is an

important element to minimize the risks of uncertainty associated with the implementation of distributed ledger technologies [4].

However, all this is not enough to make the regulation optimal. The effectiveness of that regulatory “nesting doll”, which is indicated in the design of digital rights introduced in the Civil Code of the Russian Federation, is doubtful. The key parameters of this design should be determined by another law (apparently, the future law on digital financial assets was meant), and through it - by-law regulation, most likely, of the level of the Bank of Russia. It is clear that this is a certain compromise that allowed digital rights to appear in the law, but it lays the foundation for potentially conservative and at the same time often changing regulation - characteristics that are detrimental to long-term investments in dynamically developing technologies.

In any case, whether the construction of digital rights is viable and in demand in practice or whether the fate of some dead innovative provisions of the Civil Code of the Russian Federation awaits it, only time will tell.

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**CONSTITUTIONAL ASPECTS OF THE LIMITATION OF HUMAN RIGHTS IN A STATE OF EMERGENCY CAUSED BY THE FIGHT AGAINST THE PANDEMIC IN EUROPE AND RUSSIA**

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**Abstract.** The article is devoted to the limitations of human rights in a state of emergency caused by the fight against the pandemic. The authors analyze the statistics of coronavirus cases worldwide. The article provides a comparative analysis of the constitutional regulation of the restriction of human rights and freedoms in a state of emergency in the countries of Europe and Russia caused by the fight against a pandemic. The authors consider the procedure for fixing restrictions on human rights both at the level of the Basic laws of states and at the level of by-laws. The state of emergency caused by the fight against the pandemic fundamentally changes the mechanisms for exercising the constitutional rights of citizens by introducing necessary and proportionate restrictions, the significance of which should be recognized by citizens of Europe and Russia.

**Keywords:** pandemic, coronavirus, state of emergency, limitation, human rights.

On the threshold of 2020, an epidemiological situation threatening the whole of mankind has arisen with the spread of the COVID-19 coronavirus, which was designated by the World Health Organization as a pandemic. Absolutely precisely, the situation can be described as an emergency in the field of healthcare, economics, law, political and social sphere, which has international significance. The scientific literature “defines such a concept as an emergency situation in the field of biological safety (of a biological nature), the hallmarks of which are the presence of devastating epidemiological, socio-economic consequences and the geopolitical resonance of the level and scale of national and international security”.<sup>1</sup> From the point of view of constitutional law, the COVID-19 pandemic necessitated the introduction of special constitutional legal regimes, such as a state of emergency, on a country-wide and individual territory scale.

The COVID-19 pandemic has already led to more than 35,000 deaths and 737,532 cases of the disease in the world, according to data collected on March 30, 2020 by the Communication Center of the Government of the Russian Federation based on official sources<sup>2</sup>. Most deaths were recorded in Europe (over 20,000). In China, where an outbreak of the new coronavirus causing COVID-19 disease broke out in December 2019, there are a total of 81,470 cases, including 3,304 deaths and 75,700 cures. Countries in which new cases of infection appear exponentially are Spain, Iran, Belgium. The most affected at present are the United States of America with 142,793 cases of infection and 2,490 deaths, Italy with 10,779 deaths in 97,689 cases of infection, Spain with 7,340 deaths (85,195 cases of infection), China with 3,304 cases of death (81,479 infections), Iran with 3,186 deaths (41,495 cases) and France with 2,606 deaths (40,174 infections)<sup>3</sup>. In Portugal, the Directorate-General of Health (DGS) has increased the number of confirmed cases of infection to 6408. The death toll in the country has risen to one hundred and forty. In Russia, according to the report on the current situation of the fight against coronavirus, all confirmed cases of the disease were recorded on March 29, 2020, 1,836, died 9. Data are as of March 29, 2020, the number of pandemic victims continues to grow exponentially.

The World Health Organization (WHO) today considers the new coronavirus COVID-19 "the enemy of mankind." 177 countries are affected by COVID-19 pandemics. The Ministry of Health of the Republic of Portugal considers the COVID-19 coronavirus to be among the "aggressive viruses", the Portuguese President calls it "an invisible and treacherous enemy." March 25, 2020 President of Russia V.V. Putin turned to citizens of the Russian Federation because of the situation with the threat of the spread of coronavirus infection<sup>4</sup>. The Russian government is taking active measures to counteract the spread of coronavirus infection, a regime of home self-isolation is being introduced. European countries are putting in place constitutional mechanisms to contain the spread of the pandemic. Among these mechanisms is the introduction of a state of emergency.

The constitutional texts of European states provide for the possibility and inevitability of restricting certain rights in a state of emergency. The constitutional formulations of the basic laws do not aim at the detailed regulation of constitutional legal regimes. In the constitutional text, it is enough to fix special regimes in case they need to be introduced and, as a rule, mention of the procedure for their introduction<sup>5</sup>. The content of the special legal regime is provided for by constitutional act, laws, decrees, provisions, edicts, etc. supreme bodies of state power. In accordance with the Constitution of the Italian Republic of 1947 (Art. 16), restrictions are imposed on the right

to freedom of movement and choice of a place of residence of a general nature, which are established by law in the interests of protecting health and safety. In Germany, in accordance with Art. 11 of the Basic Law of 1949 "All Germans enjoy freedom of movement throughout the Federation." This right may be limited only by law, including "when it is necessary ... to combat the danger of epidemics." Article 13 proclaims "the inviolability of the home may be limited, including ... to meet the urgent need for premises, to combat the danger of epidemics" (paragraph 3). Moreover, Art. 98 of the federal state of Germany, Bavaria provides for the restriction of rights by law only if it is urgently necessary for public safety, to comply with moral principles, for health and the common good<sup>6</sup>. According to the Constitution of the Spanish Kingdom of 1978 (chapter 5 "On the suspension of rights and freedoms", the rights recognized in articles 17, 18 (paragraphs 2 and 3 of the rights of a detained person), 19, 20 (paragraphs 1a and 5 (freedom of expression and press), 21, 28 (clause 2 of the right to peaceful assembly and association) and in article 37 (clause 2 of the right to strike) may be suspended if a decision is made to impose a state of emergency or state of siege in accordance with the conditions provided for by the Constitution. The basic law of the Russian Federation stipulates that in a state of emergency, to ensure the safety of citizens and protect the constitutional order, certain restrictions on rights and freedoms may be established in accordance with the federal constitutional law, indicating their limits and duration.

A state of emergency, as a type of special constitutional legal regimes, is "rather complex integrated legal institutions, the application of which introduces changes in the regulation of many aspects of socio-political life"<sup>7</sup> European countries that unexpectedly faced threats to life and health of the population, economic recession, rising unemployment, and the unwillingness of national health systems to quickly respond to changing social conditions, almost immediately had to develop a set of emergency measures to combat the pandemic in an emergency and measures to support the economy. Indeed, the state of emergency is not a dogmatic figure, but a really working construction, including a set of measures of an economic, political, social nature. As soon as possible, all European countries had to overestimate the state's resources in response to the threat of a pandemic. European governments agreed that the introduction of a state of emergency in the context of curbing the spread of the COVID-19 coronavirus is not an interruption of democracy, but is aimed at facilitating the work of medical professionals and reassuring the population. However, national governments should be extremely specific in determining the measures to be taken to avoid abuse.

So, in France over the past 30 years, the state of emergency was a measure introduced more than once: in the Gallic territory of New Caledonia in 1985 in clashes for independence; in 2005, when the surroundings and suburbs of Paris and other French cities were a place of unrest, as in 2015; in 2016 as a result of a terrorist attack and the death of 84 people; in 2020 as a response to the COVID-19 pandemic. In Portugal, a state of emergency was declared throughout the country on March 18, 2020 in connection with the fight against the coronavirus COVID-19. The introduction of the state of emergency in Portugal has never been applied since the Portuguese Revolution on April 25, 1974. After the introduction of a set of measures aimed at preventing social contacts and the spread of the new COVID-19 coronavirus, the German government nevertheless introduced a state of emergency in certain territories (Bavaria) in the presence of more than 7,000 confirmed cases and then to all territories of the country. Bavarian Prime Minister described this measure as “radical”, justifying that social contacts should be as limited as possible to prevent the spread of the virus, if necessary, the intervention of the armed forces<sup>8</sup>. The Czech Republic introduced a state of emergency in connection with the fight against the coronavirus COVID-19 March 12, 2020; Bulgaria - March 13, 2020; Spain - March 14, 2020; Sweden - March 16, 2020; Luxembourg - March 18, 2020, etc. Some European countries have taken the path of introducing a “social exclusion regime” for people who do not show symptoms of a disease and a “quarantine regime” for patients (Denmark, Hungary). In Russia, on March 30, 2020, Russian Prime Minister Mikhail Mishustin<sup>9</sup> appealed to regional authorities with a request to pay attention to measures to completely isolate citizens recently taken in Moscow and the Moscow Region in connection with the coronavirus pandemic and to consider introducing the same restrictions at home. On March 30, in Russia, by order of the president, a non-working week began in order to curb the spread of coronavirus. During it, citizens will be saved wages, life-supporting structures such as banks, medical facilities, shops, pharmacies and transport will also work. These regimes do not provide for a wide range of restrictions on constitutional human rights (except freedom of movement, freedom of mass events, do not provide for the possibility of attracting the resources of individuals and organizations in the fight against a pandemic) and are not enforced by acts of constitutional significance. However, in most countries, these regimes are transitional to a state of emergency and are most often preceded by it (Spain, Germany, Portugal, etc.).

Constitutional acts of the majority of European countries on the state of emergency related to the fight against the COVID-19 pandemic provide

for the possibility of forced detention of citizens at home and restrictions on movement on public roads, if only such movements are justified (France, Germany, Spain, Italy, Portugal). The governments of the countries in this case determine situations and goals in which freedom of individual movement, preferably of an unaccompanied citizen, is maintained.

To reduce the risk of infection and implement preventive measures, the competent authorities can impose the necessary restrictions, including forced detention at home or in a medical institution, the creation of sanitary barriers. The Italian Ministry of the Interior has issued a certificate that everyone should have with them when they go out. In this document, the citizen must indicate the reason why he is out of the house and state that he is not subject to quarantine, mandatory for everyone who had a positive result of COVID-19 infection or who had contact with an infected person. The certificate must be filled out before leaving home and submitted to the police along with an identity document. In France, you also need to have a document with you that justifies why the person is away from the place of residence. However, in France, individual outdoor sports are allowed while maintaining a safe distance for everyone. In Spain, measures to maintain the right to psychological and physical health such as outdoor sports are prohibited during the state of emergency. In Germany, it is forbidden to gather on the street in a group of more than two people. Since March 27, Russia has completely stopped charter and regular flights with all countries due to a new type of coronavirus pandemic. Sanatoriums, resorts are temporarily closed until June 1, as well as catering establishments that do not provide distance trading - until April 5. Since March 30, by an order of the Government of Russia,<sup>10</sup> temporary restrictions have been introduced on the movement of all transport across the state border of the Russian Federation, including the land section of our border with Belarus. Economic support measures for small and medium-sized enterprises in the context of the spread of coronavirus infection have been approved<sup>11</sup>.

A logical restriction of political rights during a state of emergency is the restriction of the right to elect and be elected, to participate in a referendum. During a pandemic, polling places are crowded places and pose a potential threat to the spread of the disease, which is contrary to the objectives of a state of emergency. However, not all countries follow common sense and prioritize economic interests, hiding behind the priority and dominant role of democracy in society. While the coronavirus pandemic had already triggered 120 deaths in France, the government decided not to cancel the municipal elections in Paris and its suburbs on March 15, 2020<sup>12</sup>. The turnout of the population was extremely low. At the entrance

to the polling station, French citizens were offered hand sanitizers and the requirement of maintaining a distance between the voters was respected. March 25, 2020, Vladimir Putin signed the Decree “On the postponement of the date of the all-Russian vote on the issue of approving amendments to the Constitution of the Russian Federation”<sup>13</sup> in order to avoid risks to the health of citizens of the Russian Federation due to the adverse epidemiological situation. This fact indicates that the President of Russia puts human and civil rights and freedoms in the first place, the security of each of us, and subsequently focuses on democratic procedures.

The constitutional right to work is undergoing modifications due to the need to combat the pandemic: remote work at home is introduced in the mode of social isolation for those for whom this measure is justified (teachers of educational organizations, schools, assessment organizations, law firms, banks). Most European countries have provided social support measures for families with children under 12 years of age due to the closure of schools and kindergartens. One of the parents of a child of a specified age is guaranteed a salary payment of 66 percent of the salary that the employee received before the introduction of the state of emergency. At the same time, 33 percent of this amount is paid by the employer, the remaining 33 percent is paid by the state. During the state of emergency, mass dismissals of employees of both private and state enterprises are prohibited<sup>14</sup>.

Distance education is being introduced in connection with the closure of schools, kindergartens, universities, but this does not apply to “children of public servants and the most vulnerable children” (Great Britain, Portugal, Germany, France, Luxembourg, Italy, Spain, etc.). This refers to the children of medical workers, police, firefighters and public servants who are transferred to a special mode of work, as well as children from low-income families who receive the necessary food in schools<sup>15</sup>. UNESCO emphasized that the current situation is an “unprecedented problem” for the education sector. In Europe, not all children have access to information and telecommunication technologies at home.

The right to health and medical care is exercised in accordance with the terms of the pandemic response. Due to the fact that national health systems are overloaded, planned operations, consultations, etc. may be canceled. In Russia, all visits to dental offices and clinics have been canceled, with the exception of emergency cases.

By a resolution of the Presidium of the Supreme Court of the Russian Federation and the Presidium of the Council of Judges of the Russian Federation dated March 18, 2020, in connection with the threat of the spread of

coronavirus infection from March 19 to April 10, 2020<sup>16</sup> the personal reception of citizens in all courts was suspended. You can submit documents to the court only by mail or through Internet reception.

The constitutional right to access to works of culture and art is realized remotely (for example, a virtual museum, a virtual library).

A state of emergency, however, guarantees the exercise of other rights and freedoms, freedom of information and citizenship. The declaration of a state of emergency does not affect freedom of expression and information. The state of emergency also does not affect the right to life, personal inviolability, civil legal capacity and citizenship, the lack of retroactive force in criminal law, the protection of the accused, freedom of conscience and religion. And "in no case should one cast doubt on the principle of a unitary state or the territorial continuity of the state"<sup>17</sup>.

In Portugal, a state of emergency is introduced for a period of fifteen days with the possibility of further extension. In accordance with the Portuguese Penal Code, Art. 348 people who do not comply with the definitions of a state of emergency may be imprisoned for a term of one to five years, or fined, or correctional labor for up to 120 days. The state of emergency declaration provides for the possibility of forced detention of citizens at home, while the police are authorized to use stun guns against persons who have violated the quarantine regime. In Italy, the country most affected by the coronavirus COVID-19, the fine imposed is 206 euros or up to three months in prison. In the case of people who are quarantined and found on the street, the punishment can be up to 12 years in prison for "negligence during an epidemic"<sup>18</sup>. A bill has been proposed in Russia criminalizing non-compliance with quarantine and escaping from a hospital during an epidemic of coronavirus; violators face heavy fines and correctional labor. In the Criminal Code of Russia there is a punishment for violation of sanitary standards, which entailed a massive infection or poisoning of citizens<sup>19</sup>. But in the situation with coronavirus, it is difficult to establish whether a massive infection was caused by escaping from a hospital or quarantine zone. Therefore, the deputies suggest supplementing the Criminal Code with a clause stating that liability should also occur in the event of a threat of mass infection or poisoning of citizens, creating conditions for this.

Thus, the state of emergency caused by the fight against the pandemic radically changes the mechanisms for the implementation of the constitutional rights of citizens, introducing necessary and proportionate restrictions. Aware of their civic duty and civic solidarity, the population must recognize the importance of time constraints in the struggle for life and a return to normal conditions for the functioning of society both in Russia

and in Europe. The positive result of the fight against the pandemic largely depends on the consciousness of citizens in observing the ban on leaving their homes.

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<sup>1</sup>Onishchenko G.G., Smolensky V.Yu., Ezhlova EB, Demina Yu.V., Toporkov V.P., Toporkov A.V., Lyapin M.N., Kutyrev V.V. Actual problems of biological safety in modern conditions. Part 2. Conceptual, terminological and determinative bases of biological safety. Bulletin of RAMS. 2013; №.11P.4–11.

<sup>2</sup>Official coronavirus public information resource (COVID-19) // Стопкоронавирус.рф (appeal date 30.03.2020)

<sup>3</sup>COVID-19 Coronavirus pandemic // URL: <https://www.worldometers.info/coronavirus/> (appeal date 30.03.2020)

<sup>4</sup>Appeal to the citizens of Russia // <http://kremlin.ru/events/president/news/63061> (appeal date 29.03.2020)

<sup>5</sup>In accordance with Art. 116 of the Basic Law of the Italian Republic, the declaration of emergency, state of emergency and state of siege shall be regulated by the relevant constitutional law. The state of emergency is announced by a decree of the Government adopted by the Council of Ministers for a term not exceeding fifteen days, informing the Congress of Deputies about this, which in such cases gathers without delay and without the permission of which the specified period cannot be extended. The decree defines the territory of the country to which it applies. “A permit and a declaration of a state of emergency must clearly define the goals for which it is being introduced, the part of the territory to which it extends, and its validity period, which cannot exceed thirty days. Validity may be extended for the same period with the same conditions.”

<sup>6</sup>Constitutions of states (countries) of the world // URL: <https://worldconstitutions.ru/?p=186>. (appeal date 22.03.2020)

<sup>7</sup>Galenpolsky F.S. The legal status of man and citizen in the conditions of special legal regimes (constitutional regulation) // Siberian Law Journal. 2004. № 4. P. 15.

<sup>8</sup>UNESCO announced that more than 850 million children and young people around the world, nearly half of the world's school population, do not attend school due to measures to curb the spread of the new coronavirus COVID-19.

<sup>9</sup>Mishustin instructed the regions to work out measures to completely isolate citizens // <https://www.rbc.ru/society/30/03/2020/5e8191549a79478bf2fc7b2d?from=newsfeed> (appeal date 30.03.2020).

<sup>10</sup>Decree of the Government of the Russian Federation of 27.03.2020 N 763-r “On the temporary restriction of traffic through automobile, railway, pedestrian, river and mixed checkpoints across the state border of the Russian Federation, as well as through the land section of the Russian-Belarusian state border” // Document was not published. <http://government.ru/docs/39307/> (appeal date 30.03.2020).

<sup>11</sup>The meeting of the Government Commission on the development of small and medium-sized enterprises. March 27, 2020 // <http://government.ru/news/39291/> (appeal date 30.03.2020).

<sup>12</sup>Municipal elections in France were not prevented by coronavirus // [www.dw.com/ru/муниципальным-выборам-во-франции-не-помешал-коронавирус/a-52780122](http://www.dw.com/ru/муниципальным-выборам-во-франции-не-помешал-коронавирус/a-52780122)

<sup>13</sup>Decree of the President of the Russian Federation of 25.03.2020 N 205 “On the postponement of the date of the all-Russian vote on the issue of approving amendments to the Constitution of the Russian Federation” // Russian newspaper. 2020, N 66, March 27.

<sup>14</sup>The situation is general and requires specification, as in European countries, the process of applying penalties to employers can be complicated by the condition that large employer organizations are transnational and can be punished for mass layoffs (for example, restricting credit lines) only in the country of origin of the organization. Therefore, there are cases of illegal dismissals, the departure of employees on unpaid leave, etc.

<sup>15</sup>Constitutions of states (countries) of the world // URL: <https://worldconstitutions.ru/?p=186>. (appeal date 20.03.2020). Bavaria introduced a state of emergency on its territory prior to the introduction of a federal state of emergency. Art. 122 of the Bavarian Constitution enshrines the obligation of citizens to help each other within the framework of the law, in case of accidents, distress, during natural disasters, as well as in relations between neighbors. It is noteworthy that some municipalities of the Portuguese Republic (for example, Ovar) went along the path of Bavaria, declaring a state of emergency and taking appropriate measures to limit their rights and to combat the spread of the pandemic before the introduction of this regime throughout the country.

<sup>16</sup>Resolution of the Presidium of the Supreme Court of the Russian Federation, Presidium of the Council of Judges of the Russian Federation of 18.03.2020 N 808 “On the suspension of personal admission of citizens in the courts” // The document was not published. <http://www.garant.ru/files/2/8/1332482/postanovlenie-prezidiuma-verhovnogo-suda-rossiyskoy-federacii-i-prezidiuma-soveta-sudey-rossiyskoy-federacii-ot-18-marta-2020-g.pdf>

<sup>17</sup>From a statement by the President of Portugal, Marcelu Rebelo De Sosa, “On declaring a state of emergency.” URL: <https://rr.sapo.pt/2020/03/15/actualidade/covid-19-marcelo-decide-na-quarta-feira-se-declara-estado-de-emergencia/video/234353/> (appeal date 20.03.2020)

<sup>18</sup>URL: <https://www.publico.pt/2020/03/18/politica/noticia/coronavirus-ano-prisao-120-dias-multa-desobediencia-estado-emergencia-1908415>. (appeal date 22.03.2020)

<sup>19</sup>The State Duma on March 31 will consider priority bills in three readings at once // <http://duma.gov.ru/news/48181/> (appeal date 30.03.2020)

## MODERN DIGITAL TOOLS FOR MUSICIANS

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**Annotation.** The article discusses various programs for use by professional musicians-teachers, describes in detail the capabilities of these recording programs, as well as further special processing of previously recorded instruments and vocals.

**Keywords:** modern digital instrumentation for a musician, virtual instruments, music and computer technology, software for creating music on a PC.

In the modern world there are many types and types of virtual synthesizers, which, every year, are becoming more and more. They have different properties and purposes. Some are capable of only changing the sound wave and reproducing it, while some tend to reach the level of real musical instruments, repeat their timbres, properties and even features of sound production.

The rapid development of virtual synthesizers opens up great opportunities for musicians. Virtual instruments allow you to have a large baggage of musical instruments, just having a personal computer with special programs. Also, their development contributes to the development and emergence of new musical genres. Some of these genres do not remain for long and go into oblivion, but there are those that remain in attention and also in the future serve to form already new musical branches and genres. It is worth mentioning that over time, technical and software that improve the creation of musical compositions, simplify the process of their creation.

Technical support includes equipment that makes it possible to record musical instruments, vocals. Equipment such as a personal computer (PC), a mixing console, microphones, various devices for recording instruments,

MIDI keyboards and synthesizers. To listen to musical material, speakers or headphones are used; in professional recording studios, studio monitors or monitor headphones are used, which allow working with musical material with higher accuracy. Improving technical support improves the perception of music, its analysis and recording of musical instruments.

The software includes programs with which you can record and subsequently perform special processing of previously recorded instruments and vocals. These programs are called sound editors. Programs that enable you to listen to recorded material are called players or players. Programs that make it possible to work with musical text, such programs are called music editors. To create arrangements, several types of programs are distinguished: auto-arrangers, sequencers, pop designers, etc. You can also highlight the programs that are used to create your own programs, various additions to existing programs, plugins.

With the development of technical and software, it became possible not only to improve the process and quality of recording musical instruments, but also to combine classical, traditional, electric musical and virtual instruments. Virtual synthesizers are improving very rapidly. Today, there are many libraries with instruments that were not only synthesized, but also recorded from real musical instruments. Nowadays, such libraries make it possible to practically recreate, or at least get closer to, the sound of a symphony orchestra, with only a music computer on hand. However, technology has not yet reached the point where the program could fully imitate real musical instruments and the game of musicians.

FL Studio 12 is a sequencer that can still be found in specialized literature under a different name - Fruity Loops - is a program for writing music. This is a powerful DAW (digital audio workstation) tool that has become popular all over the world. Since its inception, it has been distinguished by originality, both in terms of the workflow and interface design

This program is supported on different operating systems, but it is best optimized to run on Windows (FL Studio 12 is ideally optimized for Windows 10). At the moment, the program is one of the most popular digital music studios. Using FL Studio, you can create a work of almost any genre. There are various versions of the program, currently the current version is FL Studio 20. System requirements are still low and acceptable for most devices. This program is easy to use even for new users:

- availability, ease of use. If you need at least some skills to use more professional sequencers, then this program will not create problems even for a novice musician. In addition, for those who are in difficulty with foreign languages, the latest versions of the program are fully Russified;

- the program uses rather complex algorithms for playback in its work; There is a parametric equalizer and an advanced mixer that supports about a hundred tracks, where each track gives the musician the opportunity to apply up to 10 special effects on it. The manufacturer - Image Line Software - offers a DAW with many plugins. The program contains its own virtual tools (VST-plugins), and has the ability to connect third-party tools from other developers.

In working with the studio, you can separate the windows and move them to the right place, dock, compress and enlarge. Moreover, the application allows you to configure your own scaling, both for the main window and for the mouse cursor, that is, you can change the scale for large or small screens. A graphical approach is essential for usability and overall usability.

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**Controller** – a subgroup in which the instrument can be assigned how and where it should sound.

**Delay, Reeverb** – a subgroup with different plugins for reeverb (space effect) and Delay (echo effect).

**Distortion** – a subgroup in which the various Distortion plugins are represented.

**Dinamics** – this category contains everything for improving the sound of the pattern.

**Filter** – a category that includes all available equalizers.

**Flanger** – category with phaser, flanger, chorus effects.

**Fx Mastering** – in this category is the main vst-plugin for general mastering of the track.

**Gain** – in this category you can assign a place to the pattern in the scene of the composition.

**Misc** – the last category contains Gross beat effects (an effect in which you can draw a sound reproduction scheme), fruit Vocoder (an effect in which you can change the timbre, pitch and tone of a recorded vocal) and other effects for various interactions with sound.

To master the created songs in the program, you can use the Ozone 8 vst-plugin (Figure 1).

The main function of the Vst plugin is to mix sound, as well as edit sounds and music that contain several separate modules and support for VST and AU audio plugins. The main feature of this vst plugin is the master assistant function. This function will produce: analysis of the audio track, equalizer settings, dynamics analysis, maximizer settings, maximizer analysis and set the dynamics of the equalizer. Using this function, you can start playing a song, then activate this function and, thanks to its algorithms, it will automatically select the most suitable settings for the equalizer, dynamics and mastering of the track.



Figure 1.

Also in the program you can load and use such plugins as: Sytrus, Harmless, Nexus 2, GMS and Harmless, etc.



Figure 2.

"GMS" is very convenient in creating sound. Each sound signal can be varied at once with three sound waves, which makes the sound each time unlike any other. The Vst plugin also includes 10 internal effects: distortion, crash, flanger, LPF, HPF, echo, reverb, pan and trance. The Amplitude scale allows each sound to be modulated according to its characteristics. In the main window of "GMS", attack settings, sound durations and wave movement are also available.

"Harmless" is not as convenient as "GMS", but in terms of selecting sound and adjusting its characteristics, it is ahead of "GMS". It has the following features: 4 Oscillators, 2 custom ADSR envelopes, 2 independent filters (LP, HP, BP), 2 programmable envelopes 2 LFO. This tool also includes a built-in arpeggiator and a set for processing sound (Distortion, Phaser, Chorus, Eq, Delay, Reeverb, Compressor). Most of all, this Vst plugin is convenient in that for each regulator, you can make a graph in the main window where and in what position it should work.

Each instrument can be processed with the built-in equalizer Fruity Parametric EQ2. For example, for Kikc (barrel), you can cut the frequencies from below to 50 Hz, just cut the middle frequencies within 300-320 Hz, and cut the upper frequencies after 3 kHz.

Fruity Multiband Compressor, gives the barrel a more juicy coloring.

The Maximus effect, in which, depending on the sound range, you can raise the sound spectra to - 6 db.

Reason 5 is another DAW program for creating and recording music. Reason was successful thanks to its intuitive, simple and realistic recom interface, as well as its incredible stability among many DAWs.

This program is supported on Windows and MacOS operating systems. From the beginning of the creation of the program to today, Reason has 11 versions of programs. The system requirements for the program are low, which makes it accessible to users of both new and older computers.

Reason is a complete program that includes a large number of instruments, effects, utilities, a library of samples and presets for creating music, both for beginners and professionals. At the heart of Reason's work are audio signal transmissions and CV voltage control inherent to semi-modular and modular synthesizers. This program can be used not only as a sequencer and virtual recording studio, but also for live performance, or for recording instruments using external sequencers, using Rewire technology. Unlike FL Studio, Reason does not provide the function of connecting third-party virtual instruments (VST-plugins). This program uses tools of its own format - Rack Extension plugins.

The whole design and the principle of operation of the tools of this program resembles a rack rack studio. In this virtual wreck, you can add instruments and effects for them. The list of available virtual instruments includes: synthesizers, samplers, effect processors, step and graphic sequencers. To switch to the "back side" of the rack rack, use the Tab key. As on a real rack rack, we can see the cables that connect the instrument and effects windows to the mixer.

The main windows for working in the program:

1. A rack where tools for outputting an audio signal, a mixer, plug-ins with instruments, and also plug-ins with effects are added.

2. The main window, which makes it possible to edit both individual instruments and the full composition in the right window (p. 5).
3. The panel for switching between piano roll modes for each instrument and the main composition window.
4. Panel with tools for editing material.
5. A window for working with a composition, where all individual instruments are organized into one composition.
6. A panel for each individual instrument, which supports the muffling function of the instrument, the solo mode, as well as automation modes.
7. Playback control panel. On this panel there are buttons for turning on the metronome, changing the tempo and size of the composition, a window with the duration of the composition and buttons for playing and recording.

**Omnisphere was developed as a plugin that integrates into a sequencer. Alternatively, a synthesizer can also be used as a sound module for live performance. Omnisphere is the only software synthesizer in the world to offer a hardware synthesizer integration function. This remarkable innovation transforms over 65 renowned hardware synthesizers into extensive hands-on controllers that open up new advanced Omnisphere synthesis capabilities. Bridging the gap in physical experience between software and hardware, users gain intuitive Omnisphere control with the familiar layout of a supported hardware synthesizer. Advanced Synthesis Engine has four layers per patch, new AC filters, powerful granular synthesis, full FX modulation. It is also possible to use your own audio file as a sound source in Omnisphere using granular synthesis and many other tools inside the synthesizer.**

**A music computer with its unlimited possibilities confidently sets off in broad strides and convincingly conquers the music production industry, leaving behind the analogue life of a musician. Composers have great opportunities to create musical works, and most musicians and composers are increasingly resorting to such unlimited resources. Thanks to an incredibly huge amount of instruments, with a personal computer one musician or composer becomes a musical group or even a whole symphony orchestra. Digital technologies have raised musical capabilities to a very high level, synthesizing sounds in a software environment allows you to diversify the sound palette and enrich the sound of modern compositions.**

**Manufacturers of software products are constantly in search of high-quality software copying of emulations of analog equipment with its unique harmonic distortions, which added a warm sound to the sound of compositions that is pleasant to the human ear.**

**TECHNICAL MEANS AND TECHNOLOGIES IN THE FORMATION  
OF PROFESSIONAL COMPETENCIES DURING FIELD  
PRACTICES OF STUDENTS IN THE DIRECTION OF "TOURISM"**

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**Annotation.** The article describes the technical capabilities for the formation of professional competencies of students studying in the direction of "Tourism". Methods for the use of modern technical equipment in conducting field trips are considered, involving the identification and comprehensive assessment of the tourist and recreational potential of the territory. The technologies used make it possible to carry out a scale assessment of the state of natural and cultural heritage objects; carry out spatial localization by mapping; the definition of indices reflecting the process of formation of the cultural landscape as a structural element of the tourist destination.

**Keywords:** technical means, technologies, professional competences, direction "Tourism", methods of using technical means, field practice, practice-oriented training.

**Introduction**

The introduction of digital and navigation systems in the educational process helps to improve the quality of practice-oriented teaching of students in order to increase their competitiveness in the field of tourism.

World experience shows that the use of modern technical means and technologies expands the educational process in training specialists with high competitiveness [1-3].

This article determines the degree of effectiveness of the use of technical means in the formation of professional competencies of students during the training field practice.

### Main part

When conducting field practices for students of the Tourism direction in order to familiarize them with the methods of field tourist and recreational research for collecting, analyzing, processing and using information, and using them in the subsequent tourist and recreational design of the information space and tourist routes, it is advisable to use various modern technical means:

- Photo and video equipment
- Voice Recorders
- GPS navigators
- Satellite trackers
- Satellite phones

Means of photo and video fixation are extremely necessary when conducting field practices in both urban and natural environments. They allow you to capture tourist and recreational objects and phenomena, increasing information content in the subsequent design of tourist routes. In addition, during the off-site work on processing the collected material during the field research, it is precisely photo and video materials that help in describing tourist sites and phenomena, assessing their attractiveness and tourist and recreational potential, since during the practice of analyzing these elements often enough time. Dictophones are also an important tool in the practice, as they can significantly save time by avoiding the written record of the description of the quantitative and qualitative characteristics of tourist and recreational facilities and phenomena. Modern smartphones have not only photo and video capabilities, but also voice recording.

In the context of field practices in the natural environment, navigation and safety systems are of utmost importance. So GPS-navigators help in orientation on the terrain, determining the location and distances, determining the optimal routes, building a route thread based on the distances traveled. Modern cameras can be equipped with GPS receivers, which allows spatial reference of the resulting photographic materials. Also in our time, almost all mobile gadgets are equipped with GPS-receivers, and in the market of mobile applications there is a huge variety of software products related to navigation (Google Maps, Yandex.Maps, Yandex.Navigator, Maps.me, Navitel.Navigator, etc.). However, in conditions of prolonged exposure to the natural environment, without access to a power source and the constant use of a mobile device, the battery will discharge within a few hours. Correct the situation, of course, modern portable batteries (Powerbank) allow, but still, when you are in autonomous conditions for a long time while undergoing field practices, it is better to use specialized

GPS-navigators, for example, Garmin, which allow you to work for a longer time without recharging, and get more accurate coordinates of objects.

Satellite trackers and satellite phones are necessary if you are in an autonomous environment as a means of security. They can be used when navigating a route in remote areas of remote access, where there may be a lack or interruption in mobile communications. Satellite trackers allow you to track the location of the subject by third parties, and in case of unforeseen situations send SOS signals via satellite, which makes it easier for search and rescue services. Satellite phones make it possible to contact the necessary persons and services in any situation, even in places where there is no mobile communication at all.

The tourist data collected during the field practice of students needs desk processing. Typically, data is analyzed, evaluated, and selected and evaluated tourist and recreational objects or events are mapped and linked into routes. GIS technologies are a modern technological tool for collecting, analyzing, processing, storing, transmitting spatial data [6]. It is they that allow the collected information to be processed and visualized through maps and the design of a spatial-visual environment.

At the moment, on the GIS-technology market you can find several powerful software products that are close in their functionality and principles of work. These are software products: ESRI ArcGIS, ESTI MAP Map-Info, free cross-platform GIS - QGIS and some others.

The field training practice of students of the Institute of Earth Sciences of the Tyumen State University is organized in accordance with the Federal Law No. 273 of December 29, 2012 "On Education in the Russian Federation", the Federal State Educational Standards of Higher Professional Education in the field of study 43.03.02 "Tourism", "The Regulation on the practice of students of educational institutions of higher professional education" approved by Order No. 1154 of the Ministry of Education of Russia.

Students' educational practice takes place in the 2nd and 4th semesters in the first and second courses, and is an integral part of the main educational program of higher professional education, it is important in the preparation of qualified specialists in the tourism and service sector.

Let us dwell on the description of the specifics of the organization and conduct of educational practice for second-year students of the two summer periods of 2018 and 2019.

In the first half of July 2018, second-year students of the direction "Tourism" underwent training practice [4]. In the 2017-2018 academic year, the practice included two stages: practice at a travel industry enterprise and field practice. The first part of the practice (or as its students conventionally

called "production" practice) took place in travel agencies of the city of Tyumen. In addition, and in institutions of further education ("DTiS "Pioneer"); Center for Tourism and Local History "Azimut"; children and youth center "Vanguard"; Ecological and Biological Department of the Tyumen Regional Public Children's Movement "ChIR". During the week of practice, students gained skills in working with documents, with clients on selecting a tour program, designing ecological routes, and also tried themselves as organizers of youth sports, tourist and local history events.

A little about the second part of the training practice - field practice. It can be called a field conditionally, because She did not provide for living in the field, but nevertheless, her program included going to the countryside with the implementation of practical tasks with subsequent cameral processing. The practice ground was the territory of the regional nature monument "Zatyumensky Forest Park". Here, students chose objects for an ecological trail, marked a route on a map, and took photos and videos. When cameral processing, the text for the excursion route was compiled. In addition to designing a training ecological trail on a map of the territory of the historical part of the city of Tyumen, students designed a guided tour with QR codes for objects, participated in a team game - quest.

Training practice, although not long, is only two weeks, but it is an opportunity for student tourists to "plunge" into a variety of tourist activities, to check theoretical knowledge in a real situation [4].

The fact that the training practice, conducted in the natural environment, forms not only professional competencies, but also unites students, teaches them to work as a group, and these are already communicative skills, can be judged from the feedback of the 2nd year student Lemeshko Diana (2018-2019 academic year) [5]:

"Practice" - it sounds so serious... You are expecting voluminous documents, reports and languid practical exercises. But our university for the second year proves the opposite, practice can be so interesting that it becomes sad when it ends.

Two-week practice took place at several sites: on the territory of the institute, the historical center of Tyumen and Zatyumensky Ecopark. Every day we had to carry out different tasks from difficult practical ones on papers; we passed on to interesting creative quests.

The most memorable in the opinion of many children was a visit to the Zatyumensky Ecopark and the passage of trails. We were invited to share in groups and create our own ecological routes with stations that could be offered to tourists in the future. Stations had their value, from medical and cognitive, for example, like the "Pharmacy at the Crossroads" station,

where various types of medicinal plants grow (nettle, millennials, dogrose), to sports, such as “Hammer of the Torah”, where participants had to lift the barbell at one of the sites of the ecopark.

In conclusion, I would like to write how we had a great time with our group. Thanks to such interesting and creative tasks, we got a lot of impressions and memories. No wonder they say that student years are the best!” [5]

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**FEATURES OF THE RELATIONSHIP OF INITIAL DRIVING  
SKILLS AND THEIR DYNAMICS WITH THE INDIVIDUAL  
PSYCHOLOGICAL CHARACTERISTICS OF STUDENTS  
OF THE TRAINING CENTER, DEPENDING ON THE INITIAL LEVEL  
OF PREPAREDNESS**

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**Abstract.** The results of a study of the relationship between the initial skills of car driving and their dynamics among students of the training center, differing in the initial level of preparedness with individual psychological characteristics and properties of attention, are presented. The hypothesis is verified that the initial level of preparedness and the further dynamics of training are associated with the individual psychological characteristics of students in driving schools. The studied sample consisted of 54 girls and 40 young men who underwent professional training in the AEI "Educational and Training Center "Technopark" in Omsk. It was experimentally revealed that the correlations of the studied indicators are multidirectional in relation to the initial level and the dynamics of car driving skills.

**Keywords:** driving skills, initial level of preparedness, skill gains, individual psychological characteristics, attention properties.

**Introduction**

Peculiarities of car driving training are considered by researchers as a process of specialized skills formation [4], provided by the interaction of elements of the functional system of activity [3, 20]. At the same time, training is a focused process of interaction between the teacher and the

student, during which the latter assimilates knowledge, skills. However, the level of initial preparedness of students of a driving school, which affects the perception of information about the conditions of movement of the car and its further implementation, is not always taken into account. Depending on the initial preparedness, the process of forming car driving skills varies. To a large extent, these differences are associated with the individual psychological and psychophysiological characteristics of the students.

The developing dominant of learning is reflected in a significant number of works [2, 5, 6, 21]. In accordance with this, the success of driver training is provided by the relationship between training methods and the development of professional skills. Learning has a leading role in developing car driving skills. The development process is ensured by the interaction of external and internal factors. External conditions, reflecting the means and methods, are closely interrelated with internal factors, which are the professional abilities of the subject. On this topic, S.L. Rubinstein noted that abilities are internal conditions for human development, which are formed under the influence of external in the process of training [17].

Learning is considered as the general ability of an individual to assimilate new knowledge, the formation of skills. Learning, based on the abilities (in particular, the characteristics of sensory and perceptual processes, memory, attention, thinking and speech) and the cognitive activity of the subject, manifests itself in different ways in different activities and in different educational subjects. V.D. Shadrikov notes that abilities as properties of functional systems having an individual measure of expression are systemic qualities in which the properties of the elements of their components are manifested, i.e. potential. Since the makings are the properties of the components of functional systems that implement a particular ability, they, together with the environment, control the process of development of abilities [19].

E.P. Ilyin noted that each ability has a motivational side, reflecting a person's tendency to engage in a particular type of activity for which he has abilities [11]. The data available to date definitely indicate that people with different abilities have unequal production indicators, which is fully manifested in the process of teaching a profession [1, 7, 8, 11].

C. Gunther showed that the formation of abilities is associated with the professional qualifications of students [22]. This indicates that the success of the development of abilities is associated with the level of preparedness of the subjects of training.

**The purpose** of the study consists in examining the characteristics of the relationship between the formed initial skills of driving a car with indi-

vidual psychological characteristics and attention properties of students of the training center, differing in the initial level of preparedness.

The hypothesis was the assumption that after a leveling experiment, students of the training center have different initial levels of preparedness that determine the further dynamics of training. The success of the preparation is influenced by the existing individual psychological characteristics of the students.

### **Research organization**

The studied sample consisted of 54 girls and 40 young men who underwent professional training in the AEI "Educational and Training Center "Technopark" in Omsk. The training was held in accordance with the requirements of the program [14].

Before the start of driving training, all students underwent autotraining course in accordance with the methodology presented in [4]. This made it possible to form an initial level of preparedness, which is an essential factor determining the effectiveness of training. Based on this, we distinguished two groups of cadets, characterized by higher and lower initial levels of driving skills.

In the future, the level of skills was assessed in control classes (7th - 8th and 23rd - 24th hours of training), held in the conditions of the circuit. The following indicators were studied: the stability of the motor skill of the beginning of the movement (SMS), the overall coordination of the actions of the car drivers (CA), the skills of determining the front (FD) and lateral (LD) dimensions of the car, the skill of assessing the visually-motor reference points of movement (VMR) and the skill of determining landmarks reversing movement (RM) [4]. The theoretical and methodological basis for the classification of the studied skills is the regulatory requirements for taking qualification exams for students of a driving school [15].

Psychophysiological features and individual-personality differences of students were studied in the classroom. Among them were determined: levels of situational and personal anxiety [9], psychodynamic properties of temperament [13], typological features of the manifestation of properties of the nervous system [10]. The Landolt test [18], the Munstenberg test [16] and the black-red Schulte tables [16] were used to study the attention functions of the participants in the experiment.

The relationships between the considered indicators were revealed using correlation analysis. For this, the *SPSS-statistics 20* software was used. The *r*-Pearson correlation coefficients were determined. We analyzed the relationships having the level of statistical significance  $p < 0.05$  [12].

### Research results and discussion

An analysis of the relationships between the studied indicators of girls with a higher initial level of preparedness is distinguished by a number of features. There are no links between signs that reflect the initial skills of the driver. The characteristic relationships of initial driving skills are observed with individual psychological characteristics and individual properties of attention. In particular, the ability to determine the front dimensions of the car (FD) positively correlates with extraversion ( $r = 0.44$ ;  $p < 0.05$ ), and the ability to determine the side dimensions (LD) is higher in girls with higher personal anxiety and neuroticism ( $r = 0.37$  and  $r = 0.45$ , respectively, with  $p < 0.05$ ). The skill of assessing hand-eye movement landmarks (VMR) negatively correlates with arousal mobility and a measure of reliability of attention. The skill of general coordination of driving actions (CA) is negatively related to the indicator of average accuracy of attention ( $r = -0.36$ ;  $p < 0.05$ ), with the switching level on black numbers ( $r = -0.39$ ;  $p < 0.05$ ) and selectivity of attention ( $r = -0.44$ ;  $p < 0.05$ ). At the same time, the selectivity of attention positively correlates with the skill of determining reference points for reversing (RM) ( $r = 0.40$ ;  $p < 0.05$ ). The stability of the motor skill of the beginning of movement (SMS) is positively associated with such indicators of the proof-reading as the average speed of information processing ( $r = 0.38$ ;  $p < 0.05$ ) and the average productivity of information processing per unit time ( $r = 0.40$ ;  $p < 0.05$ ).

In girls with a higher initial level of preparedness, no associations were found between the growth rates of driving skills. At the same time, in relation to the correlations of the initial indicators, there are significant differences in the relationship between the dynamics of driving skills and the psychophysiological and individual psychological characteristics of students.

The CA skill growth rate negatively correlates with the attention reliability indicator ( $r = -0.36$ ;  $p < 0.05$ ) and positively with the speed of attention selectivity ( $r = 0.36$ ;  $p < 0.05$ ). The dynamics of the FD indicator is negatively associated with extraversion ( $r = -0.41$ ;  $p < 0.05$ ). The growth rate of VMR skill has a close positive relationship with excitation mobility ( $r = 0.63$ ;  $p < 0.01$ ). The dynamics of the FD indicator is determined by the negative relationship with personal anxiety ( $r = -0.38$ ;  $p < 0.05$ ) and neuroticism ( $r = -0.48$ ;  $p < 0.01$ ).

In girls with a lower initial level of preparedness, the relationships between driving skills are more integrated in relation to persons with a higher initial level of preparedness. Skill RM positively correlates with indicators LD ( $r = 0.40$ ;  $p < 0.05$ ) and CA ( $r = 0.57$ ;  $p < 0.01$ ). The latter indicator is positively associated with VMR skill ( $r = 0.41$ ;  $p < 0.05$ ). At the same time,

CA positively correlates with such individual psychological characteristics as: personal anxiety ( $r = 0.40$ ;  $p < 0.05$ ), endurance coefficient in the visual analyzer ( $r = 0.40$ ;  $p < 0.05$ ), average accuracy of attention ( $r = 0.44$ ;  $p < 0.05$ ), coefficient of accuracy of the visual analyzer ( $r = 0.41$ ;  $p < 0.05$ ) and negatively with the strength of the nervous system ( $r = -0.40$ ;  $p < 0.05$ ). The initial skill level RM is positively associated with situational and personal anxiety ( $r = 0.43$  and  $r = 0.45$ , respectively, at  $p < 0.05$ ), and an indicator of average accuracy of attention ( $r = 0.41$ ;  $p < 0.05$ ). The initial level of the LD indicator correlates with braking mobility ( $r = 0.45$ ;  $p < 0.05$ ) and with the endurance coefficient in the visual analyzer ( $r = 0.52$ ;  $p < 0.01$ ). The FD skill is negatively correlated with selectivity of attention ( $r = -0.53$ ;  $p < 0.01$ ).

The relationships between the growth rates of driving skills indicators for less trained girls with individual psychological characteristics are significantly different from the ties between entry-level skills. It should be noted the complete absence of correlations between the growth rates of driving skills. More pronounced relationships were identified in relation to individual psychological characteristics. Thus, the CA skill growth rate negatively correlates with personal anxiety ( $r = -0.40$ ;  $p < 0.05$ ) and average attention accuracy ( $r = -0.41$ ;  $p < 0.05$ ). The dynamics of LD skill is negatively associated with inhibition mobility ( $r = -0.41$ ;  $p < 0.05$ ) and endurance coefficient in the visual analyzer ( $r = -0.46$ ;  $p < 0.05$ ). SMS growth rate negatively correlates with external balance ( $r = -0.50$ ;  $p < 0.01$ ), and the FD indicator is negatively related to the average speed of information processing ( $r = -0.40$ ;  $p < 0.05$ ). The dynamics of RM skill positively correlate with the endurance coefficient in the visual analyzer ( $r = 0.41$ ;  $p < 0.05$ ).

A slightly different relationship between the studied indicators is characteristic of young men with a higher initial level of preparedness. In particular, the relationship of the formed skills with each other was not revealed. Connections with individual psychological characteristics are more pronounced. So, the initial indicator LD positively correlates with personal anxiety ( $r = 0.44$ ;  $p < 0.05$ ), neuroticism ( $r = 0.41$ ;  $p < 0.05$ ), and selectivity of attention ( $r = 0.41$ ;  $p < 0.05$ ), negatively interconnected with the external balance ( $r = -0.43$ ;  $p < 0.05$ ) and switching on black numbers ( $r = -0.43$ ;  $p < 0.05$ ). The initial level of the SMS indicator is negatively associated with the reliability indicator of attention ( $r = -0.45$ ;  $p < 0.05$ ) and positively with the average accuracy of attention ( $r = 0.43$ ;  $p < 0.05$ ). The initial VMR skill correlates with the speed of attention selectivity ( $r = 0.42$ ;  $p < 0.05$ ), and the RM skill with the excitation mobility ( $r = 0.44$ ;  $p < 0.05$ ).

Among the correlations of the growth rates of driving skills, the CA indicator is associated with the FD skill ( $r = 0.58$ ;  $p < 0.01$ ), and the SMS indicator

is negatively correlated with RM skill ( $r = -0.46$ ;  $p < 0.05$ ). Wider connections of the growth rate of driving skills are observed with individual psychological characteristics and properties of attention. So the SMS growth rate negatively correlates with the average productivity of information processing per unit time ( $r = -0.42$ ;  $p < 0.05$ ), the indicator of average accuracy of attention ( $r = -0.45$ ;  $p < 0.05$ ) and positively with indicator of the reliability of attention ( $r = 0.45$ ;  $p < 0.05$ ). The dynamics of the LD indicator positively correlates with external balance ( $r = 0.41$ ;  $p < 0.05$ ) and negatively with situational, personal anxiety ( $r = -0.41$  and  $r = -0.47$ , respectively, with  $p < 0.05$ ) and neuroticism ( $r = -0.44$ ;  $p < 0.05$ ). The growth rate of the VMR skill is positively associated with the internal balance ( $r = 0.41$ ;  $p < 0.05$ ) and negatively with the rate of selectivity of attention ( $r = -0.43$ ;  $p < 0.05$ ).

The correlation of initial skills in less trained young men differs significantly from more prepared ones. Among driver's skills, only SMS indicator negatively correlates with LD skill ( $r = -0.48$ ;  $p < 0.05$ ). SMS indicator negatively correlates with the strength of the nervous system ( $r = -0.45$ ;  $p < 0.05$ ) and positively with the average productivity of information processing per unit time ( $r = 0.63$ ;  $p < 0.01$ ). LD skill is negatively interconnected with situational ( $r = -0.45$ ;  $p < 0.05$ ), personal ( $r = -0.51$ ;  $p < 0.05$ ) anxiety and neuroticism ( $r = -0.48$ ;  $p < 0.05$ ). The endurance coefficient of the visual analyzer is positively associated with the indicators LD ( $r = 0.50$ ;  $p < 0.05$ ) and RM ( $r = 0.54$ ;  $p < 0.05$ ), while the indicator LD is negatively associated with personality anxiety ( $r = -0.45$ ;  $p < 0.05$ ).

More integrated relationships have been identified in relation to the growth rate of driving skills. In particular, the dynamics of the SMS indicator is interconnected negatively with the growth of skills FD ( $r = -0.45$ ;  $p < 0.05$ ) and LD ( $r = -0.67$ ;  $p < 0.01$ ). At the same time, the connection between driving skills and personal characteristics and attention functions is much wider. So to the greatest extent this is observed in relation to the growth of SMS with such indicators as extraversion ( $r = 0.45$ ;  $p < 0.05$ ), strength of the nervous system ( $r = 0.56$ ;  $p < 0.05$ ), the speed of attention selectivity ( $r = 0.45$ ;  $p < 0.05$ ). Negative connections between SMS dynamics and situational ( $r = -0.46$ ;  $p < 0.05$ ) and personal ( $r = -0.52$ ;  $p < 0.05$ ) anxiety, neuroticism ( $r = -0.51$ ;  $p < 0.05$ ), an indicator of the average accuracy of attention ( $r = -0.47$ ;  $p < 0.05$ ). The growth rate of LD skill positively correlates with personal anxiety ( $r = 0.52$ ;  $p < 0.05$ ), agitation mobility ( $r = 0.53$ ;  $p < 0.05$ ) and negatively with the strength of the nervous system ( $r = -0.61$ ;  $p < 0.01$ ). The dynamics of the FD indicator is positively associated with situational ( $r = 0.65$ ;  $p < 0.01$ ) and personal ( $r = 0.52$ ;  $p < 0.05$ ) anxiety, as well as neuroticism ( $r = 0.51$ ;  $p < 0.05$ ).

Driving a vehicle makes a person high demands on his individual psychological characteristics. To a large extent, this should determine the system of formation of professional actions in accordance with the level of initial preparedness, psychophysiological and psychological characteristics of the subject of training.

The results of the study revealed a number of characteristic features in the structure of correlation relationships depending on the gender and level of preparedness of the participants in the experiment. Comparing the correlation between girls' indicators, it should be noted that for those more trained at the initial stage of training, personal characteristics (personal anxiety, extraversion, neuroticism) are positively interconnected with the initial level of driving skills, and negatively with the growth rate. The same is true in relation to the mobility of excitation, as well as in relation to some features of attention. The structure of the relationships of the studied indicators in less trained girls differs significantly from the more prepared ones by the greater integration. In particular, the studied initial driving skills correlate with each other.

Presumably, the lack of links between the skills of more trained girls is evidence of a simpler system of driving, when each element of driving is provided with a certain skill. Probably, this helps girls to avoid difficulties in driving. Nevertheless, young men with a higher initial level of preparedness revealed isolated connections between the growths of the formed skills.

In less trained young men, both the initial level of driving skills and the rate of their growth are more often associated with personal characteristics. But the nature of these correlations is different. At the initial level, they are often negative, and at the growth rate, they are positive. At the same time, the correlation between the growth rates of driving skills is negative, reflecting the heterochronism of the formation of driving skills.

In conclusion, it should be noted that in girls, the connections of individual psychological characteristics and attention functions with initial driving skills are in most cases positive, and negative with the growth rate of skills. In turn, in youths, correlations of individual psychological characteristics with initial driving skills in most cases have a negative orientation, and with a growth in skills, a positive one. This is especially true for such individual characteristics as personal anxiety, inhibition mobility, endurance coefficient in the visual analyzer and average attention accuracy.

Driver training in training centers does not fully take into account the processes of regulating the activities of biological systems. Probably, the law of initial values formulated by J. Wilder [23] is manifested here. A system with a higher level of reactivity is more likely to respond to a training

stimulus to a lesser extent than a system with a lower level of initial activity. In this regard, there are multidirectional relationships between individual psychological indicators with an initial level and a further increase in driving skills.

### Conclusions

1. The initial level of preparedness and the further dynamics of training are associated with the individual psychological characteristics of students in driving schools. Gender differences in the structures of correlation pleiades show that the formation of professional preparedness has certain differences. The individual psychological indicators in girls in most cases are positively associated with the initial level of preparedness, and in boys with the growth rate of driving skills.

2. The nature of the relationship between the generated skills shows that girls' training should involve the implementation of exercises aimed at the separate mastery of individual elements of driving a car, ensuring their dynamics. It is necessary to use a significant number of leading exercises that form individual initial skills. To effectively teach young men, tasks should contribute to the integrated development of several car driving skills at the same time.

3. The nature of the relationship of individual psychological characteristics with driving skills and their growth indicates that in phased planning of training it is necessary to take these indicators into account.

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## THEORETICAL BACKGROUND TO THE CREATION OF WESTERN MODELS OF SELF-REALIZATION OF AN ADULT'S PERSONALITY IN ARTISTIC ACTIVITY

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**Abstract.** This article identifies the main feature of the western cultural area - "rationalism" and on this basis models of self-realization of an adult's personality in artistic activity, which are typical for representatives of Western culture, are specified.

**Keywords:** self-realization of adult personality, artistic activity, Western models, anthropological approach.

Around the world, the number of citizens of the older age group (60 years and older) is growing. Global demographic trends are clearly manifested in Russia. Modern Russia is characterized by a high proportion of the population older than working age, and the growth in the proportion of the older age group (elderly population) is accelerating. This group, which is growing in quantitative terms, does not have a high quality of life: according to experts of the World Health Organization, elderly Russians are ruined by bad habits, poor physical culture, but also a bad mood, insecurity in the future and fear of old age, which in the minds of the majority is associated with poverty [6].

In this period of life, self-realization of a person should become a necessity and a duty to himself for an adult. Domestic education can help an adult choose this path and offers artistic activity as one of the ways of self-realization.

The complexity of the methodological problem lies in the fact that a person can only be described in terms of his consciousness (E. Cassirer). This fact poses the problem of self-realization in a completely new way, so that it cannot be solved using conventional research methods, but only using the modeling method. In addition, the self-realization of an adult's personality is revealed as a cross-cultural problem, due to the fact that

at present there is no single, universal human idea of self-realization of a person. This makes it possible to consider and synthesize the experience of self-realization of an adult's personality in artistic activity, accumulated in Western culture and education. This experience differs from the domestic one - with a greater elaboration of this problem (A. Maslow, C. Rogers).

In this study, the "West" is a cultural area in which the understanding of "human nature" initially goes beyond the framework of a civilizational "norm", in the direction of rational knowledge of a person, emphasizing the central figure of the "knowing individual". Following the statements of many philosophers, cultural scientists and psychologists - specialists in the field of Western culture (E. Husserl, A. Maslow, E. Fromm, J. Habermas, M. Heidegger, O. Spengler, K.-G. Jung, K. Jaspers), the main feature of Western society is "rationalism." "Rationalism" can be considered in the form of the following provisions:

A) In the traditions of the West, "self-realization" of a person is the realization of the powerful creative power of a person-activist (A. Bergson, F. Nietzsche, A. Schopenhauer), it is aimed at "conquering" the external nature, at social transformation. The whole Western European culture, starting with its cradle - ancient civilization, is characterized by a self-centered worldview.

Ancient Greek thinkers (Aristotle, Plato, Socrates) pose and study the question: what is a man?, recognize his value, see the imperfection of human nature and understand his self-realization as self-knowledge, self-realization. The famous expression "nosceteipsum", "know yourself" belongs to Socrates. Knowing about yourself is considered the peak, the goal that you need to strive to understand your capabilities, internal qualities [4, p. 108]. Intelligence is recognized by Aristotle as the highest form of perfection - this is how the foundations for rationalism are laid in the European cultural space for the coming centuries. The ancient Greeks chose the "theoretical-contemplative" type of "life attitude", which comes "out of surprise at the contemplation of the Universe" (E. Husserl), gradually, over the course of history, gives way to modern representatives of Western culture choosing the opposite attitude, which comes from practical use.

In the XX century self-realization is considered as the realization of their unique abilities in activity. Self-realization of a person in artistic activity takes place in difficult conditions of opposition of the outside world, when a "person" is considered as a separate part of reality, an isolated atom, independent and opposing the world, capable of reflecting and indirectly perceiving it (V.S. Soloviev); The "soul of culture" loses its intimate connection with every human soul, the meaning of culture no longer inspires people, they are now turned not to the realization of human values, but to utilitar-

ian goals (O. Spengler); the role of aesthetic education is underestimated, the justification of verbalism and intellectualism in learning is growing [1, p. 267]; there is a "massification" and technicalization of all spheres of life; the development of science, the growth of cities, the decline in the field of art, the rejection of direct and creative perception of the world; civilization preserves beautiful works of art, scientific achievements, but brings to a person the social and technical improvement of life; reduced level of needs [3, p. 28-39].

This study examines the self-realization inherent in a fruitful person who chooses the way to exist - "to be", following the concept of E. Fromm [7]. Each person's self-realization is accompanied by the expenditure of time and money, so its construction requires a solid foundation of health and bodily well-being.

B) The rationalist attitude taken in the West towards the age, health, old age, personality of an adult, in particular an elderly person, suggests that these issues are resolved in the direction of a global distrust of self-preservation of physical health - a person in old age, as well as in the direction of disrespect for old age. Due to the fact that a decrease in the body's resistance to psychosomatic diseases, with increasing age, is accepted as the "norm", the following ideas about physical, psychological and social health are characteristic of Western civilization as a whole and for most of its social institutions (education, health, family) of an elderly person: the natural connection of a person with nature and the unconscious beginning with age come to oblivion [10, p. 321]; a "liberated" view of the bodily principle is established, a person loses humanistic self-perception [8, p. 173]; muscle tension arises, bodily pleasure is not in demand, negative thoughts appear, the creative power of the personality decreases (A. Lowen); there is a separation of generations; in the ordinary minds of Westerners, the contemptuous attitude of the young and strong towards the old and weak is accepted [11]; or an unjustifiably super-optimistic attitude to health is affirmed: an adult is invited to maintain his active role in old age so as to preserve the lifestyle and value attitudes inherent in middle age (M. Riley); or confine oneself to a subculture of people of their age (A.M. Rose), becoming a member of a small social group, in exchange weakening interaction with other members of society and family contacts [2, p. 249].

At present, when as a result of economic and political "radical shocks" in the formation of personality in the West there has been a "collapse of anthropocentric thinking" (J. Habermas), the "rationalism" of Western society requires careful study and, at the same time, its overcoming in models of self-realization of adult personality in artistic activity. Next, we consider the

theoretical prerequisites for creating models - in the form of the following provisions.

1. The purpose of the models – is to study and justify a methodology aimed at preparing a person for self-realization in artistic activity.

2. The pedagogical tasks of Western models are as follows: 1) to teach how to use and strengthen bodily abilities (breathing, vision, sensorimotor abilities); 2) to teach how to express your emotions and portray an object at the same time; 3) to give specialized knowledge about drawing, painting, composition; 4) teach you to tune in not only to mundane, but also to high ideas.

3. This model is based on an anthropological approach, in the development of philosophers (I. Kant, T. de Chardin, M. Scheler). “The anthropological approach to self-realization of an adult’s personality” – is a concept that guides the general strategy of continuously expanding a person’s capabilities towards the full functioning of the open, unique, active integrity of the “body-soul-mind-spirit” (bio-psycho-socio-spiritual system), capable of self-regulation - during the second half of life. Such a feature of the anthropological approach in education, as the requirement of a holistic and universal comprehension of man, has been ignored and simplified not so long ago within the boundaries of considering human nature as a bio-psycho-social system. This is permissible for the modern "sculpting, creating, forming" education, which helps a person to build his life path according to universal and individual norms of development - throughout the first half of his life path. However, in the second half of the life path, a prerequisite is created for a person on the basis of an anthropological approach, which liberates the body principle, makes it possible to feel admiration for experiencing your growing spirituality and accept your life in true light.

4. On the ideological foundations of the anthropological approach, a statement can be formulated that expands the content of the principle of nature conformity: pedagogical laws should be brought into line with the concept of “human nature” as a “microcosm” that has an amateur and self-moving force in the development of the world. The principle of nature conformity means the need to consider and develop the following features of human nature:

1) everyone in old age needs to restore the natural connection of the bodily principle with nature, acquire the need to maintain physical health, coordinate training with the age stage of their development through self-regulation;

2) everyone in old age needs to fill the spiritual foundation with positive feelings, look for incentives for creativity;

3) everyone in old age should make a choice in favor of a non-utilitarian life style (S.L. Frank, J. Habermas); to strive for knowledge of what the external world is, taking into account the “subjective” dimension (J.-P. Sartre), to emphasize the rational principle in oneself as a person-activist (A. Bergson, F. Nietzsche, A. Schopenhauer);

4) everyone in old age can supplement the system of material needs purposefully provided by Western society (V.S. Soloviev, S.L. Frank) – spiritual needs; to restore the human ability to “authenticity”, to the sense of the transcendental – to the “experience of time ahead” and the “feeling of beingness” - the ability to be amazed and admire the fact that the world and we ourselves exist” [9].

5. In the education of an adult's personality, the principle of cultural conformity is observed, which means the need to take into account the following features of the outside world in a world outlook expanded to the cosmic level:

1) on the scale of the Universe – a man in his deepest essence is directly one with a higher reality, therefore he should strive for this unity in the act of genuine life, following the concept of man, in the development of V.S. Soloviev;

2) on the scale of world culture – orientation to the best achievements of other cultures and their free introduction into education is observed;

3) on the scale of Western culture – one should strive for balance, self-preservation, look for cultural meanings that are oriented towards the realization of human values (O. Spengler); increase the role of aesthetic education;

4) one should strive for a direct and creative perception of the world; increase the level of needs;

5) strive for a humane attitude to the older generation, to unite the younger and older generations;

6) on a scale of close environment – to fully utilize the educational resource of artistic activity, to uncover the healing resource of activity, a realistic direction prevails.

6. In education, there must be a subject, one who is self-fulfilling, and, in particular, “personality, exemplary” for an adult — the personality of a long-lived artist. The subjects of Western models are specified in the model on the basis of cultural material, including: creative biographies and works of 26 European (French, Italian, Spanish, German, etc.) and 4 American long-lived artists who have lived for more than 80 years. Among these artists there are very famous personalities (J. Bellini (1430/1433-1516), Michelangelo (1475-1564), Titian (1488/1490-1576), Claude Lorren (1600-

1682), Edgar Degas (1834-1917) etc.), there are less well-known (George Pauli (1855-1935), Cuno Amier (1868-1961), Eduard Leon Cortes (1882-1969), Serge Brignoni (1903-2002), etc.), including several female artists (Mary Cassatt (1844-1926), Angeles Santos (1911-2013), etc.).

The general features of the self-realization of many artists in the late period of life, despite the individual differences in the particular, can be called the following: lack of loss of strength, achievement of the highest point of development in painting, impressions of paintings appear in their immediacy, without a shadow of theoretical rationality; "old wisdom" is felt, an enlightened mind, indifference to the hustle and bustle of things, there is an appeal to the main issues of life; the acceptance of impending death, the refinement of sensuality, trepidation, the vital vibration of imaginative visions; relentless search for new themes, plots, techniques, types of artistic activity.

As an example, let's give a brief description of the achievements in the field of self-realization in the late life of Georgia Totto O'Keefe (1887-1986), an American artist who lived 98 years. By the age of 59, she found her "artistic voice" - first thanks to images of flowers, then surrealistic still lifes and landscapes inspired by the highlands in New Mexico. It was there, spending a solitary life, away from the hustle and bustle, where the artist found a space for creativity. In 1946, a retrospective of her works took place at the New York Museum of Modern Art, and in 1972 a giant exhibition of O'Keefe's works opened at the Whitney Museum.

When she was already over eighty, she did not stop there and went on her first trip around the world, and again impressions contributed to the emergence of new motifs - views of the clouds from the window of the plane. Based on these impressions, she created her latest paintings depicting a variety of cloudy "landscapes". From the pages of her letters and autobiography, the artist spoke about the importance of observing, organizing, perseverance and giving all of herself to the "wild" joy of painting.

7. Based on the study of creative biographies of long-lived artists, as well as the study of methods of art education in the West [N.N. Rostovtsev], it can be assumed that during the training of artists and in the creative process, the artists themselves used certain methods and techniques. These methods and techniques can be grouped, in accordance with the four pedagogical tasks set above, as follows:

1) methods of "developing all the forces and abilities of human nature" that motivate the general development of the "artistic power of our nature" (I. Schmidt): developing the hand and preparing it for drawing; creating and finding beautiful forms; development of imagination (transformation

of famous artistic images of S. Dali, scaling, enlargement of plant images of D. O'Keefe, creative play). Methods for the development of sensorimotor abilities of a hand (L. Tedd): the method of drawing with a brush and pen - for the development of a "solid hand"; the method of drawing alternately with the right, then the left hand, and then simultaneously with both hands (drawing symmetrical figures promotes interhemispheric interaction); a method of expanding the circle of classes and the variety of materials (C. Amier, P. Bonnard, E. Degas, A. Matisse, Michelangelo, J. Miro, D. O'Keefe, P. Picasso) - alternate classes in painting, clay modeling, application and etc.; exercises for the eyes - focusing and relaxing vision;

2) the method of the initial period of study – supporting a positive emotional mood, mind and spirit of a young artist (A. Durer); the method of imitation of a mentor, aimed at adopting his artistic manner (Middle Ages); the method of imitation of the master (P. Bonnard, P. Picasso); method of emotional coloring of activity; illustration (G. Ernie), decorative drawing; an experiment with color, form, style (A. Matisse, P. Picasso);

3) methods of obeying the laws of artistic logic – the natural laws of the plastic and color system: the method of drawing from nature (starting from the ancient Greek period, Efrantor from Corinth), the method of shading the volumetric shape in tone (Apollodorus), the principle of mastering the sketching technique (medieval period), the method of copying creations remarkable artists (ancient Roman artists), including drawing on a large-scale grid; analytical, or constructive method of depicting lines with regard to proportions, perspectives and anatomy (in the development of Chennini Chennino, Alberti, Leonardo da Vinci, A. Durer); reception of eye development, a sense of proportion; reception of drawing from nature using a curtain; the method of generalizing the form, chopping (Alberti, A. Durer), the method of drawing "whole-parts" (Leonardo da Vinci); memory drawing method (Leonardo da Vinci); specialized, academic methods for developing the line art of drawing (French methodologists, XVII century); the facilitating method of reducing black-and-white relations in kind using a device called "Claude's mirror" (K. Lorren, XVIII century); verbal methods "drawing as gymnastics of the mind" (see→ reason→ build the volumetric shape of an object on a plane→ analyze it deeply).

The method of copying from samples (I. Soldan, 1836), the method of controlling the drawn forms using drawing tools or a template (Galliard); the geometric method of teaching drawing on the basis of geometry using special models (brothers A. and F. Dupuis); a natural method of teaching drawing objects based on visual perception (F. Kuhlman, L. Tedd), receiving sight; the method of sequentially constructing the shape of an object

from the simplest geometric bodies - a ball, cylinder - to an expression of the character of nature; the method of tonal solution of the shape of the object on the plane, tone modeling; an auxiliary technique for building molds with soft and pliable materials - coal and sanguine (A. Ashbe); the method of rational attitude to the palette - observation in nature, collecting and classifying halftones and expressing them through the corresponding colorful mixtures (E. Delacroix, D. O'Keefe, Titian); halftone method - the use of halftone as the preparation of a semi-finished color, with its subsequent modeling (E. Delacroix); method of mechanical mixing of paints; optical mixing method; the picturesque method of working in the open air - contributing to the enrichment of the artist's picturesque palette (impressionists M. Kassat, M. Lieberman, K. Monet); visual memory development method (Horace Lecoc de Bois Bodran);

4) a method of reflection on the high problems of artistic creation; Bible reading method and drawing on biblical topics (Middle Ages, Renaissance); the method of free communication in the studio space (studios in Paris, Sh. Holloshi studio, end of XIX century); method of conversation about art.

This article discusses the theoretical prerequisites for the creation of Western models of self-realization of an adult's personality in artistic activity, namely: goal, objectives, approach, principles of nature-conforming and cultural-conforming, creative biographies of subjects of self-realization - long-lived artists, teaching methods and techniques. The constructed Western model of self-realization will allow in the future to use the best achievements of Western education - in our domestic adult education.

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## LINGUISTIC INTERFERENCE UNDER THE CONDITIONS OF ARTIFICIAL BILINGUALISM AND WAYS OF OVERCOMING IT

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**Abstract.** The article discusses issues related to the theory and methodology of teaching foreign languages, as well as factors affecting the success of teaching foreign languages in the context of artificial bilingualism. A distinction is made between artificial and synthesized bilingualism.

**Keywords:** foreign language, affiliation, artificial and synthesized bilingualism.

The language environment in the lesson in a foreign language is narrow and inconsistent, students spend much less time in it than in the environment of their native language. When learning a foreign language in educational organizations, an important factor is how language learners invest in the creation of public language activity and what mechanisms regulate this activity. The most important factor in the success of training in a group is the socio-psychological and linguistic characteristics of students. The formation of an artificial language environment is carried out with the help of educational materials and instructions of the teacher - tutor. The teacher organizes the learning process, monitors academic performance, explains the features of using language material and acts as a model of speech competence for students (especially at the initial stage of training). As for the training materials, they also set certain training parameters. Here problems may arise leading to incomplete or erroneous mastery of linguistic phenomena when learning a foreign language in a study group. If teaching a foreign language is based on materials compiled by non-native speakers, in this case there is a distorted presentation of the material, its adaptation by equating the phenomena of a foreign language with the phenomena of the native language (despite the fact that these phenomena are similar, but

not identical) and translation of foreign vocabulary. Some of the students who studied (especially in the preschool period) with a textbook containing inaccuracies will learn the wrong option and transfer it to school in the future. Therefore, modern teaching materials in foreign languages should be formed with the participation of native speakers and taking into account the requirements of the time. In the work "The "interference" linguistic-cultural code and its historical and philosophical understanding", we have already noted that *"in theory and teaching methods, where the main purpose of teaching foreign languages – is the formation of communicative competence, such factor as the fact that language and culture are taught in the framework of my own culture under the conditions of artificial bilingualism, where the native language and native culture are dominant was not taken into account. It is difficult to understand authenticity in the conditions of artificial bilingualism. The scope of authenticity depends on a number of factors, one of which is the linguistic and linguistic-cultural distance"* [5:99].

It is worth mentioning separately the influence of a foreign language teacher on the creation of a language environment. Each person is characterized by individual characteristics of speech, including a set of lexical and grammatical units, idiomatic expressions, etc. At the same time, it should be noted that with prolonged communication with each other, people begin to adopt various linguistic elements of someone else's speech, if the authority of the person with whom they communicate is large enough. Considering that the authority of the teacher is high (especially at the early stage of training, when it is perceived by students as a model), it can be assumed that students adopt the language elements of the teacher's speech. This explains why different groups of students (with different teachers) tend to use different language elements - the same within a group, but different between groups. Teachers are also characterized by speech inaccuracies and errors that can be transmitted to students as a result of the analogy mechanism.

One of the most important factors influencing the process of language acquisition is communication with groupmembers (classmates) who learn a foreign language outside real communication situations and have a certain lexical "luggage" at the late stage of training. If, while communicating with native speakers of a foreign language, the student masters new, everyday language forms, then when communicating with peers who are not native speakers of the language, there is a rather high risk of adopting speech errors. People tend to adopt the language and words that they hear in the speech of friends and acquaintances. If a student regularly encounters inaccurate use of a linguistic phenomenon, he, not realizing the incorrectness of this option, takes it into his speech.

A similar situation occurs when mastering a native language, if there is an illiterate speech in the family or among friends. The authority of the teacher in this case will not help, since most of the time the child hears the wrong option from relatives and significant people.

In this case, the psychological processes of affiliation and psychological infection play a large role. Affiliation is expressed in the need "to be in the company of other people, in creating warm, emotionally meaningful relationships with other people" [2:53] Realization of this need is impossible without communication. And it is communication that is the most effective way of getting closer to people, which is especially significant in a situation where, willingly or not, a person has to carry out joint work with these people. The community of communicative elements is especially important, because people whose set of lexical and grammatical units differs significantly will not be able to find a common language with each other. Thus, in the process of getting used to each other in the group, most people observe a process of "adjustment", especially in adolescence, when the opinion of friends is most significant. Often, students cannot explain why they adopted a particular mistake, even if they recognize this mistake. As they say, it "blurts out" or "hooks."

It is customary to distinguish between artificial and synthesized bilingualism. Consider an example from a German essay on the Russian language: «*Москва – это есть столица России, которая лежит на Москве-реке*». According to the rules of the Russian language, this sentence is possible, since the phonemic, morphemic, syntactic levels are not violated. However, native speakers of the Russian language rate such examples as incorrect. The English version of a similar example: "I want to drink", "I want to eat".

In the above examples, the speech norm is violated. The norm - is the regulator of the actual compatibility of linguistic units existing in the linguistic system.

Here is the question asked by a foreign student on the tram: «*Не передадите ли плату, положенную за проезд*». The bilingual incorrectly chooses from among the synonymous variants known to him that which would be appropriate in a given speech situation. Thus, the form of speech is attached to the communication situation. This connection between the form of speech and the speech situation is especially clearly manifested in the choice of style. Expression «*дай мне*» cannot be translated into English as «*give me*» or even «*give me please*».

Artificial bilingualism can be observed when teaching a foreign language occurs at school, in courses through special techniques. Learning a

foreign language can be both an end in itself (learning a foreign language at school) and a necessity (knowledge of a new language is required for the socialization of a person). With artificial bilingualism, a foreign language “is mastered in a learning environment using volitional efforts and special methods, techniques” [1: 22-25]

Synthesized bilingualism occurs when natural and artificial conditions are combined. A similar situation is often observed in modern society in relation to children and adolescents, for example, in connection with the influx of migrants into the regions of Russia, when the Russian language, being a foreign language for them, is mastered both in the process of everyday communication and during school. Adult migrants are also faced with the need to master the language of a new sociocultural environment. The social conditions in which an individual or a social group feels the need to learn a foreign language were investigated by E. Haugen and were called linguistic pressure. According to the author, linguistic pressure has an incentive and coercive force towards individuals, contributing to a better study of a foreign language [4].

Differences in the acquisition of a second language by children, adolescents and adults are observed. If the study of two languages begins simultaneously in early childhood (up to 5–7 years), one speaks of mastering two native or first languages, or double mastering the first language, emphasizing that the same mechanisms are involved in the process of mastering the second language as in mastering first language. There are opinions that it is only possible to talk about dual language acquisition in relation to children under 3 years old [4]. In this case, after the age of 3 years, they speak of primary and secondary language acquisition. Such possession is qualitatively different from the subsequent method of learning the language, since later this process can no longer take place absolutely spontaneously. If the principle of “one language - one person” is observed, when each parent uses only one language, then bilingual children form a connection between their language and a specific field of application (for example, “mother’s words” and “father’s words”). The more parents pay attention to how children learn each language, the less languages mix, but it is not possible to completely avoid interference. The age of 8-11 years is considered a critical period in mastering a second language, since after this period the probability of a good mastery of the phonetic system of a foreign language decreases, the likelihood of a natural mastery of language constructions decreases, etc. “For many children of this age, the impact of schooling is decisive. The result of teaching a second language varies depending on how much “quantity” of a particular language children

receive in the classroom and in what language they communicate with their peers. When learning a language after 16 years, they usually speak only about mastering a second language” [4]. When an adult finds himself in a different language environment, to some extent he masters the second language spontaneously through communication with others, but due to his experience in using his native language, he begins to think more about the structure of the second language. “He tries to introduce an element of consciousness into the mastery of the language, repeats whole phrases and individual fragments of what he heard in similar circumstances, systematically learns different sides of speech” [3: 56-57].

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## REVISITED THE STUDY OF VIRTUAL COMMUNICATION WRITTEN TEXTS

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**Annotation.** The author notes that recent studies of traditional communication technologies, such as e-mail, text messaging, chat and phone calls, have revealed a list of problems specific to these types of communication. Ordinarily, the choice of economy or redundancy of speech efforts tactics is due to the resulting text of conversation, the characteristics of which guide communicants in the linguistic means selection and organization. Accordingly, the communications can remain effective even if encoding an oral message without graphics and punctuation. Interlocutor's attunement to one another has a crucial significance to the effectiveness of chat-communication. Nevertheless, the understanding of virtual communication substance can be complete only within the framework of its analysis as a fragment of virtual discourse, which, in turn, reflects global discourse processes. Moreover, the written form of some genres of virtual communication and its spoken character as the key features of a new form of speech are most clearly expressed in chat-communication. Consequently, the term spoken-written speech format for representing the process and result of virtual communication (text) some genres is most appropriate as it reflects the functioning of the discursive fragment of virtual communication itself.

**Keywords:** virtual communication, spoken-written speech format, discourse, text

Virtual communication emerged as a psycholinguistic and sociocultural phenomenon much more recently. Moreover, virtual communication as a study object of the type of communicating, the speech culture of its participants and the linguistic features of their speech cause genuine interest. The permanent incompleteness of this area research, due to the ongoing development of the phenomenon, its significant elements transformation is the virtual communication distinctive feature. Accordingly, many authors

define virtual communication as a simulated process of information exchange between people using computers or the Internet. The virtual communication productivity as an alternative to not mediated by technical means of communication (face-to-face) commonly is the research query.

Various authors (Kirkman, Rosen, Gibson, Tesluk McPherson 2004) found the face-to-face interaction could be the key to virtual team empowerment and that teams were more likely to take corrective action with regular face-to-face interaction. <...> In 2010, the focus of virtual research moved away from just looking at the technology and started to analyze the virtual worker versus the collocated worker (Lojeski & Reilly, p. 51, 2010). <...> In 2014 Bartelt and Dennis conducted an experimental study to examine the impact of different genre rules developed for two communication tools: instant messenger and discussion forum tools triggered different genre rules with different behaviours (Morgan, Paucer-Caceres & Wright, 2014, p. 607). Many virtual studies keep pointing to the fact that a media-rich environment with multiple communication tools in use could be the answer to the successful use of virtual communication in the workplace (Mitchell, 2015). Virtual communication can only be successful when these areas are consistently addressed and the criteria managed. However, they also found that as virtuality grew in the different groups their need for routine and constant communication was necessary to reach their goals successfully. <...> Researchers Morgan, Paucer-Caceres & Wright also found that “misunderstandings and misinterpretations occur frequently, but this can be overcome through a mixed-methods approach to communicating - verbal, face-to-face and written” [Layng 2016].

The language of virtual communication thereby is interesting to researchers, primarily because of its focus on the technological capabilities of the online environment [Meredith 2014], which largely determines its specificity in both structural and discursive aspects. Somehow the above issues affected both psychological, sociocultural, and technical aspects of virtual communication are reflected in the virtual discourse as well as their solution.

However, an understanding of the virtual communication essence can be complete only through the virtual discourse analysis which acts as a reflection of global discursive processes. Ordinarily the producent, receiver, report and the channel of communication are distinguished in the communicative interaction traditional structure. It is advisable to consider the totality of verbalized messages of communication participants as discourse since the producent and receiver alternate roles depending on the report direction in communicating. Moreover, discourse as a comprehensive system

of meaning generally refers to a body of conversation about a subject and its embedded assumptions, values, and power structures. Consequently, a text as a linguistic object is a constituent of discourse. But if you deal with the result of conversation it became an interpretable and readable object that text generally refers to.

In my opinion, communication exists as a discourse fragment, as some text per saltum. This fragment has a form of an implementing alternant for a certain communication with the data of participants and the channel of communication. However, we do not mean specific individuals by the communicating participants, but only communicator's portrayal relevant for a given fragment of the discourse (producent and receiver).

The conversation (the communicating) is not something that the producent selects for the receiver and presented in any form for further transmission through a channel of communication defined between them. Conversely, the message is also indeterminate for the producent in some sense, as well as for the receiver. Because it is a fragment of an untensed discourse in its essence and does not depend on the communicants' characteristics and other extratextual factors (the communicating environment) in this sense.

Ordinarily, the trends analysis of the virtual communication genre-specific system emergence and its impact on the traditional one is an important aspect of the virtual communication language study. Thus Shakhovsky V.I. notes, "verbal reflection allows us to consolidate all the semantic transformations and current innovations of modern human life in signs" [Shakhovsky 2015, p.17]. Moreover, chat communication as the most widespread genre of virtual communication is considered as a special type of language (speech) existence, which is a new Russian, newspeak, contrary to the norms and traditions of the classical Russian [Samoilenko 2014, p.66], in the form of spoken content and written on the method of speech embodiment.

The virtual communication language is interesting for its specific vocabulary, special syntax, original form and words formation on a structural point of view [Gladkaya 2017; Latipova 2018;], as well as the variety and non-traditional writing [Basalaeva, Ruzha, Shpilman 2016; Basalaeva, Shpilman 2015; Shirokova 2015; Kholodkovskaya 2014] as well. In general, researchers note a wide variation in stylistic means at all levels of the text structure, especially on the graphic one [Maksimenko 2017, p.155].

Researchers suggest the saving in the communicants' efforts one of the main reasons for the spoken-written speech occurrence. It is also important that there are tools for saving efforts in Internet communication,

available for users and popular with the audience (unified abbreviations, emoticons and other graphic tools, speech recognizers, etc.). Most often, chatting is “reproached” for the impossibility of adequate transmission of a significant part of spoken communication – paraverbal one. Although additional graphic tools and occasional punctuation do not improve the situation and increase it sometimes.

The free communication modalities help the communicator to remain effective in all cases of communicating. He became a participant in only those discussions, he set himself up for. Moreover, an individual is free to verbalize his speech intention or not, to hide his real emotions and to avoid conflict or give loose to feelings. Consequently, communicator's verbal behaviour is the less socially determined the less personal information is transmitted.

Commonly, one somehow imagines his interlocutor in all the variety of means of presentation during the conversation. If he is familiarly acquainted with a partner of conversation it seems to see him gesturing, his facial expression, one can even hear the voice, intonation specificity while reading the text of his message. Conversely, one somehow adjusts interlocutor's image if it is not familiar to the portrayal of the known one, who, to one's opinion, looks like this interlocutor or is a typical representative of such communicator, and then remains based on such knowledge in the communicating.

Nevertheless, the verbal communication incompleteness can mark some intimacy in communicating (e.g. couples communication). The main characteristics of communication, in this case, will be its formlessness and non-intensionality (not without substance but with discrepant content level). When the general meaning of the statements is not deduced from the sum of the meanings of what was said (written) by the communicants but it is interpreted based on the recipient's expectations from the communicator image and is based on the attunement to one another communicator images.

Moreover, interlocutor's attunement to one another has a crucial significance to the effectiveness of chat-communication. Communication can remain effective even with the message coding without punctuation and paralinguistic marks. The mirroring can be assumed consequently, but in the conditions of virtual communication, when each interlocutor is represented only by the text message, and there can be any number of interlocutors, mirroring does not come from the interlocutor's portrayal. When the communicator's attunement is that even the reduced statements are still interpreted correctly and do not affect mutual understanding, the chat text acts as a fragment of a more global entity, as mentioned before.

The overall pattern represented by fragments of speech statements characterized as an independent sequence of sentences that is coherent and more or less cohesive in spacetime. The possible incompleteness or underdevelopment of such fragments, however, does not prevent them from being defined as independent texts, since each of them will be characterized, if not by both signs of the text, and semantic integrity and grammatical coherence then at least one of them. Therefore, the general meaning of the statements is interpreted based on the expectations of the communicants from communication and the mood of the participants in communication with each other. The individual can realize almost any portrayal, e.g. hide tongue-tie or illiteracy can be deliberately styled, thematic competence or linguistic performance can attract interlocutor's attention, etc., by de-individualizing the way of representing language and the graphic style in favour of text chat. But while individualizing the way representing language in a spoken-written text, the speaker (writer) forms meaningful statements. These statements are not meaningless because the verbalized message can be interpreted, but meaningful, because their lexical-semantic content is necessary to indicate the communicant's portrayal.

Consequently, the choice of efficiencies or redundancy of speech efforts tactic is determined by the text of the communication itself, which features refer communicants in their selection and organization of linguistic means. In this sense, the definition of virtual communication is refreshed with a new value. The virtual communication is not only one that is mediated by technical means, but also one in which virtual (represented) communicants' portrayal features are used as a decoding tool.

Ordinarily, the genre-determined features of spoken and written speech are transformed into a special set of characteristics of spoken-written communication each time we deal with virtual communication. And the text allows interpreting its language implementation. Accordingly, the virtual communication analysis will highlight features of spoken and written language in this case. But any attempt to make a text, based on the distinguishing features only will fail. The traditionally distinguished forms of speech - spoken and written constantly interact in real communication (vs virtual) but it does not exclude the need for a separate spoken-written form, in which the qualitative characteristics of speech forms do not just combine and sum up.

The spoken-written form characteristics offer the researcher such parameters that determine the uniqueness of the form and the way of representing each fragment of all communicative interactions. There are many combinations of all these parameters that, perhaps, the channel of com-

munication, or rather the specificity of metareflection, remains the only constant. Moreover, virtual communication as mediated by communication tools assumes that only those options will be realized that are characterized by a constant communicants' understanding of mediation character of this kind of communication. Consequently, virtual communication effectiveness is a problem that worries researchers in various fields of knowledge.

Therefore, to sum up, it is already possible to summarize the advances in the virtual communication research area and consider the results at the present stage. It is necessary to consider a consequence of the use of language change, the system of language change and also as a reason for rethinking the content of the speaker speech manner at the present stage of language development. It is important to consider what features of the linguistic personality are expressed in the text of communication, how the individual embodies himself in signs and what linguistic and extralinguistic factors help or prevent him from translating his speech intention. But the most important issue is to understand what makes it possible to translate a particular communicative interaction into a fragment of global discourse as one of its variety.

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## SCIENTIFIC MANAGEMENT AS A MEANS OF COMMUNICATION AND INSPIRATION

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**Annotation.** The article proposes a communicative-inspiratory approach to the study of scientific management. Scientific management is seen as communication and inspiration. Inspiration acts both as a property of creative thinking and as a technology of work. The ethics of science, values and ideals are the basis of the inspiratory management of the complex system "organization - man - society". The author comes to the conclusion that management as communication and inspiration acts as a mental-sensory activity of an ethical and aesthetic nature, focused on the common good.

**Keywords:** scientific management, communication, inspiration, communicative-inspiratory approach, organization, person, society.

Public management according to Aristotle is "political communication", aimed at the benefit. For knowledge of the good to inspire a person, it is necessary, according to Plato, a difficult way of educating the soul and a good education. Inspiration is focused on the ideal and the highest values. On the one hand, inspiration is an attribute of free thinking, and on the other, technology of work. Management, "activity over activity" (G. P. Shchedrovitsky), acts as communication, inspiring a person to a new stage of expedient activity, creativity. The purpose of the study of scientific management as communication and inspiration is to solve the problem of translating culture, ideals and values in the system "organization - man - society". The study of management problems as a communication process is based on various approaches: systemic, functional, process, quantitative, behavioral, marketing, etc. We offer a communicative-inspiratory approach.

The society in which we live, P. F. Drucker calls the "society of organizations", "the society of knowledge." R. Salmon believes that in modern society there is "an inversion of values: from a consumer society to a communication society" [3, p. 277]. Communication is communication, the process of exchanging information, knowledge, a means of communication of objects of the spiritual and material world. Communication as a means of

communication implements the social functions of communication. Analysis of management as communication involves the study of interpersonal communication problems. An important role is the study of the impact of mass communication on the development of man and society. The epistemological approach to management as communication within the framework of non-classical rationality involves the study of management in the context of subject-object relations. In the context of post-non-classical rationality, management relations are regarded as “subject-subjective” relations (V. E. Lepsky). The analysis of the collective subject of management is being developed, the social philosophy of science is developing (I. T. Kasavin).

The ethics of science, in the opinion of I. T. Kasavin, becomes the basis of humanitarian expertise, mediation in “exchange zones”. “At these communication sites, scientists, engineers, entrepreneurs, officials, politicians and ordinary taxpayers establish, criticize and revise the normative parameters of scientific, technical and technosocial projects. And at the same time, they all learn virtues, focusing on the moral example of outstanding scientists” [1, p. 102], - concludes I.T. Kasavin. The subject of control in the communication process is not an epistemological, but an existential subject of activity. Y. Habermas in *The Theory of Communicative Action* notes that the subject of research is communicative rationality. Scientific management as communication and inspiration is based on the anthropological content of knowledge. Communication is seen as a need, as “a necessary relationship between the organism and the environment” [2, p. 56]. The basis of scientific management is the inspiration of the subjects of management, their communication.

Management as communication is closely related to human needs: survival, cooperation, interpersonal communication, obtaining information, exercising authority, education, self-identification, etc. Needs are associated with individuals, organizations, social groups and humanity as a whole. Needs can be conscious and unconscious. Needs form a dream, a desired image, an ideal, values, goals. Needs can be material and spiritual, rational and irrational, elevated and low-lying, biogenic and sociogenic, the needs of social recognition, self-esteem and self-realization. The main functions of the communicative process are: cognitive and evaluative. E. Seper notes that non-rational communication is insufficiently studied. Also distinguish the interpersonal and textual semantic linguistic function of communication (M.A.K. Halliday). Communicators can be public organizations and individuals. The globalization of communication carries the risk of losing a person's identity.

Management as communication is closely related to the formation of interest in communication. Inspiration of the student is a necessary condition for his understanding and actions in accordance with the information received. Management as an inspiration from communication, as a mental activity forms opinions, ideas, ideals and goals. The following elements can be distinguished in the structure of a message: information source, message, communication channels, communicants, interference and sources of interference, social and individual filters, information loss, communication environment, feedback communicator - communicator, inspiration. "Features of inspiratory management (inspiration) are:

- program-targeted rational management behavior;
- Inspiration has a moral and humanistic character;
- stimulates activity to creativity on the basis of implicit knowledge: historical traditions, artistic images, ideals of freedom and justice;
- inspiratory management has a "hybrid nature (politics, management, philosophy, religion, law, art) and is formed by a" hybrid community ", it is dialectical in its essence;
- inspiratory management is a way of transition to self-government as the basis of genuine democracy;

"The inspiratory department is nationally specific." [4, p. 158-159].

In the process of communication, information should attract attention, be selected, translated into the recipient's language and used by him. To inspire information should simplify reality, in a sense, idealize information. Model, cognitive technologies allow communicants to better organize their thoughts, to form a specific image of the subject being studied.

Management of any organization can be represented as permanent communicative actions. The concept of organization, firstly, means a certain activity, process; secondly, a social institution; thirdly, the degree of orderliness of the object, the nature of its structure, relationships. Management information can be divided, according to Ts. G. Afanasyev, in accordance with management functions: initial information, organizational information, regulatory information and accounting and control information. The effectiveness of management as a process of communication lies in the ability to provide feedback: to listen to others and to reveal oneself. Management should satisfy the communicative needs of employees of the organization: the need for objective information, continuous training, the presence of feedback, the need for labor inspiration. Information should not be impersonal. In the process of management as a communication, the employee should feel the care of the leader, the correct assessment, respect of others. The distortion of messages often occurs as a result of a

sense of the futility of the work being done, a desire for personal gain, an unwillingness to conflict with management.

Management as communication is actively manifested in the external environment of the organization. Management objectives in this case are responding to new requests and principles of consumers, implementing new opportunities, improving information networks, developing human resources, globalizing strategic planning, etc. An important role is played by the formation of a positive image of the organization and corporate culture. The objectification of social reality occurs in the process of human material and spiritual activity. Social order is impossible without faith in it. Corporate culture acts as a philosophy and ideology of organization management. It includes formal and informal values and norms of behavior. Thanks to the corporate culture, the employee begins to identify himself with the organization, an emotional connection is formed between the members of the team. Management as communication and inspiration is based and supports the moral and ethical values of the complex system “organization - man - society”, strengthens the intellectual potential and spiritual energy of man. The classic of modern management, P. Drucker, wrote that the time has come for brainworkers when the leader should not only command, but inspire. “And although leaders must have significant authority, their function in a modern organization is not to command. Their function is to inspire” [5, p. 103].

Management as communication acts primarily as communication, interaction, the ability to inspire, interest, inspire confidence, and facilitate the practical use of the information received. Management as communication and inspiration is based on ethical and aesthetic values: friendship, responsibility, the pursuit of higher values and goals. It includes myths, symbols, ceremonies (U. Ouchi). An important role is played by the elements of myth, utopia, philosophy, religion. Corporate culture should not be transformed into corporatism: dividing people into their own, who deserve the best, and strangers from whom they must distance themselves. The main thing in the implementation of management as communication is the philosophy of the common fate of mankind, the inspiration of a better future for it.

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## FOOD DEPENDENCE AS A LEADING DEADAPTING FACTOR IN PATIENTS WITH TYPE 2 DIABETES

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**Abstract.** The article is devoted to the determination of food dependence in the structure of deadapting factors in patients with type 2 diabetes.

The examination included 26 patients with type 2 diabetes mellitus and 26 conditionally healthy individuals who made up the control group. Experimental psychological techniques were used: hospital scale of anxiety and depression; questionnaire "coping - strategies" by R. Lazarus; Dutch food behavior questionnaire; test for the diagnosis of food dependence; questionnaire "Rehabilitation potential" of a person with various chronic diseases; The 16-factor questionnaire of R. Kettell.

The analysis of psychological characteristics was carried out in the comparison groups. It was revealed that 50% of patients with type 2 diabetes mellitus have a food dependence, which allowed us to divide the main group into two subgroups. The first subgroup consisted of patients with type 2 diabetes mellitus with food dependence, the second subgroup of patients without food dependence. Patients in the first subgroup were characterized by high anxiety and a depressive mood background, self-strictness, tension, and irritability, which were interconnected with food dependence. Patients in the second subgroup were more adaptive with a harmonious attitude to their own disease.

**Keywords:** type 2 diabetes mellitus, food dependence, deadapting factors, anxiety, depressive background, tension.

### Introduction

Today, there are 150 million people with diabetes in the world, and this number is constantly growing and, according to forecasts by WHO (World Health Organization), will reach 300 million by 2020. Thus, diabetes mellitus is another “epidemic” of the XXI century, along with atherosclerosis and oncological diseases (5).

It is known that with diabetes there are a variety of mental disorders that affect the course of the disease and disrupt the adaptation of patients. Among the deadapting factors, numerous emotional disorders, increased fatigue, irritability, and cognitive impairment are described. (8). Type 2 diabetes mellitus is a consequence of certain and quite numerous diseases (3). Many researchers have noted the relationship between type II diabetes and obesity. It was also determined that type 2 diabetes develops in more than 10% of obese people, and about 80% of patients at the onset of the disease are overweight. Moreover, with an increase in the degree of obesity, the frequency of diabetes mellitus also increases (4,5). According to many doctors and scientists, the main tools in the fight against this disease are self-control, physical activity and rejection of bad habits (6,7). G. Gastaldi et al. in his study concludes that the frequency of concomitant eating disorders and type II diabetes mellitus is from 10 to 20% [9]. Eating disorder can manifest itself in the form of night food syndrome, which is characterized by the consumption of 25% or more of the recommended daily caloric content of foods after dinner or periodic spilling and eating at night 3 times a week or more [10]. In a study by E. Manucci et al. on eating disorders in patients with diabetes mellitus and obesity, it is concluded that they have more pronounced restrictive tendencies compared with the group of subjects without diabetes mellitus [8]. The authors suggest that the presence of excessive body weight and obesity in patients with non-insulin-dependent diabetes mellitus is associated with a higher risk of eating disorders, primarily due to the presence of the necessary restrictive measures in food patterns.

However, despite the availability of papers on eating disorders, in patients with type 2 diabetes, the question of the mechanisms involved in the formation of these disorders and food dependence in particular remains poorly understood. Obviously, food dependence is a deadapting factor in the disease in this population, for which early diagnosis and correction is necessary.

**Purpose** of the present study was an examination of food dependence in the structure of deadapting psychological factors in patients with type 2 diabetes.

### Patients and methods

The study included 26 patients, of which 13 women and 13 men with a verified diagnosis of “type 2 diabetes mellitus”. The duration of an existing disease is from 1 to  $\pm 15$  years.

The average age of the subjects was 60 years. The control group consisted of 26 examined, conditionally healthy individuals, similar sex and age composition.

The examination was carried out in 2019 at the clinics of the Samara State Medical University in the department of “Endocrinology and osteoporosis.”

The following experimental psychological techniques were used: Dutch Food Behavioral Questionnaire (DEBQ); test for the diagnosis of food dependence (adapted version of T.U. Stankusheva, 1982); hospital scale of anxiety and depression; questionnaire "Questionnaire of coping behaviors" of Lazarus.; Kettel's personality questionnaire; Questionnaire “The rehabilitation potential of a person with various chronic diseases” of I. Yu. Kulagin, L. V. Senkevich. Spearman's rank correlation coefficient was used to analyze the relationship of characters, and the Mann – Whitney U test was used to assess the significance of differences.

### Results

The study of personality characteristics revealed significant differences between patients with type 2 diabetes mellitus and the control group on scales “L” (U = 185, 5, at p = 0,014); “O” (U = 401.5, at p = 0, 021); “Q3” (U = 167, 5, at p = 0, 004); “MD” (U = 486, 0, at p = 0, 01). High results on the scale of “Confidence-Suspicion” (L) indicate a tendency of patients to suspiciousness, internal stress. High results on the “Calmness-Anxiety” scale (O) indicate the presence of self-doubt, and low indicators on the “adequate self-esteem - inadequate self-esteem” (MD) scale also indicate uncertainty and excessive criticality.

**Table 1**  
**Results from the “Hospital Anxiety and Depression Scale” (HADS) questionnaire in comparison groups**

Criterion	Main group n=26	Control group n=26	U	p
Anxiety	7,64	5,72	433,0	0,018*
Depression	4,12	4,84	261,0	0,306
*-p<0, 05				

According to the results of the “Hospital Anxiety and Depression Scale” questionnaire, significant differences were identified on the “anxiety” scale, which is expressed in anxiety about an existing disease and, in our opinion, makes it difficult to successfully adapt to the disease.

The study of the characteristics of eating behavior according to the test questionnaire (T. Stankushev) showed that 50% of patients with type 2 diabetes have food dependence.

According to the results of the “Dutch Food Questionnaire”, significant differences were identified on the scale of “emotiogenic eating behavior” (U = 576.0, at p = 0.001), which suggests that patients with type 2 diabetes tend to “stress eat” during their worries and negative thoughts.

**Table 2**  
**The structure of eating behavior (DEBO) in comparison groups**

Criterion	Main group	Control group	U	p
Emotiogenic eating behavior	3,392	2,152	576,0	0,001*
Restrictive eating behavior	3,068	1,6788	372,0	0,243
External eating behavior	2,716	2,48	362,0	0,334
*p<0, 05				

The methods of coping behavior in the comparison groups have differences in the type of “distancing” (U=188.0, at p=0.015), which suggests that patients with type 2 diabetes compared with the control group in terms of coping with a problem situation, attempts are made to overcome negative experiences by subjectively reducing its significance and the degree of emotional involvement in it.

The study of the rehabilitation potential revealed significant differences on the following scales: “internal picture of the disease” (U=36, 0, at p <0.002), “motivational component” (U=35.50, at p <0.0024), “emotional component” (U=36.50, at p <0.003), “self-evaluating component” (U=33.50, at p <0.045), “communicative component” (U=36.0, with p <0.002).

A decrease in the indicators of the components of the rehabilitation potential in patients with type 2 diabetes mellitus suggests a presumably lower possibility of adaptation to the disease.

**Table 3.**  
**Coping behavior strategies in comparison groups**

Coping-strategies	Main group (n=26)	Control group ( n=26)	U	p
Confrontation	43, 34	45, 92	343, 5	0, 541
Distancing	49, 61	39, 6	188, 0	0, 015*

## Process Management and Scientific Developments

Coping-strategies	Main group (n=26)	Control group ( n=26)	U	p
Self control	59, 26	49, 28	229,0	0, 103
Search for social support	63, 07	58, 64	224, 5	0, 082
Acceptance of responsibility	51, 46	58, 28	5,0	0, 346
Escape-avoidance	39, 42	37, 96	294,0	0, 717
Planning solution to the problem	69, 03	78, 2	397, 5	0, 97
Positive reevaluation	55, 73	58, 8	336,0	0, 647
* <sub>-</sub> p<0, 05				

We carried out a correlation analysis of the personality characteristics of patients with type 2 diabetes mellitus in two subgroups 1A - with food dependence and 1B - without food dependence.

Differences in the criteria of “anxiety” (U=38.0, at p=0.033), “depression” (U=31.0, at p=0.011), and “restrictive eating behavior” (U=26.0, at p=0.004), “the internal picture of the disease” (U=27.0, at p=0.001), “relaxation-tension” (U=118.5, at p=0.001).

The differences obtained indicate that patients with food addiction are characterized by higher anxiety and a depressive mood background, self-strictness, tension, and irritability. In our opinion, this is due to the fact that patients with food addiction cannot stop overeating, they feel guilty and irritated in this regard.

Patients without food dependence are characterized by a more adaptive and harmonious attitude to their own disease, which is explained, *inter alia*, by the lack of food dependence, and the ability to control the amount of food consumed.

The correlation analysis made it possible to determine the presence of relationships between certain indicators in the group of patients with type 2 diabetes. We give the main significant relationships:

- external eating behavior is inversely related to factor L: “credulity - suspiciousness” (rs=-0.407, at p≤0.05), that is, the higher the indicators of external eating behavior, the lower the suspicion and alertness towards people;
- external eating behavior is inversely related to factor Q3: “low-high self-control” (rs=-0.545, at p≤0.001), that is, the higher the indicators of external eating behavior, the lower the ability to control your own emotions and behavior;
- restrictive eating behavior is inversely related to factor Q3: “low-high self-control” (rs=-0.488, at p≤0.05), that is, the higher the indicators of restrictive eating behavior, the lower the ability to control your own emotions and behavior;

- restrictive eating behavior is directly related to such a coping strategy as "acceptance of responsibility" ( $r_s=0.486$ , at  $p\leq 0.05$ ), that is, the higher the indicators on the scale of "acceptance of responsibility", the higher the tendency to restrictive eating behavior;
- external eating behavior is directly interconnected with such a coping strategy as "escape-avoidance" ( $r_s=0.471$ , at  $p\leq 0.05$ ), that is, the higher the indicators on the scale "escape-avoidance", the higher the tendency to external food behavior;
- restrictive eating behavior is directly correlated with the presence of food dependence ( $r_s=0.624$ , at  $p\leq 0.001$ ), that is, the higher the indicators on the scale of "restrictive eating behavior", the higher the tendency for the appearance of food dependence;
- external eating behavior is directly correlated with the presence of food dependence ( $r_s=0.781$ , at  $p\leq 0.001$ ), that is, the higher the indicators on the scale of "external eating behavior", the higher the tendency to the appearance of food dependence.

**Conclusion.** This work is the first stage in the study of the psychological characteristics of patients with type 2 diabetes mellitus to identify targets for psychocorrection. Early diagnosis of food dependence as the leading deadapting factor in patients with type 2 diabetes mellitus will optimize medical care for this contingent and include the psychological component in their rehabilitation program.

### **Conclusions:**

1. Patients with type 2 diabetes mellitus with food dependence are characterized by high anxiety and depressive mood background, self-strictness, tension, and irritability.
2. Patients with type 2 diabetes mellitus without food dependence are characterized by an adaptive and harmonious attitude to their own disease.
3. Patients with type 2 diabetes are characterized by restrictive eating behavior ( $r_s=0.624$ ) and the higher the rate of restrictive eating behavior, the higher the tendency to food dependence.
4. For patients with type 2 diabetes, external eating behavior is characteristic ( $r_s=0.781$ ) and the higher the indicator of external eating behavior, the higher the tendency to food dependence.
5. Food dependence is a leading deadapting factor in patients with type 2 diabetes.

### **Declaration of financial and other relationships**

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## UPBRINGING OF PRESCHOOL CHILDREN IN A CHINESE VILLAGE

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**Annotation.** Traditionally, in the family, children from birth are instilled with moral principles, life values that are transmitted and assimilated through education and become part of the Chinese tradition. According to the results of a field study in the village of Xinkaizhen, Jiangxi Province, in the south-east of China, the characteristic features of the development of modern Chinese preschool education are identified. The new socio-economic conditions of Chinese society are transforming the process of raising children. There is a tendency for the child to develop early in the womb. Special literature, CDs with classes for developing hearing, and the intellect of the unborn baby are sold in the village. From birth to three years, the early development center offers services in accordance with the educational concept of "child-centered, learning and fun". Most of the children aged 3-6 years go to kindergarten, the main purpose of which is to get involved in the regime, look after the health of the pupils and prepare them for school in a playful way. The results show that not all preschool children attend kindergartens. Currently, out of ten, three, village children of preschool age 5-6 years old are brought up by grandparents at home. Parents' low incomes have become a common reason for the decline in attendance at kindergartens.

**Keywords:** upbringing, village, China, population, changes.

Field expedition work took place in 2019 with fixing the results in the form of photographs, map diagrams, individual observation diaries. In the process of collecting data, we identified the optimal solution for parents, which simplifies the task, ensuring the full development of the child. Kindergarten is aimed at accelerating the development of the processes of

upbringing and education, making them diverse, interesting and effective. Under the education in kindergarten, we consider the formation of personality, where the natural process of integration of the child into society takes place. The result of the survey of parents showed that the process of preparation for kindergarten is mandatory, and requires time and effort to develop the child's primary skills of independence and creates the conditions for equal communication with peers.

The only kindergarten has been operating in the Xinkaizhen village for 10 years. This is a three-story brick building with a large walk area equipped with modern slides, swings, horizontal bars. On the territory of the kindergarten there is a parking for special buses that transport children home, as the village is divided into nine parts, the streets of which are located at different distances.

Upon admission to kindergarten, a medical card is issued for the child and a personal badge with a photo and brief information about the child is issued. Without a badge, they can not miss kindergarten. In the younger groups, a period of adaptation is provided, so a runny nose for the Chinese is the norm. In order not to catch a cold, educators advise observing the regimen, drinking a lot and not overeating, otherwise the yin-yang balance will be destroyed.

According to our observations, parents escort children to the gates of the kindergarten, they can get into the group only on open day. On the street for parents hangs a TV, divided into several sectors, where you can watch online the activities of children of all groups. Next to the bulletin board is a children's menu. Payment for staying at a state kindergarten costs about 800 yuan per month.

Fifteen groups are divided by age: 3-4 years - the youngest; 4-5 years - average; 5-6 years - the eldest. Each group has about 25 children, two teachers who undergo special training and certification. Each group has its own uniform. By the color of the costumes, you can determine which group this child is from. A special uniform is required at all celebrations of the group, and on weekdays it is allowed to wear any clothes. (see photo 1)

Children are admitted to the preschool from 7.30 o'clock; at the entrance, the temperature of each child is checked. One teacher meets children in a common corridor and takes them to his group. Each group has two rooms: in one they study and eat, in the other they sleep and play.

There is a strict daily routine in the garden: from 8.30 - breakfast, mainly consists of rice porridge, mantou, with various fillings, a stewed egg with carrots and peas. Teachers from 9 hours conduct classes: learn hieroglyphs, draw, sing songs, dance and watch educational cartoons. During

the break, all children go in formation to the toilet, you must definitely hold on to the clothes of the previous one. In their free time, the guys play games. The most important component of the children's group is the game and toys. The toy is an instrument of socialization, a kind of link between the child and the objective world, as well as part of children's gaming reality.

At 12 o'clock all the children go out to the gym, which takes about 20-30 minutes to the music. From 13.00 to 13.30 hours lunch, usually the menu consists of liquid soup, or lean rice, the side dish includes meat, fish, vegetables. From 2 p.m. to 3 p.m. the sleepy hour, children sleep in a room on the floor, on special mattresses, which are cleaned every time after sleep. At 17.00 dinner: a bun with beans, corn tortilla, stew with pumpkin.

During dinner, the teacher talks about the rules of table etiquette, which are generally accepted in China. 1. Rice is eaten with chopsticks. 2. During a break during the meal, you should put the chopsticks flat on the bowl, in no case should stick sticks in the rice vertically, because such rice is served only by the dead during the funeral. 3. Eat soup with a spoon, and not drink from a cup; do not stir hot soup with chopsticks. [1, p. 23]

At present, chopsticks have become the most prominent representative of Chinese culture and one of the important signs of the Chinese tradition.

The working day ends in the kindergarten at 19 hours. Carers take the children in a formation of 2 people to the site, near the gate. Each parent takes his child, the rest are transported home by bus. (see photo 2).

At the end of the week, parents are given a leaflet with the results of the child's creativity. Groups arrange demonstrations for parents, prepare events for all major Chinese holidays.

It is with the help of traditional cultural means, such as: holidays, folklore, games, in the children's environment, that the child is introduced to group norms, which as a result forms him as a person. It was found out from a survey of parents that their children are happy to attend kindergarten and believe that such a system helps to create optimal conditions for the full development of the child's personality and for his successful entry into the "big world". All kindergarten graduates can read and write. They demonstrate the ability to count and solve puzzles, prepare theatrical scenes, dances. It was amazing to observe how the children danced very complex dances, and no one ever lost their way and made a mistake, the complete synchronization of all movements. Almost all children have amazing natural plastic, the ability to hold their face - no embarrassment. They are very fond of taking pictures, posing, solemnly raising two fingers up, in a Victorian victory gesture.

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The Chinese believe that the real concern for the younger generation is that love should be manifested in the upbringing and education that children receive, they must be kind and strict at the same time. It is such principles of education that have come down to us from antiquity in the book "On the teaching of children". The tradition of caring for children is included in the moral code of the Chinese nation, which guarantees the well-being of each individual family and the stability of society as a whole. [2, p.17]

According to the Chinese scientist Liang Qichao, children are the future of the country, the hope of the Chinese nation. "If the young are wise, then China will be wise; if the young are rich, then China will be rich; if the young are strong, then China will be powerful; if the young are progressive, then China will progress". The new replaces the old - it is an irresistible law of history. The future always belongs to today's children. [3, p. 251]



**Photo by the author 1. Younger group. Open Day.**



**Photo by the author 2. Children awaiting parents.**

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## INFLUENCE OF MOTOR ACTIVITY ON THE QUALITY OF LIFE OF PATIENTS WITH VARIOUS EXTENSION OF VEINS OF LOWER EXTREMITIES AFTER SURGICAL INTERVENTION

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**Abstract.** In this article, the author discloses an analysis of the results on the impact on the quality of life in patients with varicose veins of the lower extremities after surgery using motor activity. The presented results of the study showed that when assessing QL, it can be seen that components such as PF, RP, associated with physical health, BP, GH and RP, due to the emotional state, behave identically, having a minimum in group 2, a maximum in group 3 and significantly declining in patients with VBNA as a whole compared with healthy patients. In terms of indicators of VT, SF and MH in general, the severity of the disease and surgical intervention do not significantly affect them.

**Keywords:** quality of life, Nordic walking, varicose veins of the lower extremities, surgical intervention.

### Introduction

In the modern world, the quality of life of the population directly depends on the well-being and economic stability of the country. This issue is very relevant when viewed from the perspective of assessing the quality of life of a practically healthy person in different environmental conditions under the influence of various factors for humans [1,3]. And varicose veins increase exponentially, this is facilitated by diseases such as obesity, lack of exercise, diseases of the musculoskeletal system. These data are confirmed by the statistics of the Ministry of Health of the Russian Federation for 2012<sup>1</sup>,

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<sup>1</sup>Statistical information for 2012 [Electronic resource] // Ministry of Health of the Russian Federation. – Access: <https://www.rosminzdrav.ru/documents/8029> (appeal date: 01.02.2020).

2014<sup>2</sup>, 2016<sup>3</sup> and 2017<sup>4</sup> showing that the number of patients requiring help in connection with VVLE is also increasing. Varicose veins of the lower extremities (VVLE) – is a disease associated with the expansion of the superficial veins of the lower extremities, which is accompanied by valve failure and impaired blood flow. The disease most often affects people aged 20-40 years, most often manifests itself in the pool of the great saphenous vein [4]. So in scientific medical journals it is described that varicose disease is determined in 25% of cases in the able-bodied population, and in women it is more common [2].

Initially, no signs of the disease except telangiectasia were noted, but after 10-15 years, edema was observed, localized in the distal parts of the lower extremities (lower leg, foot). Edema usually worsens in the evening and decreases after a night's sleep. Somewhat earlier (3-5 years after the onset of the disease), patients begin to complain of a feeling of heaviness and fullness, as well as pain in the calf muscles, which increase with immobility and decrease with walking [4].

A rather limited number of works has been devoted to the question of the effect of VVLE on the quality of life of patients.

**Purpose** of the study was to identify the quality of life on a specific example of a group of patients with VVLE after surgical treatment with the use of motor activity.

### **Materials and methods**

86 respondents took part in the study, including 31 people - men, 55 - women, who were further divided into subgroups: group 1 - respondents from VVLE C1-C2 to CIVIQ2 who did not undergo surgical treatment. A total of 17 patients; Group 2 - respondents with VVLE C3-C4 to CIVIQ2 who did not undergo surgical treatment. A total of 19 patients; 3rd group - respondents with VVLE 3 months after EVLC using Scandinavian walking. A total of 22 patients; Group 4 - clinically healthy respondents. A total of 28 respondents. In total, 8 respondents aged 25 years and younger, 30 respondents aged 26-35 years, 22 respondents aged 36-45 years, 14 respondents aged 46-55 years, 12 respondents aged 56-65 years were surveyed. The distribution of respondents by age revealed that respondents aged 26-35 years prevail in all groups. So, their share in group 1 is 47.1%, in group 2 - 36.8%, in group 3 - 31.8%, in group 4 - 28.6%.

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<sup>2</sup>Statistical information for 2017 // Ministry of Health of the Russian Federation. – Access: <https://www.rosminzdrav.ru/documents/9479> (appeal date: 01.02.2020).

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The average age of respondents in group 1 is  $35.82 \pm 1.72$  years, in group 2 -  $39.11 \pm 2.76$  years, in group 3 -  $42.64 \pm 2.55$  years, in group 4 -  $39.29 \pm 2.41$  years. The gender distribution of respondents also showed a predominance of women. They amounted to 64.7% of the respondents of the first group, 57.9% of the respondents of the second group, 68.2% of the respondents of the third group, 64.3% of the respondents of the fourth group. Quality of life was assessed using the international standardized questionnaire SF-36 [5].

The results of the study were subjected to statistical processing using software packages Microsoft Excel 2007 and Statistica 10.

### Results

The effect of VVLE on the PF score - this parameter indicates how much physical health affects the patient's ability to perform physical activity. It can be noted that the lowest PF was found in patients with VVLE C3-C4 before surgery ( $44.47 \pm 4.70$  points). A slightly higher indicator of patients with VVLE C1-C2 before surgery ( $49.71 \pm 5.93$  points). After surgery using Scandinavian walking, the parameter PF increases to  $78.41 \pm 3.80$  points. Healthy patients showed a result of  $90.54 \pm 1.34$  points. Moreover, when analyzing the significance of differences by Student's t-test, we can talk about the absence of statistically significant differences between groups 1 and 2 ( $p = 0.493463$ ,  $p > 0.05$ ). Between group 1 and 3, the differences are significant ( $p = 0.001235$ ,  $p < 0.05$ ), between group 1 and 4 they are also significant ( $p = 0.000000$ ,  $p < 0.05$ ). The differences between groups 2 and 3 ( $p = 0.000002$ ,  $p < 0.05$ ) and 2 and 4 ( $p = 0.000000$ ,  $p < 0.05$ ) are also significant. Between groups 3 and 4, there is also a statistically significant difference in the number of points scored ( $p = 0.004187$ ,  $p < 0.05$ ). Thus, insignificant difference can be recognized and only the between groups 1 and 2, which indicates a weak effect of the degree of the disease on the PF scale of patients with VVLE. Moreover, the disease itself has a significant effect on the physical functioning of patients with VVLE, which is not leveled even after surgery, i.e. even patients from group 3 have significantly different scores compared to patients from group 4. At the same time, the quality of life of patients from group 3 was evaluated at a follow-up examination 3 months after the intervention and the use of Scandinavian walking.

The next indicator is the RP scale, after its processing it is clearly visible that the influence of VVLE on the patient's ability to perform daily work is significant. So, in the second group, the indicator was minimal and equal to  $14.47 \pm 3.97$  points, in the first group -  $32.35 \pm 8.78$  points, in the third group -  $75.00 \pm 5.70$  points, in the fourth group -  $88.39 \pm 4.36$  points. As

before, between groups 1 and 2, the differences are not statistically significant ( $p = 0.072465$ ,  $p > 0.05$ ). The differences are significant between groups 1 and 3 ( $p = 0.000243$ ,  $p < 0.05$ ), 1 and 4 ( $p = 0.000015$ ,  $p < 0.05$ ), 2 and 3 ( $p = 0.000000$ ,  $p < 0.05$ ), 2 and 4 ( $p = 0.000000$ ,  $p < 0.05$ ). In other words, as in the case of the PF scale, the effect of VVLE on functioning due to physical condition certainly exists. Moreover, the differences between groups 1 and 2 are not significant, which indicates a weak connection between the severity of the pathology and the quality of life of patients.

The scale indicator - BP - is one of the indicators that is most affected. The survey results on this scale indicators of pain intensity: in group 1 was  $27.76 \pm 5.91$  points, in group 2 -  $16.68 \pm 1.97$  points, in group 3 -  $54.09 \pm 5.22$  points, in group 4 -  $77.79 \pm 3.09$  points. That is, as before, in group 2 the indicator is minimal, in group 3 it is maximum. The highest rate is observed in healthy people. Between groups 1 and 2, the differences are not statistically significant ( $p = 0.084523$ ,  $p > 0.05$ ). The differences are significant between groups 1 and 3 ( $p = 0.0001964$ ,  $p < 0.05$ ), 1 and 4 ( $p = 0.000000$ ,  $p < 0.05$ ), 2 and 3 ( $p = 0.000000$ ,  $p < 0.05$ ), 2 and 4 ( $p = 0.000000$ ,  $p < 0.05$ ). That is, the result is similar to that in the first two cases and can be explained by the same reasons.

The indicator on the GH scale, which was estimated by the respondents, showed in general that this scale has higher values than the previous ones. The average general health indicator in group 1 is  $47.35 \pm 5.16$  points, in group 2 -  $40.26 \pm 1.60$  points, in group 3 -  $58.95 \pm 7.29$  points, in group 4 -  $92, 14 \pm 1.49$  points, that is, the indicators in group 2 are still the lowest, and in group 3 the highest of patients with VVLE. There were no statistically significant differences between groups 1 and 2 ( $p = 0.084523$ ,  $p > 0.05$ ). The differences are significant between groups 1 and 3 ( $p = 0.001964$ ,  $p < 0.05$ ), 1 and 4 ( $p = 0.000000$ ,  $p < 0.05$ ), 2 and 3 ( $p = 0.000000$ ,  $p < 0.05$ ), 2 and 4 ( $p = 0.000000$ ,  $p < 0.05$ ).

The VT scale is much less dependent on VVLE than the components from the block of physical health scales. From the results of the questionnaire on the VT scale, it follows that groups 1, 2 and 3 show almost the same result - in group 1 -  $58.24 \pm 3.61$  points, in group 2 -  $57.11 \pm 2.14$  points, in group 3 -  $28.64 \pm 5.09$  points; in group 4 -  $80.00 \pm 1.34$  points. The differences between groups 1 and 2 are not statistically significant ( $p = 0.789403$ ,  $p > 0.05$ ). They are not significant between groups 1 and 3 ( $p = 0.949245$ ,  $p > 0.05$ ), 2 and 3 ( $p = 0.783209$ ,  $p > 0.05$ ). The differences are significant between groups 1 and 4 ( $p = 0.0000001$ ,  $p < 0.05$ ), 2 and 4 ( $p = 0.000000$ ,  $p < 0.05$ ). It can be concluded that, in general, VVLE affects the vital activity of patients, because healthy respondents show significantly

better results *ceteris paribus*. However, between the groups in the pre- and postoperative period there are no differences.

A similar dynamics is observed when analyzing the SF indicator. It can be seen that a slight decrease in the indicator in group 2 in comparison with groups 1 and 3 is preserved, and the indicator of healthy people exceeds that in patients with VVLE. So, in group 1 the indicator is  $68.38 \pm 3.41$  points, in group 2 -  $67.76 \pm 2.40$  points, in group 3 -  $75.00 \pm 4.11$  points, in group 4 -  $87.50 \pm 2.57$  points. The differences between groups 1 and 2 are not statistically significant ( $p = 0.882707$ ,  $p > 0.05$ ). The differences between groups 1 and 3 ( $p = 0.223143$ ,  $p > 0.05$ ), 2 and 3 ( $p = 0.783209$ ,  $p > 0.05$ ) are also not significant. The differences are significant between groups 1 and 4 ( $p = 0.002832$ ,  $p < 0.05$ ), 2 and 4 ( $p = 0.000000$ ,  $p < 0.05$ ). That is, social functioning under the influence of VVLE symptoms decreases, but within the group there were no significant differences in patients with VVLE.

The indicator on the RE scale undergoes a significantly more sharp decrease, and the picture of decoding is more likely to resemble that in the analysis of the scales of the physical block. In assessing this scale, it can be noted that in group 1 the average indicator is  $33.33 \pm 8.08$  points, in group 2 -  $21.05 \pm 5.23$  points, in group 3 -  $75.76 \pm 6.27$  points, in group 4 -  $89.29 \pm 4.87$  points. Between groups 1 and 2, the differences are not significant ( $p = 0.210915$ ,  $p > 0.05$ ). The differences are significant between groups 1 and 3 ( $p = 0.000195$ ,  $p < 0.05$ ), 1 and 4 ( $p = 0.000000$ ,  $p < 0.05$ ), 2 and 3 ( $p = 0.000000$ ,  $p < 0.05$ ), 2 and 4 ( $p = 0.000000$ ,  $p < 0.05$ ). That is, the effect on the ability to perform their social functions in patients with VVLE is significantly reduced. However, after surgery, it significantly increases.

When analyzing patients' subjective assessment of their mental health (MH scale), it can be concluded that the most significant assessment of mental health suffers in patients of the first group ( $37.19 \pm 2.32$  points), then the second group ( $32.56 \pm 1.21$  point), the third group ( $46.72 \pm 2.18$  points), the fourth group ( $55.47 \pm 0.53$  points). Moreover, the differences between groups 1 and 2 are not significant ( $p = 0.278248$ ,  $p > 0.05$ ). They are not significant between groups 2 and 3 ( $p = 0.304820$ ,  $p > 0.05$ ) and 2 and 4 ( $p = 0.132600$ ,  $p > 0.05$ ). The differences are significant only between groups 1 and 3 ( $p = 0.008756$ ,  $p < 0.05$ ), 1 and 4 ( $p = 0.001126$ ,  $p < 0.05$ ).

Each of the four scales serves as a data source for calculating the subscales of physical and mental well-being. According to the results of the calculation, it can be concluded that physical well-being depends on whether surgical treatment was carried out or not, and mental well-being

does not depend on this factor. At the same time, both physical and mental well-being are significantly higher among healthy respondents. So, the indicator of physical well-being in group 1 is  $37.19 \pm 2.23$  points, in group 2 -  $32.56 \pm 1.21$  points, in group 3 -  $46.72 \pm 2.18$  points, in group 4 -  $55, 47 \pm 0.53$  points. The index of mental well-being in group 1 is  $44.29 \pm 0.98$  points, in group 2 -  $45.08 \pm 0.98$  points, in group 3 -  $46.65 \pm 0.97$  points, in group 4 -  $49.05 \pm 0.80$  points.

To exclude the effect of age on the results of the experiment, a correlation analysis was carried out (table 1). It can be noted that in patients with VVLE there is no direct relationship between age and quality of life indicators, when, as in the case with healthy people, these indicators in some cases correlate. Thus, in general, age can have an effect in the case of physical functioning and physical well-being, but in the case of VVLE this effect is not significant. This result can also be explained by the fact that as the respondents were selected persons with a maximum age of 63 years. Apparently a significant effect of age can be observed in more age groups than those that were surveyed.

**Table 1 Correlation analysis of indicators of quality of life according to the questionnaire SF-36 and the age of patients with VVLE**

<b>Scales</b>	<b>Patients with VVLE</b>	<b>Control group patients</b>
PF	-0,2	-0,8
RP	0,1	-0,4
BP	0,1	0,0
GH	0,0	-0,2
VT	0,0	-0,4
SF	-0,1	-0,4
RE	0,0	-0,3
MH	0,1	-0,2
PH	-0,2	-0,8
MH	0,1	-0,4

**Conclusions**

VVLE - is a pathology that reduces the quality of life of patients suffering from it. The study obtained convincing evidence that allows us to judge the effectiveness of minimally invasive surgical techniques in the treatment of VVLE using physical activity in the rehabilitation period to improve the quality of life of patients. It is important that the dynamics of improving the quality of life indicators had a clear time dependence. So, 1 month after treatment, there was a deterioration in the quality of life on a pain,

physical and social scale, which is associated by the author of the work with residual pain, the need to limit motor mode, loads, the need to wear special compression hosiery. However, the psychological component (MH) is significantly improved, which is associated with a decrease in symptoms of the disease such as edema, convulsions. After 3 months, no major changes were observed, because patients should still wear compression knitwear, avoid heavy loads. At the same time, the MH component continues to improve significantly. In the future, normalization of all indicators of quality of life to population values is noted.

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**PLANT BIOMASS OZONATION. THERMAL ANALYSIS/MASS SPECTRA OF PYROLYSIS PRODUCTS OF WOOD**

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**Annotation.** Transformations of aspen and pine wood under ozone impact are investigated by synchronous thermal analysis, coupled with mass spectrometric (MS) analysis of non-condensed products of biomass pyrolysis. The MS analysis of pyrolysis products of ozonized samples indicates a decrease in lignin and hemicellulose amounts, and a formation of oxygen-containing biomass ozonation products. It is assumed that ozone treatment of wood results in not only destruction, but also polycondensation of aromatic structures of lignin. For aspen wood, the polycondensation is noticeably less pronounced as compared to the pine wood.

**Keywords:** wood, ozonation, delignification, ozonolysis products.

The removal of LG is a very important issue not only for the pulping industry but also for utilizing carbohydrates as a starting material to produce sugars and alcohols in an industrial scale to build up the renewable and sustainable systems. With this, ozonation is a method of plant biomass delignification at a pretreatment stage in polysaccharides and monosaccharides processing [1-4].

It was shown that a presence of water is necessary to conduct ozone delignification of a biomass efficiently; the role of water in the ozone treatment is discussed in [2-5]. The best ozonation efficiency was observed for aspen wood of 55 % moisture content (MC) [5]. For pine wood, 60-63 % MC was found to be the optimal one [3].

In optimal MC range, the specific ozone consumption is a governing factor for the lignocellulose materials (LCM) degree of delignification (DD) [3,4,7]. Determination of LG content in ozonized wood by common method

showed that 40-90% DD can be achieved under ozone impact [2,5]. Ozone also reacts with LG ozonation products, such as formic, glyoxalic and oxalic acids [3,5].

In combination with mass spectra (MS) of pyrolysis gaseous products, synchronous thermal analysis has proven to be an informative method of lignin (LG) and plant biomass structure investigation [6-9]. Analysis of non-condensed products of LG, hemicelluloses (HC) and cellulose (CL) made it possible to assess the contribution of these biomass components to the formation of CO, CO<sub>2</sub>, H<sub>2</sub>O, HCHO, CH<sub>4</sub> and other compounds in biomass pyrolysis [7,10]. In the study of pyrolysis of ozonized pine wood, it was noted the relationship between the amount of water and methane released and the LG content in the ozonized LCM [11].

The aim of this research is to assess the feasibility of the thermal analysis to find out the optimal ozone consumption interval in which lignin destruction in pine or aspen wood dominates.

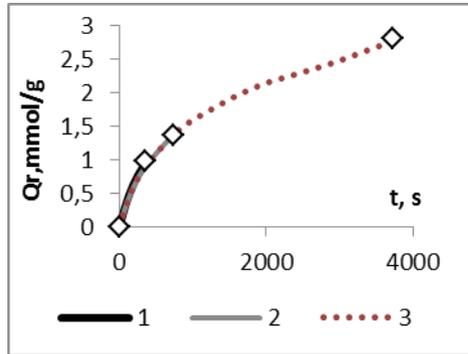
### Experimental

Samples of aspen wood (*Populus tremula*) (fraction 0.315-0.63 mm particle size with MC of 58-60% relative to the mass of oven-dry wood (o.d.w.) and pine wood (*Pinus silvestris*) of 60-65% MC. The procedure of ozonation and determination the amount of ozone consumption (Qr, mmol/g) are given in [3, 5].

Thermal analysis of the samples was carried out using the Netzsch 449 C Jupiter thermal analyzer, combined with the mass spectrometer NET'SCH 409 AOELOS. The sample of air-dry wood was analyzed at a heating velocity of 10 °C/min in the range of 40°C to 1000°C in the argon atmosphere, the gas flow rate was 8 ml/min, and the sample mass was 6-7 mg. The integration of mass spectra (MS) for different masses was carried out taking into account the baseline intensity of the ion current for each mass. The result of the integration was rationed to the initial sample [9].

### Results and discussion

Figure 1 shows kinetic ozone absorption curves by aspen wood samples. Fig.1 illustrates the different absorption rate of ozone at the initial stage (curve 1), and subsequent ozonation stages (curves 2 and 3). The Qr values corresponded to the end of ozone processing at different ozonation durations, and the residual LG content for aspen and pine samples are given in Table 1.



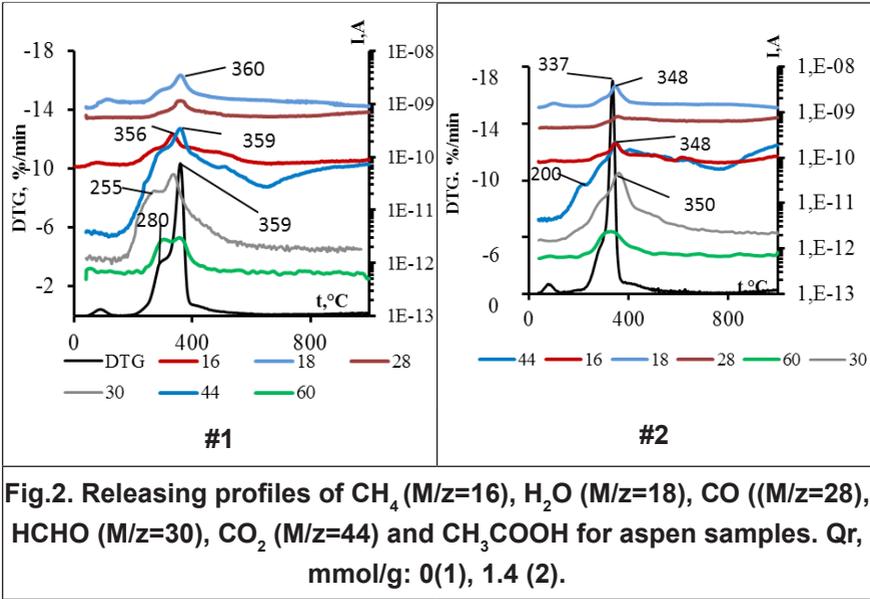
**Fig.1. Kinetic curves of specific ozone absorption by aspen wood. Ozonation duration, s:360 (1), 720 (2), 3700 (3)**

**Table 1. Qr values corresponded to the end of ozone processing at different ozonation durations, and the residual LG content for aspen and pine samples.**

aspen			pine		
t, s	Qr, mmol/g	LG,% [5]	t, s	Qr, mmol/g	LG,% [3]
0	0	25.3	0	0	29.0
360	1.0	15.3	180	0.6	23.1
740	1.4	12.0	430	1.4	18.0
3700	2.8	9.0	3400	3.2	16.8

Figure 2 shows the DTG curves for the original aspen wood (#1) and the ozonized aspen LCM (#2) ( $Q_r$ , 1.4 mmol/g). The DTG curve of the original wood is characterized by a maximum of 359 °C, and the curve for the ozonized sample has a maximum of 337°C. The shoulder of 280 °C at the DTG curve of the original sample is due to the thermal destruction of the HC. It is practically absent at the DTG curve of the sample #2. These data show the in ozonation of the wood destruction of HC takes place. LG, which is known as the most thermally resistant component of plant biomass, also destructs.

During the thermal destruction of wood in an inert atmosphere volatile non-condensable products are formed (Fig. 2). Among them, water ( $M/z$  18),  $CH_4$  ( $M/z$  16),  $CO_2$  ( $M/z$  44), CO ( $M/z$  28), formaldehyde ( $M/z$  30), acetic acid ( $M/z$  60) present. These compounds are typical for the thermal destruction of plant biomass and lignin [6-11].



**Fig.2. Releasing profiles of CH<sub>4</sub> (M/z=16), H<sub>2</sub>O (M/z=18), CO ((M/z=28), HCHO (M/z=30), CO<sub>2</sub> (M/z=44) and CH<sub>3</sub>COOH for aspen samples. Qr, mmol/g: 0(1), 1.4 (2).**

Profiles of the pyrolysis products are characterized by a maximum in the range of the maximum DTG curve. Compared to the original wood, the maximum of the #2 sample products release, shifts to the lower temperatures, which is consistent with the data of DTG. Thus, the maximum allocation temperatures for samples #1 and #2 are at 356 °C and 348 °C, for CO<sub>2</sub> - at 359°C and 348°C. The profile of CO<sub>2</sub> release of the sample #2 has a shoulder at 200°C corresponded to thermal decomposition of the biomaterial ozonation products. The curves of water release have the first maximum at 97-100 °C of physically adsorbed water releasing. The maxima of water release in the range of thermal destruction of cellulose and HC for samples #1 and #2 are seen at 360°C and 348°C.

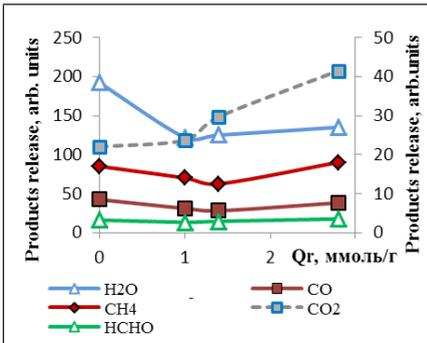
According to [6,7], the main source of CH<sub>4</sub> and CO formation in pyrolysis is OCH<sub>3</sub> groups which mostly present in LG and HCs. The release of water is provided by the decomposition of LG, HC, and CL. It is noted that the amount of CO<sub>2</sub> and H<sub>2</sub>O produced during biomass pyrolysis is consistent with the oxygen content in the biomaterial, and the source of oxygen for CO<sub>2</sub> formation under pyrolysis conditions in an inert environment is mainly cellulose [6].

The intense shoulder at 255-260°C observed in HCHO allocation profile of sample #1 and attributed to the thermal destruction of the HC is not seen in the profile of the sample #2 because of HC destruction in wood

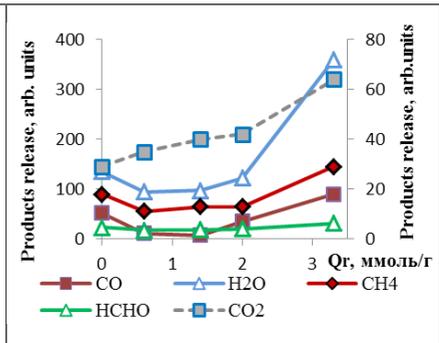
ozonation. Destruction of HC in the ozonized sample is also seen from the comparison of the  $\text{CH}_3\text{COOH}$  profiles, since it is known that the acetic acid is a pyrolysis product of hardwood hemicellulose, that mainly is composed of 4-O-methyl-D-glucurono-D-xylan and has high contents of O-acetyl and uronic acid [10].

In #2 sample, the  $\text{CH}_4$  releasing curve is characterized by a shoulder at temperatures above  $500^\circ\text{C}$ . This suggests that the destruction of LG in the ozonation of wood is accompanied by polymerization of aromatic structures. This assumption is based on the well-known notion that the source of  $\text{CH}_4$  formation at high temperatures is aliphatic and aromatic carbon. It is also supported by the fact that methane is generated in the thermal decomposition of LG up to  $800^\circ\text{C}$ .

Ozone treatment of wood results in LCM delignification by means of ozonolysis, and for Qr 1.4 mmol/g the DD reaches 52%. LG destruction is accompanied by a formation of oxygen-containing ozonation products presenting on the sample surface [2,5]. Under ozonation, apart from LG destruction degradation of HCs also occurs. As a result, ozonized samples are characterized by increasing content of CL as well as a variability of oxidation products presence. With this, a combination of the modified LCM structure decomposition processes is observed in the thermal analysis data. Figure 3 shows the dependence of the amount of pyrolysis products on the specific absorption of ozone by aspen wood.



**Fig.3. Pyrolysis products release (arb. units) of ozonized aspen wood depending on specific ozone consumption.**



**Fig.4. Pyrolysis products release (arb. units) of ozonized pine wood depending on specific ozone consumption.**

In pyrolysis of ozonized aspen wood, the amount of CO and  $\text{CO}_2$  increases with an increase in Qr, which is due to oxygen-containing biomass

oxidation products and CL [2]. The dependence of water and methane amounts released is characterized by a slight delay in the Qr range of 1.0÷1.4 mmol/g, associated with a decrease in the aromatic content and OCH<sub>3</sub> because of LG ozonolysis as well as HC degradation. At more high Qr values, CH<sub>4</sub> and H<sub>2</sub>O release increases slightly since aliphatic compounds containing C-O and C-O-C groups present in the sample.

The similar data for pine wood shown in Fig.4 differ from the data for aspen wood. In this case, the LG and HC destruction are also reflected in the pyrolysis data. The curves of CH<sub>4</sub> and H<sub>2</sub>O release go down in Qr range of 0.6÷2.0 mmol/g and arise at more high Qr. The amount of CH<sub>4</sub> released at Qr 3.3 mmol/g is higher than in the original sample and more high than in pyrolysis decomposition of aspen wood treated by ozone under the same conditions. The same result is seen in Fig.4 for H<sub>2</sub>O, CO and CO<sub>2</sub> and HCHO curves. We suppose that the above difference is due to relatively low delignification of pine wood by ozone (DD is only 40% [5]) and a formation of LCM with more high CL content as well as more high LG poly-condensation compounds content, as compared to aspen wood [5].

The Qr values of the best delignification found from thermal analysis data correspond to initial stages of ozone treatment as it is seen from Fig.1 and Table 1. It is clear from Fig.1 and Table 1 that 5-10 min ozonation duration is a range of the most effective delignification of the LCM.

### Conclusions

1. MS analysis of ozone pyrolysis products reflects the main processes accompanying ozone biomass treatment: disrupting of lignin and the formation of oxygen-containing oxidation products.
2. Ozonolytic delignification of biomass is accompanied by polymerization and poly-condensation processes that reduce the efficiency of ozone treatment. In the case of aspen wood, the polymerization processes are noticeably less pronounced than for pine wood.
3. The best delignification can be expected at the initial stage of LCM ozonation duration.

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## INCONSISTENT UNIVERSE

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**Abstract.** Modern cosmological models are considered. It is shown that existing models of inflation and the Higgs mechanism have a number of disadvantages. The interpretation of the Higgs field vacuum as a material source of the Minkowski metric is proposed. A new inflation model is proposed. It is shown that the expansion of the Universe violates the law of conservation of energy, which leads to the generation of additional mass. The groundlessness of the version of the thermal death of the Universe is indicated.

**Keywords:** inflation, Big Bang, symmetry, Higgs field, thermodynamics

### Introduction

According to modern concepts, the Universe arose from the Planck superdense state.

Time  $10^{-43}$  - Planck era. The first  $10^{-42}$  s - the era of the Great Unification, GUT.

After the Planck era, the single supersymmetric field decays, and the gravitational interaction is separated from it. The period of  $10^{-43}$  -  $10^{-36}$  s corresponds to the era of combining three interactions - weak, electromagnetic and strong, this is the era of cosmological inflation. In the era of inflation, massive elementary particles arise. The universe is warming up.

After  $10^{-36}$  s, a strong interaction is separated, which causes the end of inflation. The end of the GUT is at  $T \sim 10^{28}$ K, with characteristic particle energies of  $10^{15}$  GeV and distance scales of  $10^{-29}$  cm.

At this moment, the Universe is filled with quarks, leptons and carriers of interactions - vector bosons, including gluons and photons, and carriers of the forces of GUT, X and Y bosons. All particles are massless. At the moment of the GUT violation, the X - and Y - bosons acquire masses of  $\sim 10^{15}$  -  $10^{16}$  GeV/s<sup>2</sup>, due to the annihilation and decay of the X - and Y - bosons and their antiparticles, they disappear at  $t > 10^{-36}$  s.

The remaining particles remain massless up to  $t = 10^{-10}$  s, at  $T = 10^{15}$  K, particle energies of  $\sim 0.1$  TeV and characteristic scales of  $10^{-14}$  m, when

electroweak symmetry is broken and electromagnetic and weak interactions are separated. Quarks, leptons, and W, Z bosons acquire masses.

The period  $10^{-31}$ – $10^{-12}$  s is the epoch of quark-gluon plasma. By the end of the quark era ( $10^{-12}$ – $10^{-6}$  s), all known interactions (strong, weak, electromagnetic, and gravitational) are separated.

By the time of  $10^{-6}$  s, the Universe is cooling to  $T = 10^{13}$  K, and the merging of quarks into hadrons becomes possible. The density of the substance reached  $10^{16}$  kg/m<sup>3</sup>. The era of hadrons begins with  $t$  of the order of  $10^{-10}$  s and ends by  $10^{-4}$  s. The end of the hadron era occurs when the radiation energy becomes less than the rest mass of the lightest hadron - the  $\pi$ -meson. By the end of the hadron era, the temperature drops to  $10^{12}$  K, the average density of the substance is  $10^5$  -  $10^7$  kg/m<sup>3</sup>. The era of hadrons is  $10^{-6}$  - 1 s.

In the era of hadrons, most of the hadrons and antiadrons annihilate, forming pairs of leptons and antileptons, their mass prevails in the Universe. About 3 seconds after the Big Bang (BB), the temperature drops to a level at which leptons no longer form. Between 100 s and 3 min after BB is the era of leptons. The size of the observable Universe is less than  $10^{14}$  m.

10 s after BB, the temperature drops to  $10^{10}$  K, and the era of radiation begins.

The era of primary nucleosynthesis - from about 100 s after BB, when the Universe cooled sufficiently to form stable nucleons. Over the next 80 s, the primary composition of stellar matter was formed: about 25% helium-4, 1% deuterium, the rest - was hydrogen.

3 - 20 minutes - nucleosynthesis of helium, deuterium, traces of lithium-7. The substance begins to dominate radiation (70,000 years), which leads to a change in the expansion mode of the Universe.

At the end of the era (380,000 years), protons and electrons recombine into hydrogen atoms, and the Universe becomes transparent to photons of thermal radiation.

Dark Ages - between 380,000 years and 550 million years after BB, the Universe is filled with hydrogen, helium, relict radiation, atomic hydrogen radiation at a wavelength of 21 cm (transitions between the components of the hyperfine structure of the  $1^2S_{1/2}$  ground state). There are no stars.

Between 550 and 800 years - the first stars, galaxies, clusters and superclusters of galaxies are formed, the emission of stars ionizes hydrogen atoms (the era of reionization). The formation of our Galaxy - approximately 0.5 billion years after BB. The interstellar gas-dust cloud that gave rise to the solar system began to form about 8.9 billion years after BB (4.9 billion years ago).

According to other sources, baryogenesis occurs in the period from  $10^{-35}$  s to  $10^{-32}$  s, according to the Arefyeva, era of hadrons - from  $10^{-6}$  s to 100 s, according to Rubakov, primary nucleosynthesis began in 1 s and lasted up to 5 minutes. According to Bronnikov and Rubin, the nucleon formation time is just a point,  $3 \times 10^5$  s.

Or, for example: the temperature of the recombination era is 4500-3000 K, which is two orders of magnitude lower than the temperature corresponding to the ionization energy of the hydrogen atom,  $1,6 \cdot 10^5$  K.

Thus, each period in the history of the universe continues to be the subject of debate.

### **Spontaneous symmetry breaking**

Cosmological inflation is caused by the transition from a false vacuum to a true one with spontaneous symmetry breaking of the Great Unification (GUT). It is postulated that the known symmetries of elementary particles come from a certain symmetry group  $G$ . At each phase transition, part of this symmetry is lost, the symmetry group changes:  $G \rightarrow SU(3) \times SU(2) \times U(1)$

The connected group  $U(1)$  describes electromagnetism,  $SU(2)$  describes the weak interaction, in the framework of the Weinberg-Salam model, they are combined into the electroweak interaction described by group  $SU(2) \times U(1)$ . Strong interaction is described by the  $SU(3)$  group. Models combining strong interaction with electroweak - GUT theory. Gravity, despite the presence of the Lorentz symmetry group and other groups in GR does not fit this construction.

The idea of gauge gravity was put forward by W. Heisenberg and E. Gapon. For a gravitational field, there are two gauge symmetries. The first is defined by general covariant transformations of tensor quantities. The field of gauge general covariant symmetry can be easily identified with the connectedness of the gravitational field (Christoffel symbols). Indeed, the expressions for the covariant derivative and gauge transformations of connectivity resemble similar expressions for the Yang - Mills field. However, it is obvious that deviations from the Minkowski metric cannot be identified with the Goldstone components, an infinite continuous manifold cannot be isomorphic to a finite discrete one. There is no similar expression for the metric tensor. An attempt to reduce an arbitrary metric to a Higgs scheme, i.e. dualistically equating the form with the content, leads only to a transition to the tetrad formalism.

Usually, an example is given of a rupture of a filament in a thin place, boiling of superheated liquid when a center of vaporization or spontaneous magnetization is thrown into it after cooling the metal below the Curie

point, etc. In the first examples, the system is initially asymmetrical. In the third example, spontaneous magnetization, i.e. long-range interatomic order, arises as a quantum phenomenon, the exchange integral  $a \sum s_i \sum s_j$  (summation over the nearest neighbors), which at atomic distances is much larger than magneto-dipole interactions, in the case of parallel spins it minimizes the crystal energy, which, in turn, is due to the presence of a crystal lattice. Anisotropy energy arises, depending on the magnitude of the magnetic tension, the metal may not have metastable states, if it has, then not one, but two alternating with "true vacuums". With an increase in the volume of metal, i.e. the number of domains, the total magnetic moment is energetically favorable to be equal to zero. In all examples – the medium is continuous. Is it possible to use continuum models for the inflationary era? In the case of the Higgs potential, symmetry breaking occurs only in the case of a single particle; in a system of many particles, symmetry is preserved.

### Planck era

It is postulated that when the hot Universe was cooled during the pre-inflationary period, the Universe was filled with quanta of GUT fields (for example, in the Georgi-Glashow GUT model SU (5) fields with density  $\varepsilon_{vac} \approx 10^{74} \text{ erg/cm}^3$ ), i.e. was not empty. After the cooling of the Universe, the vacuum was no longer false; bubbles of true vacuum  $\sim 10^{-20}$  cm in size began to form in it, the radius of which increased with the speed of light. Since the vacuum bubbles are empty inside, their sizes increased according to the exponential de Sitter law  $R = R(0) \exp(\sqrt{\Lambda/3}t)$ . At the end of inflation, the size of the bubbles was  $10^{30} - 10^{38}$  m. The size of the visible Universe is  $10^{26}$  m, if the model is correct, our Universe is one of such bubbles, which was formed without the "seed" GUT fields left outside it. However, if the Universe cooled before inflation, it is unclear what form of energy thermal energy passed into. Secondly, if the bubble size is 4 to 12 orders of magnitude larger than the radius of the visible Universe, then its mass should also be 12 to 36 orders of magnitude larger. (Linde also indicates other sizes -  $l : 10^{10^{12}}$  [1]). At the same time, in the Planck era preceding inflation, the presence of an ordinary superdense mass is postulated. Planck radius  $r_{\text{планк}} = \sqrt{\hbar G / c^3} = 1,6 \cdot 10^{-35} \text{ m}$ , Planck temperature  $10^{32} \text{ K}$ , Planck density  $5,1 \cdot 10^{96} \text{ kg/m}^3$ ,  $m = r V = 4\pi r^3 / 3$ , Planck mass  $m_{pl} = 2,176 \cdot 10^{-8}$ . Schwarzschild radius  $r_g = 2Gm / c^2$ ,  $G = 6,67 \cdot 10^{-11}$ . It is argued that the initial state of the universe - is a singularity. At the same time, the initial dimensions of the universe are declared to be Planck. For the Planck

mass, the Schwarzschild radius is  $r_g^{pl} = 3,23 \cdot 10^{-35}$ . Consequently, the Planck Universe - is a black hole. It is not clear how the Big Bang could have come from a state of singularity with enormous gravitational force.

On the other hand, since black holes have no hair, they are structureless. Unstructured objects cannot be transformed, therefore, the Big Bang is impossible. Otherwise, we would observe many Big Bangs, including in our galaxy.

They say that a black hole did not arise because the gravitational energy and mass are equal to zero in total. But this statement contradicts the very process of the appearance of black holes during compression of a mass that is more critical under the influence of gravity. It is in view of this circumstance that Lee Smolin put forward the theory of the emergence of the Universe from the explosion of a singularity inside a black hole.

**Higgs mechanism**

The Higgs scalar field fills the entire Universe with a uniform and constant background. Against this background, elementary particles move, interacting with the background, they become massive.

Photons that do not interact with scalar fields remain massless.

We briefly introduce the minimal Higgs model. We write out the Lagrangian:

$L = T - U, U = -m^2 \mathbf{j}^+ \mathbf{j} + \lambda (\mathbf{j}^+ \mathbf{j})^2$ ,  $T$  - kinetic energy, the quadratic term in the potential describes self-interaction,  $L_{Higgs} = D_m \mathbf{j}^+ D_m \mathbf{j} / 2 + m^2 \mathbf{j}^+ \mathbf{j} / 2 - \lambda (\mathbf{j}^+ \mathbf{j})^2 / 4$ ;  $D_m = \partial_m - ig T_a A_m^a$  - invariant derivative, where  $T_a$  - calibration group generator,  $A_m^a$  - gauge fields creating mass through the Higgs mechanism. In the ground state of the field, condensation occurs, a vacuum average.

Consider  $D \rightarrow \partial$ . At  $m^2 > 0$  Lagrangian corresponds to a scalar field of mass  $m$ . The vacuum mean of such a field  $\langle \mathbf{j} \rangle = 0$ . At  $m^2 < 0$  potential has two minimums,  $\langle \mathbf{j} \rangle = \pm m / \sqrt{\lambda} = \pm u$ , extremum  $\mathbf{j} = 0$  does not match the minimum potential. We expand the field near the minimum in small perturbations and quantum fluctuations:  $\mathbf{j} = u + v$ . Then the Lagrangian of fluctuations will have the form:

$$L_{fluct} = (\partial_m v)^2 / 2 - \lambda u^2 v^2 - \lambda u \mathbf{m}^3 - \lambda v^4 / 4 + const .$$

Identifying the terms in the obtained Lagrangian and the Lagrangian for the linear Klein-Gordon-Fock (KGF) equation  $L_{KG} = \frac{1}{2} (\partial_m y)^2 - \frac{1}{2} m^2 y^2$ ,

we get: the mass of the Higgs particle  $m_v = \sqrt{2\lambda} u^2 = \sqrt{2} m$ .

The same is true when the first two terms of  $U = m^2 j^* j + |j^* j|^2$  remain in the potential for a weak  $SU(2)$ - doublet:  $j^* = (j_1 + i j_2) / \sqrt{2}$  with the same value for mass [2].

However, the solution itself for the Higgs field is not considered. For  $m^2 > 0$  the solution of the KGF equation has the form of a superposition of plane waves:  $j : e^{i(kr - \omega t)}$  and  $\langle E^2 \rangle = m^2 + \langle p^2 \rangle$ .

The equation of motion of the pendulum with the 2nd and 3rd order of nonlinearity gives anharmonic oscillations [3]. The equation obtained from the above Lagrangian with  $m^2 > 0$  has the form:

$$\partial_m \partial^m j + \omega_0^2 j + |j|^3 / 2 = 0.$$

The solution of the nonlinear KGF equation with the 3rd and 5th orders of nonlinearity has the form of a stationary soliton [4]. The solution to this equation also has the form of a soliton - with a parameter at the 5th power equal to zero and with nonlinearity reduced to the spatial part:  $j^3 \rightarrow |j|^2 j$ . If  $m^2 < 0$ , the amplitude of such a field becomes imaginary. That is, the field energy is negative, but not antimatter.

Redefining  $j \rightarrow N, x \rightarrow \mathbf{x}, t \rightarrow \mathbf{t}$  and changing the sign of the self-action constant, it is possible to eliminate coefficients in the equation; in a plane problem, when only one horizontal coordinate is involved, the equation goes into the following:

$$-\frac{\partial^2 N}{\partial \mathbf{t}^2} + \frac{\partial^2 N}{\partial \mathbf{x}^2} + N - N^3 = 0$$

In the stationary case, the equation has a solution

$$N_{cr.} = \sqrt{\frac{2k^2}{1+k^2}} \operatorname{sn} \frac{\mathbf{x} - \mathbf{x}_0}{\sqrt{1+k^2}}$$

where  $k$  – modulus of the Jacobi elliptic function,  $\mathbf{x}_0$  - integration constant, which can be set equal to zero. It can be shown that this stationary motion is unstable with respect to plane longitudinal fluctuations of  $N = N_{cr.} + \Phi(\xi) \cdot e^{i\alpha\xi} \cdot e^{-\beta\tau}$  and three-dimensional transverse long-wave fluctuations.

On the other hand, if the mass is large and the self-action constant is small, the imaginary mass leads to a tachyon solution, respectively, if physically meaningful solutions from  $\exp[\pm(i\omega t)]$  are chosen, then the field decays. Given the instability of the field, as well as the fact that the mass of the Higgs boson is about 125-126 GeV/c<sup>2</sup>, it becomes obvious that the implementation of the Higgs mechanism is problematic.

In addition to the Higgs field, mass forms an interaction with a quark-gluon condensate.

The composition of nucleons consists of three quarks of type  $u$  and  $d$ . The total mass of three quarks of type  $u$  and  $d$  is no more than 2% of the mass of the nucleon. On the other hand, according to experimental studies of the internal structure of nucleons, less than 50% of the mass of a nucleon falls on the energy of motion of quarks inside the nucleons. The gluon condensate is generated by a fluctuating gluon field, it induces the appearance of a quark condensate, and strongly interacting and strongly correlated quark fluctuations are extracted from the vacuum. As a result, a quark-gluon condensate forms as a combination of all these quark and gluon vacuum fluctuations. Both vacuum subsystems, the Higgs and quark-gluon condensates, make an approximately equal contribution to the nucleon mass. However, how the interaction with the Higgs field disappears in reactions of the  $e^- + e^+ \rightarrow 2g$  type (the photon does not interact with the field, therefore massless) remains unclear.

### Cosmological inflation

The models of infinite inflation and with finite time, with different types of inflatons, quadratic inflation, hybrid inflation, hybrid inflation with a slope [5], etc. are considered.

We will consider quadratic chaotic “eternal” inflation, but inside our Universe, i.e. time limited. The era of inflation lasted from  $10^{-42}$  to  $10^{-36}$  sec. (see, for example, [6]). At this time,  $10^{42} \text{cek}^{-1} > H > 10^{36} \text{cek}^{-1}$ . Inflation ends in connection with the separation of gravitational interaction from other fundamental interactions as a result of symmetry breaking, according to another version because repulsive gravitational matter is unstable. By this time, the radius of the universe is about  $10^{-2}$  m. In the chaotic (perpetual) inflation model proposed by Linde, Albrecht, and Steinhardt, the Universe is filled with a special scalar field with extremely high density and relativistic negative pressure. The potential of the scalar field. We write out the system of the Friedman equation for the scale factor and for the scalar field:

$$H = \dot{a} / a = \sqrt{2\pi G / 3m\phi}, \quad \ddot{\phi} + 3H\dot{\phi} + m^2\phi = 0$$

Linde explains his model as follows: with a large Hubble constant, friction is large, the scalar field decreases very slowly. Therefore, the Hubble constant, which is a function of the scalar field, almost did not change for a long time. The solution of the Einstein equation with a slowly varying Hubble constant describes an exponentially rapidly expanding universe:  $a : \exp(Ht)$ . Gradually, the field decreased, the Hubble constant also decreased, friction became small, and the field began to oscillate, giving rise to elementary particles. The volume of the Universe was constantly

growing, the potential energy of the scalar field was released in the form of elementary particles and their kinetic energy, forming a quark-gluon plasma, ordinary matter, particles colliding, exchanged energy and gradually came to a state of thermodynamic equilibrium, the Universe became hot. However, the solution of the equation for a scalar field is not considered. This decision depends not only on how large the Hubble constant is, but also what is the mass of the field (that fluctuations are possible only with restoring force, that is, we need the "rigidity" of the field, so we can forget about it). More precisely, their ratio plays a role. We write out the equation for oscillations with friction  $\ddot{j} + 2d\dot{j} + w_0^2 j = 0$ . With high friction  $d > w_0$  there are no oscillations:

$$j = e^{-dt} (Ae^{w_0 t} + Be^{-w_0 t})$$

Therefore, at a large Hubble constant, a scalar field cannot generate particles. The field amplitude rapidly decreases to zero, the field ceases to play a role.

Oscillation mode is possible only when friction, on the contrary, is small:  $w_0 > d$ , then

$$\varphi = \Phi e^{-\delta t} \cos(\omega t + \varphi_0), \quad \omega = \sqrt{\omega_0^2 - \delta^2}$$

But in this case, the field spectrum is limited to one frequency (one particle).

Realistic models of elementary particles involve many varieties of scalar fields. For example, in the combined theories of weak, strong, and electromagnetic interactions, there are at least two other scalar fields. In this case - two, three particles.

If the Hubble constant began to decrease, it had to pass a critical point, at  $w_0 = d$  - critical attenuation:  $j = e^{-dt} (A + Bt)$ . At this point, the field also attenuates and cannot go into vibrational mode.

It is important that in the first case the square of the natural frequency can be negative, as in the Higgs Lagrangian, then the regime will also be oscillatory.

If the friction is negative, then the solution is determined by a characteristic equation similar to the Phidias equation, it coincides with the case of large friction, with increasing and decaying parts.

We note one more important point: a substance with the equation of state  $p = -r$  is unstable with respect to small perturbations. The square of the speed of sound in it is negative, so the small perturbations described by the exponent with an imaginary decrement either grow exponentially or decay exponentially. Growing disturbances destroy the substance with negative pressure and stop inflation. On the other hand, if the Planck Universe arose before the period of particle generation by the scalar field and

before the Higgs mechanism began to operate, it could not have superdense ordinary matter, because there hasn't been one yet. In general, the Higgs model for energies below 1 TeV is not suitable for singularity. Finally, if the exponential expansion of the early Universe is due to the emergence of vacuum bubbles (de Sitter model), an additional scalar field is not required to explain the exponential nature of the expansion.

**Higgs Inflaton**

The Higgs field has become an integral part of the Standard Model in the Weinberg-Glashow-Salam theory, combining electromagnetic and weak interactions, explaining the masses of weak interaction carriers, W and Z bosons, spontaneous symmetry breaking.

If the mechanism of the appearance of masses due to the Higgs field takes place, it can also be assumed that, just as the masses bend the Minkowski space, the vacuum of the Higgs field may form an empty Minkowski space as a kind of ground state [7]. Then in the Einstein equation  $R_{mm} - Rg_{mm} / 2 - \Lambda g_{mm} = 8\pi GT_{mm}$  it is necessary to set equal to zero not the energy-momentum tensor, as in the de Sitter model, but to consider the zero curvature, but in the presence of a vacuum:

$$\Lambda g_{mm} = -8\pi GT_{mm} ,$$

Hence the components of the energy-momentum tensor  $p_{vac} = -r_{vac} = -\Lambda / 8\pi G$ , the components of the metric tensor are proportional to the components of the Minkowski empty space metric. In this case, the question of the expansion of the universe from a black hole is resolved. After the appearance of particles, the curvature appears, which these particles form (it is not given in advance, independently, from the outside), with an increase in the number of particles, the curvature increases, and the de Sitter scenario is realized. Thus, the question posed by E. Schutzler is solved about the material source of empty space-time.

If the Linde inflaton field is identified with the Higgs field, that is, friction with the Hubble constant is also included in the non-linear KGF equation with the negative mass squared, then we accept that the Minkowski metric is formed not by the Higgs field, but by the scalar Linde field, which not only generates particles, but also gives them mass, a scalar field generating particles is not required, and the contradiction with the decay of the scalar field at large  $H$  is also removed:

$$\partial_m \partial^m \phi + 3H\dot{\phi} - w_0^2 \phi + \lambda \phi^3 / 2 = 0$$

Rapid expansion increases the volume, the density of the substance decreases, which is why during inflation the spatial curvature is greatly reduced, there is a transition to the Friedmann stage of expansion, when the scale factor changes according to a power law.

If the uncertainty principle is written in four-dimensional form  $|\Delta s| |\Delta p| \geq \hbar / 2$ , where  $s$  – interval,  $p$  – 4 - interval [8], and the birth of the Universe in the spirit of Lee Smolin and Edward Tryon is presented as a quantum fluctuation in the form of a pair of maximon-antimaximon particles, each of which generates a metric and decays like resonances in  $10^{-43}$  s, then the reciprocal of Planck time loses the meaning of the angular frequency. Due to CP symmetry, particles and antiparticles have oppositely directed impulses, annihilation does not occur, two Universes arise, with matter and antimatter, the problem of the absence of antimatter is solved.

### **Black holes**

Existing mathematical models of black holes are controversial. For example: since black holes do not have hair, they are structureless. Unstructured substances cannot possess qualities, then, according to existing models, a black hole cannot possess a gravitational field.

The nature of black holes is such that the application of a thermodynamic approach to them is unlawful. Although the canonical ensemble is used to describe the thermodynamics of black holes, the black hole is not a canonical ensemble. But what happens to the laws of thermodynamics in the process of black hole formation?

With the formation of empty space around stars and galaxies, the possibility of radiation outside arises, entropy begins to grow again. The impact of black holes stops this process, entropy begins to decrease. It would seem that in the black holes themselves, the entropy, which is correlated with surface gravity, increases due to radiation and due to the increase in the surface of black holes during the capture of matter. In this case, radiation leads to a decrease in temperature, and capture of matter leads to an increase, since the entropy of a black hole is given by the Hawking-Beckenstein expression:  $S = \mathbf{p} r_h^2 / G = A / 4G$ , where  $A$  —surface area of the horizon of the black hole. On the other hand, the temperature of a black hole is inversely proportional to its radius:  $T : 1/r : 1/GM : 10^{-4} M_c / M$ . That is, its temperature is extremely low. In string theory for charged black holes, if  $M = Q$ , the temperature vanishes; in the general case of black holes, string theory cannot calculate their entropy. Consequently, the reverse process of substance compression leads to the opposite result: instead of heating - cooling.

### **Non-conservation of energy**

Thermodynamics suggests the possibility of raising the question in relation to inflation models.

The objections of the chaotic inflation model are precisely in the “thermodynamic” spirit of Penrose, but they are extremely simplified.

1. Since there is no heat transfer for the Universe, the entropy of the Universe, if it can be considered, does not change:  $dS = dQ / T, S = const$ . In contrast to the expansion of gas into the void, in the case of the expansion of the Universe, there is no void, the Universe still has to generate empty space around itself at each moment of expansion. Which shows that the idea of the impossibility of a perpetual motion machine of the 2nd kind is limited by local systems.

The introduction of only the classical gravitational field violates the 2nd law of thermodynamics (in the well-known problem of heating two balls, on a thread and on a stand, see [9]) already locally.

2. Temperature is an intense quantity, so this parameter cannot be applied to the universe. If only because it is impossible to operate the thermostat. There is no concept of equilibrium - therefore, there is no concept of temperature.

In contrast to a gas of atoms or molecules, the partial temperatures of the components of outer space exist on their own. The temperature of the gas mixture is calculated by the formulas:

$$T = \sum_i \frac{p_i V_i}{C_{pi} / C_{vi} - 1} \left( \sum_j \frac{T_j p_j V_j}{C_{pj} / C_{vj} - 1} \right)^{-1}$$

or  $T = \sum_{i \neq j} r_i T_j \left( \sum_k r_k \right)^{-1}$  For clarity, we obtain the expression for the

equilibrium temperature of a system of monatomic gases when the sum of internal energies does not change:

$$T = \left( \sum m_k^{-1} \right)^{-1} \sum T_i m_i^{-1} \text{ or } T = \overline{m_i / T_i} \cdot \overline{m_k}$$

where  $\overline{x}$  - harmonic mean  $x$ . The temperature of interstellar space - 4 K, while the temperature of the CMB - 2.7 K, i.e. over billions of years, equilibrium has not been established.

3. There is no heat transfer, there is no external piston, the process of expansion of the Universe is adiabatic.  $pV^k = const, T^k p^{1-k} = const, k = C_p / C_v$ . But there is no pressure in the Universe, instead of it - anti-gravity according to Gliner - Linda, the Hubble expansion. Since the Hubble constant is approximately constant in the era of lambda dominance, the temperature cannot change either. Otherwise, in both eras it is impossible to introduce such an intense parameter as temperature. Moreover, in the era of lambda dominance, since, due to the small number of collisions, thermodynamic averaging does not occur, it is also impossible to introduce a thermostat, therefore, it is also impossible to introduce temperature [10].

4. If we consider the Universe as a thermodynamic system, then in the 1st law of thermodynamics we find that one of the terms is identically equal to zero, since the Universe does not make heat transfer, there is nothing

to exchange with. In theory, the term corresponding to the work done on the system is equal to zero, because there is nothing to do this work, there can be no external "piston". For example, the pressure in the Universe is almost zero, since neither the astronaut in open space, nor the spacecraft, nor the star, nor the galaxy, nor the accumulation of galaxies, experience almost no pressure from the side of outer space, it is obvious that the pressure of such a vanishingly small magnitude cannot appear in 1th law of thermodynamics.

In lectures, Linde illustrates the mechanism of lowering the temperature and internal energy of the Universe by law  $dU = -pdV$ , where  $V$  – volume of the Universe,  $p$  – pressure, it, Linde believes, is constant, with increasing volume  $U$  and  $T$  decrease. As we saw above, this is not true. Even if we assume that pressure plays a role in the thermodynamics of the Universe, then the statement about its constancy is an error, the expansion of the Universe is an adiabatic process,  $pV^g = k$ , where  $k$  – constant,  $g = C_p / C_v$ , with an increase in volume, the pressure decreases. The equation has the form:  $dU = -kV^{-g}dV$ . Hence the decrease in internal energy during expansion:  $U = -kV^{1-g} / (1-g) + c_1$ . Since gravitational forces are many orders of magnitude weaker than the Van der Waals forces, the Universe can be represented as an ideal gas. However, the fact is that if we imagine the contents of the Universe as an ideal gas, then its internal energy during expansion does not depend on the volume, as shown by Joule back in 1845. In real gas  $(V - b)(p + a / V^2) = nRT$ . The Van der Waals constants  $a$  and  $b$  take into account attraction between molecules at large distances (constant  $a$ ) and strong repulsion at small distances (constant  $b$ ). This repulsion makes the interior of the molecule inaccessible to other molecules and reduces the total free volume. Since penetration into the internal spaces is not threatened in the universe, the constant  $b$  can be safely set equal to zero:  $V(p + a / V^2) = nRT$ . Moreover, the constant  $a$  ceases to be constant:  $a : 1 / r^2, a \rightarrow a', n \rightarrow n'$ , we get:

$$[r^{3(1-g)} + a' / r^8] = n'RT$$

where  $r$  – radius of the universe,  $n$  - number of moles,  $a'$  - new constant. Since gas, when expanded, does work against external pressure forces, the specific heat of the gas at constant pressure is greater than the specific heat at a constant volume,  $c_p > c_v$ , their ratio is close to unity. That is, at small and large  $r$ , that is, at different stages of expansion, the dynamics of the system is different, is there anti-gravity vacuum or not, see [11]. For large  $r$ , the second term in the left-hand side can be neglected; we see that as the volume grows,  $T$  falls approximately like the cubic root of the volume.

5. In a real gas, when expanding into a void, the average distance between the molecules increases, the attractive forces do negative work, and the potential energy increases. Since the total internal energy remains constant, the kinetic energy of the molecules, and hence the gas temperature, decreases. In the Universe, the role of Van der Waals forces is played by gravitational forces, and only on the “surface”, because the “inside” of the Universe, the sum of gravitational forces at a point is equal to zero in the approximation of Newtonian mechanics and is not equal to zero only in GR. However, it is difficult to talk about a decrease in the kinetic energy of the elements that make up the Universe. Firstly, galaxies, which in the selected reference frame not only do not reduce their velocities, but increase with distance from the reference point. The role of pressure in the semiclassical approximation can be ascribed to the pushing galaxy as the “force” of Hubble (antigravity).

The pressure in the Van der Waals equation can be represented as the internal pressure determined by the Hubble law. Representing the

Universe in the form of a ball, in the classical case, the work performed during the expansion of the Universe:  $dA = r \int_s (\frac{\partial V}{\partial r} + H\dot{r}) dr ds$ , where  $V = \frac{gM}{r} [1 + \sum_{i=1}^{\infty} \sum_{j=0}^i P_{ij} \sin j (C_{ij} \cos j\alpha + S_{ij} \sin j\alpha)]$ . If we imagine that the entire mass of the ball is concentrated in the center, then

$$dA = \int_s r (\frac{gM}{r^2} + H\dot{r}) dr ds$$

Let's take the average distance between galaxies of 2 Mpc (according to other sources - 0.7 Mpc). We take the average mass  $m$  of the galaxy for 300 billion solar masses:  $m = 2 \cdot 3 \cdot 10^{11} \cdot 10^{30} = 6 \cdot 10^{41} \text{ kg}$ . One square  $2 \cdot 2 \text{ Mnk}$  contains one galaxy. The radius of the Universe  $R = 7,4 \times 10^{26} \text{ m}$ . The area of one square  $s = 0,36 \cdot 10^{34} \text{ m}^2$ .  $1 \text{ nk} = 3 \cdot 10^{16} \text{ m}$ . So, the total surface density  $\rho = 1,6 \cdot 10^6 \text{ kg} / \text{m}^2$ . Sphere area  $S = 4\pi R^2 = 0,68 \cdot 10^{54} \text{ m}^2$ . Then, if we consider the galaxies as points

$$dA \approx 10^{60} \text{ kg} (\gamma M / r^2 + H\dot{r}) dr, \quad A \approx 10^{60} (-\gamma M / r + H^2 r^2 / 2)$$

If we assume that all dark energy has arisen due to the expansion of the Universe, then its mass when estimating the 2nd term on the right side of the equation with  $r$  corresponding to the dimensions of the observed Universe is about  $10^{60} \text{ kg}$ . The first term on the right-hand side of the equation has a value that is several orders of magnitude smaller; the integration constants do not change the picture.

If we assume that the average density of the universe –  $10^{-29} \text{ g/cm}^3 = 10^{-26} \text{ kg/m}^3$ , then, given that the radius of the universe is  $1,3 \times 10^{26} \text{ m}$ , and volume is –  $4 \times 10^{79} \text{ m}^3$ ,  $m = 4 \times 10^{53} \text{ kg}$ . Meanwhile, the mass of only interstellar gas is estimated at  $10^{58} \text{ kg}$ . Planets and stars make up 0.5% of the entire mass of the Universe, 3-4% - interstellar gas, 20-25% - dark matter, 70-75% - dark energy. 9/10 galaxies are hidden from us. Even if you add three orders, the 60th order will not be achieved.

Let us imagine stars or galaxies with gas atoms and take into account the contribution of their chaotic kinetic (including rotational), "thermal" energy. The rotation speed of the outer parts of galaxies is 50 - 300 km/s. A group of galaxies, including the Milky Way, the Andromeda galaxy and the Triangle galaxy, moves at a speed of  $627 \pm 22 \text{ km/s}$  relative to the relict radiation. There are 125 billion galaxies in total, stars of the order of  $3 \cdot 10^{22}$  stars in the visible part, star masses are in the range from 0.08 to 100 solar masses, the most massive of them is R136a1, 265 solar masses, the mass of the Sun is  $M = 2 \times 10^{30} \text{ kg}$ , the masses of galaxies vary from  $\sim 10^7 M_{\odot}$  to  $\sim 10^{13}$  solar masses, according to other sources -  $10^5 - 10^{12}$ . Even if we take into account the maximum masses, velocities and numbers of stars and galaxies, their "thermal" energy divided by the square of the speed of light is several orders of magnitude less than  $10^{60} \text{ kg}$ .

According to Gliner, the expansion of matter owes its origin to the anti-gravity of a cosmological vacuum, and the substance itself appeared as a result of quantum fluctuations of the same vacuum [12].

Rubakov believes that an increase in dark energy with the expansion of the Universe does not violate the law of conservation of energy, since the negative energy of gravity increases [13].

However, in this case, all dark energy should be generated exclusively due to ordinary matter. Secondly, the nodes of the superclusters of galaxies are condensed, the Universe, expanding, is compressed in the nodes of the superclusters [14]. Such a process resembles fluctuations that can be correlated with cosmological Boltzmann fluctuations. In general, the reverse process of the formation of galaxies, stars, clusters of galaxies, black holes according to this statement should lead to the disappearance of dark energy. It is known that in the modern Universe there is 5% less dark matter than it was in the era of recombination, which is explained by its decay.

In any case, the processes of formation of stars, galaxies, clusters of galaxies and densifications of their nodes occur with a decrease in entropy, and its gravitational energy decreases. A further decrease in entropy during the formation of asymmetric organic macromolecules and the occurrence of metabolism occurs due to weak [15] and electromagnetic forces with an increase in the entropy of stars and planets.

From the above estimates, we see that the increase in the mass of the Universe is not compensated by the energy of gravity. This means that if the mechanism of energy (mass) due to the work of antigravity, i.e. expansion, exists, then there are many "unaccounted for" elementary particles in the Universe, the number of which grows as a result of expansion.

On the other hand, if, according to Linde, the fluctuations of the scalar field generated particles in the era of inflation, nothing prevents the scalar field from generating ordinary matter in the modern era.

Gorbunov and Rubakov believe that all dark matter was formed in the era of inflation [16].

It is fair to assume that the mass of each type of particle is acquired at substantially different values of the Hubble constant, with a sharp decrease at the end of inflation, the spectrum of particles arising from vacuum in the Hubble "field" should also change. In the modern era - for example, long-wave electromagnetic radiation.

### **Thermal death of the universe**

White dwarfs will cool down to 1 K in  $10^{17}$  years. In  $10^{19}$  years, neutron stars will cool down to 30 K. In  $10^{32}$  years, the substance will decay into photons and neutrinos. The most massive black holes in the centers of galaxies will evaporate over  $10^{96}$  years. But this is an incomplete picture. 1) The process of stars cooling will be inhibited by compression of supercluster nodes. 2) According to Hubble's law, galaxies scatter with acceleration. It decreased by tens of orders of magnitude during the era of inflation, but since the era of 5-6 billion years, the Hubble constant has been slowly increasing. Upon acceleration, the Fulling - Unruh effect occurs, the production of pairs of particles from a vacuum. The temperature of the observed Unruh radiation is expressed by the same formula as the temperature of Hawking radiation, but does not depend on surface gravity, but on the acceleration of the reference frame  $a$ :  $T = \hbar a / 2\pi k c \approx 4 \cdot 10^{-21} \cdot a$ . The Milky Way also moves away with acceleration from other galaxies. When the acceleration reaches a certain value, the galaxy will be surrounded by radiation. In order to heat the system by 1 K, it is necessary that it has an acceleration of the order of  $10^{20}$  m/s<sup>2</sup>, so even this degree would have to wait many orders of time more than the age of the Universe. Based on Hubble's law, acceleration  $a = H^2 r$ ,  $r = r_0 \exp(Ht)$ , given that the modern radius of the universe is  $r : 10^{27}$ , and assuming for estimation that the Hubble constant increased uniformly over 7 billion years from zero to the present value  $10^{-18}$ , can be calculated when the acceleration reaches the designated level:  $t^2 \exp(10^{-36} t) : 10^{64} c^2$ , whence  $t : 3 \cdot 10^{24}$  years. That is, after the cooling of white dwarfs and neutron stars, but long before the decay of the matter, the galaxies will begin to gradually heat up [17].

### Conclusion

From the Linde-Starobinsky model, in which the Universe eternally reproduces itself, with many mini-universes, which are bloated quantum fluctuations in Friedman's hot universes, it follows that if the Universe contains at least one inflationary domain of sufficient size, it will begin to continuously produce new inflation domains. Inflation at each point can end quickly, but many other fragments will continue to expand. The total volume of all these domains will grow unlimitedly. One inflationary universe gives rise to other inflationary bubbles that give birth to others. This perpetual inflation proceeds as a chain reaction, producing a fractal-like picture of the Universe. Each part of the universe can come from a singularity in the past and can end with a singularity in the future. The unified M.-string theory gives an endless series of births and collapse of universes that are not distinguishable in essence. Similarly - the Steinhart rebound theory. These theories correspond to only one side of the motion of matter - the cycle, but not transformism (irreversible qualitative changes) and not the ascent from simple to complex, from lower to higher. All available cosmological models are built from local ideas about the minimum of potential energy, about the law of growth of entropy and about the law of conservation of energy, although the 2nd law of thermodynamics violates the classical gravitational field, it is not applicable in cosmology, and the law of conservation of energy in GR is absent.

In a cosmological context, it is impossible to introduce the concept of total energy, which includes the energy of the gravitational field itself, therefore, the law of conservation of energy, which prohibits the growth or decrease of energy of any form of matter, is absent [13]. Obviously, if only for reasons of local laws, that such a form of movement as climbing from the lowest to the highest (emergence) is possible only if the law of energy conservation is violated globally.

The model of the Higgs inflation and Higgs vacuum as a material source of the empty space of time allows solving a number of problems of cosmology and, possibly, will make it possible to complete cosmology so that, in addition to phase transitions, it correlates with the elements of the Hegelian triad.

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## INCREASING NUTRITIONAL MOTIVATION OF NEWBORN PIGLETS

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**Abstract.** In the first days after birth, the pigs are not able to reliably fix the sow's nipple due to slipping, as a result of which they receive less milk, which negatively affects the immune system and their development. To ensure reliable grip of the nipple, we developed a method based on the creation of stops for the hooves of the hind legs of the pig. For this, a removable elastic surface with elastic protrusions 1-1.5 cm high is laid in the area for piglets.

**Keywords:** piglets, sucking, stops for the rear hooves, safety, milk flow, elastic surface, rugs.

The physiology of the milk transfer process in sows is significantly different from other farm animals. Unlike the udder of cows, sheep and horses, pigs do not have dairy tanks. Isolation of milk occurs in accordance with the milk flow reflex, which appears spontaneously under the influence of neurohumoral factors and under the influence of stimulation ("massage") of the udder of the piglets at the time of sucking. If after childbirth the reflex is carried out only by touching one of the nipples, then late excretion of milk occurs only after the latent period of the reflex, and in the nipples that are not irritated by the piglet, it does not occur. For the first sucking, the pig receives 25-50 g of milk. The total amount of milk secreted by the sow during the period of one sucking ranges from 150 to 600 g per day. After farrowing, the sow feeds piglets up to 25 times a day, and subsequently - 12-14 times. On average, sows secrete 400-500 kg of milk for lactation (60 days). The average daily milk yield is 7-8 kg and can reach 11-12 kg.

Under normal production conditions, the milk yield of sows is conditionally equated to the mass of piglets that they feed at the age of 21 days. Piglet sucking is a forced-reflex stimulator for milk production. When suck-

ing, the first impulse is transmitted to the posterior pituitary gland, which secretes oxytocin; it enters the mammary glands and causes a contraction of the myoepithelial cells of the alveoli and the terminal parts of the glands, after which milk is released, which is absorbed by the piglets.

**Table 1. Change in the composition of colostrum and milk after farrowing**

Indicator	Time after farrowing, hour.							Lactation week 2-8
	0	3	6	9	12	15-24	27-48	
Total dry residue, %	30,2	28,7	26,6	23,6	20,8	19,6	21,2	21,2
Fats, %	7,2	7,3	7,8	7,8	7,2	7,7	9,5	9,3
Protein, %	18,9	17,5	15,2	11,7	10,2	7,2	6,9	6,2
Lactose, %	2,5	2,7	2,9	3,0	3,4	3,7	4,0	4,8
Ash, %	0,63	0,62	0,62	0,63	0,63	0,66	0,72	0,95
Calcium, %	0,05	0,04	0,05	0,05	0,06	0,07	0,11	0,25
Phosphorus	0,11	0,11	0,11	0,11	0,11	0,12	0,13	0,15

Each sucking has two phases. In the first, lasting 18–20 seconds, the piglet grips the nipple with its mouth, massages the gland, then freezes for 2-3 seconds. In the second phase, milk is sucked from the nipple canal. Lactation reflex in sows is accompanied by involuntary grunting characteristic of sows only. At the beginning of lactation, colostrum is secreted, which gradually changes the chemical composition to ordinary sows milk over 4-5 days (table 1). Colostrum contains up to 19% protein (up to 33% falls on gamma globulins), 2.5-4.8% lactose, 0.05-0.25% calcium, 0.11-0.15% phosphorus. 1 kg of colostrum contains 6.9 MJ of exchange energy. With the first servings of colostrum, due to the presence of antibodies in it, the piglet acquires passive immunity against intestinal and colds diseases. Therefore, the piglet should consume 250–280 ml of colostrum during the first day of life, which gives it vitality and weight gain.

The lactation period of a sow is determined by the period of weaning of the piglets, and the amount of milk allocated for lactation depends on the individual characteristics, breed and origin, the age of the animal, the number of piglets under the uterus and their viability. A healthy and strong offspring sucks all milk from the mammary gland, stimulates its secretion, weak - sucks out milk not completely, which reduces its subsequent excretion and in some cases can lead to mastitis. In the first minutes of colostrum secretion, piglets sucking the front nipples receive the greatest amount of it. In the initial period of lactation, the number of suckings by the mother's piglet reaches 25-30 times a day, on the 7-8th day this number decreases

to 18 times. On the second or third day, piglets are firmly fixed to the nipples. Frequent sucking is associated with a small volume of the stomach of the newborn. Subsequently, the capacity of the stomach increases, and the frequency of sucking is reduced, which allows the offspring to consume pre-starter food from 3-5 days.

**Table 2. The average weight of piglets at weaning, depending on the amount of milk in the sow**

Milk yield, l/day	Number of piglets			
	10	12	14	16
8	6,96	6,05	5,4	4,91
10	8,33	7,19	6,38	5,71
12	9,7	8,33	7,35	6,62
14	11,06	9,44	8,33	7,48

At the present stage, multiple fertility is a stable, high-level selective biological sign of sows. However, the number of newborn piglets is inversely proportional to their weight. With increasing litter size per animal, the average weight of each piglet decreases by 25-45 g. In this regard, sows, due to their high multiplicity, give birth to piglets with different degrees of maturity, which leads to their different growth rates, including due to lower consumption of colostrum.

Sows on the first day after farrowing feed piglets almost every hour, so the act of feeding requires the piglets to show great strength and activity. More mature and larger animals quickly occupy the most milky and most comfortable for sucking front nipples, repel weak ones and, as a rule, have time to suck out several neighboring nipples, as a result of which immature piglets systematically lose their feeding act and are in a state of hunger.

However, even larger pigs in the early days still do not know how to securely fix the nipple due to slipping from the nipples due to the lack of a stand for the hind limbs. At the same time, they receive less milk, which negatively affects their development. In addition, we must not forget that the allocation of milk from the sow's nipple occurs briefly and only with active massage of the nipples.

**Thus, it is necessary to ensure reliable grip of the nipple, eliminating the sliding of the suckers. In the method developed by us, this is ensured by the creation of stops for the hooves of the hind legs of the piglet by using edastic surfaces (rugs) with protrusions.**

The lack of comfortable conditions for the piglets to fully receive mother's milk entails insufficient safety of the offspring, diseases of the mammary glands of sows and hypoglycemia in piglets. It should be noted that the underdeveloped stomach of newborn animals necessitates frequent consumption of food in order to satisfy the need for nutrients. After farrowing, the lactation curve very much depends on whether the piglets are active enough to stimulate the udder and how, whether the lactation will progressively develop, or whether it will immediately decline. Therefore, for successful milk delivery, it is necessary that the piglet, holding the nipple with his mouth, hold it and perform intensive massaging circular movements with the help of a snout. After the massaging actions of the pig, the sphincter of the nipple relaxes, and the milk becomes available for suction, after which milk is injected into the mouth of the pig. If the piglets are not actively massaging the nipple, part of the milk remains in it, which can lead to inflammation of the udder. Incomplete exhaustion in sows causes an uncomfortable state, and in some cases, mastopathy. At the next farrowing, the mammary glands cease to form milk at all or become low-milk. Only proper sucking allows you to better develop the capacitive system of the sow's mammary gland. The efforts of the piglets during sucking should be adequate to the amount of milk produced by one or another gland. However, in the early days, newborn piglets are still weak, often slip and cannot hold the nipple. Often this is due to the struggle between the piglets over the place at the nipple, as a result of which they get less milk, which leads to hypoglycemia in the piglets and a decrease in milk production in the sow.

We have developed a method for growing suckling piglets in the machine, including the allocation of zones for sows and piglets, determining the functioning nipples of the sow and forming nests according to the invention, immediately after the nest is formed on the floor of the machine, a removable surface with elastic protrusions is laid in the zone for piglets with a height of 1-1.5 cm, to create a stand on the hooves of the hind legs, then piglets are placed on a removable surface and kept on it for the first three weeks of their life. The novelty of the claimed technical solution is due to the fact that thanks to the creation of comfortable conditions for the full receipt of mother's milk by piglets, high safety, prevention of diseases of the mammary glands of sows and hypoglycemia in piglets are ensured.

The method of growing suckling piglets in the machine is applicable at agricultural enterprises, pig breeding houses, as well as pig farms, which meets the criterion of "industrial applicability".

A new method of growing suckling pigs is carried out as follows. In a machine with dedicated zones for sows and piglets, the functioning nipples of the sow are determined and formed according to the number of piglets, then on the floor of the machine, in the area for piglets, a removable surface (mat) with elastic staggered protrusions is laid to create a stand on the hooves of the hind legs, then piglets are placed on a removable surface and kept there for the first three weeks of their life. In this case, the height of the protrusions should be sufficient for a stand of 1-1.5 cm. If the height of the protrusions is less than 1 cm, then a reliable stand will not be provided for the hooves of the hind legs of piglets, if more than 1.5 cm, then the piglets will stumble, touching neighboring piglets, which can lead to stress. The protrusions can be made rectangular, square or oval. The content of suckling piglets under such conditions is necessary in the first 3 weeks of their life, when they do not yet have permanent places on the udder and are not able to reliably hold the sow's nipple. As the piglets grow, their gripping-sucking reflex increases and by the end of the third week of life they reliably hold the sow's nipple.

To confirm the effectiveness of the method, we conducted scientific research. For this, sows with farrowing sows with a nest formed by the number of functioning nipples were placed in two neighboring machines. In the control embodiment, the piglets were placed in a standard sowing machine. In the experiment, immediately after the formation of the nest on the floor of the machine, in the area for piglets, a removable surface was laid with elastic, staggered protrusions to create a stand on the hooves of the hind legs, then piglets were placed on the removable surface and kept on it for the first three weeks of their life. When choosing the height of the protrusions, it turned out to be optimal - 1.1 cm. In both versions, the number of functioning (lactating) nipples corresponded to the number of piglets in the litter. The staggered arrangement of the protrusions provided a reliable stand for the hooves of the hind legs to small piglets.

Providing access to nipples allows suckling piglets to receive a sufficient amount of milk, which positively affects the growth and development of piglets, their viability and safety. Visual observations confirm our hypothesis that the creation of a stand for the hooves of piglets in the first three weeks creates a comfortable environment for sucking piglets and ensures the normal functioning of the mammary glands of the sow. In addition, this content allows you to quickly establish a ranking hierarchy in the nest. At the same time, prevention of diseases of the mammary glands in the sow is carried out.

The method is protected by a RF patent for an invention, which indicates the presence of elements of global novelty and industrial applicability.

## RECYCLING OF ANIMAL WASTE

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**Annotation.** The strategy of solving environmental issues and organizing waste-free production of agro-industrial complex through the introduction of energy-saving biotechnologies that can process secondary raw materials is discussed. The non-use of organic matter in animal husbandry and processing industries is irretrievably lost for the planet and for man. Such research is of great scientific and practical significance. Biological systems efficiently process waste, and their bioconversion products are promising in agriculture, feed production and green construction.

**Keywords:** recycling, bioconversion, biological systems, bioremediation, ecology, processing, sewage sludge, hygiene, infection.

One of the most acute problems of our time in many countries of the world is the processing and disposal of animal waste. The use of micro-and macro-organisms in this case seems to be the most promising. Biotechnologies in solving environmental problems are environmentally sound. The use of fast-growing micro-organisms that actively assimilate biogenic substances contributes to the effective cleaning of wastewater from contamination of both organic and mineral composition.

The rate of waste accumulation, unfortunately, is many times higher than the rate of their utilization in the natural conditions of our country. Scientists solve two problems simultaneously: the development of methods for processing agricultural waste (secondary products) and the subsequent use of their processing products in the form of compost, "biohumus", biogas and other products necessary for humans [1-3].

The strategy for addressing environmental issues is related to the organization of waste-free production of agro-industrial complex through the introduction of energy-saving technologies that allow the rational use of biotechnologies and the processing of secondary raw materials. Unfortu-

nately, the variety of biological methods for processing manure, manure, animal waste, processing plants and other resources of organic origin of the agro-industrial complex is reduced, at best, to the creation of organic fertilizers, and at worst – to their primitive utilization. In our opinion, the agro-industrial complex needs an industry for waste processing with high technologies (biotechnologies, microbial technologies, etc.) [4].

Technologies for recycling human and animal waste have been used for more than 5000 years and practically the same technologies are still used today (composting, aerobic-anaerobic transformation of organic compounds, etc.) [5,6]. The history of guano exploitation in Peru is similar to the history of human use of many other earth's riches. Once the Incas used it wisely, and the guano trade kept the state budget at a decent height, accounting for half of the state's revenue. Guano had a fixed price, production was planned, and Peruvian guano reserves were estimated at more than 23 million tons. Therefore, manure and manure can be a good business [7,8].

At the end of the 80-ies of the XX century, the scientific basis of the technology was developed, which provides for complex processing of animal waste and provides for cleaning them from pollution by almost 100% [9-11]. The technology allowed cleaning the effluents of industrial pig-feeding complexes from organic, nitrogen - and phosphorus-containing pollutants to sanitary standards for discharge of effluents into the reservoir. The possibility of using biologically purified runoff for technical purposes of the pig complex and for irrigation of agricultural land was established, excess active silt – as a fertilizer or for activation by yeast in order to obtain protein products. Thus, biotechnology was created, which made it possible to provide low-waste and practically waste-free processes for recycling waste from industrial pig-feeding complexes. At the same time, cleaning the effluents of complexes with a population of about 110 thousand pigs allowed to get 32 thousand units. tons of protein products for feed and (or) technical purposes [6,7].

Industrial animal husbandry creates the problem of processing large amounts of waste – liquid manure and sewage, which are sources of pathogenic microorganisms, chemical pollution, causing disruption of ecosystems. The estimated amount of manure runoff generated from one cow's head on milking grounds is 20 l/day, the content of excrement is 2-3% of their average daily output. The amount of droppings released by a bird per day depends on the type and age (200-400g). Manure obtained from cattle contains a large amount of nutrients- $N_2$ -3.2%;  $P_2O_5$ -1.8%;  $K_2O$ -5%. A laying hen produces about 0.8 kg of nitrogen and 0.2 kg of phosphorus per year. The amount of litter from one chicken per day is about 5% of the weight of the bird [9,10].

There are great opportunities to use "free" organogenic plant nutrition elements to obtain high-quality crop production and increase soil fertility. Mineral fertilizers entering the agroecosystem in large quantities cause direct economic damage - the productivity of the soil and the quality of the crop yield are reduced.

As a rule, bird droppings accumulate near poultry farms, which is a constant threat to the environment. The volume of bird droppings and their chemical composition depend on the type of bird and its maintenance technology. One bird per day accounts for 0.19-0.23 liters of waste containing more than 1% nitrogen, phosphorus and potassium. Now integrated aerobic-anaerobic processing of the liquid fraction of wastewater with pre-filtration and separation of the liquid and solid fractions has been developed. The fermented runoff is subjected to a two-stage treatment system (nitrification-denitrification – dephosphotation). The use of this scheme allows for almost 100% removal of both nitrogen and phosphorus from drains.

In addition to organic fertilizers, a wide range of products with a high commodity value can be obtained from manure (soils, biofertilizers with protective and stimulating effects, feed additives, bioenergetics, etc.). For a specific enterprise, you can develop an acceptable biotechnology or microbial technology that will fit into the production process of poultry farms or livestock complexes [11]. The use of such technologies will increase the profitability of production, clean the environment and switch to waste - free cycles of processing agricultural products to obtain new commercially significant goods.

Secondary raw materials or by-products, or so-called agricultural waste, are quite suitable in other industries. As a result of physical, chemical and biological processing in a single technological cycle, they retain the maximum of useful substances unchanged, are marketable, have a standard and a certain price. In some cases, additional components of microbial origin will give secondary products of processing plants other valuable qualities and will be in demand in other industries - medical, microbiological, etc. It is possible to return to agriculture in the form of manufactured biologics with a protective effect on fields and greenhouses.

In addition to the economic value of manure and manure, the amount of nutrients in all the runoff of livestock farms in our country per year is equivalent to 2.2 million tons of nitrogen, 1 million tons of phosphorus and 2 million tons of potassium. Unused liquid waste is a small percentage. However, after processing and introduction of advanced microbial technologies, effluents can be the starting material for obtaining certain final and intermediate useful products with a different quality and market value.

Algae and aquatic plants grown on livestock runoff will also make a significant contribution to environmental protection [2,9].

Consequently, animal husbandry, due to energy-saving advanced biotechnologies, provides agriculture with the richest material for organizing environmentally safe and waste-free production with year-round employment of workers. At the same time, manure and manure is a potential source of infectious and invasive diseases of animals and humans. On the one hand, the source manure and manure is a valuable organic fertilizer, and on the other - it is a serious environmental hazard (when used directly without pre-treatment).

Promising technologies for preparing manure and manure are being actively developed due to "Express composting", vermiculture, anaerobic digestion, thermophilic aerobic processing, etc. Manure and manure, in addition to being used as a fertilizer, is an alternative source of energy. Anaerobic digestion produces a valuable product such as biogas. The reduction of  $\text{CO}_2$  to  $\text{CH}_4$  occurs in several stages. Biogas production is a multi-stage process carried out by a methanogenic community of microorganisms. This is a highly specialized group of bacteria, strict anaerobes, which get energy for their life activity in the process of anaerobic respiration and use the fermentation products of other microorganisms that live with them in close community, forming methane. The substrate of methanogens are carbon sources:  $\text{CO}_2 + \text{H}_2$ , acetate, formate, etc. as a source of nitrogen, they utilize ammonium nitrogen, urea, and assimilate molecular nitrogen.

To produce biogas, micro-organisms use products of animal manure transformation (cattle, pigs, poultry), waste from agricultural processing plants, and any organic fast-decomposing waste containing carbon. In the balance of raw materials for biogas production, 80% is animal manure processed in bioenergy plants. During methane fermentation, 90% of the fermented organic matter is converted to methane and carbon dioxide. The qualitative composition of gases largely depends on the composition of the fermentable material.

Biogas is used as a fuel for generating electricity, heat, automobile fuel, etc. Solid, fermented sediment of organic material is successfully used as a fertilizer in "organic farming". Technologies provide for controlling the rate of methane formation and the purity of the gas, bringing the concentration of methane to 95%.

When disposing of poultry droppings, a number of biotechnologies are offered: anaerobic digestion, removal of biogas and neutralization of the fermented mass, drying, grinding and manufacturing of pellets. A microbial

technology for thermal processing of bird droppings (at a temperature of 80 - 85°C) has been developed, which allows to obtain high - quality organic fertilizer for multi-purpose purposes and a substrate for solid-phase cultivation of micro-and macro-organisms [3,6]. This guarantees the death of pathogenic microorganisms, weed seeds and helminths. On the basis of recycled waste, biologics of complex action are created and completely replace chemical agents in remediation of oil-contaminated objects (soils, reservoirs, etc.), gas-air emissions, and genetically modified ones are able to destroy xenobiotics and other difficult-to-decompose pollutants.

Waste (secondary raw materials) of animal husbandry, thanks to biotechnologies, can be converted into valuable raw materials for obtaining organic fertilizers, bacterial preparations of protective and stimulating action, feed and feed additives, combustible materials (energy carriers). The efficiency of processing agricultural waste depends on its chemical composition and physical properties, which, in turn, determine the choice of technology and quality of the final finished processed product. The correct technology for recycling or recycling provides the least damage to the environment and the possibility of obtaining commercial economic effect.

Safe crop waste is usually used in bioenergy, feed production and, last of all, in the creation of organic fertilizers. Protein preparations (feed additives) are obtained from crop waste without prior acid or alkaline hydrolysis, significantly reducing the cost of production, as well as therapeutic and preventive drugs for animals.

Carbon-containing waste from crop production (straw, pollen, husk, etc.) is subjected to yeast and obtained a granular product containing cell biomass (yeast, cellulose, soluble carbohydrates and BAS), necessary for the animal body. The process of straw yeast is carried out in a sourdough way, while increasing the taste and nutritional properties of straw, the feed mixture is enriched with B vitamins and protein - the protein content increases by 1.5-2 times.

You can only yeast feed rich in mono-disaccharides. Types of plant mass can make a long list depending on the geographical location and goals. With the help of microbial transformation of plant mass, a wide range of various compounds can be obtained: cellulose-glucose-alcohols, acids, biogas, etc.

In the countries of Southeast Asia and Oceania, biotechnologies for the production of protein products using mycelial fungi, yeast, and bacteria are traditionally and very widely used. From edible raw materials of plant origin by solid-phase cultivation, products are obtained that are the most important food additive to the diet of the inhabitants of these countries.

One of the promising ways to obtain protein substances is microbial synthesis – this is a real solution to the problem of protein deficiency in human food and feed. The enrichment of well-known plant foods with protein and the creation of new types of food, thanks to the protein of unicellular, primarily yeast, bacteria, fungi, algae – can be an important direction in food biotechnology. Industrial production of microbial mass proteins is less labor-intensive than agricultural production, and does not depend on climatic conditions and soil fertility. At the same time, it provides for the fullness of food and feed not only in terms of protein content, but also essential amino acids.

It is important to organize the processing of renewable plant raw materials: starch and cellulose-oligolignin complex with the choice of the most effective method of its conversion (hydrolysis, direct cultivation of microorganisms, fermentolysis, gasification, etc.). By microbial degradation and conversion of cellulose and hemicellulose, ethanol and raw materials for the chemical industry can be obtained, and by creating or selecting strains of microorganisms with better adaptation to these types of bioconversion, a greater yield can be obtained.

Fermentation of the hydrolyzed soluble and insoluble substrates are bacteria, actinomycetes, yeast, etc. Get a variety of foods: protein substances (supplements, food) or food concentrates and fodder purpose, gaseous or liquid energy sources, medical products, etc. Feed protein preparation comprises a protein and residues of plant materials destined for feed supplements for agricultural animals, so the raw materials should not be affected by rotting and contaminated soil. The use of this drug reduces the consumption of protein in the diet of farm animals.

Thus, the recycling of animal and crop waste is of great scientific and practical importance, since the results of biotechnologies can help in making decisions about the possibility of environmentally sound and safe use of manure, manure, animal waste and plant residues. Unfortunately, there are very few existing methods for regulating the impact of agricultural waste on the natural environment, assessing the consequences of their use, and the effectiveness of agricultural technologies and disposal of hazardous waste. In our country, according to the most optimistic estimates, their use in agriculture still reaches only 5%, in contrast to the civilized world, where this figure is 30-40% (Western Europe) and 60% (USA).

All the achievements of biotechnologies are meaningless and can remain on the pages of scientific publications if the corresponding biotechnological processes cannot be evaluated realistically, using economic and environmental practices. It is not surprising that we are faced with an

abundance of theoretical models and a lack of data necessary to ensure that these models and technologies do not remain on paper. Agricultural activity has an economic meaning that allows you to take into account everything related to production and can be evaluated statistically.

Young professionals should know that waste does not exist as long as it contains carbon, nitrogen, and micro-organisms used as food and energy sources. Training manuals, practical manuals and textbooks show rational technologies for processing agricultural waste and their secondary efficient use as feed, fuels, fertilizers, etc.

The practical use of living systems (micro-organisms, algae, vermiculture, etc.) to preserve and improve the human environment requires well – trained personnel-technologists in the field of bioconversion of waste or secondary agricultural products. Specialists should know the main processes of bioconversion, the mechanism of processing, methods of storage and disposal of hazardous waste, the advantages and disadvantages of certain technologies, alternative systems for solving environmental problems and their prospects. Since biological processes in soils are system-forming, they determine a number of the most important ecological functions of the soil cover and conditions for the formation of a full-fledged and safe crop production.

New approaches to the processing of secondary agricultural products will allow us to assess the level of soil fertility, the ability of self-restoration of agroecosystems and rehabilitation (remediation) of abandoned lands. Bioconversion will allow recycling the organic part of waste, and create useful products and materials, as well as the closed nature of the cycles of transformation of substances - waste-free technologies.

For more than 30 years, the faculty of animal Science and biology, and now the faculty of technology of the Timiryazev state agricultural University, has been lecturing on the bioconversion of waste and secondary agricultural products, created demonstration materials, modules, manuals and textbooks. Students are shown the negative consequences of mismanagement of waste, manure, droppings and secondary resources of organic origin of agricultural enterprises and processing industries.

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## FEATURES OF HIGHER NERVOUS ACTIVITY OF COWS IN CONNECTION WITH THE LEVEL OF MILK PRODUCTIVITY AND PROTEIN CONTENT IN BLOOD SERUM

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**Annotation.** A connection has been established between the type of higher nervous activity and the level of milk productivity and the protein content in blood serum. The highest yield of milk was observed in a strong balanced mobile type, the least - in cows of a weak type. It has been established that blood proteins play an important role in the life of the body and are consistent with the data of many researchers who have shown the importance of the processes of excitation and inhibition in the level of participation of blood proteins in the metabolism.

**Keywords:** type of higher nervous activity, blood serum, protein fractions, milk yield, fat mass fraction, protein mass fraction.

### **Relevance**

When breeding cattle in dairy complexes with modern keeping technology, it is necessary to use animals with a certain type of higher nervous activity, contributing to the formation of high milk productivity in specific feeding and keeping conditions [1, 2].

Along with the traditional system of step selection that has developed

in zootechnical practice — by origin, exterior, constitution, productivity, and quality of offspring — forecasting the productivity of animals taking into account their behavioral characteristics, which can be successfully used in breeding and breeding, is important [1-3].

The work of domestic scientists established the relationship between the types of nervous activity of animals, in particular cattle, the most important biological and economically useful traits with the level of milk productivity of cows and the fat content in milk, with the immunobiological reactivity of the body [1], with the rate of milk production of cows, with types constitution, with the level of sperm production and sperm quality of bulls, with resistance to stress.

**Material and methods**

The object of research was the number of cows of black-motley breed in JSC Plemzavod "Povadino", located in the Moscow region. The types of nervous activity of cows were determined by the method of motor food conditioned reflexes (Letyagina E.N., 2004).

Based on the methodology, animals were divided into four groups: I - mobile; II - inert; III - rampant; IV - weak. Blood was taken from animals to assess biochemical status. The material for analysis was transported to the Helix laboratory service in Moscow. The content of total protein (g / l) and protein fractions were evaluated in blood serum samples: albumin (g/l), α-globulin (g/l), β-globulin (g/l), γ-globulin (g/l).

**Research results**

In some cattle breeds, the types of nervous activity and their relationship with economically useful traits are not well understood. Below are materials on the study of typological features of the higher nervous activity of cows of black-motley breed in connection with their level of milk productivity and protein composition of blood serum.

**Table 1 - The average content for lactation of the total protein and protein fractions in the blood serum of cows of different types of nervous activity**

Type of nervous activity	n	Total protein (g/l), X±Sx	Protein fractions, X±Sx			
			albumin (g/l)	α- globulin	β- globulin	γ- globulin
Mobile	7	7,96±0,118	3,52±0,053	1,15±0,034	1,17±0,027	2,12±0,035
Inert	5	7,91±0,198	3,47±0,082	1,11±0,031	1,22±0,035	2,11±0,11
Rampant	7	7,70±0,115	3,38±0,062	1,12±0,022	1,22±0,032	1,99±0,099
Weak	4	7,30±0,108	3,12±0,129	1,07±0,027	1,10±0,036	2,01±0,048

In the studied 23 cows, four types of nervous activity were established: strong balanced motile (7 cows), strong balanced inert (5), strong unbalanced rampant (7) and weak type (4).

The content of total protein and protein fractions in the blood serum of cows of different types of higher nervous activity turned out to be uneven (table 1).

By the content of total protein and albumin in the blood serum, animals with strong nervous processes (mobile, inert and unrestrained types) were superior to cows with weak nervous processes (weak type of nervous activity) ( $P > 0.99$ ).

The increased level of protein in blood serum observed in animals with strong nervous processes, especially in cows of a strong balanced mobile type of nervous activity, indicates a higher level of metabolic processes in comparison with weak type cows. This corresponds to the role that blood proteins play in the life of the body and is consistent with the data of many researchers who have shown the importance of the processes of excitation and inhibition in the level of participation of blood proteins in the metabolism.

The analysis of variance revealed the influence of the type of nervous activity on the variability of the content of serum blood proteins ( $P > 0.999$ ).

Cows of different types of higher nervous activity also differed in the level of milk productivity. The highest yield of milk was observed in a strong balanced mobile type, the least - in cows of a weak type (table 2).

**Table 2 - Milk productivity of cows of different types of nervous activity for 305 days of lactation**

Type of nervous activity	n	Milk yield for the first lactation, kg	Mass fraction of fat, %	Mass fraction of protein, %
	7	7667±228	4,11±0,04	3,15±0,08
Mobile	5	7498±390	4,10±0,02	3,01±0,04
Inert	7	7380±308	4,25±0,03	3,17±0,03
Rampant	4	6675±323	4,15±0,01	3,22±0,02
Weak				

The difference in milk yield between cows of mobile and weak types of nervous activity is statistically significant ( $p > 0.95$ ), between animals of inert and unrestrained types of nervous activity on the one hand and cows of weak type on the other, it is close to reliable. A slightly higher content of fat and protein in the milk of cows of a weak type of nervous activity, which

does not reach, however, the limits of statistical significance, is associated with a lower level of milk production in the latter.

Differences were also found in the nature of the lactational activity of cows of different types of higher nervous activity. Animals of a weak type were characterized mainly by rapidly declining ones, and cows of an unrestrained type - by less aligned lactation curves compared with cows of a mobile and inert type of nervous activity.

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