



SCIENTIFIC RESEARCH OF THE SCO COUNTRIES:

SYNERGY AND INTEGRATION 上合组织国家的科学研究：协同和一体化

Proceedings of the
International Conference

Date:
August 9

Beijing, China 2023

上合组织国家的科学研究：协同和一体化
国际会议

参与者的英文报告

International Conference
“Scientific research of the SCO coun-
tries: synergy and integration”

Part 3

2023 年 8 月 9 日。中国北京
August 9, 2023. Beijing, PRC

Proceedings of the International Conference
**“Scientific research of the SCO countries: synergy
and integration”** - Reports in English

(August 9, 2023. Beijing, PRC)

ISBN 978-5-905695-82-7

这些会议文集结合了会议的材料 – 研究论文和科学工作者的论文报告。它考察了职业化人格的技术和社会学问题。一些文章涉及人格职业化研究问题的理论和方法论方法和原则。

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DOI 10.34660/INF.2023.35.62.121

跨境市场建筑产品出口管理模式
MANAGEMENT MODEL OF EXPORT OF CONSTRUCTION
PRODUCTS IN CROSS-BORDER MARKETS

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抽象的。作为全球市场建筑服务出口发展和增加的一部分，制定和实施进入跨境市场的管理机制的重要性日益增加，这反过来又使企业能够降低扩大在海外市场的成本。国外市场。

所提出的模型基于其在建筑领域应用期间获得的数据。它适用于现有的经济环境。

该管理模式的主要特点是其进入国外市场的灵活性和适应性。该模型包括基本工具，例如：策略选择、风险分析、国家选择、贸易伙伴选择和合同工作。根据公司进入的市场，还可以使用不同的工具，例如：进入标准分析、组织和经济壁垒、计算操作模型、产品生产和技术解决方案的应用，这证实了科学新颖性和实践导向模型。

该模型适用于在不确定、缺乏既定业务流程的情况下进入新市场的情况。该模式可以形成货物和服务出口合作的新渠道。

关键词：跨境市场、管理模式、施工管理机制、创新施工技术。

Abstract. *As part of the development and increase in exports of construction services in the global market, the importance of the development and implementation of management mechanisms for entering cross-border markets is increasing, which in turn allows companies to reduce the costs of expanding their presence in foreign markets.*

The proposed model is based on the data obtained during its application in the construction sector. It is applicable within the existing economic environment.

The main feature of the management model is its flexibility and adaptability when entering foreign markets. The model includes basic tools such as: strategy selection, risk analysis, country selection, choice of trading partners and contractual work. Also variable tools, depending on the market to which the company enters, such as: analysis of entry criteria, organizational and economic barriers, models of calculation operations, production of products and application of technological solutions, which confirms the scientific novelty and practice-oriented model.

The model is applicable when entering new markets in conditions of uncertainty, lack of established business processes. The model allows to form a new channel of cooperation in the export of goods and services.

Keywords: *cross-border markets, management model, management mechanisms in construction, innovative construction technologies.*

Assessing the opportunities and prospects of development of the global market of construction services, one can pay attention to the changing importance of various factors in terms of ensuring competitiveness. Implementation of modern innovative technologies is the key to success and the main growth driver for most companies.

The key factors influencing the increase in construction through 2030 include:

- development of construction technologies and emergence of new materials;
- demand for modular and frame residential buildings using innovative technologies;
- application of software (Big Data) for project management;
- the need for reconstruction and renovation of existing production facilities to adapt them to the standards of modern construction;
- application of new ecological standards in design with due consideration of sustainable development factors;
- prospects for increased construction of engineering, transportation and social infrastructure in developing countries;
- housing and food problems in many developing countries.

By 2030, the construction market will be worth approximately \$18 trillion in actual financial terms. Growth will be driven by strong demand for housing in developing countries. New economic patterns and the adoption of modern technology will drive demand in Africa and Asia, with the average market in these areas growing at a faster rate than in other regions.¹

Due to the increasing importance of modern equipment and technologies, rapid housing construction, accelerated urbanization trends in these regions, as well as the emergence of demographic problems, namely overpopulation, the main flow of investment will be redirected to these regions.²

Overall, a positive global growth trend is expected until 2030. The construction services market reaches a growth rate higher than the global GDP, becoming a very promising area for the national release of construction companies to international markets.

For an export-oriented company, interaction in the global market is a difficult task due to a number of organizational and economic problems:

Competition: in the global market competition is very high, especially in the emerging construction industry where many companies offer high quality and advanced products and services. This may lead to lower prices and reduce the profit of the company.

Risks of currency fluctuations: when operating in the international market, the company faces the risk of currency fluctuations, which may lead to loss of profits.

Customs and transportation costs: when exporting goods, the company needs to take into account customs duties and taxes, transportation costs, which may increase the cost of goods.

Different rules and regulations: there are different rules and regulations in the global market.

Problems with localization: when operating in the global market, the company faces problems with localization of its goods and services, which may lead to a decrease in demand for them.³

Entering foreign construction markets is associated with a number of risks and specific requirements of national standards. One of the significant factors in assessing entry into a new market is to analyze the influence of political, religious and cultural traditions of a given region. The authors found that the legislation of the region can significantly complicate the implementation of projects.

The main criteria for choosing a partner country are: political system, customs duties, tax rates for non-residents, logistics channels, legislation of the country, cultural and religious traditions, labor costs, banking system, exchange rate fluctuations.

The choice of a partner country is made within the framework of a positive evaluation according to the presented criteria.

The management model proposed by the authors (Fig. 1.), allows overcoming the barriers of entry to foreign markets.

The system approach, realized in the model, provides the company-exporter of the construction industry with mechanisms for managing its sustainable development, takes into account the current conditions of work in specific states. This approach actualizes and optimizes the work of construction companies in international markets.

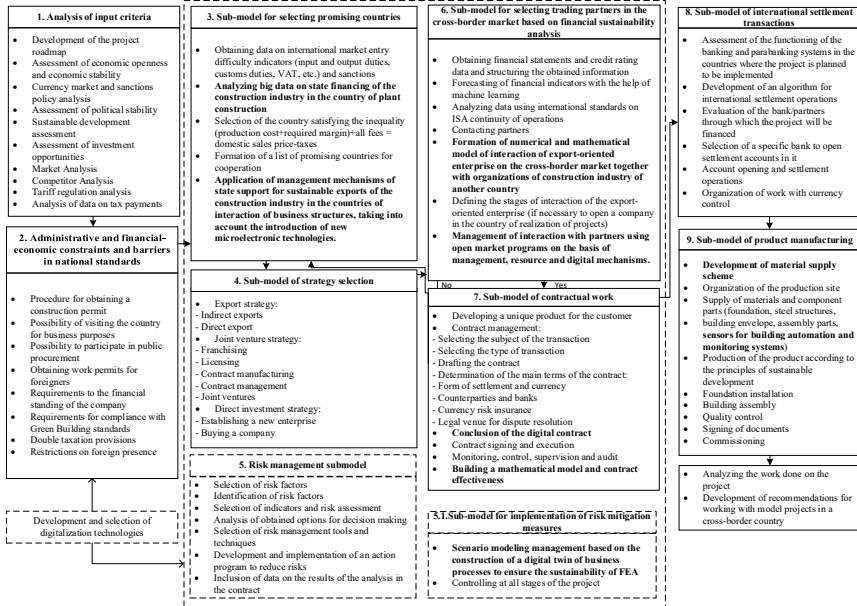


Figure 1. Management model of export of construction products in cross-border markets

The main difference and perspective of this model is the use of modern systems of big data analysis to identify potential risks and threats to entering a new market, taking into account the experience already gained in the format of online control. At the stage of input criteria analysis, the input data required for further analysis of the target market and assessment of the prospects of work in it are collected.

In the next step, the existing administrative and financial-economic limitations and barriers in the national standards are identified. Only after making sure that there are no restrictions and barriers, the interested party can continue to implement its strategic decision within the framework of the proposed management model. ⁴

Having proceeded to the stage of selecting a promising country through the algorithms of this sub-model, a new approach is applied, according to which a big data analysis of public financing of the construction industry in the country where construction is supposed to be launched is carried out. Management mechanisms of state support for sustainable exports for the construction industry in the countries of interaction of business structures are applied, taking into account the introduction of new microelectronic technologies.

Having formed a list of potential target markets, the interested party proceeds to the next stage, in which it uses a sub-model for identifying trade partners in the selected cross-border markets, using financial sustainability analysis tools. Already at this stage, business contacts with partners are established, the stages of interaction of an export-oriented enterprise are defined, up to the opening of a company in the country of project implementation, and the management of interaction with selected partners is built using open market programs based on management and digital mechanisms. At the same time, a digital or mathematical model of interaction of the export-oriented enterprise in the target market is formed by the selected company, either privately or jointly, in the given cross-border market. Further activities are carried out in close cooperation with the selected counterparty and are focused on building efficient business processes.⁵

Taking into account the full agreement, the interested parties proceed to the organization of contract work. Based on the obtained data, a mathematical model of contract implementation is built and its effectiveness is determined, which allows to confirm or deny the correctness of the decision to enter the market and adjust the implemented strategy at the early stages of the project.

In the process of choosing a strategy, first of all, it is necessary to determine what type of export is most effective: direct with the opening of a branch in the country, or indirect with the cooperation of a company registered in the region. The choice is made taking into account the political environment and economic efficiency, then ways to expand the presence are determined, for example: franchising, licensing, contracting.

This tool fully minimizes negative effects in the company's interaction in export-import operations related to the promotion of knowledge-intensive and digital construction technologies in the foreign market. In case of negative results of the interrelated submodels at the stage of contractual work and risk assessment, the interested party returns to the sub-model of selecting promising countries and repeatedly searches for promising markets of cooperation.⁶

As soon as the contractual stage is completed, the stakeholder starts working in the settlement sub-model. Having organized settlement and financial support of the project, the interested party starts working out the issues of production.

In parallel with the realization of contractual work, a sub-model of the company's risk management related to competition is launched, innovative technologies are applied, such as building monitoring sensors, which allow to determine the necessary parameters of the building during its construction.

Based on the work done, we analyze and develop recommendations for working with model projects in cross-border markets. The algorithms used in the model allow selecting the most promising countries for successful and safe business and determining the most optimal partner according to individually selected parame-

ters for the current legal, trade, banking, insurance and tax regimes, developing innovative digital tools for payments and international settlement operations.⁷

The structure of the management model allows to fully identify, analyze and evaluate existing and emerging external and internal factors that can affect the implementation of the project.

The multifactorial nature of the assessment, within the framework of this management model, allows it to become the basis for creating a digital and mathematical model of interaction of an export-oriented enterprise, a model of partnership and change management, the production potential of an export-oriented construction enterprise in foreign markets using open market programs based on managerial, resource and digital mechanisms, scenario modeling management systems based on the construction of a digital twin of business processes to ensure the sustainability of foreign economic activity.

As part of the application of the model, BRICS becomes one of the basic platforms for establishing partnerships. In recent years, the volume of trade between the BRICS countries has increased significantly. As part of BRICS cooperation, countries can develop their infrastructure, including transport systems, energy and communications. Today, more than 22 new states want to join the BRICS, and it is quite likely for them to use the new union currency in mutual trade. This can help improve trade and economic ties between countries. In particular, Africa is one of the promising growth markets.⁸

Africa's overall real GDP growth for 2022 averaged around 4.2%, according to data released by the African Development Bank. At the same time, comparing this growth with the indicators of the undisputed leaders in this field China and India, this indicator will lag behind, however, the growth rate of African countries will significantly outpace the growth rates of emerging economies.⁹

Africa's population is growing rapidly. After 1960, which is considered to be the starting point of the post-colonial history of the continent, the population of Africa increased by 1.1 billion people, which is almost a quarter of the total increase in the inhabitants of our planet during this period, and the share of Africans in the population of the Earth increased from 9.3 to 17.4 %. Moreover, this growth will continue. According to UN Population Bureau projections, by the end of this century the population of Africa will exceed 4 billion people, by 2100 between a third and 40% of the inhabitants of the Earth will live here, which will require the construction of new buildings and improved infrastructure.¹⁰

Russian construction companies have various construction technologies, such as the "Flexible Sandwich" technology, which allows for the construction of fast-erecting buildings in the shortest possible time, which may become a growth driver for building construction in Africa. Given the increasing economic integration between the BRICS partners, entry into this market is becoming easier,

including by financing projects at the state level within the framework of public-private partnerships.

Speaking about the prospects of going beyond the national market, construction companies that have innovative technologies in their arsenal and apply an integrated approach to the implementation of development projects, through saturation of the sphere of activity with a variety of infrastructure with various forms and formats of interaction, have the opportunity to increase market share and maintain leadership in the market for a long time.

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数字化普法素养与法制教育机制

DIGITAL LEGAL LITERACY AND THE MECHANISM OF LEGAL EDUCATION

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注解。数字法律素养是每个人很快就必须拥有的知识、技能和能力。这是当今的一个热门话题，因为数字技术正在改变社会关系的各个领域。这种法律体系和观念上的转变，不能不影响个人和公众的法律意识，而这又往往使个人的法律社会化进程变得复杂化。所有这些都表明社会存在一些倒退过程，需要寻求适当的法制教育措施。现代法律现实条件下的法制教育措施应该系统化、体现一定机制，并有效运用，以形成个人适当的法律文化水平。

关键词：数字法律素养、法律理论、数字技术、法律意识、法律教育、法律文化、转型、社会关系。

Annotation. *Digital legal literacy is the knowledge, skills and abilities that everyone will soon have to possess. It is a topical issue today, as digital technologies are transforming all spheres of social relations. This transformation, both in the system of law and in ideas about it, cannot but affect individual and public legal consciousness, which often complicates, in turn, the process of legal socialisation of the individual. All this indicates some regressive processes in society and necessitates the search for appropriate measures of legal education. Measures of legal education in the conditions of modern legal reality should be systematised and represent a certain mechanism, which will be effectively used in order to form a proper level of legal culture of the individual.*

Keywords: *Digital legal literacy, theory of law, digital technologies, legal consciousness, legal education, legal culture, transformation, social relations.*

Introduction. The construction of a state based on the rule of law requires society to have appropriate legal knowledge that can ensure a high level of developed legal consciousness and effective functioning of the legal system, which is based on the fundamental values embedded in the potential of law. At present, simultaneously with the dilatation of national legal benchmarks such as freedom, justice, tolerance, equality, there is a cardinal transformation of established ideas

about law and its value. Instability in the belief that there is a system of legal values can become a consequence of violation of legal and social order, as well as lead to the degradation of legal consciousness and the decline in the indicators of legal culture, which often complicates the process of legal socialisation of the individual. All this indicates some regressive processes in society and necessitates the search for appropriate measures of legal education.

Discussion. The category “mechanism of legal education” arouses the interest of scientific theorists for quite a long time. Fundamental studies in this area were the works of Alekseev S. S. C.¹. Thus, the scientist notes that the category “mechanism of legal education” is intended to demonstrate the moment of movement and functioning of a legal norm. In his opinion, this category is quite closely interrelated and is derived from the concept of legal education, based on which the scientist deduces the ways of legal education: legal techniques of permitting, prohibition and positive obligation. They are ways of legal influence, which are expressed in the norms of law and other elements of the legal system.

B. V. Lazarev points to the same ways of legal education as S. S. Alekseev, but specifies that the method is a set of legal ways of legal education, and the ways are what is called the “building material” that constitutes the method².

H. I. I. Matuzov and A. V. Malko believe that the mechanism of legal education has a certain purpose - it is to ensure the unimpeded movement of the interests of subjects to values, namely the guarantee of their fair satisfaction. The mechanism of legal education is a system of legal means, consistently organised in order to overcome various kinds of obstacles that arise on the way of realisation of rights and legitimate interests of the relevant subjects of social relations³.

B. N. Hropanyuk defines the concept of the mechanism of legal education as a system of legal means that allow to order social relations in accordance with the goals and objectives of the state of law⁴.

According to the scientist M. A. Bobylev, the mechanism of legal education largely depends on the state of national legislation. A. Bobylev, the mechanism of legal education largely depends on the state of national legislation, on the extent to which the adopted laws are really working⁵.

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³ H. I. Matuzov, A. V. Malko. Theory of State and Law Jurist. 2004 // https://pravo-olymp.ru/wp-content/uploads/2013/04/TGP_Matuzov_Malko.pdf // circulation date 11/0/2022.

⁴ B. N. Hropanyuk Theory of State and Law. M. 2008 // https://www.studmed.ru/view/hropanyuk-vn-teoriya-gosudarstva-i-prava_0b149543882.html // circulation date 11/09/2022.

⁵ M. A. Bobylev. Mechanism of legal impact on social relations // <http://lawlibrary.ru/article1047282.html> // circulation date 29/12/2022.

According to V. M. Syrykh, in order to get the right ideas about the mechanism of legal education, its capabilities and ability to fully perform the proper functions, it is necessary to thoroughly consider all its elements in the relationship and interaction, which will make it possible to study the mechanism of legal education as a complex set of legal means and subjects capable of carrying out legal regulation or legal activity that has legal results. At that, the author notes that the mechanism of legal regulation has three integral components: the mechanism of law-making, the mechanism of implementation of law norms, as well as the mechanism of state coercion⁶.

Discussion of the issue. The mechanism of legal education has a number of important features. Thus, the mechanism of legal education should be understood as the totality of not only legal, but also other social norms that allow the state to influence society, thereby forming the vector of lawful behaviour. That is, the stimulant of legal behaviour can be not only sanctions, but also internal beliefs inherent in a morally mature person.

The main criteria of the mechanism of legal education are certainly legal means enshrined at the legislative level, lawmaking, as well as other regulators of social relations. Such as morals, morality, religion, ethics, traditions established in a given society.

Since one of the main goals of the mechanism of legal education is the generation of legal culture, it is impossible not to take into account the specifics of the legal reality of the society where the mechanism of legal education realises its functions.

Taking into account the above criteria of the mechanism of legal education, as well as the legal reality in which it will be formed, it is important to note that in order to achieve high efficiency of its functioning, firstly, it is necessary to have the above-mentioned totality, as well as a combination of both legal and non-legal (moral) methods accompanying the mechanism of legal education. Secondly, lawful behaviour and legal culture, being the purpose of the mechanism of legal behaviour, can be formed not only under the influence of coercive force, i.e. sanctions, but also under the influence of the inner conviction of the individual, relying on the principles of self-restraint. Thirdly, the fundamental factor here is the national legal features and traditions of society. Fourthly, the high efficiency of the mechanism of legal education is achieved by means of a deep analysis of the legal reality in which it implements its functions, which makes it possible to identify the objective reaction of society to the methods and means introduced.

Thus, the main elements of the mechanism of legal education can be legal and non-legal (moral imperatives) norms, legal policy of the state, law-making and

⁶ Syrykh V. M. Theory of State and Law// file:///C:/Users/nelli/Downloads/Теория_государства_и_права_6-е_изд.,_перераб._и_доп._(1)%20(1).pdf // circulation date 17/09/2022.

legal reality. Thus, for example, at the present stage of social development, digital technologies, which have an active influence on the legal reality, are of particular importance.

The peculiarity of modern social relations is the intensive impact of digital technologies on them. This impact causes the emergence of an alternative social space - digital. In this space, a person becomes a full-fledged subject of social relations, making transactions, providing services, servicing his/her everyday life, entering into contracts, realising his/her political rights and freedoms. All communications, as well as in real space, in digital space have their consequences, sometimes negative. Often these consequences cannot be regulated by applying the norms of existing law. This factor shows that the legal reality is as follows: digital technologies invading social relations have significantly transformed them, and law is no exception. Entering into relations in the digital space, a person often does not think about the consequences, which leads to offences for which there is not always responsibility. The sense of impunity creates a deep defect in legal consciousness. In this regard, digital legal literacy has a special role to play.

Digital legal literacy as a concept is a person's possession of a certain set of legal knowledge and skills that allow him or her to fully communicate in the digital space in a certain status - a digital person. A digital person must not only possess knowledge and skills for safe handling and effective use of information flows, but also relevant competences. In particular, the understanding that they are communicating with others like themselves. A digital person cannot fail to recognise that all actors in the digital space have the same rights and freedoms, legitimate interests and unconditional reciprocal obligations.

Conclusions. Digital legal literacy is a set of knowledge, skills, abilities, skills and competences that allow the effective and safe use of all available digital resources. Thus, the main subjects of digital legal relations can be subjects with the status of "digital". At the same time, digital legal literacy today is not only the ability to use a personal computer or an appropriately equipped phone or smart-phone, it is also a wide range of digital competences, rules of digital consumption, knowledge of the basics of digital security, law, and legal culture. This is a certain set of competences that a modern, legally and digitally literate person possesses.

Digital competences, as the main element of digital legal literacy, act as a set of knowledge and skills that enable the effective use of digital technologies. It is about digital security, information retrieval, its application, and the circulation of social networks, where a person's behavioural style, his or her position on certain issues, abilities, critical perception and further broadcasting of relevant information are actively manifested. Digital competences, as well as their absence, can clearly demonstrate the level of legal consciousness and legal culture of the individual, which reveals the objective need for basic legal knowledge that allows ef-

fective and safe communication with other digital subjects without violating their rights.

Thus, the analysis of the main elements of digital legal literacy, namely digital consumption, digital competences and digital security, allows us to come to the conclusion that the abovementioned totality can now be effectively used as an element of the mechanism of legal education. Obviously, the use of digital technologies and the possibilities of digital space, at present, without appropriate legal knowledge and a proper level of legal culture, seems to be extremely difficult and dangerous. The Internet is actively mastered by the age contingent, the younger generation, it is they who are at risk and may face certain threats. With the development of digital relations and the involvement of more and more subjects, the problems of legal illiteracy have become particularly acute. For this reason, the skilful and timely use of basic algorithms of digital legal literacy, the ability to find the necessary information in the digital space, to adequately assess, interpret, perceive it, to possess the skills to resist the threats characteristic of the digital space, to realise the inevitability of responsibility for what they have done, will not only increase the level of legal culture of users, but also protect them from the above risks and dangers, forming a proper level of legal consciousness of users.

DOI 10.34660/INF.2023.26.44.123

高中教育背景下的数字技术
**DIGITAL TECHNOLOGIES IN AN EDUCATIONAL CONTEXT
HIGH SCHOOL**

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抽象的。在数字社会形成、数字经济发展的背景下，教育体系不可能一成不变。如今，将信息技术融入高等教育的教育过程是学生掌握现代经济专业能力和技能的关键。数字化不仅影响教育内容，也影响教育组织，旨在打造大学现代化的数字化教育环境。本文以沃罗涅日国立技术大学的有效实践为例，描述了能够在传统教育的最佳方法和对远程学习过程的新理解之间保持平衡的技术[1； 4]。

关键词：传播、远程学习、信息技术、信息内容、教育环境。

Abstract. *In the context of the formation of a digital society and the development of a digital economy, it would be impossible to leave the education system unchanged. The integration of information technology into the educational process of higher education is today the key to students' mastering professional competencies and skills for the modern economy. Digitalization affects not only the content of education, but also its organization, aimed at creating a modern digital educational environment of the university. The article describes technologies that allow maintaining a balance between the best methods of traditional education and a new understanding of the distance learning process using the example of effective practices of the Voronezh State Technical University [1; 4].*

Keywords: *communication, distance learning, information technology, information content, educational environment.*

Introduction

The challenges of the times have opened up new approaches to teaching and learning in order to solve the problems that the new reality creates. Modern digital technologies are radically changing the economy and lifestyle in general. The labor market requires a qualitatively different content of the training of graduates of educational institutions, primarily specialists with high communicative competencies and skills, and the effective integration of information technology in education requires a clear balance between the best methods of traditional education and new forms of the educational process.

Formulation of the problem

The information space is changing rapidly, expanding the communicative discourse of the educational environment. Digital technologies affect not only the content of education, but also its organization. It can be said that “the quantitative growth in the use of new educational technologies has led to a new reality of the “digital university”. At the same time, there is an interpenetration of analog educational technologies and digital technologies: the latter do not completely displace the former, and the former can no longer exist independently of the latter” [2].

The ubiquitous digitalization has determined the specifics of the modern communication process, a feature of which has become a multiple increase in the amount of information, an infinite increase in the speed of creation and distribution, as well as a significant simplification of the methods of its transmission. All this has increased the degree of penetration of technical means of communication into the daily life of a modern person and has increased the influence of information technology on his lifestyle. Under these conditions, the development of the social and communicative competence of a modern teacher becomes an integral part of higher education. It is obvious that the education system and the pedagogical paradigm are being transformed and are undergoing major changes due to its sudden immersion in the distance learning system and the active use of digital technologies.

Research methods: methods of empirical research: observation, comparison, experiment, sociological survey.

Material analysis

The challenges of the times have opened up new approaches to teaching and learning in order to solve the problems that the new reality creates. The main trends in the field of digital education are: adaptability, flexibility and individualization of learning, the creation and use of open educational resources, gamification and game-oriented learning, the active use of mobile devices, the development of pedagogical design.

It should be noted that in the conditions of the formation of a digital society and the development of a digital economy, it would be impossible to leave the

education system unchanged. Participants in the educational process who do not have «digital» skills, sooner or later may find themselves outside the system of the modern high level of competencies. And in the new conditions, universities direct all resources to the formation of a modern digital educational environment, since its main task is to “implement educational programs at a high-quality level and with convenient ways to access the educational space” [3].

Voronezh State Technical University already has experience in using distance technologies, as well as developments in the field of open online education [1]. The experience of the university has shown that the trends in the transformation of the pedagogical space in the context of digital education and distance learning include:

1. Transition to the openness of education, which makes it more accessible and flexible.
2. Transformation of the “teacher-student” relationship. This is manifested in the changing role of the teacher in the educational process, who acts as a moderator and facilitator of the educational process, as well as in focusing on the development and support of student independence.

Forms of distance learning used to organize classes in professional disciplines of training areas at Voronezh State Technical University are classified according to the type of communication with students:

- asynchronous distance learning takes place at different times for communicants (e-mail, conversations with students on subjects in social network chats, professional online communities of teachers and students that host educational and methodological materials).
- synchronous distance learning takes place in real time using online communication platforms (electronic information educational environment of the university, student chat of the university, video conferences and webinars on various communication platforms). The two types of communication indicated above can be facilitated by Web 2.0 technologies (blogs, wikis, podcasts, cloud technologies for networking), which allow not only to receive information, but also to create resources on the Internet.

Based on the forms, there are several models of distance learning used at the Voronezh State Technical University:

1. Distributed class model. This option can be called an online meeting. The teacher and students organize it at a certain time. You can ask questions, consult, chat with other students. This model assumes the use of synchronous forms of distance learning.
2. Autonomous learning model. The student receives all the necessary educational material through asynchronous channels and follows a specific program

developed by the teacher. Communication with the manager takes place in the form of online consultations, but the interaction is very limited.

3. Model of integrated (blended) learning. This model integrates online communication in a synchronous and asynchronous form, forming a flexible schedule of interaction between the teacher and students, in which an important place is also given to the collaboration of students, their communication with each other and the creation of an online student community for educational purposes. This model has shown itself to be the most effective, as it allows you to combine the advantages of real-time communication and the organization of autonomous learning activities of students offline using digital resources, provides the ability to create a flexible schedule for network interaction between students and teachers, and monitor student learning activities.

The transition to a new system of relations in the educational environment, the introduction of innovative strategies and communication technologies within the framework of the interaction of participants in the educational process, of course, contributes to the harmonization and improvement of the quality of education. It is necessary to note the transformation of the role of the teacher in the process of distance learning. Since distance learning opens up wide opportunities for including a variety of Internet resources in the educational process, the task of the teacher changes and can be represented as follows: the distribution of activities in the classroom online and offline, taking into account the individual characteristics of students, monitoring and self-control of students, forming and maintaining motivation, encouragement of independence and productive project and group work of students, it is also the task of the teacher to guide the student in the search for high-quality information among the many available sources, which, in turn, makes it possible for the teacher to look at their own courses «from a different angle», from the point of view visibility and accessibility of mastering the theoretical material by students in the conditions of a shift in emphasis to independent study [6]. Within the framework of distance learning, a university teacher acts as a tutor - a mentor, who is an important intermediary between the educational material and the student. Thus, the organizing and controlling functions in the activities of the teacher come to the fore.

Research results

In March 2023, the authors of the article conducted a study among students of the Voronezh State Technical University. To the question: “Do you consider the active use of distance learning justified?” only about 5% of all respondents answered in the negative. The remaining 95% of respondents’ answers were in the affirmative. At the same time, during the summer session (June 2023), a survey of students was conducted on the topic of satisfaction with the conditions of cer-

tification in a remote format; the following results were obtained¹. In response to the question: “Are you satisfied with the remote format of passing the examination session?” - 45% of the respondents answered “no”, 25% answered firmly “yes”, the rest were undecided. Respondents who answered this question in the negative believe that the online format for taking exams “does not provide an opportunity for an open dialogue with the teacher, does not allow you to adjust your answers during the exam, etc.” Thus, the authors of this article made the following conclusions: although today, in the era of a wide and accessible information space, a student can independently be present in an open communication environment, he still needs verbal interaction with the teacher in the learning process, this is especially important for students of communication specialties.

Conclusions

At Voronezh State Technical University, student learning becomes available anytime, anywhere and on any device, for example, online applications expand access to university resources, making it possible to distribute high-quality content among communities. Let’s take as an example a simple informational content for a university student: e-mail and getting a network IP address; a wide range of support services; consulting, including customer service for services, a wide range of training courses; web servers; database access. Such information content complements the educational process with new opportunities: saving time, the ability to re-listen to lectures in recordings, etc. One can single out a distance learning model that is actively used by university teachers - this is a model for integrating communications in a synchronous and asynchronous form, which we noted above, in which a flexible schedule of interaction between the teacher and the student is formed. Here, an important place is also given to the collaboration of students, their communication with each other and the creation of an online student community for educational purposes. This model has shown itself to be the most effective, as it allows combining the advantages of real-time communication and the organization of autonomous learning activities of students offline using digital resources, provides the ability to create a flexible schedule for network interaction between students and teachers, and exercise control over students’ learning activities. An additional result of distance learning at the university was the dynamics of acquiring such soft skills (“soft” skills) from students as high adaptability and quick mobilization, the ability to work in a team. In today’s market conditions, future graduates will definitely need these skills. Obviously, the educational trajectory chosen by the Voronezh State Technical University, including the field of distance

¹ The study was conducted on the basis of the branch of the Department of Public Relations of the Voronezh State Technical University ANCO «Agency for Regional Socio-Economic Projects» in March 2023. and June 2023 using the survey method. 150 students of different faculties and courses were surveyed.

learning, is fully in line with modern trends and largely determines the strategy for the professional development of a graduate.

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DOI 10.34660/INF.2023.10.86.124

基于整合性原则的学习技术的使用
**THE USE OF LEARNING TECHNOLOGY BASED ON THE
PRINCIPLE OF INTEGRATIVITY**

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抽象的。本文介绍了“语义关联的发展”教学方法的使用以及不同教育层次的复杂的工作组织形式。该方法与学生跨学科整合知识和经验、思维的能力的发展有关，以及为所研究的过程/现象创建系统网络背景的能力，尽可能接近更全面的图景。现实。简要描述了作者在综合语义基础上的普遍教学体系，其中一部分是比较学生语义关联的方法。该系统的主要概念原则是科学性、知识与经验的整合、意义形成、效率、问题性质等。

关键词：教育教学体系、综合方法、语义关联方法、思维发展、整体过程环境的创建。

Abstract. *The article presents the use of the teaching method “development of semantic associations” and a complex of organizational forms of work at different levels of education. The method is associated with the development of students’ ability to interdisciplinary integration of knowledge and experience, thinking, as well as the creation of a system-network context of the process / phenomenon being studied, as close as possible to a more holistic picture of reality. A brief description of the author’s universal didactic system of teaching on an integrative-semantic basis, part of which is the method of comparing students’ semantic associations, is presented. The main conceptual principles of the system are scientific character, integration of knowledge and experience, meaning formation, efficiency, problematic nature, and others.*

Keywords: *didactic system of education, integrative approach, method of semantic association, development of thinking, creation of a holistic process context.*

Biological education determines the effectiveness, strategy for the development of scientific technologies and biological literacy, economics, and security in society. Its status, content, purpose have traditionally been associated with the study of the phenomenon of life, the variety of forms of its manifestation.

At present, it is already understood that underestimated systemic transformations in various spheres of human activity lead to the destruction of ecological systems, to the blurring of the boundaries of wildlife, to serious climatic disruptions that provoke cataclysms in the micro and macro world. Achievements of biological science are called upon to ensure the solution of socio-natural problems, the development of medicine, agriculture, bio-ecological technologies, the level of society's culture.

An adequate response to the emergence of new achievements, complex problems can only be common civilizational efforts, including through science, education, the development of biological literacy, adequate training of teachers for different levels of education.

Biological literacy, according to our definition, is the ability to independently and timely apply biological knowledge, predict and be responsible for decisions made in everyday and professional activities in order to preserve life as a phenomenon, nature, human health and its adaptation to changes [Pivovarova, 2007]. It is a sign of a developing personality, culture and maturity of society.

The development of *biological science* and a literate society involves the modernization of not only biological education, but, first of all, attention should be focused on higher pedagogical education using adequate innovative teaching technologies.

Unresolved problems of teacher training move to the level of general education secondary school, universities, and then manifest themselves with renewed vigor in scientific, any other professional activity and everyday life of every person, as a result of making illiterate socially and biospherically significant decisions.

In this regard, it is important to pay special attention to the training of pedagogical and scientific personnel, which include learning technologies that develop the universal and professional competencies of the individual. The universal didactic system of education developed by us on the basis of an integrative-semantic concept is aimed at the formation of most of these abilities and competencies [Pivovarova L.V., 2006.]. The concept of the training system is based on the following didactic principles: interdisciplinary integration of knowledge and experience, meaning formation, learning productivity, predictability, problematic, knowledge effectiveness. The training system includes the theoretical and practical parts of the discipline being studied, a system of traditional and innovative teaching technologies, including methods (semantic graphical modeling of processes, development of semantic associations, trainings, case analysis, gaming technologies, interactive lectures, etc.) and a set of organizational forms of work, part methods are copyrighted. All these methods are carried out through the active activity of students in the paradigm "competence - activity - competence". It is in this approach, where theoretical knowledge is not separated in time from practical

knowledge, that the emergence of competencies and meanings occurs through the acquisition of experience in their activities. This approach is able to solve the problems of subject-disjointed education and thus turn the educational process into a cultural phenomenon.

An integrative approach to learning is aimed not only at mastering knowledge, but also at generating the meanings contained in them. Based on the meaning-forming educational context, it is possible to solve intersystem problems, such as, for example, ecological and economic, as well as well-known biosocial ones. Productive work of professionals on them is possible only with education adequate to these challenges. Particular attention should be paid to overcoming the narrow limits of academic subjects and the assimilation of those fundamental ideas on which the study of any science should be based. In addition, modern innovative approaches will ensure the competitiveness of graduates, creativity, transforming their activities.

The didactic training system is universal, it has a positive experience of implementation in the educational process of high school students for the development of biological literacy, as well as in educational centers for advanced training of biology teachers at the Faculty of Biology of Moscow State University, the Artek and Sirius Educational Centers. In addition, it was used in the system of pedagogical training of students and graduate students in the course “Methods of teaching biology” in the development of methodological literacy in universities at the biological and pedagogical faculties of Moscow State University, the University of Moscow State Pedagogical Institute in Shenzhen. It was used during trainings of universal competencies for specialists in a number of business companies. The system of education on an integrative basis was first presented to the UNESCO Commission on Biological Education on the example of the formation of biological literacy of high school students, where it attracted attention and received support [Pivovarova, Korzhenevskaya, 2009].

The article proposes to consider an example of one of the author’s methods of a didactic learning system on an integrative basis “development of semantic association” (comparative aspect). Its effectiveness is manifested in the development of the ability for interdisciplinary integration of knowledge and experience, the expansion of the semantic and emotional-sensory spheres of the individual, as well as associative, system-network and predictive thinking, intuition, the creation of a wide and deep context of the situation / process, the growth of cognitive activity among students, including teachers.

The method of development of semantic associations. The term “association” was coined by John Locke. The human brain is able to create and reproduce connections between individual phenomena, meanings, events, facts, objects, sensations, which are connected in meaning with the word initiator and are called

associations. J. Locke considered association as one of the mechanisms for the formation of complex ideas. In the process of association, neural networks are formed, an integrative semantic scientific, problematic context. In the process of reflection, learning, it is constantly supplemented and the situation / problem is immersed in a more saturated field of information. It is created by a broadly and deeply informative interpenetrating field of interdisciplinary and within disciplinary knowledge and images. A scientific, practical problem is considered in the picture of knowledge, images that are closest to reality.

A. Einstein analyzed the role of associations in creative thinking, including in the implementation of his scientific activities. Currently, theories are being developed in which associative abilities are considered as the basis for the development of genius. H. Huygens, who improved the telescope, while watching children playing with glasses, “caught” an association that led him to the idea of creating a telescope eyepiece. A sudden vision (as an insight) of a new connection leads to the construction of a new semantic structure, sometimes to a discovery (E. Sinitsyn, O. Sinitsyna, 2004.) Attention to association is increasing today, for example, in the development of the theory and practice of teaching foreign languages [Shchukin A. N., 2004; Frolovskaya M.N., 2007], in the field of business training (MBA system).

Semantic association, in contrast to free association, is associated with the generation of words, concepts related in meaning to the word initiators. The method is used in the didactic model of teaching due to the fact that it contributes to the establishment of extraordinary system-network relationships between knowledge related to different cognitive areas, as well as elements of the problem being solved and the outside world. The formation of a system of semantic associative links leads to an understanding of certain relationships that exist in the educational discipline, science and in the real world. Thus, an integrative context is created: a wide and deep semantic field in the space of multidirectional knowledge, images.

Comparison of semantic associations with certain initiating words (thinking triggers) “before” and “after” studying a topic or a course of lectures, practical exercises, reflects changes in students’ ideas, for example, about the object of study, indicates the development of thinking, the birth of new knowledge and meanings.

The objective part of the description of the method is that at the first stage, students are asked to select semantic associations, that is, words related in meaning to the word initiators in accordance with the topic of the lesson in the allotted time (60 seconds). Words initiators are offered by students. The subjective part is determined by the emotional and evaluative component of the teacher’s activity, the ability to create a situation of success, cognitive interest. It is an individual trait and depends on the personality of the teacher.

The connections that arise in the human mind are of an associative semantic nature, they can make up not only individual words, but also a chain of interrelated meanings, key words and concepts.

Associations are divided into a group of the first order (the most obvious connections), which is formed at the first stage in a time pressure situation (before studying the topic) and the second. Second-order associations are logical connections between events, objects, phenomena and facts found by students after an active, purposeful mental activity based on the development of new knowledge, reflections and human experience.

Usually, first-order associations represent an enumeration of familiar, superficial associative words. However, their quantity and quality differ from person to person. For example, a lot of first-order semantic associations arise on the word - the trigger of thinking “apple”: spring, autumn, photosynthesis, tree, juice, vitamins, little time and others. On the phrase “body cell” or “immunity”, we see completely different associations associated with biological science.

It is important to notice the change in the nature of semantic associations after mastering the course of classes at school and university, when more conscious associations of the second order appear. For example, in our example, students have such new associations: Newton, the apple of discord, the food industry, labor, shake the apple tree, “Apple trees in bloom ...”, still life, apple pie, cook jam, apple Spas, export - import, Michurin, portrait from fruits, Adam and Eve - the bible, the smell of apples, semantic association, brain explosion, interesting, classwork and others. Associations of a higher order to the word initiator - body cell are associated with biology, medicine, technology characteristics, education, history. Some of the associations expressed by students at the first stage are also repeated.

For a visual demonstration of individual educational changes at the workshop in the course “methods of teaching biology”, graduate students compared associations of the first and second order in high school students according to the following scheme. 1) quantitative changes in words and phrases were determined (the breadth of the field of associative links). 2). The directions of semantic associations associated with the emergence of new phrases (noun and verb, adjective), educational paraphernalia, multidirectional scientific connections and concepts, as well as the activities of students in the classroom were singled out. 3). The appearance of generalizing associations, hypothetical, emotional and evaluative.

After training, there is a noticeable change in the breadth and direction of associations, they become multidirectional, intersystem, generalizing, predictive. As our studies have shown, the breadth of the associative field in individual work for every fifth high school student during the formation of biological literacy increases almost 2 times, for some - 3-4 times. Less noticeable changes were also

observed. The more associative links a person can identify, the more he is capable of knowledge integration, generalization, system-network thinking.

It is known that the breadth and variability of associations are signs of the development of systemic and predictive thinking (Sheffer, 1997; Regush, 2003). Their use initiates active mental activity, facilitates the development of hypotheses, and allows a multilateral consideration of linear or related system-network processes (educational - historical - biological).

A comparison of semantic associations of the second order shows quantitative and, most importantly, qualitative differences from those that are characteristic of the ascertaining (first) stage. They reflect the emotional attitude to the process of association, activate the rational, semantic component of learning. Usually, before using the method, students are informed of its developmental goal, which serves as motivation for completing tasks.

The method aimed at the development of semantic association can be used in individual and group work. In the latter case, it becomes interactive, since it is carried out in the activity learning process. In the group form of work, the associations of one person are a trigger for the emergence of associations in others, and the meanings of one student can be enriched with the meanings of another.

When using the method and the group form of work, associations appear that are almost uncharacteristic in the individual performance of the task. For example, “different opinions”, “stream of thoughts”, “argument” and others that characterize the process of association itself. Thus, there are associations, a new direction and a double meaning associated with the object and thinking about it. This feature of the method, associated with the use of group work, indicates a developmental nature, an increase in the productivity of learning in a didactic system on an integrative basis. This method can be used not only in the education of students, but also to develop an understanding of interactions in any area of life, including private life, as well as memory at any age. The great role of semantic associations in the development of the human lexicon is known.

The formation of new semantic associative connections by students in learning contributes to a more complete and deeper understanding of certain relationships, processes, meanings, connections that exist in the real picture of life. All this will allow future specialists to become more successful in life and professional activity.

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模因在现代互联网传播中的作用

FUNCTIONING OF MEMES IN MODERN INTERNET COMMUNICATION

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摘要。本文讨论了模因在互联网交流空间中的功能特征。尤其是互联网和社交网络上的交流，决定了现代语言人格的言语行为特征，也让你认识到语言系统进一步发展的特征和前景。模因是现代交流的一个组成部分，这使我们能够将它们视为一个独立的交流单位。本文还根据形式和语义原则对模因进行分类。

关键词：模因、互联网传播、社交网络、文本克里奥尔化。

Abstract. *The article deals with the features of the functioning of memes in the communicative space of the Internet. Communication on the Internet and social networks, in particular, determines the features of the speech behavior of a modern linguistic personality, and also allows you to identify features and prospects for the further development of the language system. Memes are an integral part of modern communication, which allows us to consider them as an independent communicative unit. The article also presents the classification of memes according to the formal and semantic principles.*

Keywords: *meme, Internet communication, social networks, text creolization.*

The very idea of the existence of fragments of information, cultural ideas that are transmitted from one person to another was noted as early as 1976 [1]. Subsequently, the meme was defined as part of the ideological code that spreads in the information media environment and reflects the events taking place in society [2]. However, it was with the advent of the Internet and the ability to quickly disseminate information that memes began to gain popularity: users began to create funny pictures with captions, short videos and funny texts, which quickly became widely recognized, became viral.

Today, memes are an integral part of our online lives. They are used to express emotions, comment on current events, or just for fun. The most general definition of a meme from the point of view of communication is the following: memes are

communicative fragments that have distinctive features, are used in communication as integral units and have specific functioning, are actively distributed and used by native speakers [3: 214].

The meme as a communicative unit has a plan of expression and a plan of content. The plan of expression serves to convey information and consists of verbal and visual components. The content plan is directly and indirectly expressed information, a structured fragment of reality, which is the subject of the message.

The basic content of a meme and the basic visual plan are formed at the time of creation and are usually quite stable in terms of semantics and creolized connection. However, the visual component most often represents a non-transformable basis, which allows you to come up with many options for captions for the same picture, while maintaining the basic semantic message. This fact has led to the emergence of online generators that allow you to create memes using a ready-made template or using your own images (for example, meme-arsenal.com, etc.), as well as a special tab for many online graphic editors that allow you to create memes based on the proposed image catalog.

For example: the “agreeing cat” meme, which appeared back in 2015, has been successfully preserved and is still used due to the universality of semantics and construction. In the original version, it was proposed to distract a woman from bad thoughts and the meme looked like this:



Figure 1. Meme “Agreeing cat: Ikea”

Let’s go to Ikea to choose new bedding. And wineglasses? And wineglasses.

Since in this case the visual component of the meme makes it possible to divide it into four interconnected parts, not only the verbal component began to undergo transformation during the further functioning. Since the first animal is larger and darker in color than the second, it is perceived as a male animal - a cat, and the second, lighter and smaller in size, is associated with a female animal - a cat, the phrases are usually lined up as a dialogue of a couple: men and women. From the point of view of the language, the scheme looks like this: *a proposal to do something - a question - an answer to the question asked with consent*. The frequency of using the language question-answer construction allows us to talk about its increased demand in communication. It should be noted that the visual component is also very significant: the expression of the muzzle in cats is read as question-answer non-verbal signals, due to which the meme received many options for captions for four “frames”. The possibility of frame-by-frame use allowed the development of dialogues between a cat and a cat, the basic semantic message remains unchanged: the cat always agrees at the end. For example, silent consent:



Figure 2. Meme «Agreeing cat: food»

Shall we see something tonight? Fine. Let's go and see what we have to eat.

In this example, there is a language game: “*let's watch something at night*” can initially be interpreted as “*let's watch at night (before going to bed)*” - a movie, TV series, program, etc. In the third frame, a clarification takes place: «*let's see*»

is used in the meaning of «look» for what we have from food, what could be eaten at night before going to bed. The basic semantics is preserved in the last frame: the “agreeing cat” slightly covers its eyes and, due to this, non-verbally conveys consent to see what could be eaten before going to bed.

The opportunity to become a meme is received by statements with the most generalized semantics, which allows them to be used in a wide variety of situations. So the opposition “expectation - reality” (“how do you think you look” - “how do you really look”) is so universal that it was used in the early twentieth century in the Wisconsin Octopus magazine, it is successfully used now and has Lots of visual options.

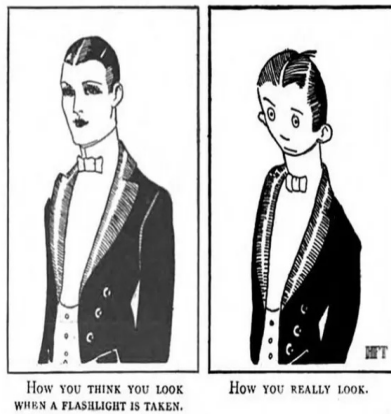


Figure 3. <https://trends.rbc.ru/trends/social/641011769a794761e6b2e155>

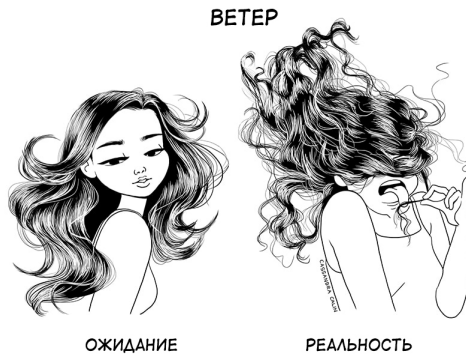


Figure 4. «Expectation - Reality: Wind» <https://tapas.io/episode/1829539>



Figure 5. «Expectation - reality: congratulation»

https://webpulse.imgsmai.ru/imgpreview?mb=webpulse&key=pulse_cabinet-image-27bd8e05-3a80-499f-b61c-509d0db69f08

The use of a certain meme can express a social position, beliefs and prejudices, likes and dislikes, positive and negative emotions. Indirectly, the use of a certain meme may indicate gender, age, or field of activity. It should be taken into account that the use of a meme in the process of communication and adequate semantization requires a certain level of communication skills, as well as cultural experience that unites the addressee and addressee of the message.

So in 2023, the film “Barbie” (Warner Bros. Pictures.) was released, in which the actor Ryan Gosling starred, and after the release of the film, a series of memes immediately appeared on the screens, comparing the images of the actor in the film “Barbie” and the neo-noir crime thriller “Drive». Since these images are visually completely opposite, this allows them to be used to emphasize the contrast. However, for a more complete semantization and understanding of the meme, it is necessary not only to compare the color scheme and non-verbalism in the presented frames, but also to know the plots of these two films, where the actor plays the role of a puppet glamorous, carefree, talkative Ken (“Barbie”) and a stern, gloomy, silent, nameless Driver, who works as an auto mechanic and stuntman during the day, and delivers robbers at night («Drive»).

For example:



Figure 6. “Ryan Gosling” meme

<https://mempro.ru/upload/000/u1/7/6/raian-gosling-popal-v-memy-v-rol-i-novo-go-kena-img-62add2d3eed19-big.jpg>

The meme emphasizes that the clothes in this case will be bright and festive, like every day of life in Barbieland, but the socks get a different fate: the harsh dark reverse side of the “lower world” in shoes, perhaps they are not washed every day. Thus, the external connotations that complement the meaning of the meme are built on associative rows that allow us to detail the socio-cultural space and the constant reality - the world that surrounds us.

Before becoming an independent element of communication, generating various meanings and interpretations, a meme goes through a certain development cycle:

- 1) origin: accidental or intentional construction of a meme;
- 2) development: reposts, development of connotations, partial transformations of the content plan and the meme expression plan;
- 3) fixing the meme in the communication system or its death, oblivion.

In the course of its formation, a meme can acquire a variety of interpretations and connotations that will accompany its use. At the moment, memes are actively used in Internet communication, reproduced in social networks, distributed through blogs and media. So in the social network «VKontakte» there are a large number of publics, the content of which consists exclusively of memes.

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宗教禁令的具体细节

CONFSSIONAL SPECIFICS OF RELIGIOUS PROHIBITION

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注解。本文致力于探讨世界主要宗教——基督教、伊斯兰教和佛教——实施禁令的特点。事实证明，禁令作为一种指令性言语行为，在任何教义的宗教价值体系中都占据着主导地位。已经确定的是，任何宗教中的所有此类指令行为都以略有不同的禁令为目的，旨在规范社会中的某些关系群体：神与人、人与人以及人与内部的世界观和态度的关系。宗教禁令的方向向量有所不同，而基督教和伊斯兰教则关注神人关系和人人关系群体，而人是一种内在的世界观和态度。宗教禁律指向的载体有所不同，基督教和伊斯兰教侧重于神人关系和人人关系，佛教则提出人的关系意义——内在世界观和世界观。

关键词：佛教、指令性言论行为禁止、伊斯兰教、世界宗教、动机、秩序、言论行为、规范和价值观体系、地位标记、地位中立、

Annotation. *The article is devoted to the consideration of the features of the actualization of the prohibition in the world's leading religions - Christianity, Islam and Buddhism. It is shown that the prohibition, acting as a directive speech act, occupies a leading place in the religious value system of any creed. It has been established that with a slightly different set of prohibitions, all such directive acts in any religion are aimed at regulating certain groups of relations in society: the relationship God-man, man-man and man-internal worldview and attitude. Some differences in the direction vectors of religious prohibitions are revealed, while Christianity and Islam focus on the group of relationships God-man and man-man, and a man is an internal worldview and attitude. Some differences in the vectors of the direction of religious prohibitions are revealed, while Christianity and Islam focus on the group of relationships God-man and man-man, Buddhism puts forward the significance of the relationship a man - inner worldview and worldview.*

Keywords: *Buddhism, directive speech act prohibition, Islam, world religions, motivation, order, speech action, system of norms and values, status-marked, status-neutral,*

The prohibition is represented as a directive incentive speech act aimed at preventing or stopping the commission of an undesirable action. According to Ya.V. Borger, the prohibition is “a speech act of a negative reaction, combining an impulse and a prohibition, uttering which the speaker does not allow to perform or demands to stop an action (verbal or non-verbal) that has already begun by the time of speech” [Borger, 2004, p. 11]. E.I. Belyaeva considers the ban to be a “negative form of order” [Belyaeva, 1992, p. 47].

The main feature of the speech act of prohibition is that it does not directly induce the addressee not to perform the action, but just causes, generates deontic impossibility of performing this action.

The effectiveness of the speech act of prohibition stems from the presumption of “superiority” of the addresser who holds a higher position compared to the addressee. In this case, the situation of prescription and prohibition is similar to the situation of order. Such position perfectly demonstrates situation of a religious prohibition, which comes from a person who initially occupies a high position in the hierarchy - The Almighty, whom a person has no right to disobey.

V.I. Karasik distinguishes “status-marked (orders, demands, requests, prayers) and status-neutral speech acts (statements, narratives, descriptions) prescriptions and prohibitions” [Karasik, 1991, p. 119]. Status-marked speech acts imply an obligatory reaction of the addressee, while status-neutral ones do not imply such a reaction. As a rule, the addresser of a ban has a higher status. In some cases, the ban is issued in the situation of social equality of participants of communication and, in this case, the ban can be transformed into a recommendation or an advice.

“Cognitive signs of the prohibition are: the categorical form in which the impulse to perform a specific action is clothed; the obligatory performance of this action for the addressee; the higher status of the addresser; the benefit of the action for the addresser” [Omelchenko, 2020, p. 481].

The most important feature of the act of prohibition, as a type of a demand, is that it is predominantly direct, acting as one of the subspecies of the directive act of demand. Being one of the types of requirements, prohibitions, in their turn, are heterogeneous in content.

The system of prohibitions is the central component of the system of moral and ethical norms of any world religion. It is interesting to note that with to a certain extent the goal any religious system is to unite the followers of a given religion in faith, provide spiritual support, reveal the need to comply with moral and ethical standards in order to get a normal existence in the society - each religion sets its own norms and requirements, as well as develops its own system of prohibitions to regulate human behavior.

To the main functions performed by any religion refer the following: regulatory (religion regulates the behavior of people in society), ideological (religion forms

a picture of the world and develops a system of values), compensatory (religion helps a person to cope with difficulties and psychological stress), communicative (religion provides communication of the believers), integrating (religion helps to rally adherents of one faith (acting as a factor in the integration and social stability of society), cultural (religion contributes to the preservation and development of social and cultural heritage, itself being a part of such heritage).

The basis of the Christian doctrine is the Holy Scripture (Bible) and Sacred Giving - the Books of the Old and New Testaments. The main Christian dogmas are: the dogma of the trinity of God, the dogma of the incarnation and the dogma of redemption.

In Christianity, moral standards are addressed to the internal motivation of a person. Christianity, as any other religion, is built as a system of norms and prescriptions according to which a person must build his life and, at the same time, prohibitions outline the boundaries of acceptable behavior. Any attempt of going beyond these limits (limits of prohibitions) automatically entails certain punishment.

Main bans in the Christian religion are verbalized in the Sermon on the Mount (Ten Commandments), contain the foundations of morality and form the moral law. The first four commandments outline the duties of a person in relation to God, the next five define relationships between people, and the last calls for purity of thoughts and desires: “I am the Lord your God; Thou shalt have no other gods before Me. Do not make for yourself an idol or any image of what is in heaven above, what is on the earth below, and what is in the water below the earth. Don’t worship them and don’t serve them; for I am the Lord your God, a jealous God, punishing the children for the guilt of the fathers to the third and fourth [kind] who hate Me, and showing mercy to a thousand generations to those who love Me and keep My commandments. Do not take the name of the Lord your God in vain; for the Lord will not leave without punishment the one who pronounces his name in vain. Remember the Sabbath day to keep it holy. Work six days, and do all your work; and the seventh day is the Sabbath of the Lord your God: you shall not do any work on it, neither you, nor your son, nor your daughter, nor your servant, nor your maidservant, nor your livestock, nor the stranger that is in your dwellings. For in six days the Lord made heaven and earth, the sea, and all that is in them; and rested on the seventh day. Therefore the Lord blessed the Sabbath day and hallowed it. Don’t kill. Don’t commit adultery. Don’t steal. Do not bear false witness against your neighbor”.

The prohibitions contained in the commandments are expressed briefly and are limited to minimum requirements, giving a person maximum freedom and defining boundaries that cannot be and mustn’t be crossed.

In Islam, prohibitions are norms that define specific actions as prohibited (haram); violation of prohibitions entails not only legal, but also religious responsibility. The system of prohibitions in Islam is more complex and regulates not only the behavior and moral standards of the believer, but also his position in the society and relationships with others. The most stringent prohibitions established by the Quran are: the prohibition of worshiping anyone other than Allah, the prohibition of disrespect to parents, the prohibition of disobedient husband, the prohibition of unlawful killing, the prohibition of adultery, the prohibition of theft, the prohibition of perjury, the prohibition of breach of obligations, the prohibition of usury, the prohibition to use certain means and products, the prohibition of gambling, sacrifices for idols, divination and witchcraft.

Islam has a detailed system of haram; two types of it are distinguished: haramzulmi (prohibition of actions which harm people) and (prohibition of actions which harm only a person himself, for example, the use of unlawful products). In addition, in Islam, everything that contributes to the commission of haram is already haram, and anyone who contributes to this is recognized as sinful.

Buddhism is the oldest of the three world religions. The central idea of Buddhism is the idea that both a life filled with pleasures and a life filled with suffering are equally far from the right path; the right path lies in the middle (this is the path of self-deepening in order to get acquire the knowledge of the truth, the path leading to peace and enlightenment of the spirit). Buddhism is based on four truths: the doctrine of suffering, the causes of suffering, the cessation of suffering, and the path to the cessation of suffering. “Righteous Faith, Righteous Determination, Righteous Words, Righteous Deeds, Righteous Living, Righteous Aspirations, Righteous Thoughts, Righteous Contemplation” - following this “eight-fold path”, a person reaches perfection and plunges into nirvana.

There are no strict prohibitions in Buddhism, but there are recommendations not to do 5 things: do not kill, do not acquire things, do not lie, do not commit adultery and do not use substances that intoxicate the mind.

Despite some differences in prohibitions of various world religions, they all regulate relations in the society. These can be relations of several types: a) relations between God and a man; b) relations between people in society; c) inner worldview and attitude of a person to himself and his existence. Moreover, it is interesting to note that different religions focus on a certain group of relationships. Buddhism gives priority to the relations of the third group - emphasizing the regulation of a person's inner worldview and his attitude towards himself and believing that inner harmony is the basis of well-being and the attainment by a person of the highest good – nirvana. Islam emphasizes the importance of relationships between members of a society, as well as the relationships between the Almighty and a man. Christianity equally recognizes the significance of all the above men-

tioned relations and therefore contains prohibitions which regulate all aspects of human life.

In modern conditions, the role and significance of religion and creed in social life is increasing. Initially, religious norms and principles laid down in its basis become the basis of moral, ethical and a number of legal norms by which society lives and adheres. That is why religious norms and principles are put at the forefront in modern society, and that invariably increases a person's interest in religion as a powerful moral regulator.

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留学生医学概况词汇教学

TEACHING THE VOCABULARY OF THE MEDICAL PROFILE OF FOREIGN STUDENTS

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抽象的。文章分析了外国医学生教材中引入特殊词汇的原则，并提出了最有效的词汇教学方法。事实证明，外国医学生专业交际能力的形成是以语言和言语能力的发展为基础的。确定在语言能力的基础水平（A2）上，建议在语篇前、语篇前和语篇后任务中呈现的言语活动类型的相互关联教学的基础上引入专业词汇。

关键词：专业语言；特殊词汇；交际能力；言语活动的类型；俄语作为外语。

Abstract. *The article analyses the principles of introducing special vocabulary in textbooks for foreign medical students and presents the most effective methods of teaching this vocabulary. It is proved that the formation of professional communicative competence in foreign medical students is based on the development of linguistic and speech competence. It is determined that at the basic level of language proficiency (A2) it is advisable to introduce specialised vocabulary on the basis of interrelated teaching of speech activity types presented in pre-textual, pre-textual and post-textual tasks.*

Keywords: *speciality language; special vocabulary; communicative competence; types of speech activity; Russian as a foreign language.*

In modern methods of teaching Russian as a foreign language (RKI) there is a constant active search for new methods and tools of teaching Russian. At the initial stage of teaching foreign medical students, priority attention is given to communication in everyday and social spheres (in a shop, transport, dormitory, pharmacy, airport, doctor), which helps to remove the language barrier in the first months of stay in Russia. The level of foreigners' mastering of the speciality language depends on successful mastering of the Russian language in the everyday sphere, as the Russian language is the main means of forming professional competences of future medical students at the 4-6 courses. The language of speciality

is “an aspect of language teaching that provides educational, scientific and professional communication when obtaining a speciality in an educational institution in the studied language” [1, p. 360] [1, c. 360].

Lexical units related to the subjects of biomedical profile - chemistry, biology, anatomy, it is rational to include in the learning process in the second semester within the framework of the basic level of Russian language proficiency. The study of special vocabulary in RKI classes is traditionally based on the text, which is the main means of teaching the speciality language. The task of a Russian language teacher is to introduce and consolidate new vocabulary by means of lexical and grammatical tasks aimed at comprehension and understanding of special texts and subsequent modelling of real situations of professional communication. Work with new lexical units is traditionally based on: 1) presentation of the introduced vocabulary with parallel translation into the learner’s native language or an intermediary language, for example, English; 2) mastering the vocabulary by means of solving pre-textual tasks that remove lexico-grammatical difficulties arising when working with the text; 3) reading a text on a speciality with subsequent generation of own utterances according to speech models using the learnt lexical units.

The aim of this article is to present the most effective methodological techniques and ways of practising medical special vocabulary in mixed-format RCT classes. Let us consider the principles of introducing new professional vocabulary into the learning process on the material of educational and teaching aids for foreign medical students. The textbooks we analyse are thematically related to the basic disciplines of the medical profile, which are included in the curricula of the specialties “Medicine” and “Dentistry”.

The ways of lexicon semantisation are determined by such factors as the level of language proficiency, stage and purpose of learning, type of lexicon (abstract, concrete) [4, p. 34]. The analysis of textbooks published over the last 5 years for foreign medical students allows us to conclude that the presentation of special vocabulary in textbooks is presented in two ways (in brackets we will indicate the level of language proficiency): in some textbooks (N. A. Ranneva (A1. A. Ranneva (A1), L.A. Linnik (A2), V.B. Kurylenko (B1)) the grammar-translation method of introducing new vocabulary through the intermediary language - English - dominates; in other manuals (N.A. Ranneva (A2-B1), V.N. Dyakova (level B1), M.E. Budko (B1)) the new vocabulary is introduced through the intermediary language - English. In other manuals (N.A. Ranneva (A2-B1), V.N. Dyakova (level B1), M.E. Budko (B1)) new vocabulary is introduced in an untranslated way on the material of original medical texts on the basis of grammatical models and systematisation of vocabulary.

Didactic material in the first type of manuals [6, 7] is organised in such a way that the translation method is combined with the non-translation method: the man-

uals contain pictures, tasks for identifying synonyms, antonyms, word nests, correlation of a picture and a word, distribution of words into thematic groups, which is an effective way to practice new vocabulary. However, in all the textbooks under consideration there is practically no such type of receptive speech activity as listening, which is the main type of learning activity (listening to lectures), as it is the basis for the formation of writing skills (making notes) and speaking skills (constructing monologic and dialogic speech). Only the textbook by L.A. Linnik presents tasks for listening and speaking, working out the written practical activity of a doctor, reading texts are offered, which can also be listened to or viewed due to the QR code system [7].

It should be noted that the majority of general Russian language teaching aids are compiled taking into account the use of modern information and communication technologies (“Russian Language: 5 Elements”, “Hello, Russia!”, “Russia - My Love”, etc.), which are aimed at practising all types of speech activity and allow to increase the effectiveness of the learning process. To date, ICT-based teaching aids of professional orientation, namely for medical students, are insignificantly represented, which necessitates the development of modern multimedia-type aids [8].

As an example, let us consider the introduction of new vocabulary on the topic “Musculoskeletal system. Functions of the object” (basic level of language proficiency). At the stage of pre-textual work we offer tasks to identify students’ background knowledge, improve their listening skills, and determine the meaning of words by analysing word composition. Here are examples of tasks:

Task. Look at the illustrations and tell which ones relate to the text entitled “General Osteology” and which ones do not.

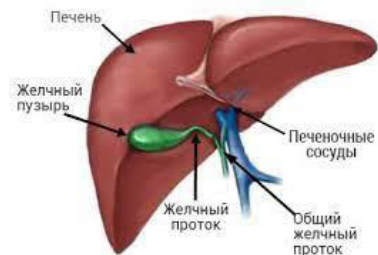


Figure 1

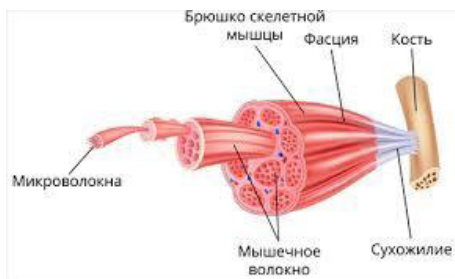


Figure 2

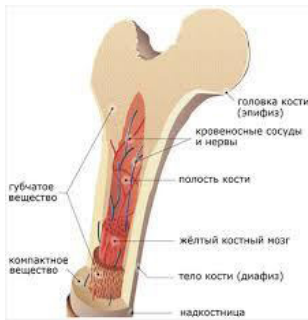


Figure 3

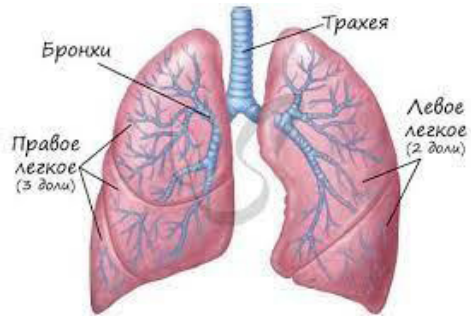


Figure 4

Task. Match synonyms to the following common words found in the text. Use the material for reference.

Architectonics, move, damage, articulate; deposit, protect, attach, locate, delimit, penetrate, form, deprive, enduring, outside, predominantly.

Words for help: structure (building), harm, connection, movement; to store, to be in, to fall into, to protect, to join, to separate, to appear (arise), to forfeit (lose), strong (dense), on the outside, mainly.

Task. Form adjectives from the given nouns with the suffixes -N-, -OV-/-EV-, -ONN-. Make three word combinations with the obtained adjectives on the model: adjective + noun.

Suffix -N-: joint, bone, back, chest, vertebra, protection, support.

Suffix -OV-, -EV-: pelvis, urine, brain, fat.

Suffix -ONN-: antigravity.

The pre-textual stage of work is aimed at primary perception and understanding of the text.

Task. Look at the illustrations in the text and say what parts the musculoskeletal system consists of (grammatical model WHAT is made up of WHAT).



Figure 5

Task. Read the text and divide it into meaningful parts. Find sentences in each part that express the main idea.

Post-text tasks are intended to determine the degree of understanding of the text and the formation of professional communicative competence, so these tasks practise listening and speaking skills.

Assignment. Familiarise yourself with the infographic. What functions does the human skeleton perform (grammatical model WHAT function performs WHAT function)?

Sample: The human skeleton performs a motor function.

Task. Listen to a fragment of a video from the Foxford Online Learning Centre about the musculoskeletal system. Compare the text you read and the content of the recording by answering the following questions.

1. Which term “musculoskeletal system” or “musculoskeletal system” is better to use and why? Which term is used in the text?

2 Which skeletal functions are mentioned in the video and which are only in the text?

3 What is the musculoskeletal system made up of? Does the text contain information about it?

Digital learning resources: Wardwall.net, LearningApps.org, Quizlet.com, as well as the electronic educational system on the Moodle platform allow to optimise the process of memorising new vocabulary [3, p. 98].

Thus, the introduction of special vocabulary in Russian language classes increases students’ motivation to learn the language and contributes to the formation of professional communicative competence of a future specialist. The analysis of

textbooks on the language of medical speciality shows the necessity to develop multimedia-type textbooks, which should present all types of speech activity. At the pre-textual stage of work with special vocabulary the main attention should be paid to auditory pronunciation skills, word semantisation through word formation, illustrative material and construction of sentences according to grammatical models. At this stage, it is possible to consolidate the learnt vocabulary through the use of digital learning resources.

The dominant type of speech activity in mastering the speciality language at the basic level is reading. Therefore, the pre-textual stage of work involves familiarisation with the creolised text, highlighting the main information in it. At this stage students learn to perceive special vocabulary in context. It is necessary to immerse the learner in a professional speech situation at the stage of post-textual tasks, where students improve their skills in working with foreign language vocabulary using audio texts as an example, and discuss the problem in groups or pairs.

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DOI 10.34660/INF.2023.83.28.128

采用比较方法看待 SCO 视角的经验
**THE EXPERIENCE OF A COMPARATIVE APPROACH TO THE
PERSPECTIVE OF THE SCO**

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抽象的。文章中，作者试图通过比较的方法，对上海合作组织成员、观察员和对话伙伴的多元文化构成进行思考，思考其发展之路。对丝绸之路的比较历史分析被用作上合组织解决地缘政治和全球问题的现代宏观区域化的基础。

关键词：丝绸之路、民族大迁徙、上海合作组织、欧盟、跨文化互动、协同、一体化、宏观区域。

Abstract. *In the article, using a comparative approach to the multicultural composition of the members of the Shanghai Cooperation Organization, its observers and dialogue partners, the author tries to consider the ways of its development. A comparative historical analysis of the Great Silk Road is used as the basis for modern macro-regionalization in the SCO's solution of both geopolitical and global problems.*

Keywords: *Great Silk Road, Great Migration of Nations, Shanghai Cooperation Organization, European Union, intercultural interaction, synergy, integration, macroregion.*

Introduction. Following the content of this scientific conference, the author would like to reinforce the meaning of synergy with the Russian proverb “One head is good, but two are better.” If we are talking about international cooperation, then it is not difficult to imagine the entire synergistic effect. As for integration, the author chooses from several of its meanings “the unification of political, economic, state and public structures within the framework of a region, country, world” [5].

Of the main goals of the SCO, it is necessary to note “jointly ensuring and maintaining peace, security and stability in the region”, and from the principles of the “Shanghai Spirit”, two points will fit the topic of the report: “respect for the diversity of cultures and the desire for joint development; non-alliance, non-direction against anyone and openness» [5].

The foregoing points to a framework on which the article will be presented.

Main text. Currently, everything is developing on a global scale, which have already gone beyond the Earth. In order to recall the origins of globalization, it is necessary to make some digression into the historical past.

The basis of globalization, according to Baidarov E.U., was laid by the nomads of the “axial era” [1]. «Axial time» covers the period from the VIII century. BC. until the 2nd century BC. (Karl Jaspers). It is known as a consequence of the Great Greek colonization. Actually the **Great Silk Road** was laid in the II century. BC. (Fig.1)[9].



Figure 1.

It was along the roads of the Great Silk Road that a powerful stream of religious and philosophical views was transmitted. Baidarov E.U. emphasizes the role of Islam, whose religious norms in the 7th century. AD led to cardinal changes in all spheres of life, in material and artistic culture, when anthropomorphic and zoomorphic images were replaced by ornamental motifs [1].

Developed after the Eurasian «Black Death» (XIV century AD), which claimed half the population of Europe and a quarter of the population of Asia; after the Great geographical discoveries, the **Great Maritime Silk Road** expanded the list of countries through which the Great Silk Road passed (Fig. 2)[1].

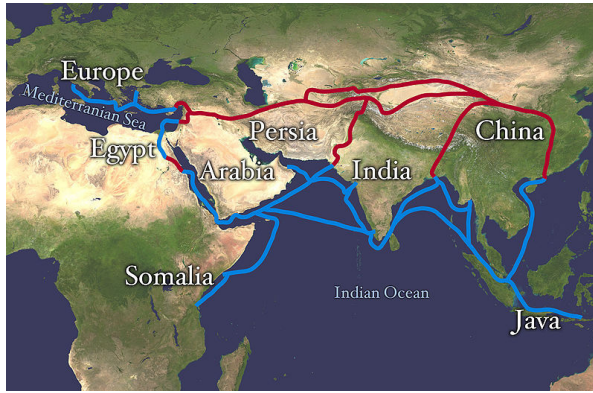


Figure 2.

Thus, the composition of the SCO member countries mainly consists of those countries that are historically located along the entire Great Silk Road, both land and sea. The apparent geographical proximity of most of the SCO members, however, does not cancel the rejection of each other when it comes to religions.

The religious factor has always played a key role in cultural interaction. Here is the time to recall one of the principles of the SCO - respect for the diversity of cultures and the desire for joint development [5]. It is impossible to ignore the sad experience of the division of countries precisely on religious grounds. This is the first thing the author would like to mention.

The second is that in order to compare the historical experience of intercultural interaction, it is worth looking at the experience of the European Union in terms of intercultural interaction or acculturation.

At the beginning of the 4th century A.D. e. Christianity, which had been persecuted earlier, was declared the official religion in the vast territory of the Roman Empire. In terms of time, this is the generally accepted beginning of the **Great Migration of Nations**, although it began in the 2nd century with the migration of the Huns from the depths of the East. Christianity acted as a unifying idea during the migration of peoples who rushed to the borders of the Roman Empire. The effect of Christianization, according to Gumilyov L.N. was that “the universalism of Christianity, in which “there is neither a barbarian, nor a Scythian, nor a Greek, nor a Jew,” took root in the nomadic world, because it did not treat nomads as inferior people and did not lead to submission to a foreign khan, whether “Son of Heaven” or “Vicar of the Prophet”” [3].

The destruction of the institution of the Delphic Oracle - a symbol of ancient culture and the official ban on all local beliefs and traditions on the territory of the Roman Empire at the end of the 4th century AD. in the context of the unifying role

of Christianity among the barbarian peoples, laid the foundation for the formation of modern European states. A disdainful attitude towards everything pagan is also set forth in the main work of Western Christianity - the immortal «Divine Comedy» by Dante [7]. The reckoning of other peoples as «barbarian», and after the Great geographical discoveries - as «wild», also the colonial «manners» remained with the Europeans at the present time.

Hence the unwillingness of yesterday's colonialists to perceive the world as it has become, but it has changed. The modern world is the world of information technologies.

After the Second Vatican Council in the 60s of the XX century, numerous Christian denominations tried to unite under ecumenism, but the Orthodox Church and the Orthodox Old Believer Church consider ecumenism a «heresy of heresies.» From this we can conclude that with such a religious worldview, and it is the main thing for people, one cannot count on complete understanding in intercultural interaction. This cannot but prompt the idea of a comparative analysis of the religious worldview of the SCO member countries, as well as its observers and dialogue partners.

Political and religious changes in the vast territory to a large extent influenced the very content of the Great Silk Road, the direction of trade routes and the nature of cultural relations. Among the Islamic countries - members of the SCO, the majority are adherents of the Hanafi mazbah of the Sunni persuasion. One cannot help but arouse some concern in the media reports that the SCO members have religious disagreements, moments of distrust towards each other due to historically established relations.

Meanwhile, as Baidarov E.U. mentions, “economic globalization is the basis of both past and modern processes of globalization” [1]. There are many global problems in the world, but, perhaps, one of them, according to the author, can unite all members, observers and dialogue partners. It is mainly the coastal countries of Indochina, Hindustan, the Arabian Peninsula and other regions that are threatened by the consequences of global warming with a possible rise in the level of the world ocean, who seek to become partners in the dialogue with the SCO.

The geoid (Fig. 3)[6] clearly shows the geographical features of Eurasia and the zones of possible flooding in case of rising sea levels.

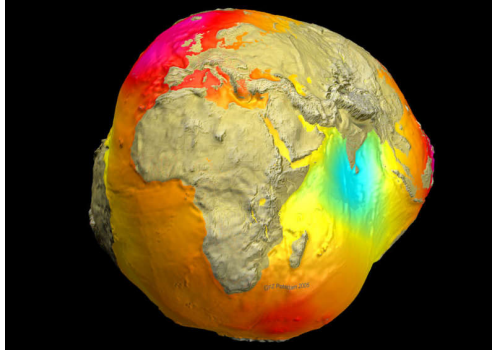


Figure 3.

When solving global problems, according to O. N. Volkova, one can refer to the experience of macro-regionalization in the European Union and Russia. She notes that discussions about the definition of a macro-region are conducted from three perspectives - territorial, functional and institutional. The choice of perspective is important for determining the direction of development. If in Russia macro-regionalization is determined by the administrative boundaries of federal districts, then in the European Union, in macro-regional strategic planning, for example, the regions of the Baltic Sea and the Danube River were taken as macro-regions. As Volkova O.N. writes: “European macro-regions represent a new – intermediate level of EU policy “between the national state and the supranational community”. In this, their status is similar to the status of Russian macro-regions (federal districts)” [2, p. 25].

In European projects, a macro-region is defined as a set of administrative units of several countries that have common characteristics that allow a single strategic approach to be applied to a given territory. This is the essence of macro-regional integration both in the EU and in Russia with its federal districts. Volkova O.N. emphasizes that it can be problematic to separate territoriality and functionality in the processes of regional integration and macro-regional construction, for example, the solution of a complex specific issue for one country requires its solution by the entire European Community [2, p. 26].

The difference in this integration in the EU and Russia is found in the financing of macro-regional strategic plans. The European Union has a well-developed network of funds to support regional integration, while in Russia the Budget Code provides for only three budgetary levels: federal, regional and municipal. It should be taken into account that the uncertainty of the concept of “macroregion” in all countries creates difficulties due to the fact that the methods and mechanisms for planning, controlling and financing macroregional aspects of socio-economic de-

velopment are not sufficiently developed, the institutional organization of managing macroregions is also an unresolved problem [2, p. 28].

At the same time, taking into account the experience of macro-regionalization in the EU and Russia, successes and shortcomings, the SCO countries are able to create their own macro-regions, develop macro-regional strategic plans and sources of funding for their implementation, which the SCO has been talking about in the media for years.

In conclusion, it can be emphasized that the SCO agenda includes not only geopolitical problems and global warming, but also a race in space technologies, nanotechnologies, quantum technologies, artificial intelligence [4], neural networks, the creators of which are already regretting their discovery. The global problem of disposal of space debris is also on the agenda, not to mention the garbage island in the Pacific Ocean, and the problem of global hunger is only getting worse, depending not only on El Niño.

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教师的应对行为。结构和部件

COPING BEHAVIOR OF TEACHERS. STRUCTURE AND COMPONENTS

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抽象的。文章揭示了教师应对行为的结构、构成和特征。作者根据对此问题的大量研究提出了他对应对行为的理解。本文介绍了教师根据社会和个人背景的应对行为的特征。作者指出了在所考虑的每种情况下教师应对行为的类型特征。

关键词：应对行为、背景、结构、挫折容忍度。

Abstract. *The article reveals the structure, components and features of coping behavior of teachers. The author presents his understanding of coping behavior based on numerous studies on this issue. The article presents the characteristics of the coping behavior of teachers depending on the social and personal context. The author notes the typological features of the coping behavior of teachers in each of the contexts under consideration.*

Keywords: *Coping behavior, context, structure, frustration tolerance.*

Coping behavior can be defined as a person's willingness to effectively resolve emerging problem situations. The practical implementation of this approach is implemented through coping strategies, coping tactics, coping techniques and is based on coping resources [3,4].

Professional coping behavior is understood by us as a willingness to effectively resolve emerging problem situations in the course of professional activity [6, p. 23].

Professional coping behavior is studied by us from the point of view of the contextual approach. We have identified three social and four personal contexts of coping behavior.

Social contexts of coping behavior include social-adaptive coping, professional coping, social-cultural coping [5, p. 27].

We have classified axiological, gnostic, behavioral and affective as personal contexts of coping behavior.

The ratio and content of contexts of coping behavior is presented in Table 1.

Table 1

Correlation and content of contexts of coping behavior

Social contexts	Social-adaptive coping	Professional coping	Social-cultural coping
<i>Axiological context</i>	Social adaptation	Social competence	Social culture
<i>Gnostic context</i>	Life skills	Hard skills	Soft skills
<i>Behavioral context</i>	Life coping	Hard coping	Soft coping
<i>Affective context</i>	Defensive or extensive level of frustration tolerance	Intensive or extensive level of frustration tolerance	Alert or intense level of frustration tolerance
<i>Personal Contexts</i>	Metacoping		

The axiological context of coping behavior includes social adaptation, social competence and social culture. In the aspect of professional coping, we consider various aspects of readiness for professional activity as components of the axiological context. Readiness is a certain level of development of personality traits that ensure its optimal functioning. The structure of readiness for professional pedagogical activity has a complex structure. Following the stages of professionalization, it is possible to single out the subreadiness of teachers for professional activities, the actual readiness of teachers for professional activities and full readiness as phases of the development of a teacher’s professional readiness. Professional readiness can be considered as a component of both social adaptation and social competence, and, of course, social culture (including inclusive).

The gnostic context of coping behavior covers a combination of life competencies (Life skills), professionally important qualities (Hard skills) and universal competencies (Soft skills).

The behavioral context of coping behavior contains different variants of coping behavior that help resolve problem situations from the everyday level to professional activities and professional development using coping techniques, coping tactics and coping strategies [7,8].

The affective context of coping behavior includes various levels of frustration tolerance from depressive to alert. They provide stress resistance, the ability to control the emotional state in different situations and prevent professional burnout [1, p. 557].

Each of the social contexts provides optimal adaptation at the appropriate social and professional level of personality development.

The interaction of these contexts forms metacoping as a mental neoplasm that ensures not only the daily existence of a person in society, but also his effective development as a professional.

The teaching profession belongs to the professions of the “man-to-man” type. An essential feature that distinguishes the work of a modern teacher (especially in conditions of inclusion) from other representatives of the professional sphere “person-to-person” is that it is associated with the sphere of personality production. The production of the personality of a person with disabilities (D) in an inclusive society requires special pedagogical skills, the ability to recognize and effectively overcome possible problem situations, as well as continuous professional and personal growth.

The professional coping behavior of teachers has been studied by us for more than a quarter of a century. The general population of the study was more than five thousand teachers at various stages of professional development. The representative sample was 3,000 subjects.

It is possible to note the features of coping behavior of teachers as socially adaptive (Life coping), actually professional (Hard coping) and as an integral part of social culture (Soft coping), including inclusive.

An analysis of the socially adaptive (Life coping) context allows us to conclude that most teachers name material income, opportunities for use (savings, investing in business, receiving dividends, etc.), ecology, social and legal security as problematic situations.

To resolve problem situations, teachers most often used the strategies of problem solving (47% of respondents) and seeking social support (35% of teachers).

Evaluation of the effectiveness of strategies shows a preference for productive strategies (46%) and productive (32%).

The most preferred strategies are cognitive (33%) and behavioral (31%).

The level of frustration tolerance is estimated mainly as detensive (53%) and extensive (28%).

The study of professional coping behavior (Hard coping) shows that the most significant problematic situations are the methodological aspects of preparing and conducting corrective measures with persons with disabilities, interaction with parents (legal representatives) as full participants in the educational process.

To resolve problem situations in the field of professional activity, teachers most often used the strategies of problem solving (43% of respondents) and seeking social support (36% of teachers).

It can be noted that the analysis of the direction of interaction in problem situations (teacher-person with disabilities; teacher-teachers; teacher-administration; teacher-parents (legal representatives)) also has its own characteristics.

The situations “teacher-person with disabilities” and “teacher-teachers” are more often resolved using the problem solving strategy; then in the situations of “teacher-parents (legal representatives)” and “teacher-administration” the strategy

of avoidance is preferred. In the first case, cognitive and behavioral strategies are dominant, in the second, emotional ones.

Evaluation of the effectiveness of strategies also shows a preference for relatively productive (48%) and productive (35%) strategies.

The level of frustration tolerance is assessed mainly as intensive (34%) and extensive (31%).

Analysis of coping behavior data as part of social (including inclusive) culture (Soft coping) allows us to note that the most problematic situations are the following: diagnosis of persons with disabilities, development and implementation of AEP and ABEP, development and implementation of SIDP, work with parents of people with disabilities. The most difficult situations are associated with the vector “teacher - persons with disabilities” and “teacher - parents of persons with disabilities” [7, p.59].

Respondents prefer to use interaction and problem solving strategies, as well as social interaction strategies. Difficulties in mastering and using new patterns of coping behavior are noted, which is manifested in the use of the same type of coping patterns in different situations.

The analysis of the data obtained shows that the most problematic situations - the development and implementation of AEP and ABEP, the development and implementation of SIDP, work with parents of persons with disabilities - are resolved using conditionally strategies for seeking social support and, in part, avoidance. This indicates that these situations are indeed complex and educators use different strategies to resolve them.

Evaluation of the effectiveness of strategies also shows a preference for relatively productive (48%) and productive (28%) strategies.

An analysis of risk factors in professional activities shows that most often teachers note such symptoms as: information overload in professional activities and a high degree of responsibility in professional activities. Quite high ratings have such risk factors as increased physical and emotional stress in professional activities and excessively intense communication in professional activities. The leading symptoms relate to the cognitive sphere, as well as behavioral and affective.

The level of frustration tolerance is assessed mainly as intensive (37%) and extensive (33%).

Thus, a comparative analysis of the coping behavior of teachers allows us to note that different contexts of coping make their own contribution to the development of social and professional adaptation, professional and personal development of representatives of the pedagogical community. Undoubtedly, one can note the specific features of coping in different social and personal contexts. We can fix that teachers (despite the identified problems) manifest themselves much more ef-

fectively in the framework of Life coping and Hard coping than in the conditions of formation and activity in the circumstances of an inclusive culture that is in the process of formation [2, c.31].

The results obtained, undoubtedly, allow to outline the lines of further formation of metacoping among teachers already in the conditions of inclusion, allow to specify the methods, techniques, forms and methodological support of this process [5, p. 101].

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俄罗斯细节：塑造国家认同

RUSSIA IN DETAIL: SHAPING A NATIONAL IDENTITY

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注解。作者在同名爱国主义教育项目的框架内，借助互动游戏“细节中的俄罗斯”，描述了他们在当地社会文化环境形成的基础上形成国家认同的方法。

关键词：民族认同、爱国主义教育、参与、细节中的俄罗斯。

Annotation. *The authors have described their own approach to the formation of national identity based on the formation of a local socio-cultural environment with the help of the interactive game "Russia in details" within the framework of the patriotic education programme of the same name.*

Keywords: *national identity, patriotic education, involvement, Russia in details.*

The problem of national identity formation is relevant for all countries of the world. The multicultural world, the erasure of cultural boundaries, on the one hand, allows us to study the world cultural heritage and develop tolerance, on the other hand, blurs our country's own national identity of the younger generation.

National identity is, first of all, a sense of "nation as a coherent whole represented by unique traditions, culture and language" [1] [1]. National identity can be described as a subjective feeling that a person shares with a group of people about the nation, regardless of their legal status of citizenship. National identity is considered in psychological terms as "awareness of difference", "feeling and realisation of 'we' and 'they'" [7]. We are more interested in the formation of a sense of national identity in the younger generation of Russians as awareness and positive acceptance of the feeling of "we are Russians", which is a significant part of patriotic education of children and youth.

For the purpose of patriotic education of adolescents based on the principles of morality and civic identity, the authors created a patriotic education programme

“Russia in details” [5]. The determinants of the creation of the programme were four problems of modern schoolchildren: the erosion of moral values of adolescents and young people, the tendency for young people to go online, the negative consequences of the inability to process and verify information flows and the lack of modern programmes and teaching aids that take into account the impact of digitalisation of educational and cultural life on the younger generation.

The conceptual approach was chosen as the basis of the programme, in the framework of which patriotic education is considered as an integral part of socio-cultural formation of personality - “the process of a person’s entry into culture, acceptance and appropriation of universal and national values, social norms inherent in a given society, and through a creative internal reassessment of this experience, the formation of one’s own model of behaviour in this society” [4]. [4]. The programme allows to create a local socio-cultural environment in which the interiorisation of national spiritual and moral values takes place. The implementation of the programme “Russia in details” allows to significantly expand the ideas of adolescents and young people about the uniqueness of their native country, geographical, cultural, scientific and other phenomena. Emotionally coloured knowledge obtained in the process of interactive activities at various stages of the programme contributes to the feeling, awareness and manifestation of love for the Motherland, understanding and sharing of one’s belonging to the multinational people of Russia.

The programme consists of 7 modules implemented at four levels of activity: individual, small group, large group and public events.

The first module is the assembly of a map from puzzle-regions. The map is an associative information “anchor” and provides for the development of adolescents’ spatial perception of information (important for the implementation of subsequent modules). The map is assembled on a magnetic board (if available) or a study table from wooden parts of the set “Interactive developmental game “Russia in details”. Each piece represents a separate region. For ease of assembly, the regions of different federal districts are painted in different colours. In the process of assembly, participants apply communication skills, logical thinking techniques, use personal experience and existing knowledge of the geography of their native country.

The second module - intellectual competitions - participation in quizzes of general cultural orientation. Thematic team quizzes are conducted by a teacher or a teacher-organiser in an offline format (optionally using an Internet portal). The quiz uses the collected map of the Russian Federation and cards with quiz questions from the set “Interactive educational game “Russia in details”. The developers have prepared and placed on the Internet portal games quizzes of general

cultural orientation, which are a tool for involving teenagers in cognitive activities. The database of quizzes on the portal is regularly updated.

The third module is intellectual competitions - participation in author's quizzes on various academic subjects, taking into account the educational level of students. Teachers can independently develop and upload a quiz to the Internet portal of the programme, or they can use the bank of quizzes prepared by their colleagues on the portal. The Internet portal provides teachers with an opportunity to create and upload author's quizzes on various subjects based on the developed technology, taking into account the educational level of students.

The fourth module is intellectual competitions - in-school, city, regional and All-Russian tournaments "Russia in Details". Tournaments are the next stage of the game. They contribute to the consolidation of previously acquired knowledge and are a condition for the formation of adequate competitive behaviour of adolescents, the ability to win and lose. In the process of participation in tournaments, teams develop naturally, motivation to achieve success is formed, and experience of working together to achieve results is gained. The tournament consists of two stages: map assembly and quiz using the Internet portal of the game.

The fifth module - creative assignment - offline and online excursions or weekend hikes. Weekend excursions or hikes provide physical touching of objects or items from one or more questions of thematic quizzes in order to perceive the atmosphere of a place, expand and deepen the adolescents' knowledge on the subject. If it is not possible to physically visit a particular place, it is possible to organise an online tour.

The sixth module is a creative assignment - an essay based on the results of joint offline and online excursions or individual/family trips. Writing an essay allows grounding emotions, defining one's attitude, systematising and consolidating knowledge about historical sites, museums, natural parks and reserves visited by pupils. Recorded personal impressions enrich the sensory experience and broaden the readers' understanding of the objects described in the essay. It is recommended to hold essay contests in the second half of the school year. The winners of the competitions are awarded diplomas and bring additional points to their team participating in the tournament "Russia in Details".

The seventh module - project activity of pupils to create their own quizzes. Project activity of schoolchildren on creation of quizzes on the basis of studying geographical and natural features, interesting facts, sights of regions provides development of interest to research activity and formation of a way of scientific cognition of the world in teenagers. Project teams can be created from representatives of one or several classes. Each project team is invited, under the guidance of the teacher (project team supervisor), to study information about the regions of this or that federal district and prepare questions about each region in accordance

with the chosen quiz theme. The prepared questions are uploaded to the Internet portal. It is recommended to conduct the project defence in the form of a team quiz (the methodology is described in the second module), where teenagers will answer questions prepared by their peers.

The uniqueness of the patriotic education programme “Russia in Details” lies in the creation of the author’s methodology of unobtrusive involvement of modern schoolchildren in the process of patriotic education with the help of specially developed methodological tools - a game set and the Internet portal “Russia in Details” (copyright “Vityaz” Centre LLC). Successfully combining offline and online formats, the interactive developmental game is an effective tool for working with teenagers of the “z” and “alpha” generations [2, 3, 6]. [2, 3, 6], satisfying their needs in tactile impressions, technology, the use of “gadgets” and the Internet, as well as corresponding to the peculiarities of information perception, mobility, openness and tolerance. At the same time, it allows to develop attention concentration and working memory, to maintain involuntary interest of participants for a considerable period of time and to train mastery of “manual” and communication skills.

The individual modules of the programme have been piloted in the Tula and Nizhny Novgorod regions, Moscow and Zabaikalsky Krai since the beginning of 2022. The first and second modules of the programme were piloted at the Children’s Railway (Novomoskovsk), the Peresvet interregional historical and cultural forum (Tula region), the “We are in our land - we are home” festival (Tula), and at the headquarters of the All-Russian children’s and youth military-patriotic public movement “YOUTH ARMY” (Moscow), at the All-Russian methodological seminar of the Russian Military Historical Society (Tula), at the All-Russian youth inter-ethnic camp “Dialogue of Cultures” (Saransk), at a summer camp for children and young people from the LPR and DNR (Tula region), at the Embassy of the Republic of China in Russia (Moscow) and at secondary schools in the Transbaikalia, Nizhny Novgorod and Tula regions. The first module of the programme in a special version of the educational and methodological manual “Russia in Details” for blind and visually impaired children was created and tested with the support of the Liana Gurtskaya Foundation “At the Call of the Heart”. The third and fourth modules of the programme have been tested in the Tula region, and are planned to be implemented in Transbaikalia this autumn. The fifth, sixth and seventh modules are being tested for the second year in Education Centre №25 (Tula).

The study of schoolchildren’s involvement in the process of patriotic education was conducted in 2022-2023 using the methods of structured observation and analysis of self-assessment of participants’ emotional state. The sample consisted of 10 groups of 15 people in the age categories of 10-12 years, 12-14 years, 14-16 years and 16-18 years. The mean value of engagement before the game was

50.1%. During the process of assembling the map, the average engagement value increased to 68.6%, at the time of completing the assembly - beginning of the quiz and during the quiz it was 75.05%, by the end of the game it was 81.6%. Comparing the curve of involvement at different stages of the game, the growth of involvement from stage to stage in all age groups was revealed (the significance of changes was confirmed using the Student's t-criterion method for unrelated samples).

The analysis of national identity formation was carried out by means of qualitative analysis of schoolchildren's statements at different stages of the programme implementation and made it possible to identify several trends: 1) interrelation of territory, people and events in the children's consciousness ("When you realise that an ordinary question is connected with a certain territory, you start to perceive it differently"), 2) correlation of knowledge and pride, attachment ("The more interesting things you learn about the country, the more you get attached to it", "I learn interesting facts about Russia and I am even more proud of my country"), 3) emergence of desire to learn more about the native country ("When we were collecting a map, I was surprised that Krasnoyarsk Krai is so big. I wanted to learn more about it"). In turn, the experts noted the systematic approach to the work ("The content of the programme is logically justified, the structure of the programme meets the requirements for programmes of this kind, the stages are clearly defined and consistently outlined, the possibilities of using the programme and formats of work within the declared areas are described in detail, the annexes to the programme clearly demonstrate the results of its approbation". Rector of L.N. Tolstoy TSPU, Associate Professor, Candidate of Pedagogical Sciences K.A. Podrezov) and comprehensive implementation of approbation - availability of a methodological manual for the implementation of the programme ("The programme complies with the legal basis for the implementation of the process of patriotic education and contains interesting, modern practices of work with students. It is important that not only the programme has been developed, but also a methodological manual for its implementation". Director of MBEI CE №25 in the city of Tula, Candidate of Philosophy E.P. Alekseeva)

The results of schoolchildren's engagement studies conducted during the approbation of 1-2 modules of the programme confirmed that the authors of the programme and methodological materials were able to solve a difficult task: to interest, fascinate and offer an adequate and, at the same time, systematic way of obtaining knowledge about the Motherland, creating conditions for an adequate national identity of the younger generation.

In our opinion, the effectiveness of the programme is conditioned by taking into account the age characteristics of modern teenagers, a reasonable combination of educational and enlightening influence, and allows in an entertaining way

to expand the world picture of modern schoolchildren regarding the territorial integrity and historical role of the Russian Federation, its national cultural, natural and historical values, to develop and support the desire to love and be proud of their homeland.

The practical significance of the project is the organisation of a targeted educational impact on younger and older teenagers of the “zet” and “alpha” generations in an interesting and entertaining form, taking into account their age and personal characteristics. In addition, the programme allows to gently bring teenagers out of the online environment into an interesting offline environment and to develop skills of verification of widely available information.

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主观现实空间概念作为高等教育机构多民族环境中跨文化心理研究的基础
**THE CONCEPT OF THE SPACE OF SUBJECTIVE REALITY AS A
BASIS FOR CROSS-CULTURAL PSYCHOLOGICAL RESEARCH IN
THE MULTI-ETHNIC ENVIRONMENT OF HIGHER EDUCATION
INSTITUTIONS**

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注解。提出了一种在民族自我意识背景下研究主观空间的方法。该文章描述了基于民族特定和种族中立内容的拼贴画构建的联想投影技术，并根据其结果对一组亚美尼亚和俄罗斯学生进行了集中采访。这项工作的主要结果是：在两个民族中都发现了两种态度——不拘一格的宽容和以文化为中心。以文化为中心的态度在亚美尼亚群体的受访者中更为明显。俄罗斯集团的态度是不拘一格的宽容。对于符号和图像的选择的争论，在大多数亚美尼亚受访者中以自动的形式表现出来，而在俄罗斯受访者中则需要特殊的反射张力。对这种差异的解释需要对其他族裔学生进行更深入的研究。

关键词：主观空间、民族自我意识、民族符号、文化中心态度、折衷包容态度。

Annotation. *An approach to the study of subjective space in the context of ethnic self-awareness is presented. The article describes the associative-projective technique of collage construction on the basis of ethno-specific and ethnically neutral content and a focused interview with a group of Armenian and Russian students based on its results. The main result of the work: two attitudes were found in both ethnic groups - eclectic-tolerant and culture-centred. The culture-centred attitude was more evident in the respondents of the Armenian group. The eclectic-tolerant attitude was in the Russian group. Argumentation of the selection*

of symbols and images, which in the majority of Armenian respondents manifested itself in the form of automatism, in Russian respondents required special reflexive tension. The explanation of this difference requires a more in-depth study involving students of other ethnic groups.

Keywords: *subjective space, ethnic self-awareness, ethnic symbols, culture-centred attitude, eclectic-tolerant attitude.*

The SCO and SCO observer countries occupy a significant part of Eurasia, have a considerable length of borders that determine their spatial and geographical commonality and many common historical events that have influenced the fate of individual peoples and the population of the continent as a whole. In the processes of economic and cultural integration, much importance is attached to the exchange of students and university professors. In our country, teaching foreign students is a long-standing tradition. At the same time, the issues of adaptation and acculturation remain topical, which is reflected in monographs, conference collections and articles in scientific journals of the past and current years [1, 2, etc.].

The task of adaptation of foreign students can be reformulated into the task of organising a cultural dialogue, the content of which can be generalised cultural symbols, significant historical events and persons, as well as the attitude to the symbolism of globalism and mass culture. This can help to overcome cultural segregation in a multi-ethnic student environment. Such a dialogue needs grounds, means and forms of organisation. Trying to solve this task, we have developed a methodology of explication of those cultural markers that determine the self-consciousness of a person, including his/her ethnic self-consciousness. “Subjective reality,” writes K.V. Martirosyan, “is historically the first subject of psychology, also called soul, inner world, self-consciousness and associated with what is commonly defined as personality. The ideas about the structure of subjective reality are associated with inner space (depth of inner world, breadth of worldview, etc.) and its fluidity, changeability, intensionality and perspective - inner time” [3].

The peculiarity of the subject - the space of subjective reality - suggests the use of low-intervention techniques that do not provoke the manifestation of psychological defences and do not constrain the respondent by the need for an unambiguous response. In addition, we need a methodology that is not sensitive to language barriers. Associative-projective techniques fulfil this requirement. We designed and tested such a technique and used it as a prologue to a group focused interview aimed at clarifying the common and different cultural attitudes and orientations of students belonging to different ethnic groups. Each respondent received a set of 130 4 × 6 cm cards and a 53 × 53 cm piece of heavy paper to create a collage. The sheet of paper was divided into three circles - the centre circle, the middle circle (with four smaller circles) and the outermost circle (with eight smaller circles).

The cards were assembled in a transparent file and a glue stick was placed in the file. It was suggested to place in the centre what is subjectively close, dear, familiar, understandable. In the periphery - what is familiar, but not accepted as their own. One can choose the distance, the degree of remoteness. In small circles on the periphery it is suggested to place what is associatively close to each other in one such circle, and what is far away and even opposite - in different or diametrically opposite circles (semantic nests). We prepared an array of pictures containing mainly images of people belonging to different ethnic, racial and religious groups, portraits of political figures, representatives of mass and media culture, as well as images of representatives of radical movements and their symbols. The same general array included generalised symbols (religious symbols, symbols of pacifism, state symbols), along with “ethnically neutral” images of natural landscapes, logos of world brands as symbols of globalisation of the world economy. And also - pictures from student life in the university where the respondents study (“Club of cheerful and resourceful” and competitions, sports and festive events).

The work was carried out in the Volgograd branch of the Russian Presidential Academy of Management and National Economy with students representing Russian and Armenian ethnic groups. We collected 86 collages. Photos of two of them are presented as examples in the figures.



Figure 1. A sample of an eclectic collage dominated by mass culture images

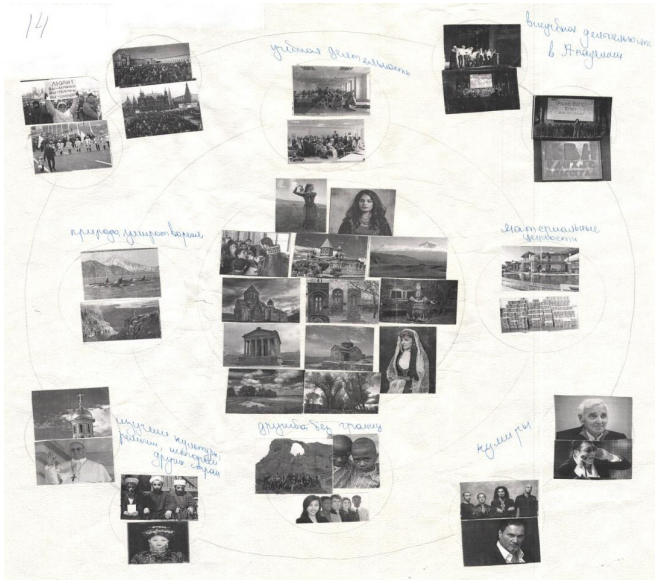


Figure 2. Ethnocentric collage with Armenian symbols in the centre of the collage

Students interested in the issues of interethnic interaction were invited to work in the focus group, provided that one session could be held with a group of 8 - 12 people and that each ethnic group was represented by half of the participants.

Based on J. Kelly's theory of personality constructs [4], we suggested that each participant divide a set of collages (50 of the most clearly structured ones were selected) into two groups on any basis, stating that these groups could be unequal in number. Then each group of collages was divided into two more groups. And so on until one collage remains in each group. Distinctive constructs in the sequence of their production were recorded by participants in special notebooks. Presumably, the constructs were supposed to form a certain hierarchical structure, but it was this that caused difficulties, which became the content of the dialogue.

The group discussion mainly revolved around the argumentation of categories of systematisation of collages, strategies of their differentiation and selection into different groups.

Here is a fragment of the dialogue participants' statements.

“Karine. Wait! Here is what Vigen says... If I am a Christian and there they are - Muslims. I as a civilised person respect their symbols, their prophets, their holidays and their history ... From the Old Testament - the story about the sacrifice

of a son, the story about Abraham and Isaac. And they have Eid al-Adha ... The story of Ibrahim and his son ... The same story in Jews, Christians and Muslims.

Ruben. Oh, my God! Why are you doing all this?

Karine. Then I have to choose. For example, how should I place Ararat, the Temple Mount and Mount Arafat in Mecca? If I'm a tolerant person, I'll put them all in a pile and next to each other, if I'm a Christian... And if I'm a patriot, I'll leave Ararat and leave the rest untouched?

Vigen. And you take chocolate and Coca-Cola and Dima Bilan, and the rest... Although you'll have to correlate Dima Bilan and Charles Aznavour... Or Yakubovich and Petrosyan. But it's not Abraham with Izbrahim (smiles).

Karine. Then no one will understand that I'm a Christian... And about my patriotism or tolerance.....

Ruben. That's why I said that there is no need for religion in these pictures.

Alexei. Or put all religion in one place..." [5].

This is just a small excerpt from the discussion about the role of religious images and symbols in ethnic self-identification. A more complete description is given in our other article [5].

In the future, we envisage approbation of the methodology with the invitation of students of Indian and Chinese ethnic groups, having coordinated the work with teachers-psychologists of medical and pedagogical universities of Volgograd, where students from India and China study.

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DOI 10.34660/INF.2023.26.25.132

十九世纪上半叶莫斯科小资产阶级的种族间和宗教间婚姻
**INTERETHNIC AND INTERCONFESSIONAL MARRIAGES OF
PETTY BOURGEOISIE IN MOSCOW IN THE FIRST HALF -
MIDDLE OF THE XIX CENTURY**

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The petty bourgeoisie is the most mass “indigenous” class in the cities of the Russian Empire: urban commoners, the taxpaying population, who lived off petty trade, crafts, renting housing, gardening, seasonal and other earnings.

In Moscow in the 19th century, the absolute majority of the bourgeoisie were Russian and Orthodox. The bourgeois “society” in Moscow until the 1860s was actively replenished by freed serfs.

The Russian petty bourgeoisie left very few sources of personal origin, so the study of the socio-cultural history of the bourgeoisie in the 19th century had to rely on mass sources. Such sources include metric books, which record baptisms, weddings and burials of the deceased. The metric records of bourgeois marriages in Moscow provide interesting material on the dynamics of social distance between bourgeois and other social groups.

On the basis of a sample of metric books the author created a database on marriages of burghers in Moscow. The sample included 1/3 of all metric records on marriages in Moscow for 1801, 1821, 1841 (CIAM. F.203. Op. 745. Vol.1 №127, 130, 230, 232, 357, 358, 359, 363) In addition, information was collected on weddings on the territory of two of the six forties (church-administrative districts) of Moscow for the following years: 1787, 1801, 1810, 1813, 1821, 1841, 1859. (CIAM. F. 203. Op. 745. Vol.1. №52, 55, 126, 129, 171, 174, 185, 188, 230, 232, 354, 355, 359, 360, 551, 552, 556, 557).

In this paper, the subject of the study are marriages of Moscow bourgeois and bourgeois women with persons of non-Orthodox religion (which for the 19th century is tantamount to non-Russian origin), as well as with representatives of other nations professing Orthodoxy.

Official marriages with non-Orthodox believers (Muslims, Buddhists) were impossible for Orthodox Christians in Russia in the 19th century, while marriages with Christians of other denominations were allowed.

Until the end of the first quarter of the 19th century, the data of metric books on foreigners and non-Orthodox (Christians of other confessions) who married Orthodox Christians were often incomplete and arbitrary. The metric record, as a rule, indicated the religion of the foreigner; the person's country of origin or national-religious affiliation was recorded arbitrarily; for persons who converted to Russian citizenship, there was usually no class identification. By the middle of the century the information of metrics became more organised: with rare exceptions we always have data on the foreigner's nationality, his confessional affiliation, and in the case of non-Orthodox subjects of the Russian Empire also his class.

Among interethnic couples, marriages of Orthodox petty bourgeois women to non-Orthodox men absolutely prevailed. Situations when a Catholic or Protestant woman married an Orthodox burgher were extremely rare. Only two such marriages were recorded. One of them was concluded in the parish of the Ascension of the Lord on Tsaritsynskaya Street (Nikitsky Sorok): in 1801, the master of the painting shop, A. Fyodorov, married a girl whose social status was defined in the metric book as "the daughter of a deceased German". The source notes that the bride converted to Orthodoxy.¹ The second recorded case took place in 1859 in the parish of the Assumption in Kozhevniky (Zamoskvoretzkiy sorok). Alexander Adolfovich Wolf, a Moscow burgher of the Orthodox faith, married a Catholic girl, the daughter of a merchant. In the person of the burgher A.A. Wolf we meet an example of rather deep acculturation. Wolf was not only a Russian citizen and was assigned to one of the urban class "societies" of Moscow, he also professed the official state religion. Wolf's patronymic indicates that he was a first-generation Orthodox Christian. As the study of historian V. Sartor shows, natives of German-speaking countries, including the so-called "Russlanddeutsche" (Germans who converted to Russian citizenship) retained close ties with the German community and continued to be perceived by the Russian environment as foreigners. Accordingly, the marriage circle of "Russlanddeutsche" petty bourgeois in Moscow included foreigners living in the city.

The noted marriages of Orthodox Moscow bourgeoisie with women from families professing Catholicism or Protestantism are separated by more than half a century, which indicates the exceptional rarity of this phenomenon.

Marriage unions of Orthodox bourgeois women with non-believers (Catholics and Protestants) were much more frequent. It can be assumed that the religious and national factor was more significant in the choice of a wife than in the choice of a husband. The memoirist N.P. Rozanov noted the existence among Moscow

¹ CIAM. Ф. 203. Оп. 745. VOL. 1. D. 129. L.66 об.

merchants of the late 19th century of a very tolerant attitude towards the marriages of daughters with “foreigners and non-Orthodox”, and an active rejection of mixed marriages for sons.²

Metric records do not always make it possible to establish the confessional affiliation of foreign grooms. Five marriages of Orthodox petty bourgeois and shop women to Catholics and six marriages to Protestants are recorded.

The nationality of a non-Orthodox spouse is relatively rarely indicated in the source. Among the husbands of Moscow petty bourgeois women are recorded: German (1801 r.)³, British (1801 r.)⁴, Greek (1841 r.)⁵, Italian (1801 r.)⁶, “Hamburg native” (1821 r.)⁷, French (1859 r.)⁸, “native of the Ionian Islands” (1841).⁹

Among the spouses of petty bourgeois women were foreigners who had both converted to Russian nationality and retained the nationality of other states at the time of marriage. For example, in 1859, a Moscow petty bourgeois woman and a “French subject” serving as a dancer at Moscow theatres were married.¹⁰

Marriages of Moscow petty bourgeois women with natives of the western regions of the Russian Empire became more frequent towards the end of the period under consideration. In the samples of 1787-1813 such marital unions are not noted, in 1821 there was a marriage of a Russian burgher with a “Polish subject”¹¹, in 1841 - marriages with a craftsman from Derpt¹² a petty bourgeois from Riga¹³, in 1859 - marriages with a native of Finland¹⁴, a nobleman from Volyn province¹⁵, a nobleman from Volyn province¹⁶.

In addition to the marriage of A. Wolf discussed above, there are two other reported marriages of representatives of the non-ethnic component of the Moscow petty bourgeoisie. In 1859, the Moscow shopkeeper Heinrich Eduard Kaul and the Moscow petty bourgeois Albert Gan, who professed Lutheranism, married Orthodox petty bourgeois women. One marriage took place in the Nikitsky and the other in the Zamoskvoretsky Soroka.¹⁷

² Rozanov N.P. Memories of an Old Muscovite. - Moscow: Russian World, 2004. - pp. 299-300.

³ CIAM. Ф. 203. Оп. 745. VOL. 1. D. 127. Л. 95.

⁴ Ibid. Д. 130. Л. 61 об.

⁵ Ibid. Д. 354. Л. 1078 об-1079; Д. 363. Л. 229 об -300.

⁶ Ibid. Д. 129. Л. 58 об.

⁷ Ibid. Д. 232. Л. 367 об.

⁸ Ibid. Д. 557. Л. 1051 об.

⁹ Ibid. Д. 359. Л. 1138 об.

¹⁰ Ibid. Д. 557. Л. 1051 об.

¹¹ Ibid. Д. 232. Л. 196

¹² Ibid. Д. 359. Л. 582 об

¹³ Ibid. Д. 360. Л. 609 об

¹⁴ Ibid. Д. 557. Л. 563 об

¹⁵ Ibid. Д. 556. Л. 941 об.

¹⁶ Ibid. Д. 551. Л. 85 об.

¹⁷ Ibid. No. 552, Л. 339 об.

Among the persons who married Russian petty bourgeoisie in Moscow in the first half of the 19th century, there were foreigners, as well as natives of the Western regions of the Russian Empire: the Baltic States, Poland, Western Ukraine, and Finland, who professed Catholicism or Protestantism. The occupation or class status of the spouse is known in 8 cases out of 18 mixed marriages of Moscow petty bourgeois women. The labour activity of a considerable part of foreigners and non-Orthodox who married petty bourgeoisie was connected with handicrafts or small business, i.e. marriages were concluded within one economically close polyethnic stratum. The proximity of income and economic activity were factors that could overcome confessional and national separation and lead to interethnic marriages in the petty bourgeoisie.

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DOI 10.34660/INF.2023.66.23.133

英国媒体对 1894-1895 年中日战争事件的反映
**REFLECTION OF THE EVENTS OF THE SINO-JAPANESE WAR
OF 1894-1895 IN THE BRITISH PRESS**

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注解。本文研究了 1894 年至 1895 年中日战争的事件及其在英国媒体中的反映。西方列强的利益，首先是英、俄、法、美，都集中在远东地区。日本的实力增强及其对领导地位的要求不断提高，而中国的实力削弱，导致这些国家之间的关系恶化，从而引发战争。

从一开始，西方列强就积极关注远东事态的发展，尽量不干涉，同时奉行旨在维护其在该地区地位的政策。

关键词：中日战争、英国媒体、国际关系、远东、舆论。

Annotation. *The article studies the events of the Sino-Japanese war of 1894-1895 and their reflection in the British press. The interests of the Western powers, first of all Great Britain, Russia, France and the USA, were concentrated in the Far Eastern region. The strengthening of Japan and its increased claims to the leadership role, and on the other hand the weakening of China, led to the aggravation of relations between these states, which led to war.*

From the very beginning, the Western powers actively followed the unfolding events in the Far East, trying not to interfere, while pursuing a policy aimed at preserving their positions in the region.

Keywords: *Sino-Japanese war, British press, international relations, Far East, public opinion.*

In the late 1880s, relations between China and Japan escalated over the desire of each to increase its influence in Korea.

The Korean peninsula was important to Beijing because it was a possible corridor for foreign invasion of China.

Japan, as well as China, saw foreign presence in Korea as a threat to its security.

Although both China and Japan were interested in the peninsula primarily for their own security, their claims to privileged relations with Korea were strongly contradictory.

The war was launched by Japan in 1894, thanks to the support of the Western powers, above all Great Britain, whose true position was to maintain a leading position in China and an advantage in the Far East.

The events of the Japanese-Chinese war were widely covered in the British press and aroused keen public interest.

On 25 July 1894, *The Daily News of Great Britain*¹ reported the emergence of rumours from Shanghai that fighting has begun between a thousand people and the Japanese. It is reported that “there have been earlier disturbances in Seoul more serious than this, with all the grave consequences which are now apparent, and it seems, observing the seated Japanese in the mansion last night, that there was little fear that the authorities would not yet be able to prevent it.” The outbreak of war between China and Japan is announced.

While *The Daily News* treats the news of the Japan-China war on 25 July 1894 as a rumour, *The Citizen*² covers the outbreak of the war as an accomplished fact. “CHINA AND JAPAN. HOSTILITIES HAVE BEGUN. A telegram from Shanghai reports that hostilities have commenced, troops at the instigation of the Chinese resident at Nagasaki having attacked the Japanese garrison at Seoul, but without success. Another report says that a Japanese cruiser sank a Chinese transport. The Japanese Government apologised for the recent insult to Mr Gardner, British Consul-General at Seoul.”

*The Burton Chronicle*³ reported: “...It was recognised that political relations between the two empires were strained, and that the Tokyo government had made demands of Corte, against which the Calm Peking Boa Network protested most vigorously; but the report that war had actually been declared was discredited by the Chinese and Japanese missions in London, and at the U.S. Embassy in Japan. Foreign Office.” The same paper writes of unsuccessful attempts to resolve the military conflict between Japan and China through the mediation of a British minister, who advised the Mikado government to endeavour to bring the negotiations to a peaceful settlement of the question

*The Echo*⁴ outlines Britain’s position in the Japan-China war. “HAVING RECEIVED A WARNING FROM ENGLAND, Her Majesty’s Government has made it unequivocally clear to both China and Japan that in the event of British interests being violated in the event of hostilities between the two countries, England will take such steps as may seem necessary. At the same time an implicit hint is

¹ *The Daily News*, Wednesday, July 25, 1894

² *The Citizen*, Wednesday, July 25, 1894

³ *The Burton Chronicle* - July 26, 1894

⁴ *The Echo*, Thursday, July 26, 1894

given that so long as due respect is paid to these interests, Her Majesty's Government will take no active steps to interfere in the dispute and will keep aloof from the belligerents." The positions of the United States and Russia, which sought to localise the conflict while not overtly intervening in it and preserving their geopolitical interests, are also examined here.

Thus, we can see that the beginning of the war was covered in the British press in different ways, even regarding the date of the first military clashes, which indicates the lack of information from both the Chinese and Japanese sides. The Chinese were more trusted by European society, so their information was considered more reliable. The Japanese, on the other hand, were not well known to Europeans, and they also had a censored press, so their information about the course of the war was not particularly trustworthy.

On 12 August 1894, The Umpire⁵ reported the first British-mediated agreements between the conflicting parties. "The Foreign Office has stated that the Japanese Government has undertaken to refrain from military operations against Shanghai or its approaches. On the basis of these assurances from me, the Chinese Government agreed not to obstruct approaches to that port. Her Majesty's Government has informed the Chinese and Japanese Ministers that the said undertaking is intended to prevent military operations in the neighbourhood of Shanghai used by ships, whether they come from the north or from the south." Nevertheless, hostilities between Japan and China continued. The Umpire reports battles near Port Hamilton (Port Arthur), Wei-Hai-Wei, at Fuxing and Yuensan, which were successful for the Japanese, although it is noted the Chinese assembled in the battles of Wei-Hai-Wei.

After the first Japanese victories in battle, the British press began to cover the events of the war in greater detail. This was due, among other things, to the Japanese government's decision to allow Western correspondents into the army and to abolish censorship for them.

On 1 September 1894, The Daily News reported on the successful advance of Japanese troops. "It is reported that the Japanese troops landed at Port Arthur early yesterday morning and that they number about seven thousand. No further details of the fighting have yet been received here, and this silence suggests that the Japanese were the victor. What is certain is that the Chinese military command did not plan a decisive attack on Port Arthur. Rather, Chinese attention was directed to the Japanese invasion of Formosa (Taiwan) and the means of preventing it. The large reinforcements delivered to the island last week are reported to have landed safely today, and another transport flotilla is about to depart Chin-Kiang for Formosa, accompanied by a strong escort of warships. A dispatch from Nagasaki states that 74,000 Japanese troops are now in the Corvette. ...The Japanese plan of opera-

⁵ The Umpire, Sunday, August 12, 1894

tions is evidently to destroy the docks and forts at Port Arthur so that the disabled Chinese warships cannot obtain shelter or repairs there, this flight was found to be still in progress when this dispatch was sent by telegraph.... A telegram from Chifu reports that Japanese troops have captured Port Arthur, a Chinese naval port.”⁶

In describing the Battle of Yalu, The Salisbury and Winchester Journal of 29 September 1894 reported: “...the Japanese say they sent their torpedo boats, which destroyed the stranded Chinese vessels, and the Chinese admit it. The Japanese also report that their damaged ships can be quickly repaired on the spot, except for the flagship, which was sent to Sasebo for repairs and was replaced by a steel cruiser. Two Englishmen aboard the Chinese ships were killed in the battle. ...Intelligence from Japan reports that the people are enthusiastic about the war and that 80,000 more soldiers are to be sent immediately to the front for the purpose of capturing the sacred city of Mukden, where the Chinese Emperor has stored immense treasure...”⁷ This information allows us to conclude that each success in battle encouraged the Japanese to fight more battles and added to their confidence in defeating China.

On 15 November 1894 The Echo⁸ reports on the Japanese overland march through Manchuria, their success at the battle of Chinlien and their unopposed entry into San Kwan.

After reports of Japan’s success in the war, despite the fact that China had not yet lost, the British ruling circles began to talk about the coming serious changes in the balance of power in the Far East.

Particular attention in the British press was paid to the process of concluding peace between Japan and China, as the situation in the Far East as a whole depended on its terms.

Lincolnshire Echo 16 April 1894 reported: “CHINA AND JAPAN. CONDITIONS OF PEACE. A Shanghai dispatch, dated today, states that Lee Hong Chang’s son-in-law telegraphs that peace was signed today. The terms are as follows: - 1. Independence of Korea. 2. Japan retains the places won. 3. Japan also retains the territory adjacent to the Liao River. 4. Formosa is transferred irrevocably. 5. Compensation in the sum of \$100,000,000,000. 5. Offensive and defensive alliance. The British steamer Yixang, often called “Taku” by the Japanese when carrying smuggled goods, was captured from Port Arthur to Sasebo, Japan. INTERVIEW WITH JAPANESE MINISTER. A representative of the Press Association today had an interview with a Japanese Minister in London, who said he took badly the information about the signing of the Peace Treaty between Japan and China. The Minister added that there was good reason to doubt the news

⁶ The Daily News, Saturday, September 1, 1894

⁷ The Salisbury and Winchester Journal, and General Advertiser, Saturday, September 29, 1894

⁸ The Echo, Thursday, November 15, 1894

published. According to preliminary information, the Foreign Ministry has no far-reaching official indication that peace has been concluded.⁹ From this report it appears that the information about the conclusion of peace between China and Japan was still premature and had not been officially confirmed.

Overland China Mate reports on the problems of making peace. “PEACE PROBLEMS. Contradictory rumours continue to reach us as to the prospects for peace. We have been informed from Japan by a person who has come into the closest relations with Japanese officials that Japan has not the slightest desire to make definite terms of peace until her troops have entered Peking. Contrary to this, however, there had been for some weeks a general impression (based apparently on reliable sources) that peace would soon be concluded; and we are now informed that an agreement was practically reached on the 13th. The proceedings at Peking have been conducted with the usual secrecy, but as the armistice ends on Saturday, some public announcement of the progress of the peace negotiations is bound to be made shortly. We believe that we express the feelings of the communities in the Far East when we say that all will be sincerely grateful for the end of the war and the return to the normal course of commercial activity. After the fall of Port Arthur we expressed the opinion that Japan would have shown true magnanimity if she had brought the war to an end; and in subsequent attempts at negotiation we think her statesmen, by allowing provocation and thoroughly knowing Oriental perfidy, showed too much irritability in their treatment of the Chinese envoys to establish the opinion that they really desired peace at that stage of the war. They were thus placed in a more favourable position to dictate their terms. As a natural consequence, if we are to accept the statements transmitted from England, Japan’s demands were on an ascending scale. While assuring that no change has been made whether Japan’s demands are reasonable, we have no hesitation in saying that they are not. Japan should be fully commended for her conduct of the war; her soldiers and sailors fought well and in many instances displayed the hallmarks of bravery and dedication; her statesmen generally avoided accusatory or inflammatory speeches, although they had every opportunity to do so. Japan developed a spirit of ultra-ura-patriotism. Her hereditary enemy had been defeated, humiliated, and forced to play the unpleasant role of petitioner before a hitherto despised nation. Surely this is enough to satisfy Japan’s national pride and patriotism. She is now in a position to emerge from the war with honour to herself, but if she makes terms of peace too unreasonable, such as even China could not agree to, and continues to wage war for the purpose of intensification and revenge, prompted by a mere thirst for carnage, the foreign government of the Powers must intervene. It is difficult to determine the point at which intervention would be justified. None of the foreign powers wish to go to war with Japan, but Japanese statesmen or the

⁹ Lincolnshire Echo, Tuesday, April 16, 1895

Japanese people should not take this as evidence of fear or weakness. Japan has proved that she is stronger than anyone realised at the outset of hostilities, but her victory over China is not proof that she is capable of standing up to any of the first-rate Western powers. It has been believed all along that the Western Powers would be forced to intervene when the terms of peace were established; and if those terms proved unacceptable to any of those Powers, Japan is in no condition to start another war. Her finances are strained to the utmost. Her treasury will not immediately be replenished by the Chinese contribution. Most of her troops are in the field and cannot receive any substantial reinforcements; the first signs of the appearance of a new enemy to Japan's claims would certainly be a signal for China to renew the struggle; Japan, except for a few preliminary strikes on foreign outposts at the beginning of the war, would be compelled to withdraw her limited navy to defend her own shores against invasion; and, however well she might resist, her conquest would be a mere question of time. Japanese statesmen cannot be blind to these possibilities, and they certainly will not allow themselves to succumb to democratic impulses. Since the above telegrams were written, it has been reported that Japan has very considerably softened her demands, and that, China has agreed to pay substantial, though modified, compensation and to cede the important Cape of Liaodong with the valuable stronghold of Port Arthur. If they form the real "mutual concessions" on which the peace treaty is based, it will put an end to many questions of international importance, and solve many of the problems and complications which have been invented and clothed in the garb of probability by the press of Great Britain, France, and Russia: but the end is not yet come, and we must await further developments before making a dogmatic statement of the present position in the Far Eastern question. France receives six times as much as she sells to Japan, while Britain gives away seven times as much as she herself receives. Hong Kong alone has three times as much goods as France sells to Japan"¹⁰.

17 April 1895. Lincolnshire Echo confirms the end of the war between Japan and China. "THE END OF THE WAR IN EUROPE AND THE BALANCE OF POWER IN THE EAST. Telegrams received from various sources on this occasion seem to leave no doubt that the war between Japan and China is now definitely over, but an account of the provisions of the agreement which has any authenticity has not yet been published. From Tokyo comes a refutation of the statement that the terms of peace include an alliance between Japan and China. "Neither Russia, France, nor Britain, as today's Standard states, can abandon their interest in maintaining the balance of power in East Asia. They have not intervened to save China from the consequences of her folly and their impotence; but they are absolutely unanimous in their determination to preserve the ruins of a crippled empire

¹⁰ Overland China Mate, No. 1370 – April 17, 1895

that has fallen prey to Japanese ambition.” It announced that for political reasons it had decided to reinforce the American squadron in the waters of East Asia, only this it deemed necessary in view of the superiority of the naval forces of the other Powers, but in order to have at hand the means of defending its commercial interests in East Asia and of furthering the relations between China and Japan.”¹¹

The coverage of the Sino-Japanese war in the British press shows that the geo-political problems arising in the Far East were of concern to Western society. The events that took place in the region were reflected in the balance of political forces in the international arena. Great Britain, Russia, France and the United States were the most interested powers in a speedy resolution of the conflict between Japan and China, as they sought to protect their interests in East Asia.

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¹¹ Lincolnshire Echo, Wednesday, April 17, 1895

被遗忘的俄罗斯权力象征（俄罗斯卢布历史上值得纪念的日期 – “俄罗斯卢布的传奇”）

FORGOTTEN SYMBOL OF RUSSIAN POWER (MEMORABLE DATES IN THE HISTORY OF THE RUSSIAN RUBLE - „LEGEND OF THE RUSSIAN RUBLE“)

Sorokoumov Sergey Nikolaevich

注解。本文概述了俄罗斯卢布历史上值得纪念的时间线，作为其演变的里程碑。作者提出了与俄罗斯卢布相关的日历周年纪念日列表。

关键词：卢布、货币、俄罗斯金融、卢布的象征、俄罗斯货币政策。

Annotation. The article overviews the timeline of memorable dates of Russian ruble as the milestones of its evolution. The author suggests a list of calendar anniversaries related to the Russian ruble.

Keywords: ruble, money, Russian finance, symbol of ruble, Russian monetary policy.

A selection from the book „The Forgotten Symbol of Russian Power“. Russia’s 10 world inventions, for comparison with the top 10 US money inventions.

Ten by ten of the greatest inventions of Russia and the USA in the world of money.*

Below are lists of the top 10 US innovations of the 20th century and 10 Russian innovations,* over its centuries of existence. The ruble is not „guilty“ of being centuries older than the dollar. But, most importantly, after reading and comparing them, you can assess their fundamentality (root basis, fundamentality and validity in the global financial system (WMS). It is in the WMS, not the inventions of accounting and accounting software like the US has.

„The Ten Greatest Money Inventions of the 20th Century“ (USA).

Quite an interesting study was conducted by the Americans in 2003 in preparation of the summit „The Future of Money“. During half a year a group of researchers from the **Da Vinci Institute (USA)** studied hundreds of innovations in the world of money, evaluating them according to a specially developed ball system. As a result of the work done, a list of ten inventions of the 20th century, which had the greatest impact on the world monetary system, was compiled in chronological

order. And the technologies introduced in the nineties of the last century are not in this rating either. All because they did not reach such a level of influence as the following:

The 10th place: Electronic cash register. The year of introduction was 1906. The machine was invented by Charles Kettering, inventor of the first electric ignition system, automatic starter for car engines and the first engine-powered generator.

The 9th place: In 1918, electronic money came into existence. That's when the Federal Reserve Bank of the United States first transferred money via telegraph. However, the idea seemed so wild to consumers that electronic money transfers did not become widespread until 1972.

The 8th place: In 1920, the first armoured collection vehicle appeared. It allowed for the safe transport of large sums of money. After 7 years such a car was robbed for the first time.

The 7th place: Electronic accounting spreadsheets. Dan Bricklin's spreadsheets, which he introduced in 1978, not only revolutionised accounting, but also captured the personal computer application market. Then in 1987, Microsoft launched Windows with the Excel spreadsheet. And by 1989, when this operating system became quite popular, Excel - became one of the company's most important programmes. Computer users could now explore and manage large amounts of data. The most widely used spreadsheet in the world today is Excel. (mine was more of a coup in programming and accounting)

The 6th place: the Smart Card. Roland Moreno, the „father of the microchip,“ received his first patent for the Smart Card in 1974. Using a microprocessor, a Smart Card can communicate with a central computer. It is used to store information about previous transactions, receive data from the bank and produce payments. However, their social effect has not yet been fully realised. As these cards will be able to store and transmit more information about transactions. (Smart-phones will die with the introduction of digital money).

The 5th place: RSA coding (encryption), 1983. The breakthrough in RSA - coding made it possible for more people to use it. Since there was no need to actively participate in communication between the person who encrypted the text with the one who decrypted it at the other end, Encryption is a prerequisite for the exchange of private information through common information networks, including the Internet. For example, when you buy something from an online shop using your credit card.

4th place: Oh, that sweet word „credit“! The first credit bureaus appeared in 1937. By 1970, there were approximately 2,250 credit companies around the world. Today, the country where credit is most popular is the United States. Before 1970, all records were kept on paper. By 1970 there were approximately 2250

credit companies in small towns around the world. Today there are several leading credit reporting systems - Equifax, Experian, Trans Union. (It's record keeping first).

3rd place: ATM. You won't believe it, but the first ATM appeared in 1939! The concept of its work was founded in 1968, the working prototype appeared in 1969. And Docutel received a patent in 1973. The first working ATM was installed in New York at the Chemical Bank. True, in the first ATM money could not be automatically withdrawn from the account, because the accounts were not connected by a computer network to the ATM. The first such network appeared in the U.S. military in 1969.

2nd place: Barcode. In the late 1940s, the supermarket industry turned to Drexel University of Technology, Pennsylvania, to automate their cash registers. At the time, it was time-consuming to pay for purchases, and mistakes were often made when entering product information. In June 1976, a huge box of Wrigley's Spearmint chewing gum became the first item sold by barcode. And it signalled the beginning of the era of barcode use. The invention of the barcode made getting information about the movement and sales volume of goods more accessible.

1st place: The credit card. Frank McNarma, founder of Diners' Club, invented the world's first universal credit card for restaurants in 1950. On 16 August 1966, a group of banks merged to create MasterCard International. Bank of America issued the first BankAmericard (now Visa) card in 1958. Today, Visa, American Express and MasterCard are among the most recognisable brands in the world. By the way, the credit card is a well-known financial trap that leads to bankruptcy because of the lack of a sense of living money.

Comment. Perhaps the main purpose of the study was to understand why it took so long between the emergence of an idea and its introduction to the market. Thus, ATMs did not take root until 50 years later. It also becomes clear that many technologies ceased to exist(!) even before they had any economic effect. And ahead, for example, „digital“ money, which will „kill“ plastic (i.e. the next „great“ inventions of the USA).

10 Russian world priorities in WMS (all jubilee dates as opposed to American dates). Two dates are „dual“ because they are based on one main invention, which unites them (1 and 1a, 5 and 5a).

1. 485 years (1534) of the first all-Russian monetary reform. It was the reform of Elena Glinskaya which unified coinage in the appanage principalities. It was also the creation **for the first time in Russia** and **for the first time in the world** of the foundations of the national, decimal, counting monetary system of the centralised Russian state (in the year of accession to the throne of her son, the young Ivan IV „the Terrible“). At that time, because of the abundance of „dashing money forged and cut off“, E.Glinskaya had essentially no choice. This prompt-

ed the monetary reform and the birth and the beginning of minting of „kopeika“ (and most importantly, one counting ruble became equal to 100 kopeikas, or 10 hryvnias). This event reflected the unconditional **world priority of Russia as the Motherland of the decimal, counting monetary system!** [1].(Since 1704). below.

1a. 315 years (1704) of the appearance of **the world’s first state Russian decimal coinage system „RDCS“**, introduced during the monetary reform of Peter the Great. Undoubtedly, for today this system should be considered the most important, the most outstanding world priority of Russia, its contribution to the WMS (world monetary system), for all the time of existence of the Russian statehood. This contribution is yet to be appreciated by Russia itself and the whole world. Russian decimal money count (RDMC) - the basis of the RDCS and now the most inviolable part of the construction of the global monetary system (WMS). In fact, the Russian decimal money account on the basis of RDCS is the world „language“ of money. [2]. Practically all the world will begin almost in a century(!) gradual transition to the Russian decimal monetary system (account).

2. 275 years (1739) Ivan Mokeev invented standing folding casters (a device for vertical casting of coins). This was a significant contribution to world coinage. Later, another Russian inventor Ivan Markov made improvements to I. Mokeev’s invention. Their invention is a Russian **world priority**. There were no analogues of the invention in the world. It is noteworthy that the ingenious invention of Russian nuggets at that time was arrogantly underestimated by the foreign management of the St. Petersburg Mint (the Russian innovation was recognised as a „harmful invention“, and actually appropriated by this „management“). As a result, the same spouts came to Russia 100(!) years later from London as an „English“ invention. [3].

3. 205 years (1814) 200 years of the capture of Paris by Russian troops (Emperor Alexander I visited the Paris Mint). The Patriotic War of 1812 - 1814 literally „demanded“ gold. And in 1814 Russian mining master L.I. Brusnitsyn discovered the first Russian placer gold deposit in the Urals. He also invented the technology of placer gold mining (the famous „Brusnitsyn’s gold-washing machine“). His discovery and inventions made a true revolution in the Russian and world(!) gold mining industry, and led to an increase in gold production in Russia by hundreds of times (!). This is Russia’s outstanding world priority. Thanks to Brusnitsyn, the Russian Empire since 1823 became the leading world power in gold mining (up to 47% of the world gold production in 1845), and held the primacy for thirty years (!), up to 1854. The schemes of gold washing machines of Brusnitsin and other inventors of Russia, are prototypes of devices („washing“) for industrial gold mining, which are still produced in the world. [4, 4a].

4. 200 years (1819) began to work at full capacity of the Expedition for the procurement of state papers („EZGB“) - the first and only (until 1918) in the country, the enterprise that performed the business of „state importance“ - printing of paper money, securities, postage stamps and stamped state paper. The first manager was Prince A.N. Khovansky, but his assistant on the technical part was appointed Jacob Reichel, who worked in this position for almost 40 years! After the domestic war with Napoleon's French army, in the period from 1813 to 1817, 5.6 million counterfeit assignments were discovered in Russia. This situation forced to take seriously the problem of combating counterfeit money. In „EZGB“, for the first time in the world, learnt to make and apply in industrial production watermarks in the form of portraits and paintings. This is the **world priority** of Russia in the world monetary system. [5].

5. 190 years (1829) as „were established platinum duplos“ (six-rubleviski), and the issue in circulation platinum coin, the nominal value of 6 rubles. The issue of platinum coins in Russia (3, 6, 12 rubles), was due to the famous Russian engineer and inventor P.G. Sobolevsky - the founder of the world's traditional powder metallurgy (he discovered this method in 1826). This invention allowed regular minting of platinum coins for circulation in Russia (for the first time in the world). In this case we are dealing with a unique case in the world financial system, an unconditional Russian **world priority**. [6].

5a. 185 years (1834) In that year at the congress of natural scientists and doctors in Stuttgart the Russian researcher P.G. Sobolevsky made a report, the author of „powder metallurgy“ told about how in Russia, „without borrowing“, created an original method and technique (technology) of research and use of platinum. This is an unconditional **world priority** of Russia in the world monetary system and metallurgy. Sobolevsky's discovery (technology of powder metallurgy) is still used today. [7]. (1829 and 1834 is one date).

6. 180 years (1839) of the beginning of the monetary reform (Manifesto of Emperor Nicholas I of 1 July 1839), the beginning of the era of silver monometallism and the introduction of the silver ruble as the main means of payment. In 1839, the „Expedition of Securities Procurement“ was the **first in the world** to master and apply on a large scale the technique of galvanoplastic copying and reproduction of clichés for printing paper money. Galvanotechnology (and galvanoplasty) is a world-class discovery of the outstanding Russian scientist and inventor B.S. Yakobi, which is still used today. This is an outstanding Russian **world priority!** However, the scientist, inventor died in need. The grave of the man who gave his life to serve Russia is forgotten by everyone today. [8].

7. 175 years (1844) of the launch into circulation of the first paper credit ruble (by the Tsar's Decree of Emperor Nicholas I, from 4 October 1844). And in the same year in London, Paris and Geneva for the first time were published reports

about the discovery of the method of cyanidation (obtaining gold, including for minting gold coins) by the Russian engineer P.R. Bagration (prince, commander, general of infantry, co-companion of A.V. Suvorov and M.I. Kutuzov). This invention of P.R. Bagration is a **world priority** for Russia. The method first proposed by P.R. Bagration is still the most important process in the world of gold metallurgy. Russian inventive creativity is the basis of all this modern most important industry. [9].

8. 155 years (1864) of the issue of the first Russian domestic winning loan in the form of 100 - ruble bonds. It turned out to be successful. At the same time the first Russian St. Petersburg private commercial bank was opened with a capital of 5 million rubles. At the St. Petersburg mint was destroyed(?) „genuine machine“ - the world's first lever press for stamping (printing) coins, created in 1809 - 1813 by Russian inventor I.A. Nevedomsky. This is Russia's outstanding **world priority** in WMS. The paradoxical underestimation of the Russian inventor's invention by the foreign management of the St. Petersburg Mint did not affect its „survivability“ (it was simply stolen and used abroad, in Germany). As early as 1818. Nevedomsky's machine began its triumphal march across Europe - under the name of the German „Ulgornovsky“ machine. The tsarist government of Russia willingly accepted it with a foreign brand. And today all over the world coin-printing machines retain the basics of the design developed by the Russian inventor in the early 19th century. [10].

9. 120 years (1899) In the same year a patent of the Russian Empire for the Orlov method of multicolour printing of banknotes was issued to the Russian inventor I.I. Orlov. The new Russian money, which the people immediately called „rainbow“, became a true sensation in the financial world. „Orlov's method of printing“ is Russia's outstanding **world priority**. To this day, printing machines produced by the world-famous KBA Giori company bear the name of the Russian inventor - „SUPER ORLOF - INTAGLIO“. Orlov method is still the basis of banknote printing all over the world. [11].

10. 105 years (1914) the beginning of the First World War and the cessation of the exchange of paper rubles for gold coin. Minting of the last commemorative ruble of tsarist Russia in honour of the victory of Peter the Great (200th anniversary of the first victory at sea of Russia over Sweden in the Battle of Gangut in 1714), the ruble that did not enter circulation because of the outbreak of war. By the beginning of the First World War, in 1914, for Russia - this is the time, the peak of the true triumph of the Romanov dynasty, - the peak of the „Russian economic miracle“. And with the beginning of this war, ended the great era of the „Golden Russian Ruble“ - „GRR“ (from 1897 to 1914). It should be noted that the time of „GRR“ in Russia - this is the end of the XIX century and the beginning of the XX century, were the time of a kind of „Golden Duplet“ Russia in the world monetary

system. It is creation and provision with gold of national currency - „Golden Russian Ruble“ and gold reserve of Russia №1 in the world. Outstanding achievement of Russia in the „WMS“! **Her world priority.** Super successes in the economy of Russia, its „GRR „, - in fact, the main reason for the West’s war against Russia.

It suffices to say that such a „golden duplet“, from then until now, has been repeated by only one country in the world - the USA! (And note that it is largely due to the two world wars of the 20th century). Let’s remember just one thing. During the 18 years of the Golden Ruble, the population of Russia increased by almost 50 million people! The figures are simply fantastic for the current Russian Federation.

P.S. Personally, I was surprised by the „modesty“ of the USA for its two actually most important (truly great, by result of the invention of the XX century)? Which are not mentioned by the Da Vinci Institute? Although I, in my book, mentioned them. How did their most truly great US „inventions“ in the WMS, they very modestly „silenced“? No words at all?

This, first of all, (see 1944 in my book), I quote from the text of the book: - „It is impossible not to mention also the most outstanding monetary „innovations“ in the world monetary system of our main „sworn friends“ from the USA. One can only guess why the USA does not officially „spotlight“ them - it is its very first „of the main“ inventions (the dollar) of the USA of the 20th century! This is the Bretton Woods currency system adopted in 1944 - a form of organisation of monetary relations, settlements (established by the Bretton Woods Conference in 1944), according to which the role of world money along with gold is performed by the US dollar!

And, the second „invention“ in 1971, when the exchange of dollars for gold was stopped and all currencies of the world lost any connection with gold. It would seem how uncomplicatedly simple, but how fundamental it turned out to be!

If it weren’t for one „but“! The most important benefit of the USA since 1944 was the possibility to print dollars without restrictions(!), and since 1971 to print dollars without gold. In Russian, it is „making money out of thin air“! How it is! I.e. in fact, to a large extent, to live at the expense of the rest of the world“. And so far, this „legalised“ robbery of the whole world by the USA continues.

Evaluate, compare the significance of innovations for WMS, it is necessary to take into account the period (speed of the beginning of their use), in WMS and including attempts to steal them, as clearly very significant (in Russia, for example, an attempt to steal Germany’s „orlovsky method“ of multicolour printing of banknotes), or an example of direct theft and appropriation by Britain of the technology of vertical casting of coins Mokeev, Markov or stealing the same Germany’s method of minting coins Nevedomsky (which was acknowledged by the same experts from Germany!).

Evaluate for yourself how much innovation underlies the entire MDS, Russian inventions are still at the heart of monetary technology. And here inventions of the USA are rather technologies of programming, accounting and they are updated, sometimes not having had time to spread even in the USA. In terms of the width of distribution in the world Russian and longer and wider in the WMS.

It just so happens. But it would seem that the more „fresh“ and new in time inventions of the USA in the field of money. They are inferior to more „early“ in time of creation, but more significant and fundamental for MDS Russian. Only one „RDMC“ is more significant, more important, more indispensable than a number of American ones, because it has long been an unshakable basis for the very construction of the „WMS“, regardless of what form money will take in the future!

P.S. 2. Do not think that our „sworn“ friends in the West did not try to take away from Russia its worldwide Russian „language“ of money (Russian decimal money account in „WMS“). The transition to the duodecimal numbering system has been proposed many times. In the XVIII century its supporter was the famous French naturalist Buffon. During the Great French Revolution, the „Revolutionary Commission on Weights and Measures“ was established, which considered such a project for a long period of time, but the efforts of Lagrange and other opponents of the reform managed to curtail the case.

In 1944 the „American Duodecimal Society“ (DSA) was organised, and in 1959 - The Dozenal Society of Great Britain (DSGB), which united active supporters of the eponymous number system. However, the main argument against it has always been the enormous cost and inevitable confusion of the transition.

(Amazingly, even earlier! Peter the Great managed with weapons in his hands, in the war with the Swedes, in the early 18th century, literally with weapons and blood, actually „hammered“ his „RDMC“ into world history, without even knowing it. After all, Peter I's opponent, Swedish King Charles XII, was an adherent and „conductor“ of the duodecimal system of monetary counting in Europe in the first half of the 18th century).

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DOI 10.34660/INF.2023.26.16.135

木贼镰孢和马铃薯对培养基中不同浓度的油和重金属的反应研究
**STUDY OF THE REACTION OF FUSARIUM EQUISETI AND
CYLINDROCARPON MAGNUSIANUM TO DIFFERENT
CONCENTRATIONS OF OIL AND HEAVY METALS IN THE
MEDIUM**

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注解。根内生菌能够限制化学物质对植物的影响并增强其对胁迫条件的抵抗力。研究中使用了从长期生长在城市土壤中的植物根部分离出的内生微型真菌木贼镰孢菌和马格努西亚努斯的培养物（分离物）。同时，这些真菌物种不是专性内生菌。在实验室实验中，对培养这些微菌的培养基中不同浓度的油和重金属进行了建模，并建立了污染物对菌丝体菌落生长参数和菌丝体中丙二醛含量的影响。发现圆柱果和木贼镰孢菌培养物具有高度金属抗性，对铬和铅的抗性比对营养素（锌和铜）的抗性最大。培养基中铜浓度为150 mg/l时，对木贼的毒性最大，但不是阈值。对蘑菇菌丝体中丙二醛含量动态的研究表明了与重金属相关的物种特异性：C. magnusianum 对高浓度的铜具有更强的抵抗力，F. equiseti 对铬具有更强的抵抗力。真菌培养物还表现出对基质中油含量的抵抗力。适应人类环境的内生真菌可以用作植物抗性管理剂，用于创建人工抗性种植园和恢复受干扰的土地。

关键词：微菌、重金属、金属抗性、耐油污染

Annotation. *Root endophytes are able to limit the impact of chemical substances on plants and increase their resistance to stress conditions. Cultures (isolates) of endophytic micro-mycetes Fusarium equiseti and Cy lindrocarpon magnusianum isolated from the roots of plants growing for a long time in urban soils were used in the studies. At the same time, these fungal species are not obligate endophytes.*

*In laboratory experiments, different concentrations of oil and heavy metals in the media on which these species of micromycetes were cultured were modelled, and the effect of pollutants on the growth parameters of mycelium colonies and the content of malondialdehyde in mycelium was established. *Cylindrocarpon magnusianum* and *Fusarium equiseti* cultures were found to be highly metal-resistant, with the greatest resistance to chromium and lead than to nutrients (zinc and copper). The concentration of copper in the medium of 150 mg/l was the most toxic for *F. equiseti*, but not threshold. The study of the dynamics of malondialdehyde content in mushroom mycelium indicated species specificity in relation to heavy metals: *C. magnusianum* is more resistant to high concentrations of copper, *F. equiseti* - to chromium. Fungal cultures also showed resistance to oil content in the substrate. Endophytic fungi adapted to the anthropogenic environment can be used as plant resistance management agents in the creation of artificial resistant plantations and restoration of disturbed lands.*

Keywords: micromycetes, heavy metals, metal resistance, resistance to oil pollution

Deterioration of soil quality caused by heavy metal and petroleum product pollution is a growing global problem resulting from human industrial activities, which in turn also leads to plant mortality [1, 2]. However, plants in association with root micro-mycetes have wider limits of resistance to external factors [3, 4]. Among such micromycetes, root endophytes, including endophytic fungi, are of the greatest interest: they are morphologically diverse in their structure, have a wide distribution area and are viable under stress conditions. The origin and source of the inoculum is an important factor. Those isolates that were obtained from soils contaminated with heavy metals were the most effective in increasing plant resistance to pollutants [5-7], indicating the ability of endomycorrhiza fungi to adapt to high stress conditions. Hence, the study of the resistance of endophytic fungi to the action of various pollutants, as well as their influence on plant stress tolerance is highly relevant. In this regard, *Fusarium equiseti* and *Cylindrocarpon magnusianum* are of considerable interest. *Fusarium equiseti* is a widely occurring root endophyte in nature and has the ability to colonise the roots of non-host plants. The fungus has long been considered pathogenic, but has recently attracted attention for its ability to act as a biocontroller in controlling root pathogens [8, 9]. *Cylindrocarpon magnusianum* also has a wide range of habitats, in addition, it is referred to the group of “oil and gas-bearing fungi”, which may be in demand in the restoration of oil-contaminated land [10, 11].

The aim of the study was to establish the limits of resistance of representatives of endophytic fungi to the content of oil and heavy metals in the substrate.

Objects and methods of research. The endophytic fungi *Fusarium equiseti* and *Cylindrocarpon magnusianum* were used as research objects. The fungi were isolated from the root system of plants growing in technogenic territories of Izhevsk city (Udmurt Republic). The species affiliation of fungi was established by DNA molecular analysis in the laboratory of the Leibniz Institute of Vegetable and Ornamental Crops (Berlin) [12, 13].

Fungal cultures were grown on nutrient agar medium (PDA) made of dextrose broth and agar-agar with the addition of different concentrations of heavy metals and oil. The diameter and growth rate of fungal colonies were measured every three days after sowing. The experiments were carried out in triplicate. Heavy metals were applied in the following concentrations: Zn - 100, 200, 300 mg/l; Cu - 50, 100, 150 mg/l; Cr - 2.5, 5, 10 mg/l; Pb - 25, 50, 100 mg/l, oil - in concentrations of 1, 2.5, 5, 7.5 and 10%. Heavy metals were introduced into the substrate in the form of salts $ZnSO_4 \times 7H_2O$, $CuSO_4 \times 5H_2O$, $K_2Cr_2O_7$ and $PbSO_4$ with recalculation to modelled concentrations. The peculiarities of fungi response to stress conditions were evaluated by malondialdehyde (MDA) content. MDA content in mushroom mycelium was estimated by the degree of accumulation of the product of its reaction with thiobarbituric acid (TBA), determining the optical density of the solution on a spectrophotometer at a wavelength of 532 nm [14]. For this purpose, 2 ml of distilled water and 3 ml of 10% TCA were added to a test tube with mushroom biomass. A 2 ml sample was taken from the resulting homogenate and 0.5% TBA was added. Mathematical processing of the results was carried out using the package “Statistica 6.0” using descriptive statistics methods. Reliability of the differences between the variants of the experiment was established at $p < 0.05$.

Results and discussion. The study of growth of *Cylindrocarpon magnusianum* and *Fusarium equiseti* cultures on media with heavy metals showed high limits of fungi resistance to the pollutant (Figures 1-8).

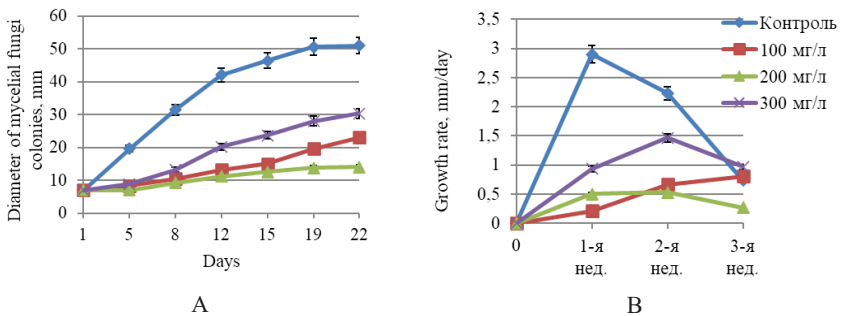


Figure 1. Size dynamics (A) and growth rate (B) of *Cylindrocarpon magnusianum* colonies on media with different zinc concentrations

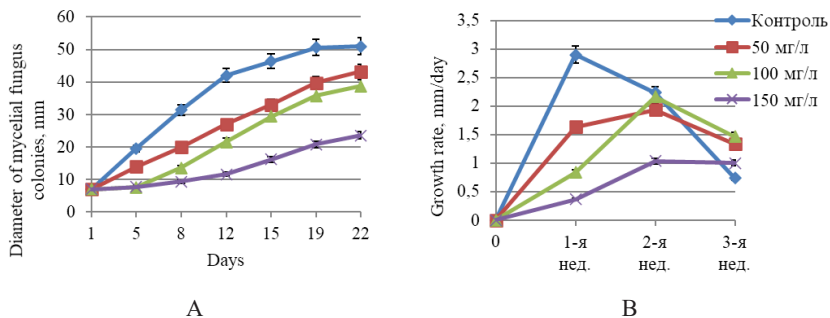


Figure 2. Size dynamics (A) and growth rate (B) of *Cy lindrocarpon magnusianum* colonies on media with different concentrations of copper

The content of copper and zinc in the medium influenced the growth of *Cy lindrocarpon magnusianum*: the size of the fungus colonies at all concentrations of metals was significantly smaller than in the control. In this case, the size of the colonies decreased in accordance with the increase in the concentration of metals (except for Zn 300 mg/l). However, threshold concentrations of copper and zinc for *Cy lindrocarpon magnusianum* have not yet been found. The growth rate of the fungus, as well as the size of its colonies, at all concentrations of copper and zinc significantly decreased compared to the control, especially in the first week of the experiment.

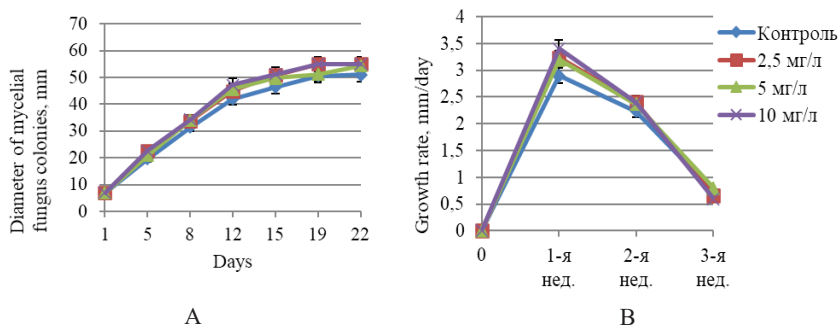


Figure 3. Size dynamics (A) and growth rate (B) of *Cy lindrocarpon magnusianum* colonies on media with different chromium concentrations

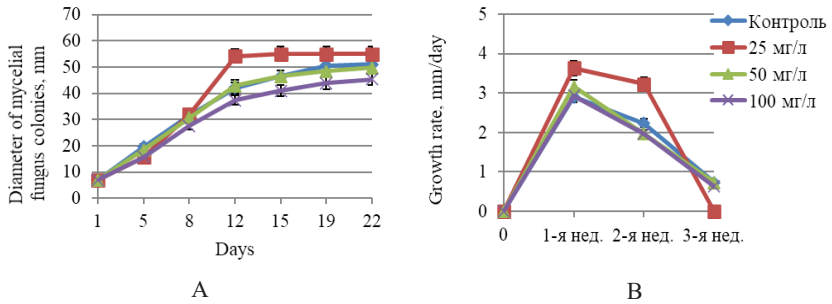


Figure 4. Size dynamics (A) and growth rate (B) of *Cyindrocarpon magnusianum* colonies on media with different lead concentrations

Chromium and lead were less toxic for *C. magnusianum*. The chromium content in the medium in all concentrations studied had no effect on the fungus growth: the size of its colonies had no significant differences from the control. Variants with lead in concentrations of 50 and 100 mg/l also did not differ significantly from the control variant. However, the content of lead in the medium at a concentration of 25 mg/l stimulated the growth of fungus colonies. No significant difference in the growth rate of fungal colonies between the other experimental variants and the control, as in the experiment with chromium, was observed until the end of the experiment.

In the experiment with *F. equiseti*, the results were similar to the experiment with *C. magnusianum* (Figures 5-8).

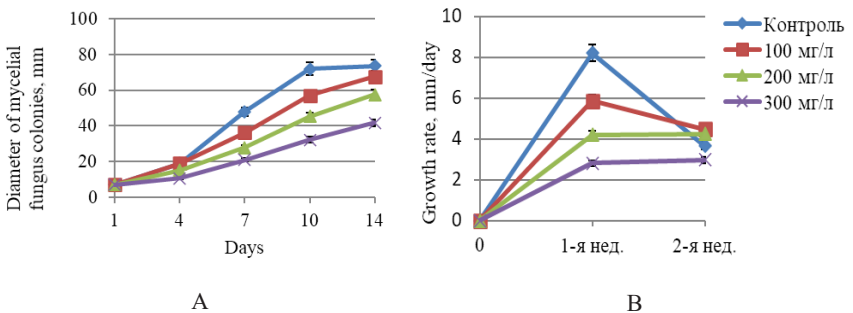


Figure 5. Size dynamics (A) and growth rate (B) of *Fusarium equiseti* colonies on media with different zinc concentrations

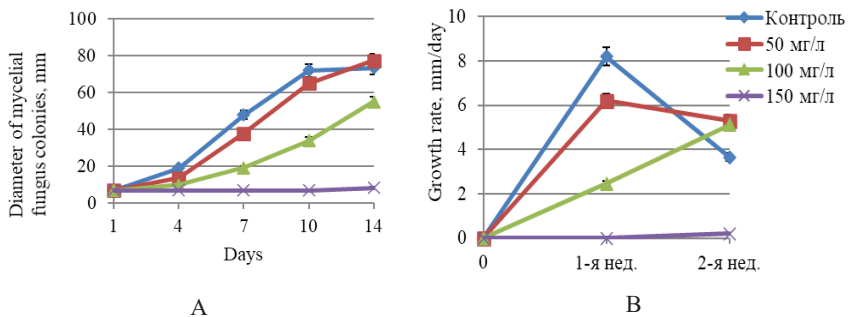


Figure 6. Dynamics of size (A) and growth rate (B) of *Fusarium equiseti* colonies on media with different copper concentrations

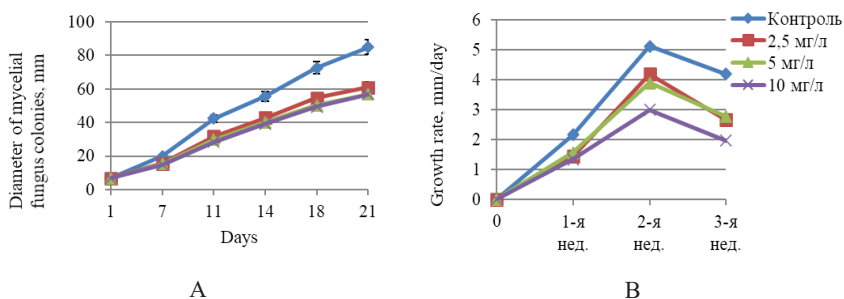


Figure 7. Size dynamics (A) and growth rate (B) of *Fusarium equiseti* colonies on media with different chromium concentrations

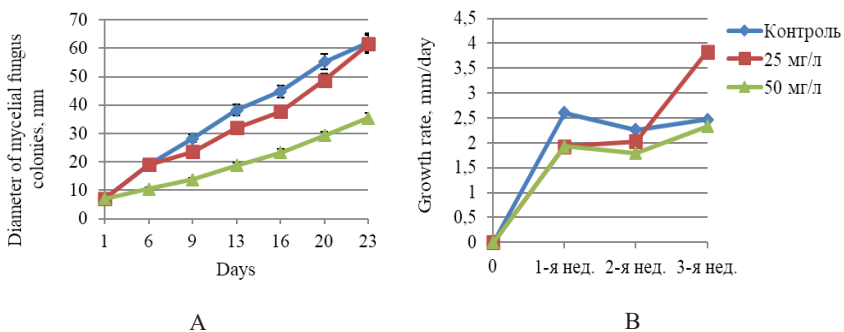


Figure 8. Dynamics of size (A) and growth rate (B) of *Fusarium equiseti* colonies on media with different concentrations of lead

The greatest inhibition of *F. equiseti* culture growth was caused by zinc and copper content in the medium. With increasing concentration of these elements, the diameter of fungal colonies decreased. The most toxic was the concentration of copper 150 mg/l, but even at this concentration of metal the growth of fungus did not stop.

The content of chromium and lead in the medium, as in the experiment with *C. magnusianum*, had no significant effect on the growth of *F. equiseti*. Nevertheless, the diameter of the fungus colonies at all studied concentrations of chromium in the medium was significantly smaller compared to the control, while the variants Cr 2.5, Cr 5 and Cr 10 mg/l had no significant difference between them. The growth rate of *F. equiseti* when chromium and lead were added to the medium in different concentrations was significantly lower than the control variant, but the difference was insignificant.

Thus, the cultures of the micromycetes *F. equiseti* and *C. magnusianum* showed high resistance to heavy metal (HM) salts in the medium, especially chromium and lead, which confirms the studies of other authors [15, 16]. *C. magnusianum* showed greater tolerance to zinc and copper salts in the medium compared to *F. equiseti*.

To assess the influence of stress factor in the form of heavy metals on the organism state, the content of malondialdehyde in mycelium of *F. equiseti* and *C. magnusianum* was determined during their cultivation on substrates with copper and chromium (Table 1). MDA is a product of lipid oxidation and can serve as an indicator of the degree of damage to membrane structures in the cells of the organism [17, 18]. A number of studies confirm the dependence of MDA concentration in fungal mycelium on the HM content in the medium. Thus, MDA concentration in *Acrocalymma vagum* first increased and then decreased with increasing Cd concentration in the medium [7]. Studies with the pigment-synthesising yeast *Rhodotorula mucilaginosa* showed that with the zinc content in the medium of 100, 150 and 200 mg/l the MDA content in the mycelium of the fungus significantly decreased, and with increasing zinc concentration in the medium (300, 350 mg/l) - significantly increased. On the contrary, on media with chromium addition, at a concentration of 10 mg/l, the MDA content in mycelium increases, and at further increase of chromium content in the medium (20 and 30 mg/l) it decreases [19].

Table 1

Content of malondialdehyde in mycelia of Fusarium equiseti and Cy lindrocarpon magnusianum, $\mu\text{mol/l}$ g crude weight

TM content in the substrate	MDA content in mycelium <i>Cylindrocarpon magnusianum</i>	MDA content in mycelium <i>Fusarium equiseti</i>
Without HM (control)	2,034 \pm 0,047 1,959...2,109	1,290 \pm 0,071 ¹ 1,064...1,516
Cr 2,5 мг/л	6,092 \pm 0,585 \uparrow 5,161...7,024	1,743 \pm 0,071 \uparrow ² 1,519...1,968
Cr 5 мг/л	7,276 \pm 1,115 \uparrow 5,502...9,050	1,760 \pm 0,070 \uparrow 1,536...1,983
Cr 10 мг/л	3,881 \pm 0,054 \uparrow 3,795...3,966	1,142 \pm 0,014 1,098...1,185
Cu 50 мг/л	2,031 \pm 0,021 1,997...2,064	2,227 \pm 0,230 1,495...2,958
Cu 100 мг/л	3,571 \pm 0,431 \uparrow 2,885...4,257	6,368 \pm 0,775 \uparrow 3,902...8,833
Cu 150 мг/л	4,117 \pm 0,291 \uparrow 3,654...4,580	8,076 \pm 0,311 \uparrow 7,087...9,066

¹Average value of the indicator \pm standard deviation.
² Significant difference from the control: increase \uparrow or decrease \downarrow of the index ($p < 0.05$).

Analysis of MDA content in mycelia of *F. equiseti* and *C. magnusianum* showed the dependence of the increase of this index on the concentration of chemical elements in the medium. The greatest response to chromium content in the medium was observed in *C. magnusianum*: MDA content in all variants was significantly higher than in the control. However, at the highest chromium concentration of 10 mg/l, the MDA content in the mycelium of the fungus was significantly lower than in other variants with chromium. *F. equiseti* was more influenced by the copper content in the medium: with increasing copper concentration, the MDA content in the mycelium increased significantly in relation to the control. In the mycelium of *C. magnusianum*, when copper was added to the medium, the MDA content was also significantly higher compared to the control (except Cu 50mg/l), but the difference was not as significant as in the experiment with *F. equiseti*.

Thus, it can be concluded that MDA synthesis plays a role in the system of adaptive responses of fungi. In the conducted study, the analysis of MDA content in fungal mycelium showed that *C. magnusianum* showed greater resistance to copper content in the medium, *F. equiseti* - to chromium content. It is also worth noting that when chromium was added to the medium at concentrations of 2.5 and 5 mg/l, the MDA content in the mycelium of *C. magnusianum* and *F. equiseti* increased, but when the metal concentration was increased to the maximum (10

mg/l), the value of this index, on the contrary, decreased. A similar result was observed in studies with the endophytic fungi *Acrocalymma vagum* and *Scytalidium lignicola* when grown on media with cadmium [7] and the yeast fungus *Rhodotorula mucilaginosa* when grown on media with chromium (VI) [19].

The results of the experiment on the growth of fungi on media with different concentrations of oil are presented in Tables 2-4.

Table 2
Growth rate of Fusarium equiseti colonies (mm/day)

Observation period	Control	Oil content in the medium				
		1%	2.5%	5%	7.5%	10%
1 week	6,5	6,8	7,2	6,8	2,5	2
2 weeks	2,3	2,7	1,9	2,3	3,4	2,5
3 weeks	2	0,9	0,3	0	1,6	0

Table 3
Growth rate of Cyllindrocarpon magnusianum colonies (mm/day)

Observation period	Control	Oil content in the medium				
		1%	2.5%	5%	7.5%	10%
1 week	2	1,4	1,3	1,1	0,9	0,7
2 weeks	4,5	4	2,9	3,4	2,1	2,3
3 weeks	2,9	3,7	0,3	2	1,9	3,2

Growth of *F. equiseti* and *C. magnusianum* was observed at all oil concentrations tested. In the experiment with *F. equiseti*, the highest inhibition of growth was caused by the oil concentration of 10 %, but it was not the threshold concentration. At oil concentrations of 1, 2.5 and 5 % in the medium, the growth rate of fungal colonies during the first week was higher than in the control variant. By the end of the experiment, the growth rate of colonies decreased and was lower than in the control in all experimental variants with oil. *C. magnusianum*, on the contrary, at the beginning of the experiment was not characterised by active growth (adaptation period), but from the second week of the experiment showed high colony growth rates.

The following conclusions can be drawn from the results.

1. Cultures of *Cyllindrocarpon magnusianum* and *Fusarium equiseti* have generally high metal resistance, with greater resistance to chromium and lead than to nutrients (zinc and copper). The copper concentration of 150 mg/l for *F. equiseti* was the most toxic, but not threshold.

2 The study of the dynamics of malondialdehyde formation in mycelia of *Cyllindrocarpon magnusianum* and *Fusarium equiseti* under the action of heavy

metals showed that fungi have species specificity in relation to heavy metals: *C. magnusianum* is more resistant to the action of high concentrations of copper, *F. equiseti* - to chromium.

3. The studied fungal cultures showed resistance to oil content in the medium, but species-specific strategies of species adaptation to the oil pollution factor were observed.

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DOI 10.34660/INF.2023.93.93.136

温室条件下栽培的香橼叶 (*Citrus medica* L.) 及其杂交种的挥发性成分
VOLATILE COMPONENTS OF CITRON LEAVES (*CITRUS MEDICA* L.) AND ITS HYBRIDS, CULTIVATED UNDER GREENHOUSE CONDITIONS

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注解。通过 SPME 和 GC-MS 分析研究了 5 个香橼变种的叶子样品的挥发性成分。香橼 (*C. medica* L.) 植物、其栽培品种和在温室中栽培的杂交种被用作模型对象：*C. medica* cv. 巴甫洛夫斯基·希什坎；*C. medica* cv. 的克隆 Skernevitsky (*C. medica* × *C. limon* cv. *Ponderosa*)；手指香橼 - *C. medica* cv. *Sarcodactylis* 和 *C. meyeri* Yu. 田中；自发杂交种 - (*C. maxima* × *C. reticulata*) × *C. medica*。九种芳香挥发性成分被确定为这些基因型遗传相关性的指标：香茅醛、柠檬醛、香叶醛、橙花醇、香叶醇、乙酸香叶酯、乙酸橙花酯、香茅醇、β-罗勒烯和柠檬烯。这表明，叶子挥发性芳香化合物的生化多样性分析不仅有助于阐明一个物种 (*C. medica* L.) 内基因型之间的相关程度和区分化学型，而且还有助于了解物种内的种间遗传关系。柑橘属 L。

关键词：*C. medica* L., 其变种, 杂交种, 叶芳香挥发成分。

Annotation. *The volatile components of leaf samples of 5 citron variations were investigated by SPME and GC-MS analysis. Citron (*C. medica* L.) plants, its cultivars and hybrids cultivated in greenhouses were used as model objects: *C. medica* cv. Pavlovskiy shyshkan; clone of *C. medica* cv. Skernevitsky (*C. medica* × *C. limon* cv. *Ponderosa*); finger citron - *C. medica* cv. *Sarcodactylis* and *C. meyeri* Yu. Tanaka; spontaneous hybrid species - (*C. maxima* × *C. reticulata*) × *C. medica*. Nine aromatic volatile components were identified as indicators of genetic relatedness of these genotypes: Citronellal, Citral, Geranial, Nerol, Geraniol, Geranyl acetate, Neryl acetate, Citronellol, β-ocimene, and limonene. It is suggested that the analysis of biochemical diversity of volatile aromatic compounds of leaves is useful not only in elucidating the degree of relatedness between genotypes within a species (*C. medica* L.) and in distinguishing chemotypes, but also in interspecific genetic relationships within the genus *Citrus* L.*

Keywords: *C. medica* L., its variations, hybrids, aromatic volatile components of leaves.

Introduction. In the botanical systems of Swingle and Tanaka, citron (*C. medica* L.) is considered as a species, which is one of four natural ancestral species in the family *Rutacea* Juss. The other species are pomelo (*C. maxima* (Burm.) Merr.), mandarin (*C. reticulata* Blanco) and papeda (*Papedocitrus*) [1]. At the same time, papeda according to the clarified data is a species and belongs to the subgenus *Papedocitrus* [2]. The citron is native to northeastern India, Myanmar and Yunnan Province of China. Citron was the first citrus tree introduced to the Mediterranean basin, and its appearance in Persia occurred no later than the first half of the first millennium BC. By the beginning of the Christian era, it was widespread throughout the Middle East and acclimatised in the eastern Mediterranean region. The citron fruit was prized for its aromatic properties, and for centuries the plant was used as an ornamental and as an antiseptic and repellent. And while the technical process of extracting essential oils was known around the eleventh century, the commercial use of citron by the perfume industry began in Sicily between 1500 and 1600 [3]. Subsequently, citron cultivation expanded considerably, reaching a peak in the nineteenth century when its fruit was used in cosmetics and confectionery, and Corsica became the largest producer and exporter of candied fruits using the local Corsican variety of citron.

Citron (*C. medica* L.) is the progenitor of the lemon (*C. limon* (L.) Burm.), all its hybrids and always as a pollinator, and differs from other citrus species by its low level of polymorphism [4]. Out of 56 lemon variations subjected to molecular genetic analysis, a low level of polymorphism was observed in varieties obtained by clonal selection and high genetic diversity is characteristic of lemons of hybrid origin. [5].

Currently, the chemical composition of essential oils of citron, its hybrids and varieties is considered as one of the important species traits. Moreover, the leaf essential oil (petitgrain) has proved to be the most convenient as its source, since its main component, limonene, whose content in the essential oil of fruit peel reaches 70%, does not prevail so strongly in it. Leaf oil is used to characterise the chemical variability of varieties and species. N. Venturini et al. [6] conducted chemotaxonomic studies to establish the relationship between morphological characteristics of citron varieties and the composition of their corresponding peel and petitgrain oils. The following main components (in %) were identified in the composition of the essential oil of the leaves (petitgrain) in true citrons: Limonene (12-47%), Neral (6.5-17.4%), Geranial (3.8-30.6%), Nerol (3-10.8%) and Geraniol (2.6-24.6%).

F. Luro et al. [2] among 24 varieties and cultivars of citron *C. medica* were able to identify four chemotypes, according to the level of seven major compo-

nents of petitgrain oil: Limonene, β -Pinene, gamma-Terpinene, Neral, Geranial, Nerol, Geraniol. However, when comparing genetic and biochemical diversity using biochemical markers (essential oil components) and molecular markers (SSR polymorphism), respectively, the authors concluded that the biochemical diversity of variation did not have the necessary consistency with molecular diversity, which limits its use for intraspecific evaluation of genotypes.

Objects of research. As model objects in our research we used leaf samples of citron (*C. medica* L.), its varieties and hybrids cultivated in the greenhouses of the Central Botanical Garden of NAS of Belarus: *C. medica* cv. Pavlovskiy shyshkan; *C. medica* cv. Skernevitsky (clone of hybrid *C. medica* L. \times *C. limon* cv. Ponderosa); fingered citron - *C. medica*. cv. Sarcodactylis, an exotic variety of citron grown in China and Japan; and *C. meyeri* Yu. Tanaka, a spontaneous hybrid species - (*C. maxima* \times *C. reticulata*) \times *C. medica*. The native range of the species is China. It is widely distributed as a greenhouse and indoor culture in temperate climates on the Eurasian continent.

Research method. The major leaf volatiles of different types of citrus species were extracted from the vapour-air space above leaf samples by vapour-phase solid-phase microextraction (HS-SPME) followed by GC-MS analysis [7]. The method allows the study of the natural flavour profile of leaves and volatile components, including those that cannot be detected by conventional methods such as solvent extraction and hydrodistillation, but can be detected by HS-SPME.

Results of the study. The component composition (%) of volatile substances determining the aroma of leaves of citron (*C. medica* L), its varieties and hybrids cultivated under greenhouse conditions are presented in the table.

Table 1
Composition (%) of volatile aromatic compounds of citron leaves (C. medica L.) and its varieties in greenhouse culture

Detention time, min.	Name of volatile components components, gross formula, CAS RN	C. medica L.	C. medica cv. Sarcodactylis	C. medica cv. Pavlovskiy Shishkan'	C. medica cv. Skernevitsky	C. meyeri Yu. Tanaka
7. 95	β -Pinene, C ₁₀ H ₁₆ , 127-91-3		0.20	0.32	4.61	1.26
8. 3	β -Myrcene, C ₁₀ H ₁₆ , 123-35-3	2.47	0.18	0.94	0.38	
8.694-.75	3-Carene, C ₁₀ H ₁₆ , 13466-78-9			0.71		
9. 108-.145	D-Limonene, C ₁₀ H ₁₆ , 5989-27-5	56.33	3.12	13.74	19.03	5.03
9. 459-.50	(Z)- β -trans-Ocimene, C ₁₀ H ₁₆ , 3779-61-1		0.25	3.55	4.36	
9.72-.85	γ -Terpinene, C ₁₀ H ₁₆ , 99-85-4		0.75	0.35		
10.17	3-Carene, C ₁₀ H ₁₆ , 13466-78-9	2.31				
10.264-	p-Cimene, C ₁₀ H ₁₆ , 99-87-6		0.15	0.21		

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10.449	Ocimene, C ₁₀ H ₁₆ , 13877-91-3	4.44				3.71
10.45- .49	Lynalool, C ₁₀ H ₁₈ O, 78-70-6			0.31		
10.94	neo-allo-Ocimene, C ₁₀ H ₁₆ , 7216-56-0			0.30		
11.336 -.41	β-Citronellal, C ₁₀ H ₁₈ O, 106- 23-0	26.59		1.37		8.96
11.351	(R)-(+)-Citronellal, C ₁₀ H ₁₈ O, 2385-77-5				2.42	
12. 526-.55	(Z)Nerol, (Z)-Geraniol, C ₁₀ H ₁₈ O, 106-25-2		1.09			4.09
12.6-7	β-Citronellol, C ₁₀ H ₂₀ O, 106- 22-9			1.90		1.21
12.7-12.8	(Z)-Citral, C ₁₀ H ₁₆ O, 5392-40-5				1.89	2.65
13.021	Geraniol, C ₁₀ H ₁₈ O, 106-24-1				1.26	
13. 2	(E)-Citral, C ₁₀ H ₁₆ O, 5392-40-5	10.74		1.88	1.95	
13.686	n- Undecyl aldehyde, C ₁₁ H ₂₂ O, 112-44-7		1.04			
13.913	4-[2-Chloro-6-(4-nitrophenyl)- 4-pyrimidinyl] phenyl methyl ether, C ₁₇ H ₁₂ ClN ₃ O ₃ , 63673-76-7		21.04	0.13		
14.27-.33	Geraniol, C ₁₀ H ₁₈ O, 106-24- 1	2.27				5.96
14.333	Citronellyl acetate, C ₁₂ H ₂₀ O ₂ , 150-84-5				3.79	
14.43-.56	(Z)-cis-Geranyl acetate, C ₁₂ H ₂₀ O ₂ , 141-12-8	7.19	7.64	5.96	5.75	4.35
14.7-14.8	Cyclopropane, C ₁₀ H ₁₆ , 14803-30-6					1.12
14.577-.68	Alepic acid, C ₁₄ H ₂₄ O ₂ , 2519- 24-6			10.09		
14.688	Neryl acetate, C ₁₂ H ₂₀ O ₂ , 141- 12-8				33.30	
14.91	Geranyl acetate, C ₁₂ H ₂₀ O ₂ , 105-87-3			27.23		
15. 098	beta-Elemene, C ₁₅ H ₂₄ , 105- 87-3		2.53			21.90
15.38- .4	Caryophyllene, C ₁₅ H ₂₄ , 87- 44-5	3.63	7.61	21.12	11.97	26.00
15.508	alfa-Bergamotene, C ₁₅ H ₂₄ , 17699-05-7	1.64				
15.615	(Z)- trans-Geranyl acetone, C ₁₃ H ₂₂ O, 3796-70-1		0.20			
15. 7	cis-β-Farnesene, C ₁₅ H ₂₄ , 28973-97-9		0.18	1.44		

15. 9	α -Caryophyllene, C ₁₅ H ₂₄ [*] 6753-98-6			0.99	0.71	3.00
16. 28	(+)-delta-Cadinene, C ₁₅ H ₂₄ [*] 13061-82-0		3.12	0.05		
16. 369	(3E,6E)-alpha-Farnesene, C ₁₅ H ₂₄ [*] 502-61-4		0.25	0.32		
16.406	(S)- beta-Bisabolene C ₁₅ H ₂₄ , 495-61-4	1.74	0.75		2.42	3.94
16.47	Isocaryophyllene, C ₁₅ H ₂₄ [*] 118-65-0		0.15	3.80		
Total, %		82,02	95,92	96,72	93,83	93,21

As follows from the presented results, the gas phase components of the natural essential oils identified in the aromatic profile of this citron genotype contain 9 volatile compounds of terpenoid nature, which account for 82 % of their total volume and are represented in proportion (%) by: Monoterpenes (D-Limonene - 56.6; beta-Ocimene - 4.44; beta-Myrcene - 2.5), sesquiterpenes (Caryophyllene - 3.63; (S)- beta-Bisabolene - 1.74; alfa-Bergamotene - 1.64) and oxygen-containing components (Geranyl acetate -7.2; Geraniol -2.27). The high content of D-Limonene and low level of biochemical diversity in the presented composition of volatile compounds indicates that this genotype is close to true citrons and is of scientific interest for comparative studies as part of the gene pool of hybrid samples and clones of the parental species *C. medica* L. Other volatile substances in the aromatic profile of *C. medica* leaves are as follows.

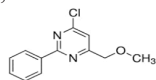
Geranyl acetate is a complex terpenoid ester. It is found in the essential oils of over 80 plant species. Of those closest to us are: coriander (*Cariandrum sativum* L.), thyme (*Thymus serpyllum* L.S.L.), citronella (*Cymbopogon flexuosus* L.) and most citrus plants. In medical preparations it is used as a component that initiates cell apoptosis, active against some forms of cancer.

beta-Myrcene is an acyclic natural monoterpene. It is represented mainly in the form of β -isomer. Especially much myrcene is found in dill (*Anethum graveolens* L.), coriander (*Cariandrum sativum* L.), wild rosemary (*Ledum palustre* L.). It has a resinous-citrus aroma with a hint of musk and spices (cloves).

beta-Ocimene is a mixture of acyclic monoterpene hydrocarbons with basil odour. It is contained in the leaves of basil (*Ocimum basilicum* L.), one of the oldest spices of the national cuisines of Transcaucasia and Central Asia, with a pleasant odour of fragrant pepper. It is a source of camphor and eugenol essential oils.

Based on our results, the biochemical diversity of aromatic components of leaves of other citron variations is low, but D-Limonene and Geranyl acetate are present among the dominant ones in each of them. In the variety *C. medica* cv. Sarcodactylis has identified 20 volatile substances that determine the aroma of

their leaves. At the same time, oxygen-containing components account for 80 % of their total volume and are dominated by: β -Citronellal (≈ 30 %), (*E*)-Citral (≈ 11 %), isomers of Geranyl acetate, totalling more than 10 %, as well as the ester



$C_{17}H_{12}ClN_3O_3$ (21,04 %), which we identified only in this citron

species.

In the aroma profile of *C. medica* cv. Pavlovskiy Shishkan revealed 22 volatile components, and more than 33 % of their volume falls on the isomer of Geranyl acetate - Neryl acetate. The same volume falls on the share of hydrocarbons: monoterpenes (D-Limonene 13,74 % and Ocimene - 3,55 %) and sesquiterpene Caryophyllene - 25 %). The amount of oxygen-containing components in the aromatic profile of leaves of this citron variety, accounting for almost 50% (> 49 %), is dominated by: β -Citronellal, β -Citronellol, *E*-Citral, (*E*)- and (*Z*)- Geranyl acetate, and Alepic acid (10.1 %), cyclopentenyl fatty acid structures that have been identified in the seed oils of woody plants of pantropical distribution *Hydnocarpus anthelmintica* Pierre et Laness. , *H. alphina* Wight, *H. hainanensis* (Merr.) and *Taraktogenos merrilliana* [8]. The seed oil is poisonous, contains cyanide glycosides and has been detected by us only in this species.

β -Citronellal is a monoterpene aldehyde, the main component of citronella oil, which gives it a characteristic lemon flavour. It is a natural product found in plants of tropical America: negro pepper (*Xylopiya aromatica* (Lam.) Mart., *Annonaceae*) and (*Chromolaena odorata* (L.) R.M. King & H. Rob., *Asteraceae*) - *Eupatorium*.

In the leaves of *C. medica* cv. Skernevitsky (clone of the hybrid *C. medica* \times *C. limon* cv. Ponderosa), 14 volatile aromatic components were identified, and more than 50 % of their volume is accounted for by oxygen-containing compounds, among which derivatives of geraniol (nerol) (Geranyl acetate -5.75 %, Neryl acetate -33.3 %) and citral -12 % predominate. Of the hydrocarbons, D-Limonene (19 %) and Caryophyllene (12 %) dominate. Thus, despite the higher diversity of leaf volatile substances compared to *C. medica*, this clone is the closest to the parent species *C. medica* L. in terms of the components dominating among them. It should be noted that the aldehyde-rich aromatic profile with Citronellal makes the greatest contribution to the aroma of leaves of the *C. medica* L. genotypes considered in this work, and in this respect, the work in which Citronellal, Geraniol, Neral, Limonene, trans- β -Ocimene in the aromatic profile of leaves were considered as indicators of genetic relatedness to the ancestral species of three Taiwanese citrus species (*C. taiwanica*, *C. tachibana* and *C. depressa*) is of particular interest [9].

The hybrid species *C. meyeri* Yu. Tanaka - (*C. maxima* \times *C. reticulata*) \times *C. medica* is also considered in this work as a genotype with citron participation.

Although more than 56 % of the leaf volatile aromatic substances in this genotype are represented by hydrocarbons, among which β -Elemene (21.5 %) and Caryophyllene (26 %), more than 27 % in the total volume of volatile aromatic substances are Citronellal, Citral, Geranial, Nerol, Geraniol, Geranyl acetate, Neryl acetate Citronellol, which indicates its certain affinity to citron, at the same time the presence of hydrocarbon β -Elemene shows at the same time the affinity of this species with sweet citrus. It is also interesting to note the presence of a small proportion of this component (2.5 %) in the aromatic profile of *C. medica* cv. Sarcodactylis, due to which it is sometimes referred to as a sweet variety of citron.

Conclusion. The volatile components of leaf samples of 5 citron variations were investigated by SPME and GC-MS analysis. Citron (*C. medica* L.) plants, its cultivars and hybrids cultivated in greenhouses were used as model objects: *C. medica* cv. Pavlovskiy shyshkan; *C. medica* cv. Skernevitsky (clone of the hybrid *C. medica* \times *C. limon* cv. Ponderosa); finger citron - *C. medica* cv. Sarcodactylis and *C. meyeri* Yu. Tanaka, a spontaneous hybrid species - (*C. maxima* \times *C. reticulata*) \times *C. medica*. Their biochemical diversity was established and nine aromatic volatile substances were identified as indicators of their genetic relatedness: Citronellal, Citral, Geranial, Nerol, Geraniol, Geranyl acetate, Neryl acetate, Citronellol, β -Ocimene, Limonene. It was shown that the analysis of biochemical diversity of leaf volatile aromatic compounds is useful not only in elucidating the degree of relatedness between genotypes within a species (*C. medica* L.) and identifying chemotypes, but also in interspecific relationships within the genus Citrus L..

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The author expresses his deep gratitude to colleagues and co-authors of my publications in this field of research:

A.I. Alekhna - curator of the citrus collection of the Central Botanical Garden of the National Academy of Sciences of Belarus;

V.P. Suboch - Candidate of Chemical Sciences for consulting assistance in adapting modern methods of analysis to the specific conditions of their implementation.

DOI 10.34660/INF.2023.15.27.137

获得具有增强的 β -胡萝卜素生物合成能力的菌株新金分枝杆菌Ac-501/22, 并确定在3 L生物反应器中培养的最佳碳源和氮源

OBTAINING STRAIN *MYCOLICIBACTERIUM NEOAURUM* AC-501/22 WITH INCREASED ABILITY TO B-CAROTENE BIOSYNTHESIS AND DETERMINING THE OPTIMAL SOURCE OF CARBON AND NITROGEN FOR CULTIVATION IN 3 L BIOREACTOR

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抽象的。这项工作的目的是获得一种具有增强的类胡萝卜素生物合成能力的新金黄色葡萄球菌菌株, 并随后优化培养条件。通过N-亚硝基-N-甲基脲化学诱变和筛选, 获得了*M. neoaurum* Ac-501/22, 其合成类胡萝卜素的能力比初始值提高了2.7倍。通过选择碳源和氮源进一步优化营养培养基, 类胡萝卜素生物合成水平达到183 mg/kg, 是初始值的4.7倍。随后在体积为3 L的发酵装置中, 在优化的培养基和实验确定的参数中培养菌株期间, 获得了这些条件下类胡萝卜素的最大产量, 等于252.4 mg/kg 干生物量。

关键词: 类胡萝卜素, 饲料添加剂, 微生物培养, 新金分枝杆菌。

Abstract. *The aim of the work was to obtain a strain of *M. neoaurum* with an increased ability to biosynthesize carotenoids and subsequent optimization of cultivation conditions. By chemical mutagenesis using N-nitroso-N-methylurea and subsequent selection, *M. neoaurum* Ac-501/22 was obtained, and its ability to synthesize carotenoids was 2.7 times higher than the initial values. As a result of further optimization of the nutrient medium with the selection of a source of carbon and nitrogen, a level of carotenoid biosynthesis of 183 mg/kg was achieved, which is 4.7 times higher than the initial values. During the subsequent cultivation of the strain in a fermentation unit with a volume of 3 l in an optimized medium*

and experimentally determined parameters, the maximum yield of carotenoids for these conditions was obtained, equal to 252.4 mg/kg of dry biomass.

Keywords: carotenoids, feed additive, cultivation of microorganisms, *Mycolicibacterium neoaurum*.

1. Introduction.

At present, the provision of the livestock industry with high-quality and balanced feed and feed additives is of paramount importance. This is due to the fact that the level of feeding of farm animals and birds is one of the main factors that have a direct impact on the full growth and development of livestock and poultry, and ensures the optimal use of the genetic potential of animal productivity [1-4]. Interest in the development of feed additives based on carotene-synthesizing microorganisms is due to the high biological role of this group of compounds, which is not limited by provitamin properties [5,6]. It has been established that, having antioxidant activity, these compounds stimulate nonspecific resistance factors, protect the body from the carcinogenic effects of aggressive oxygen species and free radicals. Also, a number of studies have shown the relationship between the processes of reproduction and the level of carotenoids in the blood [7].

It is known that 80-90% of carotenoids are currently obtained by chemical synthesis or extraction from plant sources. However, the demand of society for the greening of production dictates the need to find other ways to obtain this group of organic compounds. An alternative to chemical synthesis are processes using enzyme systems of microorganisms. From this point of view, the search for effective methods for the production of carotenoids using microorganisms becomes relevant [8].

The needs of animals in carotene should be covered by feeding plant foods with a high content of these compounds (corn, alfalfa, grass meal, etc.) [8]. However, providing animals with carotenoids from plant sources is difficult due to their gradual degradation during harvesting and storage. In this connection, special feed additives enriched with carotenoids are being developed and introduced.

From the available literature data, it is known that bacteria of the genera *Mycolicibacterium* are capable of synthesizing pigments of a variety of nature in sufficient quantities, including carotenoids [9]. This fact makes these microorganisms promising candidates for developing on their basis a technology for obtaining microbial carotene-containing biomass for feeding farm animals and birds. Given the above, the aim of the work was to obtain a *Mycolicibacterium neoaurum* strain with an increased ability to biosynthesis of carotenoids, and subsequent optimization of cultivation conditions.

2. Materials and methods.

2.1. Maintenance of *M. neoaurum* on agar medium.

To maintain *M. neoaurum* strains, a nutrient medium of the following composition (g/L) was used: agar-agar, 17.0; glucose, 10.0; soy flour, 10.0; citric acid, 2.2; urea, 0.5; NH_4Cl , 1.0; $7\text{H}_2\text{O}$, 0.5; $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, 0.05; CaCO_3 , 1.5 (pH 7.0–7.2).

The strains were stored on these agar media for 4 weeks at a temperature of 4°C, followed by subculturing. For long-term storage, the culture was freeze-dried (the carrier was dried milk).

2.2. Media composition and cultivation conditions.

For the cultivation of *M. neoaurum* in flasks, a medium with laboratory index A of the following composition (g/L): glucose, 20.0; soy flour, 10.0; citric acid, 2.2; urea, 1.0; NH_4Cl , 1.0; KH_2PO_4 , 0.5; $7\text{H}_2\text{O}$, 0.5; $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, 0.05; CaCO_3 , 1.5 (pH of the medium 6.8–7.2).

When studying the effect of a carbon source on the biosynthesis of carotenoids, instead of glucose, sucrose, lactose, fructose, raffinose, glycerol, mannitol, and sorbitol were introduced into the main medium A in an amount (20 g/l). Soy flour (nitrogen source) in medium A was exchanged for an equivalent amount of soy peptone, milk powder, pea flour, yeast peptone, yeast extract, meat peptone.

The culture flasks were placed on an Innova 44 shaker at 220 rpm and 35°C and cultured for 2 days. Then, the resulting inoculum in the amount of 10% vol. were transferred to flasks with a similar medium and grown under the same conditions for 48–50 h. The resulting culture liquid was used either for inoculation of a fermentation unit, or it was freeze-dried to determine the carotenoid content.

2.3. Mutagenesis.

For chemical mutagenesis, N-nitroso-N-methylurea was used. 100 ml of culture liquid *M. neoaurum* Ac-501 obtained after 48 hours of cultivation was centrifuged for 5 minutes at 7500 rpm. The concentrated bacterial biomass was resuspended in 10 ml phosphate buffer pH 6.2. To 5 ml of the resulting cell suspension was added 5 ml of a 2% NMH solution. The suspension was incubated with stirring for 0–160 min at 30°C. At predetermined time intervals, 2 ml of cell suspension was taken and 10 ml of phosphate buffer with pH 7.0 was added. Next, the suspension was centrifuged at 7500 rpm for 5 min. The supernatant was discarded and the procedure was repeated again. Then, after the last separation of the supernatant, 10 ml of buffer pH 7.0 was added, which was the first dilution. Next, a series of successive tenfold dilutions of cells obtained by incubation with NMH was made. To obtain monoclonies, 0.1 ml of cell suspension was taken from each tube for inoculation of Petri dishes with agar medium. The cups were placed upside down in a thermostat and incubated at a temperature of 30°C for 5–8 10 days. Then the number of grown colonies was counted.

2.4. Cultivation of the *M. neoaurum* Ac-501 strain in a 3-liter fermentation unit.

The laboratory fermentation unit consisted of a 3 L fermenter with a working volume of 2.0 L. Process parameters (temperature, pH, pO_2) were controlled us-

ing specialized electrodes. The pO₂ level was adjusted by changing the number of revolutions of the agitator in the automatic mode.

The preliminarily prepared nutrient medium was loaded into the bioreactor and sterilized in an autoclave at 121°C for 60 min. After sterilization, the bioreactor was placed on a fermentation unit, sensors, air and cooling water flows, and electric motors were connected. The initial pO₂ content was set at 100%. Before inoculation, a sample of the medium was taken for microbiological and biochemical control. The amount of inoculum was 10% of the volume of the medium in the fermenter (200 ml). Seed material was applied along the seed line.

2.5. Determination of the content of carotenoids.

30 ml of culture liquid was centrifuged at 7500 rpm for 5 min. The supernatant was decanted, the biomass was extracted with 10 ml aliquots of acetone 3 times. The acetone extracts were combined, transferred to a separating funnel, 10 ml of petroleum ether was added, thoroughly shaken, and a saturated NaCl solution was added dropwise to break the emulsion. Then, the acetone layer was separated and re-extracted with petroleum ether. The obtained petroleum extracts were combined, filtered through a glass filter. The absorption spectrum of the carotenoid extract was determined on a Thermo Spectronic spectrophotometer at a wavelength of 474 nm against a solvent (petroleum ether). The total content of carotenoids (M) was determined by the following formula:

$$M = \frac{(\text{ml of ether}) \times (A_{474})}{2.1 \times (\text{dry weight of biomass})} \times 100\%,$$

where A₄₇₄ is the degree of absorption of the solution, obtained experimentally

2.1 - the value of 1% extinction.

2.6. Statistical data processing.

Each experiment was carried out three times in triplicate, the arithmetic mean was used for the calculation. Statistical data processing was performed using the STATISTICA 6.0 program (StatSoft, Inc.). The level of significance of differences between control and treatments (p<0.05) was determined using a t-test for independent variables.

3. Results.

3.1. Obtaining strain *M. neoaurum* Ac-501/22.

The strain *M. neoaurum* Ac-501 was chosen as the initial strain producing β-carotene from the laboratory collection. The initial productivity of the strain was 44.4 mg/kg of β-carotene. To increase the production capacity of *M. neoaurum*, a series of studies was carried out on mutagenesis using NMH and subsequent selection of isolated colonies with altered morphological features. During the study, a number of experiments were carried out to study the effect of the mutagenic factor on cell survival (Fig. 1).

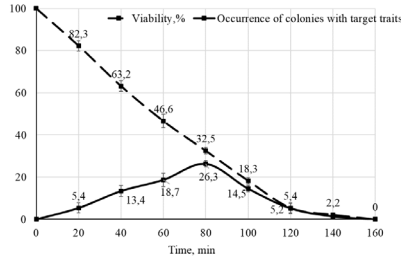


Figure 1. Survival of *M. neoaurum* when exposed to NMU and the frequency of occurrence of isolates with targeted properties.

The main selection criterion was the color change of the colonies from yellow-golden to orange or carrot. According to the constructed survival curve (Fig. 1), the optimal exposure time for *M. neoaurum* in NMH solution is 80 min. It was during this period of exposure to the mutagenic factor that the appearance of the largest number of colonies with target traits was recorded - 26.3%. The selected colonies were seeded on liquid nutrient media to determine the content of β -carotene in the biomass. The most productive colony was again exposed to NMH. As a result of a series of 7 rounds of mutagenesis, a strain was obtained capable of synthesizing 122.3 mg/kg of β -carotene, which is 2.7 times more than the original one. The strain was assigned laboratory number *M. neoaurum* Ac-501/22.

3.2. Determination of the influence of nitrogen and carbon sources on the process of accumulation of carotenoids in the biomass of *M. neoaurum* Ac-501/22.

The ability of *M. neoaurum* Ac-501/22 to utilize such carbon sources as sucrose, fructose, lactose, raffinose, mannitol, sorbitol, and glycerol was studied. The control medium was glucose. The results are presented in Figure 2a.

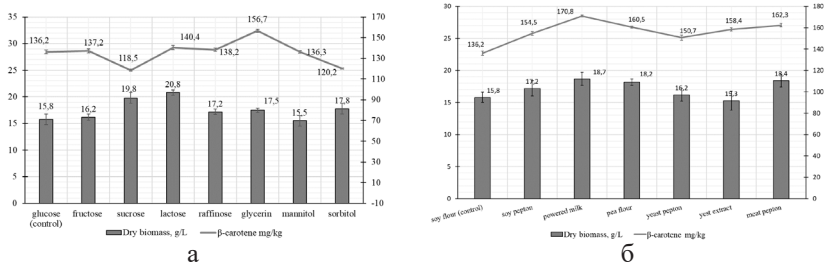


Figure 2. *M. neoaurum* Ac-501/22 biomass accumulation and β -carotene content depending on the carbon source in the growth medium (48 h of growth).

As follows from the obtained data, the strain *M. neoaurum* Ac-501/22 is able to use sugars and organic polyhydric alcohols included in the study as a carbon source. The highest productivity of the culture was achieved when replacing glucose with glycerol and amounted to 156.7 mg/kg, which is 15% more than in the control variant. An increase in the yield of dry biomass by 10.8% was also noted compared to the control.

When studying the influence of a nitrogen source on the process of β -carotene biosynthesis, it was determined that *M. neoaurum* is able to grow not only on a medium with soy flour (control conditions), but also on the substrates used in the study - milk powder, pea flour, yeast extract, meat peptone, yeast and soy peptone-soy flour (control conditions). The highest productivity of the strain (Fig. 2b) was achieved in the variant of replacing soy flour with milk powder and amounted to 170.8 mg/kg, which is 25.4% more than in the control variant.

3.4. Cultivation of the *M. neoaurum* strain in a modified medium.

Based on the obtained results, a medium was proposed that received the laboratory index AM, containing glycerol 20.0 g/l and milk powder (10.0 g/l).

According to the obtained data, the cultivation of *M. neoaurum* on the AM medium made it possible to increase the productivity of the culture in terms of biomass by 21.5% and β -carotene - by 35%.

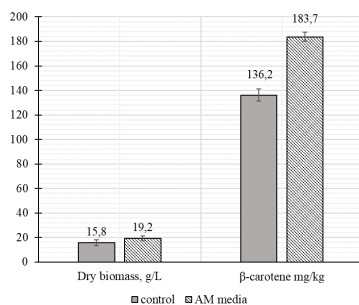


Figure 4. Accumulation of *M. neoaurum* biomass (48 h) and content of β -carotene depending on the composition of the medium.

3.5. Cultivation of *M. neoaurum* Ac-501/22 in a fermentation plant.

Cultivation of *M. neoaurum* was carried out in 3 parallel repetitions using an optimized nutrient medium AM. Fermentation was carried out under fed-batch conditions at controlled pH and pO_2 . The pH value of the medium and the concentration of dissolved oxygen were determined experimentally (data not shown). The results are presented in fig. 5.

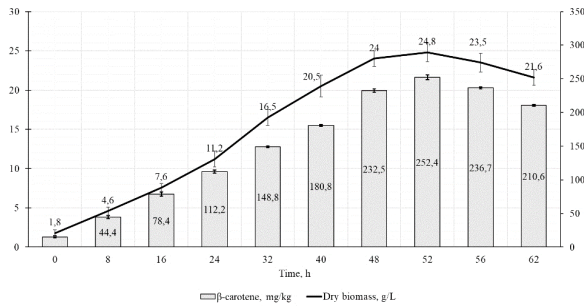


Figure 5. Growth dynamics of *M. neoaurum* Ac-501/22 and accumulation of β -carotene during strain cultivation in a bioreactor in the mode of pH, pO_2 control and feeding.

As follows from the obtained data (Fig. 5), maintaining the pH of the nutrient medium at a level of 7.0–7.2, stirring speed of 450 rpm, pO_2 of 50%, and supply of glycerol for 24 hours of cultivation in an amount of 5.0 g/l makes it possible to achieve biomass productivity – 24.8 g/l and β -carotene - 252.4 mg/kg.

Conclusion.

As a result of the work performed, the *M. neoaurum* Ac-501/22 strain was obtained, which is capable of synthesizing carotenoids 2.7 times more than the original strain. The composition of the growth medium was determined, which makes it possible to obtain a bacterial biomass by 15.2% more compared to the initial data. The main parameters of strain cultivation in a bioreactor were determined. The obtained data will further allow scaling up the process of β -carotene biosynthesis.

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DOI 10.34660/INF.2023.88.14.138

某制药公司办公室和现场员工远程业务沟通的特点

**PECULIARITIES OF REMOTE BUSINESS COMMUNICATION
OF OFFICE AND FIELD EMPLOYEES OF A PHARMACEUTICAL
COMPANY**

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抽象的。药品销售市场的快速变化需要新的促销系统方法。在这方面，远程业务通信的作用：办公室、现场工作人员和客户、医疗和制药专业人员正在急剧增加。与远程工作相关的新因素的影响可能会导致业务的繁荣或衰落。这项研究调查了办公室和现场员工之间的沟通活动和对远程互动形式的态度的变化；它评估性格类型、舒适度和远程工作的其他指标对销售结果的影响。

关键词：沟通、制药公司、销售、混合办公、远程工作、医药代表。

Abstract. *Rapidly changing conditions of the pharmaceutical sales market require new approaches to the promotion system. In this regard, the role of remote business communications: office, field staff and customers, medical and pharmaceutical professionals is sharply increasing. The influence of new factors related to remote working may contribute to the flourishing of business or its decline. This study examines changes in communication activity and attitudes toward remote forms of interaction among office and field employees; it assesses the impact of personality types, comfort levels, and other indicators of remote working on sales results.*

Keywords: *communication, pharmaceutical company, sales, hybrid office, remote work, medical representative.*

Introduction.

The system of work organisation of pharmaceutical companies historically has its own peculiarities in contrast to the business processes of other industries. As a rule, there is a central office in one or two cities and in remote cities there are several employees of the field force of medical representatives in the regions who

make visits to doctors and pharmacies. Regional medical representatives communicate with their regional manager remotely, solving current working issues via electronic communication, meeting once a month at joint double visits or regional meetings.

The work of medical representatives in the area of responsibility is organised through on-site and off-site activities - live communication with specialists - doctors and pharmacy staff. Until recently, only a small percentage of interaction with specialists consisted of e-mail correspondence, phone calls and communication via other messengers. Thus, according to Ipsos research in Russia, the share of remote visits in the structure of multichannel promotion before the pandemic in work with pharmacists was 3% and 6% with doctors [1]. According to an international study in May 2020, conducted in Germany, France, UK by Accenture - before Covid-19 about 64% of meetings with representatives of pharmaceutical companies were conducted in person, which may indicate a greater experience of remote communications in working with doctors in these countries [2].

In March 2020, there was a sudden situation of the need to restructure business communication due to quarantine measures under Covid-19 worldwide. Different companies reacted to this challenge in different ways: some companies simply went into self-isolation and product research and skills development, practically excluding communication activity with doctors and pharmacy staff; most companies showed flexibility and high adaptability of their business processes of drug promotion and digital technologies came to the fore [3].

In this study, our **goal** was to identify the most significant elements of remote business communication during a pandemic of office staff, regional medical field representatives, and external specialist clients that influence business performance outcomes during a period of complete isolation of face-to-face communication.

The study involved 48 office staff and 150 field staff of medical representatives of a pharmaceutical company interacting with 30000 external customers, employees of health care facilities and pharmacies. The object of the study was the impact of the isolation regime during the quarantine period of Covid-19 on business communications and sales results. The study is selective, representative. The study addressed the following objectives: To determine how the communicative activity and attitudes towards remote forms of interaction of office and field employees of a pharmaceutical company changed during the period of quarantine Covid-19.

To evaluate the influence of personality types and comfort level of remote work of field employees on sales results.

To identify changes in the emotional background of a medical representative and a doctor when making a product presentation without visual contact - activation of verbal (emphasis on key messages, verbalisation of feelings, complexity and length of sentences, benefit in priority over properties and characteristics) and

paraverbal manifestations (intonation, volume, timbre of voice vibration, pace of speech).

The following **research methods** were used to solve the set tasks:

- A social questionnaire including the Big Five model (or the OCEAN model) modified by the authors
- Developed test to determine the changes in communication during the period of isolation
- Analysing statistics of changes in customer contacts from face-to-face, face to face, to remote - telephone, messengers, email.
- Statistics of changes in sales of the company's products in different reporting periods.

The hypothesis for this study is the assumption that the development of competences of remote communications taking into account the psychological type of personality increases the level of quality of interaction with customers and provides an increase in product sales skills and business performance in general.

The novelty of the scientific results lies in the fact that for the first time it will be proved the relationship and impact of the development of competences of remote communications on the results of sales in the conditions of severe restrictions of face-to-face contacts during the pandemic period.

The validity of the results is based on statistical processing using methods of scientific validity - Student's criterion, correlation, probability distribution.

Practical value of this work will allow to realise a scientifically valid approach to the development of competences of remote communications for practical business in the field of sales.

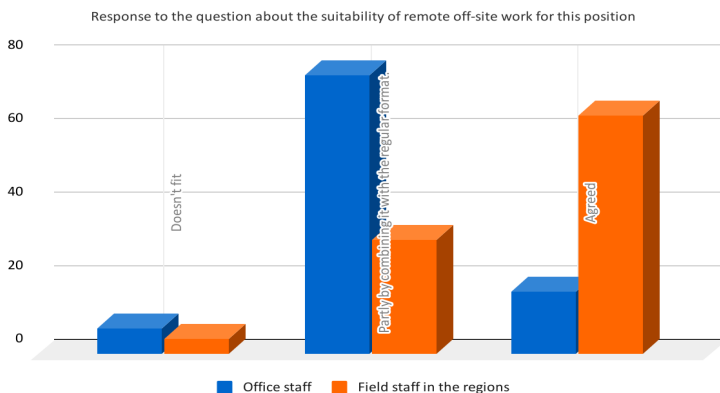
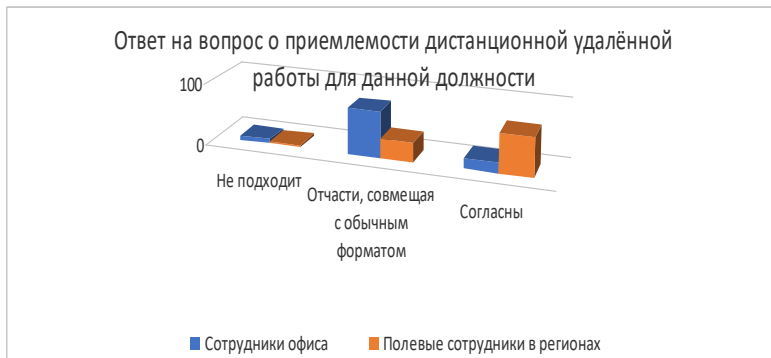
Approbation of the topic was carried out with the participation of employees of a pharmaceutical company for the promotion of medicines.

Experimental research.

After the address of the President of the Russian Federation on 25 March 2020, Moscow, Moscow region and most of the regions announced the introduction of the self-isolation regime. In connection with the transition to remote mode, the organisation of work of office staff and field forces of medical representatives in the regions was changed, which had a certain impact on the psycho-emotional level and efficiency of the tasks performed.

1 Emotional perception of the employees of the new work format was assessed by the answer to the question about the acceptability of remote telecommuting for their position: office employees answered - 7% did not fit, 17% agreed, 76% only combined presence in the office; regional employees (field staff) answered - 4% did not fit, 31% partially disagreed with this statement, but 65% were ready to work remotely. Psychological readiness to work in the conditions of remote tel-

ecommuting was shown to a greater extent by regional employees than by office employees.



Analysing the advantages and disadvantages of remote work, the employees noted the following features: the communication process became more complicated for 43% of office employees and 55% of regional medical representatives in working with external clients - specialists when switching from face-to-face meetings to remote cooperation.

Assessing team interaction, 19% of office staff and 7% of field staff experienced a feeling of lack of teamwork and lack of informal communication with colleagues.

When characterising the disadvantages of remote working, 24% of office employees did not see any disadvantages, while field employees with this opinion

were fewer - only 8%. Office employees, evaluating their experience of working remotely: 33% felt no difference between working remotely from home and working in the office; 26% noted the feeling of greater satisfaction from work due to a better work-life balance; 14% had a better work efficiency and only 10% evaluated this experience as negative; 17% did not comment on their experience.

An interesting fact was that after returning to the usual rhythm of life, almost all office employees would like to work on a flexible schedule some part of the time: 3 times a week working in the office and 2 at home, seeing the advantages in the possibility to increase their performance by eliminating the inconveniences of the office and travelling time.

Field workers, answering the open question about what disadvantages were highlighted in remote work, noted, first of all, the complicated process of communication with specialists (which is the basis of the work of field forces), it was also noted that it was difficult to organise a workplace at home, as relatives were also self-isolated and distracted 15% of employees from work. Examples of distractions were: relatives, children, neighbours, animals; difficulty concentrating and switching away from domestic and family problems; difficulty in secluding oneself to work; confined space; lack of working area and space, lengthened working hours and prolonged sitting at the computer and phone; hypodynamia; lack of gadgets working simultaneously for all family members; drastic limitation of “live communication” without eye contact, difficulty in getting through and tension of doctors from overload and constant calls, lack of ability to follow up directly with

More than 70% of medical representatives noted positive aspects of communication when working remotely with doctors: the possibility of greater coverage of the audience, no queues at the polyclinic, safe in terms of their health contacts, it is easier to contact the doctor, to communicate at a convenient time, to focus the doctor’s attention on the topic, which means the possibility of mutual understanding and discussion of a specific problem and ways of its solution to help and alleviate the suffering of the patient. The ability to answer a question asked remotely, send additional information in electronic form (messengers, e-mail), connect to webinars.

Development of new and more productive professional skills, for example: conducting a structured remote visit, working through the techniques of paraverbal communication, techniques of presenting information in the format of a bundle: benefits, advantages, properties.

A more detailed study of the personality types and comfort level of remote working of field employees was conducted. When analysing personality traits, a significant negative correlation was found between extraversion and comfort with remote work ($r = -0.244$, $p = 0.005$). Medical representatives who scored higher on the extraversion scale experienced greater discomfort than those with lower scores

on this scale. No relationship was found between other personality traits and comfort level (matched sample significant correlations at the 0.05 level).

Another significant negative correlation was found between extraversion scores and sales performance ($r = -0.361$, $p = 0.000$). Those medical representatives with higher scores on extraversion showed a greater drop in sales than those with lower scores on this scale.

In addition, the study found that medical representatives with lower levels of extraversion felt more comfortable working remotely and therefore achieved higher sales results.

A strong positive correlation was found between medical representatives' comfort level and their sales results, meaning that those employees who experienced fewer problems during the 3 months of remote working were more productive and efficient. This supports the assertion that remote working can be successful if the employees' workplace at home is well equipped, employees are motivated, can maintain a life-work balance and are willing to overcome the challenges that may arise when working in isolation (Peters et al., 2004; Lupu, 2017).

Thus, it can be said that important general conditions for successful home-based work, are:

- employees should feel comfortable telecommuting using modern communication tools
- extroverts in the team should be given extra attention to make them feel comfortable and maintain their productivity.

The organisation of staff in the office and field forces of medical representatives, thanks to training webinars and modern means of communication, was quickly reorganised. Specialists were grateful for the up-to-date information received via messengers. It's also worth noting an international trend that according to Accenture's physician survey, during the pandemic, the percentage of meetings conducted remotely increased to 65% or more. Physicians see great value in the increased number of virtual interactions. Pharmaceutical companies are reassessing and redefining their relevance in the new realities, and physicians see the benefit to themselves and patients.

It has been noted that office staff now want employers to provide flexible work schedules of 3 times a week working in the office and 2 at home.

Last but not least, the study established the conditions under which telecommuting can be effective in business.

To improve business efficiency when switching to a hybrid and remote working format, it is important to consider:

1. providing employees with office and communication equipment for remote working:

- Organisation of high-quality remote communication (corporate mail, text

- group chats, group video calls and conference calls, etc.);
- Utilising the capabilities of messengers (WhatsApp, Viber, Skype, Telegram, etc.);
- Consulting and quick problem solving by an IT specialist remotely 24 hours (taking into account time zones);
- Effective cross-functional interaction of all departments of the company.
- Training of employees to develop skills and competences necessary for remote work and ensuring high results:
- New leadership qualities in managers, built on trusting relationships and desire to help their employee. “Freedom within certain limits” with checkpoints spelled out in standards. Support for team spirit and a shared information space for the ability to communicate, especially for the extroverted personality type. Motivation and ability to notice breakdown in adaptation, prevention of professional burnout.
- Self-organisation, self-control and time management with activity planning and structuring of the day, adherence to work and rest regime.
- Digital etiquette of remote work according to the rules of interaction between office staff and clients.

Thus, working in a hybrid and remote format gives a company:

Ability to expand its workforce;

Greater coverage of clients in remote territories;

Reduction of office maintenance costs;

Reduction in the number of employee business trips to the regions and traveling days;

Increased employee loyalty and comfort;

Opportunity to attract the best experts from anywhere in the country.

Only with a flexible approach and timely application of new, more effective interaction tools can companies expect a high level of knowledge and trust from employees and customers.

A well-thought-out system of communication of a hybrid office with remote work will help build social and professional ties with colleagues, clients and ensure the necessary results in sales and business growth.

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DOI 10.34660/INF.2023.35.72.139

生产共和制单一企业“BELPFARMACIA”的数字化——其发展的主要方向
**DIGITALIZATION OF THE PRODUCTION REPUBLICAN
UNITARY ENTERPRISE «BELPFARMACIA» – THE MAIN
DIRECTION OF ITS DEVELOPMENT**

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注解。本文概述了白俄罗斯共和国领先的制药企业——贸易和生产单一企业 RUE “BELPHARMATSIYA”（以下简称企业）实施的数字技术。所使用的研究方法（分析和综合、描述性方法）使我们得出这样的结论：现阶段的电子服务是药学领域的一个新现实，通过改进医药活动朝着创新形式的方向发展。

关键词：药学、电子服务、人口、药品供应。

Annotation. The article provides an overview of digital technologies implemented at the leading pharmaceutical enterprise of the Republic of Belarus - the trade and production unitary enterprise RUE “BELPHARMATSIYA” (hereinafter referred to as the Enterprise). The research methods used (analysis and synthesis, descriptive method) made it possible to conclude that electronic services at the present stage are a new reality in the field of pharmacy, opening up the possibility of increasing the availability of drug care for the population by improving pharmaceutical activities in the direction of innovative forms of development.

Keywords: pharmacy, electronic services, population, drug supply.

Health refers to a socially significant phenomenon, the level and condition of which is used to judge the degree of development and well-being of society. For this reason, health care occupies one of the central places in the social policy of the Republic of Belarus, where innovative forms are actively introduced.

Since the sphere of drug circulation is an integral part of the healthcare system and one of the main factors ensuring the availability of drug care for the population, the emergence of e-health has a direct impact on pharmaceutical activities.

According to the Licensing Department of the Ministry of Health of the Republic of Belarus, as of July 1, 2023, 3,967 pharmacies provide drug services to the population, of which 1,851 (47%) are state-owned pharmacies and 2,116 (53%) are non-state owned.

RUE “BELPHARMATSIYA” has changed its name eight times over the 100 years of its existence, has undergone several structural transformations, has accumulated a wealth of experience in the field of drug provision of the population and healthcare organizations, has set high standards for the provision of services, created its own traditions and has established itself as a reliable and conscientious partner. The Company considers its main task to be the maximum provision of the population with safe, effective and high-quality medicines, medical devices and other pharmacy products at affordable prices.

The structure of the Enterprise includes more than 200 pharmacies, a pharmacy warehouse, a control and analytical laboratory and an information and pharmaceutical center, the competence of the latter is the introduction of digital technologies. The Company employs about 2,000 people, most of whom are experienced highly qualified specialists with pharmaceutical education. In its aspiration to “Always be close to the patient”, the Company annually opens new pharmacies and introduces new forms of drug service.

Pharmaceutical activity today is a work with a large amount of data and at the same time it is a personal work with a person. At the intersection of these trends, an effective scenario for the operation of the Enterprise is formed. The Company’s development strategy is based on ensuring the high quality of social services provided using advanced methods and new technologies for the benefit of the population. The digitalization of business processes of the Enterprise makes the chain of movement of medicines transparent, allows you to manage inventory in the pharmacy warehouse and pharmacies, taking into account the turnover of goods, make rational decisions about purchases and storage. The activities carried out at the Enterprise since 2005 to create a unified corporate software environment made it possible to collect, process, systematize, visualize, analyze, accumulate and provide various information about the work of all structural divisions of the Enterprise.

The following projects have been implemented and are constantly being improved at the Enterprise: “Pharmacy Warehouse”, “Belarusian Pharmacy”, “Personnel Management. Salary”, “Reference Pharmacy”, “Electronic Document Management”, “Qualification Certification of Specialists”, etc. Specialists of legal, repair and construction, control and analytical services, specialists of the department of customs clearance of goods work with modern software, labor protection and office, members of the attestation commission for the assignment of qualification categories to pharmaceutical workers, etc.

A WMS system has been introduced into the practice of the pharmacy warehouse of the Enterprise - an information system designed to manage the processes and resources of the warehouse according to established rules and algorithms, including planning, distribution and control of the execution of warehouse operations in real time. Work in the WMS-system made it possible to increase the productivity of workers involved in warehouse operations by building the most optimal route when placing an order; improved the quality of shipments of goods from the warehouse by eliminating serial sorting during selection; reduced the need for pharmaceutical specialists; increased the efficiency of warehouse space use due to zoning and targeted placement of goods.

Remote provision of all aspects of pharmaceutical care through the use of available telecommunication channels (telephone lines, Internet, VPN, videoconferencing, etc.), allowed the Company to be the first among the pharmacy chains of the Republic of Belarus to develop such a direction as telepharmacy.

Visitors can get information about the availability of medicines and other pharmacy products in pharmacies, and clarify the addresses of the nearest pharmacies by scanning stickers with a QR code, the layouts of which are located in the service halls of all pharmacies, or at information kiosks. Special software for information kiosks was developed and installed for the first time in the Republic of Belarus in 2014 in the pharmacies of the Enterprise.

To inform the population, there is an inquiry service at a single free telephone number 169, each subscriber of which can find out not only information about the availability of pharmacy products in the pharmacies of the capital, but also reserve the goods at the pharmacy of his choice.

All pharmacies of the Company accept contactless payment from visitors using a QR code using the Pay™ mobile service, a payment service for mobile devices based on electronic money and not tied to a bank payment card. Mobile service Pay™ is available free of charge for customers of any bank in the country.

Since 2013, for the first time in the EAEU countries, the AIS “Electronic queue” has been introduced into the practice of the pharmacies of the Enterprise. This made it possible to increase the efficiency of pharmacies and the loyalty of visitors, to ensure the rapid distribution of the flow of visitors in the right directions, to eliminate the shortcomings of the “live” queue, to reduce the likelihood of conflict situations, to reduce the time for serving visitors, to increase the productivity of pharmaceutical workers, to get expert advice in conditions of confidentiality.

The enterprise provides the population with a contactless sales service for related pharmacy products through vending machines (vending machines). Work experience shows that this is a modern, high-tech and progressive direction.

The most promising from the point of view of promoting electronic services in healthcare and pharmacy is the implementation of electronic prescription circulation technology. The enterprise is the creator of the concept and the initiator of the development of the AIS “Electronic Prescription” - a centralized system for electronic prescribing and dispensing of medicines, including preferential provision of medicines. Prior to commissioning, primary testing, debugging and adjustment of technological processes were carried out. The pharmacy network of the Enterprise became the first in the country connected to this service in 2015. Since the start of the project, doctors from Belarusian healthcare organizations have issued more than 58.8 million electronic prescriptions. The experience of using the system has shown advantages over issuing a paper prescription: it eliminates illegibility or misinterpretation of prescriptions, allows you to see all the medicines prescribed to the patient, avoid erroneously indicated dangerous dosages, unwanted drug interactions, etc. A basis has also been created for the introduction of automation of settlements between healthcare organizations and pharmacies.

One of the first among the pharmaceutical enterprises of Belarus in 2009, the site PHARMA.BY was created, where information about the Company and the services provided is posted and updated, the possibility of reserving goods in the pharmacy network is provided, and the SMS notification service is connected. The site page is presented in popular social networks. For comfortable access to the site from mobile devices, a mobile version of the site has been created, where everything is placed in such a way as to make user interaction with the resource as convenient as possible.

Since 2015, the PHARMASKLAD.BY website has been operating, providing customers with the opportunity to order goods at the pharmacy warehouse of the Company online.

In order to improve the qualifications of specialists through distance learning for specialists of the Enterprise, the training portal PHARMACADEMY.BY has been operating since 2018.

In 2023, the Enterprise opened the first state Internet pharmacy in the Republic of Belarus at PHARMAMALL.BY. Online you can now order and buy over-the-counter medicines, medical devices and equipment, hygiene products, oral care products, products for children, food and cosmetics. The order can be obtained independently at any pharmacy of the Company or arranged for delivery by courier to any point in Minsk.

To attract new customers and partners, the Company adheres to the tactics of active interaction with social networks and instant messengers. In the Instagram messenger RUE “BELPHARMATSIYA” is represented by two accounts. One of them “belpharma-cia” is a corporate account. The second account “apteki_belpharmacia” was created with the aim of promoting pharmacy products, increasing

the customer base and popularizing pharmaceutical activities. The channel “My BELFARMATSIYA” has been created in the Telegram messenger.

The company takes an active part in the exhibition forums “Healthcare of Belarus”, “TIBO”, “Eurasian Week”, where the achievements of the state pharmacy network were presented due to the introduction of information and communication technologies.

It becomes obvious that the growing possibilities of data networks, the development of technologies in the very near future will transform the pharmaceutical industry in the same way that they transformed the media, retail and banking industries in their time. Digitalization is a new and necessary reality in pharmacy, which opens up the possibility of improving pharmaceutical activities in the direction of innovative forms of development, which will increase the availability of drug care for residents of each locality of the country, make it efficient and of high quality.

门诊阶段合并症患者的管理
**MANAGEMENT OF COMORBID PATIENTS AT THE
OUTPATIENT STAGE**

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抽象的。应对 21 世纪的健康和发展挑战需要对卫生系统采取新的方法和投资。一方面是社会老龄化、慢性病及合并症发病率上升、患者受教育程度和需求提高,另一方面是新的医疗技术、深度专业化和卫生基础设施的发展要求向人们提供的护理应侧重于日益复杂的护理需求,在整个交付过程中进行协调,并且更容易获得(在经济上、地理上和全天候)。在俄罗斯,最近制定了几个立法项目,以提高医疗保健的质量和可及性,形成以患者为中心的医疗保健。在莫斯科,引入并测试了一项新计划,改变了初级卫生保健的组织方式,优化了共病患者(尤其是老年人)的管理方法。这使得提高资源利用效率并实现既定目标成为可能。

关键词: 合并症、门诊阶段、医疗护理、多学科方法、老年患者。

Abstract. *Addressing health and development challenges in the 21st century requires a new approach and investment in health systems. The aging of society, the higher incidence of chronic diseases and comorbidity, the increase in the education and demands of patients, on the one hand, as well as new medical technologies, deep specialization and the development of health infrastructure, on the other, require that care provided to the population be focused on increasingly*

complex care needs, is coordinated throughout its delivery and is more accessible (financially, geographically and around the clock). In Russia, several legislative projects have recently been developed to improve the quality and accessibility of medical care, the formation of patient-oriented healthcare. In Moscow, a new program was introduced and tested with a change in approaches to the organization of primary health care, optimization of methods for managing comorbid patients, especially the elderly. This made it possible to increase the efficiency of resource use and achieve the goals set.

Keywords: *comorbidity, outpatient stage, medical care, multidisciplinary approach, elderly patients.*

Increasing the level of medical care, improving the quality of life are accompanied by an increase in the proportion of elderly and senile patients suffering from chronic non-communicable diseases, and therefore the problem of combined pathology, the so-called “comorbidity” in the domestic and world medical literature is currently receiving more and more attention.

The organization of management of comorbid patients at the outpatient stage is carried out in medical organizations of the state, municipal and private healthcare systems.

In the Russian Federation, outpatient support for comorbid patients is carried out in a medical organization providing primary health care, or its division, at the place of residence (stay) of the patient - in case of acute diseases, exacerbations of chronic diseases in the event of a call from a medical worker or when he visits a patient for the purpose of monitoring his condition, the course of the disease and the timely appointment (correction) of the necessary examination and (or) treatment (active visit), with the patronage of certain groups of the population in case of detection or threat of an epidemic of an infectious disease, patients with an infectious disease, persons in contact with them and persons, suspicious of an infectious disease, including through door-to-door (door-to-door) rounds, examinations of workers and students;

Recently, a number of legislative initiatives have been adopted in domestic healthcare to improve the availability and quality of medical care, the optimal distribution of resources of medical organizations in the regions by creating a three-level system for the provision of medical care [1], as well as the formation of patient-oriented healthcare [2] with the introduction modern diagnostic technologies and including dynamic outpatient monitoring using telemedicine technologies.

In the management of chronic patients, according to the methodological recommendations of the CRIHOI “Chronic patients throughout life”, rational models are proposed based on the formation of functional groups of medical workers

(doctors, nurses), whose tasks will include the preparation of individual plans for the management (outpatient care) of patients with chronic diseases that ensure the implementation of a complex of therapeutic, diagnostic, preventive, rehabilitation, social measures to control patients throughout life [3].

The implementation of a new organizational technology of comprehensive care for chronic patients is proposed as a structural subdivision of an outpatient clinic with medical, rehabilitation and personnel capabilities, for which the organizational structure and functions of the department of chronic diseases are proposed. The technology intends to ensure maximum accessibility and complexity of medical care for patients with an interdisciplinary approach and coordination, creation of conditions for the integration of preventive, curative and social care, differentiation of the volume and types of care, taking into account the risk of complications and exacerbations in the established departments of chronic patients.

Outpatient care for the population [4] is carried out by local general practitioners, general practitioners (family) in cooperation with medical specialists in the profile of the disease, which involves the formation of an interdisciplinary approach (cardiologists, neurologists, rheumatologists, endocrinologists, pulmonologists, gastroenterologists, etc.) according to the plan of patient management, taking into account the presence of comorbid diseases and conditions [5]. This is necessary for the effective functioning of the declared interdisciplinary approach to the management of chronic patients, especially in comorbidities.

This work is carried out in several steps:

- In the presence of clinically pronounced comorbid diseases or conditions, as well as an estimated high/very high risk of complications, it is necessary to consult a specialist (cardiologist, gastroenterologist, psychiatrist, etc.) and decide on further examination, prescription and correction of therapy for a comorbid disease
- In the absence of a clinically significant comorbid disease, a moderate or low estimated risk of complications, specialist consultation and additional therapy are not required.
- Determine the tactics of patient management, taking into account the identified comorbid diseases.
- In the presence of clinically significant comorbid diseases or conditions, as well as an estimated high / very high risk of complications, the treatment of the underlying disease is carried out in parallel with the registration and treatment of the comorbid disease, as well as the prevention of complications associated with antirheumatic therapy.
- In the absence of a clinically significant comorbid disease, a moderate or low estimated risk of complications associated with it, special prophylaxis is not required.

- Control of comorbid pathology in the treatment of the underlying disease

The primary care physician must clearly represent the prognosis of diseases, which is the basis for the formation of a plan for therapeutic and preventive measures using the comorbid patients prognosis calculator in primary medical and social care. [6].

At the outpatient stage of medical care, the principle of a multidisciplinary approach and a multidisciplinary team is formulated. This provides for the interaction of various medical specialists in specialized diseases, cardiologists, pulmonologists, endocrinologists, nutritionists, rehabilitation specialists, specialists in physical therapy, functional diagnostics, physiotherapy, clinical psychologists, psychotherapists, nurses, social workers and other specialists. Of course, for each pathology, a special set of specialists and methods of secondary prevention is used. A multidisciplinary team ensures that balanced decisions are made and the patient is managed on a multidisciplinary basis, sets goals, develops an individual program for managing a comorbid patient, carries out current medical supervision and conducts complex activities

The structure of the Russian Scientific Society of Therapists organized the section “Comorbidity”, in the structure of the Russian Society of Cardiology - the section “Comorbidity in Cardiology”.

In 2017, the All-Russian public organization Association of General Practitioners (Family Doctors), section “Concomitant Pathologies”, presented clinical recommendations “Comorbid pathology in clinical practice”, which for the first time consider the issues of comorbidity of cardiovascular pathology, diabetes mellitus, liver diseases, of the musculoskeletal system, features of pathology in elderly and senile patients, problems of rational use of drugs and adherence to therapy in a comorbid patient. In these recommendations, the term “comorbidity” refers to a combination in one patient of two or more chronic diseases that are etiopathogenetically interconnected or coincide in time of appearance, regardless of the activity of each of them, and the term “multimorbidity” is used in the recommendations as a synonym.

The program for the management of patients with multiple chronic diseases in Moscow has shown [7] that due attention is paid to the problems of the elderly in our country at the federal level [8]. The programs undertaken in the Russian Federation achieve the key goals of which are defined: a steady increase in the duration, level and quality of life of older citizens, stimulating their active longevity, etc.

Thanks to the significantly expanded functions of the doctor and nurse, and the following additions have been made to their functional responsibilities:

- telephone consultations, an invitation to an appointment, a reminder of the need for an examination, checking the fulfillment of appointments, etc., answers

to medical questions, assistance in case of an emergency, making an appointment and pre-ordering certificates and extracts), regular calls from a nurse to monitor the patient's adherence to treatment;

- maintaining a register of patients, consolidating information about the condition of patients and the success of treatment; - creation and formation of long-term individual treatment plans, developed taking into account all the patient's chronic diagnoses, with their handing over and explanation of the sequence of measures to achieve target indicators;

- organization and preparation of clinical reviews and interdisciplinary consultations of specialists; - analysis of calls for emergency and emergency medical care and emergency hospitalization. Analysis of the situation in a group of patients according to certain nosologies (atrial fibrillation, unstable angina, etc.);

- counseling on lifestyle, geriatric problems, nutrition and physical activity;

- continuous professional development - participation in conferences, lectures by chief specialists, testing, clinical reviews, master classes, situational centers.

At the same time, all the previously existing functional duties of the district general practitioner (dispensary observation of patients, general medical examination, maintaining an outpatient card, issuing prescriptions, etc.) are preserved.

To standardize the process with the help of repeated timing of the time of admission, algorithms were developed for the primary and repeated appointments of a doctor and a nurse.

The effectiveness of the implementation of the Program was assessed according to a special methodology developed jointly with the Research Institute for Health Organization and Medical Management of the Moscow Health Department. This technique made it possible to assess the expected overall effect of the implementation of the program by reducing the number of calls for emergency and emergency medical care, as well as hospitalizations associated with the diagnoses included in the Program.

The program is aimed at improving the efficiency of medical care and improving its accessibility to people older than working age, whose number is increasing every year, with a change in approaches to the organization of its primary link, optimization of patient management methods.

The approbation of the program for the management of patients with chronic diseases in Moscow made it possible to increase the efficiency of the use of healthcare system resources. With the correct organization of the provision of primary health care to patients with multiple chronic diseases in Moscow, the costs required for the implementation of such a Program turn out to be less than the financial effect obtained by reducing the load on the inpatient link and the link of emergency and emergency medical care.

A review of organizational technologies for the management of chronic patients in outpatient settings in different countries shows that the most promising models are implemented in the coordination of medical care by primary care, focused on the needs of patients, on improving their health, as well as the ratio of costs and results of treatment [9].

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获得抗菌白细胞多肽的超声暴露的最佳模式

OPTIMAL MODES OF ULTRASOUND EXPOSURE FOR OBTAINING ANTIBACTERIAL LEUKOCYtic POLYPEPTIDES

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抽象的。本文提出了优化超声波处理供体白细胞的方法，确保具有抗菌活性的肽复合物的最大产量。该研究的对象是从经过超声波处理的供体白细胞中获得的蛋白质-肽复合物。采用肉汤连续稀释法测定抗菌活性。确定每个测试样品相对于微生物测试菌株的最低抑菌浓度（MIC）的单独值。确定了白细胞浓度的最佳值，并选择了超声处理供体白细胞的条件，以获得抗菌活性增强的蛋白肽复合物。

目的是寻找最佳的超声暴露模式以获得具有抗菌活性的白细胞肽。

关键词：超声波、暴露时间、抗菌活性、白细胞浓度、细胞破坏。

Abstract. *The article presents approaches to optimizing the treatment of donor leukocytes with ultrasonic waves, which ensures the maximum yield of peptide complexes with antibacterial activity. The object of the study was a protein-peptide complex obtained from donor leukocytes treated with ultrasound. The method of serial dilutions in broth was used to determine the antibacterial activity. The individual values of the minimum inhibitory concentration (MIC) were determined for each of the test samples in relation to the tested strain of the microorganism. The optimal values of the concentration of leukocyte cells were determined, as well as the conditions for ultrasonic treatment of donor leukocytes were selected to obtain a protein-peptide complex with increased antibacterial activity.*

The aim is to search for optimal modes of ultrasound exposure to obtain leukocytic peptides with antibacterial activity.

Keywords: *ultrasound, exposure time, antibacterial activity, leukocyte concentration, cell destruction.*

Introduction

The creation of competitive products is impossible without the extensive use of new technologies. An innovative method for obtaining polypeptides from biological objects can be ultrasound treatment, which, in addition to the cavitation processes that occur, leading to changes in the physicochemical characteristics of bio-objects, also exhibits antiviral effects [1]. At high ultrasound frequencies applied to a cell suspension, the mechanisms of destruction also have a mechanical nature, and the threshold intensity of ultrasound causing cell death depends both on the ultrasound frequency and the cell type [2].

Ultrasound methods can be utilized to intensify the process of extracting proteins from by-products of immunopharmaceutical production and to break them down into low molecular weight peptides. We have previously investigated the cytotoxicity of a new polypeptide obtained through ultrasound treatment of donor leukocytes in vitro [6].

Significant increase in cell death rate at ultrasound intensities exceeding 0.7 W/cm² is due to cavitation, the threshold of which depends on the volumetric concentration of cells in the medium. In diluted suspensions, the cavitation threshold coincides with that in water and becomes substantial when the volume fraction of particles in the suspension exceeds 2% [3, 4]. In this study, we present novel approaches to optimize the treatment regimen of donor leukocytes with ultrasound waves, ensuring the maximum yield of peptide complexes with antibacterial activity.

Materials and Methods.

The object of the study was a protein-peptide complex obtained from donor leukocytes treated with ultrasound.

Ultrasound treatment was performed by immersing the working tool of the ultrasound system into the leukocytic cell solution. The ultrasound exposure conditions were as follows: constant power of 50 watts and frequency of 30 kHz; the amplitude varied within the range of 60% to 80%. The duration of ultrasound treatment for blood leukocytes ranged from 30 seconds to 150 seconds. The effectiveness of ultrasound treatment was evaluated based on the number of destroyed cells and the level of biological activity.

The viability of leukocytic cells was determined by staining them with a 1% sodium eosinate solution, followed by counting in a Goryaev chamber. The number of leukocytes was calculated using the formula:

$$\tilde{O} = \dot{A} \times 1110 \times 200 \times 100, \text{ where}$$

X is the number of leukocytes in 1 liter of suspension.

A is the number of leukocytes counted in the entire Goryaev chamber.

1110, 200 - is the conversion factor to adjust for the volume of 1 ml.

100 is the volume of the leukocyte suspension in ml.

The antibacterial activity was determined using the serial dilution method in Mueller-Hinton broth. The testing was conducted in sterile 96-well polystyrene plates in an 8x12 format. Individual minimum inhibitory concentration (MIC) values were determined for each of the tested samples against the target microorganism strain using the serial dilution method in Mueller-Hinton broth. The prepared plates were inoculated with a suspension of the tested microorganisms for the research.

The assessment of the antibacterial activity of the investigated leukocytic protein-peptide complex was conducted under the guidance of V.P. Korobov, a candidate of medical sciences, head of the Laboratory of Microorganism Development Biochemistry at the Institute of Ecology and Genetics of Microorganisms, Ural Branch of the Russian Academy of Sciences. The strains *Staphylococcus cohnii* 3165 were used to study the antibacterial properties of the obtained peptide complex. The minimum inhibitory concentration was defined as the lowest concentration that completely suppressed visible growth of the tested strain. Control growth on the non-inoculated culture was carried out alongside the serial dilution methods in the broth. The purity of the microorganism suspension used for inoculation was verified by streaking on non-selective media [7].

This research method allowed the evaluation of the antibacterial activity of the protein-peptide complex against the specific strains of microorganisms, providing valuable insights for potential applications in antimicrobial therapies.

Results and Discussion.

The first stage of this study involved assessing the level of destruction and antibacterial activity based on the ultrasound exposure conditions: time and amplitude (Table 1).

The data from Table 1 reveals the impact of varying ultrasound exposure parameters on the level of destruction and antibacterial activity of the leukocytic protein-peptide complex. It is observed that different time durations and amplitudes of ultrasound treatment lead to distinct levels of cell destruction and antibacterial effectiveness.

Table 1

The state of the cell suspension under the influence of ultrasound conditions.

№	Ultrasound exposure conditions		Deconstructed leukocytes after US treatment, %	Antibacterial activity level, mg/ml*
	Time of exposure, sec	Amplitude of ultrasound, %		
1	30	60	50	0,0547
2	60		58	0,0547
3	90		70	0,0273
4	120		85	0,1094
5	150		100	0

6	30	80	60	0,1094
7	60		70	0,0547
8	90		75	0,0547
9	120		90	0,1094
10	150		100	0

*- The minimum concentration of the peptide complex at which the growth of test strains ceases.

The obtained results during the experiment (Table 1) demonstrated that an increase in the duration and amplitude of ultrasound exposure led to a rise in the number of destructured leukocytes and an increase in antibacterial activity (0.0273 and 0.0547 mg/ml) at 90 seconds of exposure at both amplitudes. Further extension of the ultrasound exposure time resulted in complete agglomeration of the leukocytic suspension, leading to a decrease in antibacterial activity. The most optimal ultrasound conditions were observed at 90 seconds of exposure with an amplitude of 60%.

A series of experiments were conducted using leukocytic suspensions with varying cell concentrations at the previously determined optimal ultrasound parameters. The viability of cells was assessed using the staining method with sodium eosinate. In this method, deceased cells were stained, while living cells retained their original color. The effectiveness of ultrasound treatment was evaluated based on the number of destructured cells and the level of biological activity of the obtained substance. Data on the average number of destructured leukocytes after ultrasound (US) treatment, depending on the cell concentration in the cell suspension, are presented in Table 2.

Table 2

A comparative analysis of leukocyte concentration after ultrasound treatment

№	Initial concentration of leukocytes in the cell suspension, million cells/ml	Percentage of destructured leukocytic cells after US- treatment, %	Antibacterial activity level, mg/ml
1	56,0	Welding	0
2	35,8	37,5±0,5	0,4376
3	13,3	40,8±0,6	0,4376
4	10,0	65,8±0,5	0,2188
5	6,7	73,2±0,8	0,0273
6	5,0	79,2±0,9	0,1094
7	2,5	86,2±0,9	0,1094

The obtained results demonstrated that the initial concentration of leukocytes directly influences the number of destroyed leukocytes after ultrasound exposure.

Based on the data, it can be concluded that the optimal leukocyte concentration in the cell suspension for cell destruction through ultrasound treatment is 6.7 million cells/ml. This optimal concentration was utilized in all subsequent experiments.

Conclusion.

In this study, we have developed optimal ultrasound exposure conditions for obtaining leukocytic peptides with antibacterial activity. To achieve the highest level of antibacterial activity in the protein-peptide complex, the following conditions for leukocyte destruction using ultrasound are required:

- Leukocyte concentration: 6.7 million cells/ml
- Exposure time: 90 seconds
- Amplitude of ultrasound: 60%
- Power: 50 watts
- Frequency: 30 kHz

These findings provide valuable insights into the optimization of ultrasound treatment for obtaining bioactive substances with potential antimicrobial applications. The established conditions can be utilized in further research and development of leukocytic peptides with enhanced antibacterial properties.

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DOI 10.34660/INF.2023.65.48.142

CAD心力衰竭患者心肌血运重建后 β -肾上腺素受体阻滞剂药物治疗分析
**ANALYSIS OF BETA-ADRENOBLOCKER PHARMACOTHERAPY
IN CAD PATIENTS WITH HEART FAILURE AFTER
MYOCARDIAL REVASCULARISATION**

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注解。 β -肾上腺素受体阻滞剂 (BAB) 在心血管疾病 (CVD) 的药物治疗中占有重要地位。它们用于冠状动脉疾病 (CAD)、动脉高血压 (AH)、慢性心力衰竭 (CHF)、心律失常以及近期急性心肌梗塞患者的一线治疗。 BABs可抑制儿茶酚胺的心脏毒性作用,抑制心肌细胞凋亡,改善舒张期等。随机临床试验和荟萃分析表明,长期使用 β -肾上腺素阻滞剂可改善缺血患者的预后,降低心血管事件的风险、死亡率和猝死。然而,其术后疗效的证据并不充分,而且还需要明确其处方的患者群体,因为副作用包括:高血糖、低钾血症、支气管痉挛、外周血管收缩和血脂异常增加。

关键词: 心肌血运重建、冠状动脉疾病、药物治疗、 β -肾上腺素阻滞剂、慢性心力衰竭。

Annotation. *β -adrenoreceptor blockers (BAB) have gained a strong position in the pharmacotherapy of cardiovascular diseases (CVD). They are used in first-line therapy of coronary artery disease (CAD), arterial hypertension (AH), chronic heart failure (CHF), arrhythmias and in patients with recent acute myocardial infarction. BABs suppress the cardiotoxic effects of catecholamines, inhibit cardiomyocyte apoptosis, improve diastole, etc. Randomised clinical trials and meta-analyses have shown that long-term use of β -adrenoblockers improves outcome in patients with ischaemia, leads to a reduced risk of cardiovascular events, mortality and sudden death. However, the evidence of their efficacy in the postoperative period is insufficient, and it is also necessary to clarify the groups of*

patients for their prescription due to side effects: hyperglycaemia, hypokalaemia, bronchospasm, peripheral vasoconstriction and increased dyslipidaemia.

Keywords: *myocardial revascularisation, coronary artery disease, drug therapy, b-adrenoblockers, chronic heart failure.*

CHD is one of the leading factors in the formation and progression of LV diastolic disorders. The diastolic dysfunction may be based on relaxation disorders and fibrotic processes arising due to the progression of atherosclerotic cardiosclerosis. Myocardial revascularisation by CABG is highly effective for the treatment of angina symptoms and reduces the risk of death in patients of certain groups (lesions of the main trunk of the left coronary artery, three-vessel lesions, occlusions and multiple coronary artery lesions). These patients have better long-term results of myocardial revascularisation (“CABG”) than PCI [2, 5].

In the early postoperative period, secondary prevention measures are initiated, when the motivation to fulfil medical recommendations is especially high. It includes diet, motor regime with dosed physical activity, elimination of modifiable risk factors and avoidance of habitual intoxications, drug treatment. According to the European recommendations on myocardial revascularisation, optimal drug therapy should include drugs to eliminate ischemia (b-blockers or calcium antagonists - first-line drugs, or ivabradine, prolonged nitrates, trimetazidine, etc. - second-line drugs), as well as drugs to prevent cardiovascular complications (aspirin/clopidogrel, statins) [3]. A number of research works show that pharmacological approach (use of III generation b blockers) is effective in regression of endothelial dysfunction. Nebivolol induces vasodilation by stimulation of endothelial nitric oxide synthase through β_3 -agonism thereby affecting the reduction of heart rate, blood pressure, improvement of systolic and diastolic cardiac functions, and also has minimal effects on lipid metabolism [1, 4].

To date, β -blockers have been prolonged for patients after myocardial revascularisation by aorto-coronary bypass grafting (“CABG”) and for patients with intermediate (40 to 50% EF) and preserved left ventricular (LV) ejection fraction. However, evidence of their efficacy in the postoperative period is insufficient and clarification of the personalisation of patient groups for their prescription is required. At present, the benefit of nebivolol in patients with CHFpEF is not proven and requires larger randomised clinical trials.

Purpose of the study: to compare the effect of drug therapy with b-adrenoblockers (bisoprolol and nebivolol) in patients with stable angina III and IV functional class (according to CCS classification) and CHF with preserved and intermediate ejection fraction after aortocoronary bypass surgery

Materials and methods

The study included 160 patients with stable angina III and IV, aged from 44 to 80 years (mean age 62.0 ± 5.0 years) with high risk of ischaemic complications: lesion of one or more main coronary arteries, who were planned to undergo myocardial revascularisation by CABG in the period from 2017 to 2022. The scientific study was conducted on the basis of the cardiosurgical department of the St. Joasaph Regional Clinical Hospital in Belgorod. The data on the gender and age composition, anamnesis, main clinical manifestations, risk factors, data of additional methods of investigation, peculiarities of treatment before hospitalisation, presence of comorbid diseases in patients were obtained.

The following were considered as inclusion criteria: diagnosis of angina pectoris of functional class III and IV (according to the Canadian Cardiovascular Society classification), postinfarction cardiosclerosis, left ventricular ejection fraction more than 40%, isolated aortocoronary bypass, type 2 diabetes mellitus, chronic kidney disease 2 and 3.

Exclusion criteria were patients requiring simultaneous surgical intervention, patients with low ejection fraction (less than 40%), acute myocardial infarction, contraindications\ intolerance to BAB, patient participation in another study.

Equivalents of angina such as dyspnoea and atypical pain syndrome were not considered because of the low frequency of stress tests required for objective confirmation of ischaemia.

There were 139 men (86.9%) and 21 women (13.1%) among the examined patients. Body mass index (BMI) was 28.3 ± 2.5 . LV systolic function was judged by the value of ejection fraction (EF): heart failure with preserved EF was diagnosed in 100 people (62,5%), CHF with intermediate EF was 60 patients (37,0%). The New York Heart Association (NYHA) classification was used to determine the CC of CHF using the 6-minute walk test. Of those included in the study, 120 patients (75.0%) had postinfarction cardiosclerosis, hypertension was present in 155 patients (96.9%), dyslipidaemia was observed in 104 patients (65.0%), type 2 diabetes mellitus in 57 patients (35, 6%), chronic lung disease/ bronchial asthma - 24 patients (15.0%), heart rhythm disorders - 23 (14.4%), peptic ulcer disease - 20 (12.5%), acute cerebral circulation disorder - 9 (5.7%). By the volume of revascularisation: 120 patients (75,0%) underwent aortocoronary bypass in the volume of 3-4 shunts, 40 patients (25,0%) underwent 1-2 branch bypasses.

All patients underwent EchoCG with evaluation of the presence or absence of signs of mechanical cardiac dyssynchrony. Table 1.

Table 1

Descriptive characteristics of patients on admission who received bisoprolol and nebivolol after revascularisation.

n = 160 nebivolol n = 52 bisoprolol n = 108	Therapy	Percentiles		
		25 (Q ₁)	50 (Me)	75 (Q ₃)
E/A (1)	Nebivolol (before treatment)	,6650	,7900	1,1200
	Nebivolol (6 months later)	,0500	,0600	,0700
	Bisoprolol (before treatment)	,6700	,7800	,9100
	Bisoprolol (6 months later)	,0500	,0600	,0700
DT, ms (1)	Nebivolol (before treatment)	194,00	221,00	263,50
	Nebivolol (6 months later)	168,00	196,00	229,00
	Bisoprolol (before treatment)	196,00	232,00	273,00
	Bisoprolol (6 months later)	169,00	210,00	230,50
E/e'(1)	Nebivolol (before treatment)	7,550	10,500	13,460
	Nebivolol (6 months later)	7,800	10,000	13,150
	Bisoprolol (before treatment)	8,500	9,780	12,050
	Bisoprolol (6 months later)	7,800	8,950	12,400
e'(1)	Nebivolol (before treatment)	,0500	,0600	,0750
	Nebivolol (6 months later)	,0500	,0600	,0700
	Bisoprolol (before treatment)	,0500	,0600	,0700
	Bisoprolol (6 months later)	,0500	,0600	,0700

In the perioperative period, all patients received standard drug therapy in accordance with current recommendations and taking into account concomitant pathology.

All patients were divided into 2 groups. In the first group of patients b-blocker “nebivolol” was administered to the therapy of patients with CAD with intermediate and preserved ejection fraction, including the use of ACE, calcium antagonists, diuretics, disaggregants. Patients of the second group took “bisoprolol” for correction of sinus tachycardia as part of standard drug therapy. During 6 months, patients in both groups received basic pharmacotherapy. In case of failure to reach the level of HR < 65 \min, titration to the maximum tolerated dose was performed on an outpatient basis at the place of residence. 6 months after the surgical intervention during dispensary check-up all patients underwent control ECHO CG.

Results and conclusions:

Against the background of therapy with nebivolol and bisoprolol in the group of investigated CHFmrEF and CHFpEF of ischaemic genesis after control ECHO CG it was found that myocardial contractility improved in 55,8% of patients who took the drug “nebivolol”, while in the group of patients who were prescribed the drug “bisoprolol” improvements were registered in 49,1%.

Long-term (from 6 months) therapy with nebivolol in middle-aged and elderly patients with CHFmrEF has the most pronounced effect on structural and functional indices of inotropic heart function recovery.

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老年泌尿病理患者急诊住院期间疼痛综合征的分析
**PAIN SYNDROME IN PATIENTS OF OLDER AGE GROUPS
WITH UROLOGICAL PATHOLOGY DURING EMERGENCY
HOSPITALIZATION**

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抽象的。经皮肾镜碎石术是治疗肾结石的首选手术方式。目前，由于较早开始的疾病复发或与年龄相关的代谢紊乱相关的尿石症的发作，老年患者有更频繁出现 KSD 的趋势。在这方面，预防老年患者术后并发症和加速康复领域的研究似乎具有相关性。本文综述了目前有关预防和缓解老年患者经皮肾镜碎石术后疼痛最有效方法的文献。

关键词：尿石症，经皮肾镜取石术，老年患者，疼痛综合征，疼痛，急诊病理学

Abstract. *Percutaneous nephrolithotripsy is the operation of choice for kidney stones. Currently, there is a tendency for more frequent manifestations of KSD in older patients, due to the recurrence of the disease that began at an earlier age, or the onset of urolithiasis associated with age-related metabolic disorders. In this regard, studies in the field of prevention of complications and accelerated recovery of elderly patients in the postoperative period seem relevant. This article reviews the current literature on the most effective methods of prevention and relief of pain in elderly patients after percutaneous nephrolithotripsy.*

Keywords: *urolithiasis, percutaneous nephrolithotripsy, elderly patients, pain syndrome, pain, emergency pathology*

Introduction. Pain assessment and management requires special attention when working with elderly patients. Due to various changes in body functions, including cognitive functions, the correct assessment of pain in elderly patients requires special attention using appropriate assessment tools. In addition, understanding the comorbidities and social context of each patient, geriatric counseling help determine the method of pain relief [1]. Most pain medications require dosage reduction compared to younger patients. Multimodal and preventive analgesia are promising approaches that deserve further study. The problem of pain in aging patients remains an active, vibrant and rapidly developing area of research, as more older people seek help for surgery or other conditions accompanied by acute pain.

Research results. Percutaneous nephrolithotomy (PNL) was introduced in the 1970s, at that time it was mainly an adjunct to the open procedures indicated for large kidney stones. Gradually, the PNL procedure has replaced open surgery for the removal of kidney stones due to better results, low trauma and postoperative complications [2]. Currently, PNL is the operation of choice for nephrolithiasis.

Standard PNL is performed in several stages: selection of the patient's position on the operating table, access - puncture of the renal cavitory system, dilatation of the puncture tract, selection of instruments, method of stone disintegration, completion of the operation - decision on the need for drainage and selection of the type of drainage [3]. At each of the stages, various strategies have been developed and are constantly being researched, taking into account the possibility of using under certain conditions, postoperative complications, the length of stay in the hospital in the postoperative period, and the volume of additional medical care.

One of the most important areas of study is the minimization and relief of pain, especially in elderly patients. Currently, research is being actively conducted in this area, however, the existing data are insufficient - further study and introduction of the most appropriate methods into routine urological practice is necessary.

Currently, there are often no approved algorithms for assessing and subsequent relief of pain syndrome, depending on its intensity in clinical practice. Qualitative assessment and documentation of pain (eg, through validated questionnaires) should be improved further. Further research is needed to address this important aspect of the postoperative management of elderly patients after PNL.

Salman Jamil and M. Hammad Ather (2020) conducted a study to evaluate the effect of the type of nephrostomy drain on postoperative pain and blood loss after minipercutaneous nephrolithotripsy. Patients with a balloon nephrostomy (12Fr Foley catheter) were compared with patients with a non-ballooned nephrostomy (Nelaton™ 12Fr catheter). STONE nephrolithometry was used to assess stone complexity. Mean pain scores on the visual analogue scale at 6 and 24 hours postoperatively and the mean decrease in blood hemoglobin concentration at 24 hours

were compared between the two groups. The study found that the mean postoperative pain score at 6 hours and 24 hours after surgery was significantly lower in the balloon group compared to the non-balloon group, which may be due to the softer material of the Foley catheter. An average decrease in blood hemoglobin concentration was also noted in the group using a nephrostomy with a balloon, which is explained by the possibility of temporary tamponade of the damaged kidney parenchyma by filling the balloon in the nephrostomy canal [4, 5].

Nadeem Iqbal et al. (2022) conducted a study comparing postoperative pain in elderly patients undergoing minipercutaneous nephrolithotripsy with drains (nephrostomy drain or ureteral stent) versus no drains. The results of the study show that the course of the postoperative period is more favorable when non-drainage interventions are performed in the elderly. The results also assess the safety and benefits of non-drainage procedures. It is standard practice to place a nephrostomy tube after completion of PNL. Its main purpose is to ensure adequate drainage of the renal cavity system, to create the effect of tamponade of the renal parenchyma at the access site in order to stop bleeding, and to allow re-examination to remove residual fragments of kidney stones. According to the results of the study, interventions without the use of drainage were accompanied by a reduction in hospital stay, a decrease in the intensity of pain after surgery and the need for analgesics without an increase in the incidence of complications and adverse outcomes [6].

Zeeshan Arshad et al. (2018) evaluated the method of intraoperative administration of a 0.25% bupivacaine solution under the kidney capsule and along the nephrostomy approach before installing a nephrostomy drain, followed by an assessment of the intensity of the pain syndrome in the postoperative period. Two groups of patients were compared: the main group (those who received bupivacaine infiltration during surgery - peritubal infiltration) and the comparison group (0.9% saline sodium chloride solution was administered during the nephrostomy access). The study showed that the infiltration of local anesthetic along the nephrostomy drainage is effective in relieving pain immediately after surgery and in the treatment of pain that occurs at a later time. There is less need for patients to use opioid analgesics and non-steroidal anti-inflammatory drugs in the postoperative period. This fact favorably affects its course, especially in elderly patients, who often develop side effects of painkillers [7].

Tao Chen, ZhenQiang Zhu, Jianlong Du conducted a meta-analysis of data on the effectiveness of intercostal nerve blockade in the effectiveness of pain relief in the postoperative period after PNL. In their study, the authors compared the results of intercostal nerve block (ICNB) with control and found a significant reduction in pain scores in patients treated with ICNB at 8, 12, and 24 hours. However, the overall need for analgesics did not differ significantly between the two groups.

As with any regional anesthesia procedure, ICNB can also lead to complications. Experimental studies on healthy volunteers have shown a decrease in lung capacity. Other complications of ICNB may include pneumothorax, pleural effusion, abscess formation, neuritis, and hypotension. The results of the study showed that ICNB can be effective in reducing the intensity of pain in the postoperative period, however, it is accompanied by a higher incidence of complications and is less effective than peritubal infiltration [8].

Conclusions. Thus, despite the large number of active studies in the field of prevention and relief of pain in elderly patients after percutaneous nephrolithotripsy, the problem remains relevant. The use of small-diameter drains made of soft materials or the rejection of drains after surgery, intraoperative peritubal infiltration or intercostal nerve block are quite effective methods. This indicates the need to introduce them into routine practice in urological departments in order to reduce the need for analgesics (NSAIDs and opioids), which is especially important in the treatment of elderly patients, due to the greater incidence of side effects of painkillers.

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DOI 10.34660/INF.2023.78.44.144

可高温高压灭菌手术模板制造
AUTOCLAVABLE SURGICAL TEMPLATES MANUFACTURING

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抽象的。一项针对牙科植入手术模板变形的灭菌研究，在由光聚合物树脂制成的 3D 打印机上做广告。

为了进行实验，购买了 3 种树脂：HarzLabs Dental Yellow Clear Pro、eSun Gray 和 FunToDo Sky Blue。从每种天然材料中都发现了痕迹：边长为 20 毫米的立方体（15 块，每种塑料 5 块）和手术模板（15 块，每种塑料 5 块）。该研究的材料由 Tsvetnoy Mir LLC 活动提供。打印是在 Phrozen Sonic Mini 4K 3D 打印机上实现的。未对样品进行特殊后处理。进行 2 系列测量：打印后和高压灭菌后。结果：灭菌后，FunToDo Sky Blue 负载立方体的变形： $X - 0.01$ mm, $Y - 0$ mm, $Z - 0.03$ mm；模板孔的直径平均增加了 0.62 毫米。灭菌后，估计由 eSun Gray 制成的立方体变形： $X - 0.05$ mm, $Y - 0.04$ mm, $Z - 0.04$ mm；模板孔的直径平均增加了 1.01 毫米。

由 HarzLabs Dental Yellow Clear Pro 树脂制成的立方体在灭菌负载变形后的平均尺寸：沿 $X - 0.145$ mm、沿 $Y - 0.01$ mm、沿 $Z - 0.04$ mm；模板中孔的直径没有改变。

关键词：手术导航模板，灭菌，光聚合物树脂。

Abstract. *A study was made of the study of sterilization for deformation of surgical templates for dental implantation, advertising on a 3D printer made of photopolymer resins.*

*For the experiment, 3 resins were purchased: HarzLabs Dental Yellow Clear Pro, eSun Gray and FunToDo Sky Blue. From each natural material, traces were found: a cube from the side of 20 mm (15 pieces, 5 from each plastic) and a surgical template (15 pieces, 5 from each plastic). **Materials** for the study were provided by the Tsvetnoy Mir LLC campaign. Printing is implemented on a Phrozen Sonic Mini 4K 3D printer. Special post-processing of the samples was not carried out. Conducted 2 series of measurements: after printing and after autoclaving. Results: After sterilization, the deformation of cubes from FunToDo Sky Blue load: $X - 0.01$ mm, $Y - 0$ mm, $Z - 0.03$ mm; the diameter of the hole in the template increased by an average of 0.62 mm. After sterilization, the deformation of cubes made of eSun*

Gray is estimated: by X - 0.05 mm, by Y - -0.04 mm, by Z - -0.04 mm; the diameter of the hole in the template increased by an average of 1.01 mm.

The average dimensions of cubes made of HarzLabs Dental Yellow Clear Pro resin after sterilization load deformation: along X - 0.145 mm, along Y - 0.01 mm, along Z - -0.04 mm; the diameters of the holes in the template have not changed.

Keywords: *surgical navigation template, sterilization, photopolymer resin.*

Conclusion: Sterilization of surgical navigation templates reconstructed infection of the implant site during surgery and the need to eliminate the transfer of the expected position of the implant. Therefore, for the manufacture of surgical templates, it is recommended to use only specialized dental photopolymers that do not present deformation when sterilized in an autoclave.

Relevance. Surgical templates are a structure that is fixed in the patient's oral cavity and serves for correct positioning during various operations, such as dental implantation, bone grafting, and tooth extraction [1-5]. One of the significant topics in the manufacture of templates can be considered the method of sterilization. This is explained by the fact that there are practically no photopolymer resins that can withstand a full cycle of hot sterilization.

Based on this circumstance, we considered a detailed study of this issue to be the most relevant. For this, a study was carried out aimed at a thorough study of the possibility of hot sterilization of photopolymer resins.

Objective. To investigate the effect of sterilization on photopolymer resins from which surgical navigation templates are made.

Materials and methods: A study was made of the effect of sterilization on the deformation of surgical templates for dental implantation printed on a 3D printer from photopolymer resins.

For the experiment, 3 resins were used: HarzLabs Dental Yellow Clear Pro, eSun Gray and FunToDo Sky Blue. Samples were printed from each test material: a cube with a side of 20 mm (15 pieces, 5 from each plastic) and a surgical template (15 pieces, 5 from each plastic). Materials for the study were provided by the Tsvetnoy Mir LLC campaign. Printing was carried out on a Phrozen Sonic Mini 4K 3D printer. Special post-processing of the samples was not performed.

Conducted 2 series of measurements: after printing and after autoclaving. For cubes, the length of the ribs along the X, Y, and Z axes was measured; for surgical templates, the diameters of the drilling bushings and the distance between the two bushings on the right and left sides were measured. Cubes were used to determine the absolute strain. Surgical templates, as more complex geometric objects, were measured to determine the degree of their possible deformation after autoclaving. The measurement results for each sample printed from the test resin were entered into a table. The mean values were calculated before and after sterilization, after

which the values were compared. After the first measurements, the samples were sterilized by autoclaving in a MELAG Euroklav 23 VS+ autoclave in standard mode at a temperature of 134°C and a pressure of 2 atmospheres. Then the measurements were repeated according to the same scheme.

Results:

The average dimensions of FunToDo Sky Blue resin cubes before sterilization were 19.85 mm for X, 19.94 mm for Y, and 19.96 mm for Z. After sterilization, the deformation was: along X - 0.01 mm, along Y - 0 mm, go Z - 0.03 mm. The average hole diameters in the FunToDo Sky Blue template before sterilization were 6.83 mm each, after sterilization they decreased by an average of 0.23 mm. The distance between the holes was 50.02 mm; after sterilization, the distance decreased on average by 0.62 mm.

The average dimensions of eSun Gray resin cubes before sterilization were 19.96 mm for X, 20 mm for Y, and 19.97 mm for Z. After sterilization, the deformation was: along X - 0.05 mm, along Y - -0.04 mm, go Z - -0.04 mm. The average hole diameters in the eSun Gray template before sterilization were 6.84 mm each, after sterilization they decreased on average by 0.24 mm. The distance between the holes was 50.01 mm; after sterilization, the distance decreased on average by 1.01 mm.

The average dimensions of HarzLabs Dental Yellow Clear Pro resin cubes before sterilization were 19.93 mm for X, 19.93 mm for Y, and 20.02 mm for Z. After sterilization, the deformation was: along X - 0.145 mm, along Y - 0.01 mm, go Z - -0.04 mm. The average hole diameters in the template from HarzLabs Dental Yellow Clear Pro before sterilization were 6.85 mm, after sterilization they did not change in diameter. The distance between the holes was 50.02 mm; after sterilization, the distance decreased by an average of 0.01 mm.

Conclusion:

Sterilization of surgical navigation templates excludes infection of the implant site during surgery and should ensure the accuracy of transferring the planned position of the implant. Therefore, for the manufacture of surgical templates, it is recommended to use only specialized dental photopolymers that that do not present deformation when sterilized in an autoclave.

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DOI 10.34660/INF.2023.67.56.145

学龄前儿童急性肾功能衰竭无尿期体温昼夜节律
**CIRCADIAN RHYTHM OF BODY TEMPERATURE IN THE PHASE
OF ANURIA OF ACUTE RENAL FAILURE IN PRESCHOOL
CHILDREN**

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抽象的。3.1~7岁急性肾功能衰竭无尿期儿童第一天体温昼夜节律中值在正常范围内。在接下来的几天里，在肾功能恢复的动态中，只有结果不佳的第3组在第7天的日均体温水平有升高的趋势，同时在整个观察过程中保持升高的趋势。第3组的平均体温昼夜节律的每小时水平的特点是白天和夜间的比率较高。18天后，第3组最重的儿童的温度调节最不稳定性增加了12岁。假定在第3组中肾脏排泄功能恢复、急性肾衰竭治疗无效的背景下致命结果的主导因素是不可避免的线粒体功能不全的营养能量缺乏状态、免疫缺陷状态。

关键词：体温昼夜节律，无尿，急性肾功能衰竭，学龄前儿童。

Abstract. *On the first day, the mesor of the circadian rhythm of the body temperature of children in the phase of anuria with acute renal failure at the age of 3.1 to 7 years was within the normal range. In the following days, in the dynamics of restoration of kidney function, only in group 3 with an unfavorable outcome, there was a tendency to increase the average daily level of body temperature on the 7th day, while maintaining a tendency to increase throughout the observation. The hourly level of the average circadian rhythm of body temperature in group 3 was characterized by higher rates both in the daytime and at night. The most pronounced instability of temperature regulation in the heaviest children of the 3rd group progressed by 12, after 18 days. It is assumed that the leading factors of a fatal outcome against the background of the restoration of the excretory function of the kidneys, the ineffectiveness of the treatment of acute renal failure in group 3 were alimentary energy-deficient state with inevitable mitochondrial insufficiency, immunodeficiency state.*

Keywords: *circadian rhythm of body temperature, anuria, acute renal failure, preschool children.*

Relevance. Acute renal failure (ARF) is a sudden impairment of kidney function with a decrease in filtration and reabsorption processes, leading to a breakdown in water, electrolyte, nitrogen and other types of metabolism, with timely diagnosis and proper treatment, it is reversible. AKI significantly worsens the child's condition, and mortality ranges from 3-5% in hemolytic-uremic syndrome, up to 30-70% in sepsis and multiple organ failure. Even with successful treatment and restoration of urinary function, long-term consequences are possible - 10-25% of children develop chronic kidney disease. Depending on the causes of development, pathological processes in acute renal failure are caused by different mechanisms: ischemia of the renal parenchyma, activation of shunts in the juxta-medullary zone, toxic damage to the glomeruli and tubular epithelium, and acute obstruction of the urinary tract. The changes that occur are initially reversible, and when the provoking factors are eliminated, the functions of the nephrons are completely restored. The aggravating effect of infectious diseases of the respiratory system, impaired cardiac function and other concomitant diseases is known. However, there is not enough information in the literature on the characteristics of the inflammatory response in acute renal failure, which developed against the background of an acute bacterial pulmonary infection in children aged 3.1 to 7 years [1-4].

Goal of the work. To study and give a comparative assessment of the temperature response with a favorable and unfavorable outcome in acute renal failure in preschool age, which developed against the background of an acute infection.

Material and research methods. The data of hourly monitoring of body temperature in 14 children with acute renal failure admitted to the ICU RSC EMC with anuria from 1 to 4 days at the age of 3.1 to 7 years were studied. Prior to admission to the clinic, all patients received anti-inflammatory therapy aimed at the treatment of acute glomerulonephritis - 8, ARI-2, pneumonia 4, AII-1 patient. According to indications, due to severe progressive respiratory failure, invasive mechanical respiratory support was provided on the first day. All patients underwent hemodialysis under the control of hemodynamics, acid-base system, respiratory system, maintenance, antibacterial, anti-inflammatory, syndromic corrective intensive therapy. A favorable outcome with the restoration of full functional activity of the kidneys and discharge from the hospital was observed in 11 children, of which 4 patients received complex intensive therapy with daily hemodialysis for up to 10 days (Group 1). Group 2 combines the results of a study of monitoring data of 7 children who required a longer complex intensive care from 14 to 60 days in the ICU. An unfavorable outcome was observed in 3 children (group 3).

Results and its discussion. On the first day, the mesor of the circadian rhythm of body temperature in children with acute renal failure aged 3.1 to 7 years was within the normal range. In the following days, no significant changes in this in-

indicator were observed in groups 1 and 2 of children. However, in group 3, a tendency to increase the average daily level of body temperature was detected on the 7th day, while maintaining the marked tendency throughout the observation (Table 1). The diagram (Fig. 1) reveals a wave-like change in the average daily temperature in group 2 with a wavelength of 7, 12, 6 days. Fluctuations in the mesor of the circadian rhythm of body temperature in children with an unfavorable outcome (group 3) differed from that in group 2 by shortening the length of the oscillation period to 6, 5, 3, 3, 6, 4, 4 days with an equal amplitude of fluctuations, which amounted to 2 and 3 groups 0.3-0.4 ° C.

Table 1
Dynamics of the mesor of the circadian rhythm of body temperature

Days	1 group	2 group	3 group
1	36,8±0,1	36,7±0,2	36,8±0,1
2	36,8±0,1	36,8±0,01	36,9±0,01
3	36,7±0,02	36,9±0,02	36,8±0,1
4	36,8±0,1	36,6±3,3	36,9±0,1
5	36,7±0,02	36,7±0,1	36,8±0,2
6	36,9±0,1	36,6±0,01	36,7±0,2
7		36,7±0,1	37,1±0,2
8		36,7±0,1	37,0±0,1
9		36,7±0,01	37,1±0,1
10		36,8±0,1	37,0±0,1
11		36,8±0,1	36,7±0,1
12		36,8±0,1	37,0±0,1
13		36,9±0,1	36,7±0,1
14		36,9±0,1	37,0±0,1
15		36,9±0,1	36,7±0,01
16		36,8±0,1	36,9±0,1
17		36,8±0,1	37,0±0,1
18		36,7±0,1	37,0±0,2
19		36,6±0,1	37,0±0,1
20		36,9±0,1	36,9±0,1
21		36,7±0,1	36,8±0,1
22		36,6±0,2	36,8±0,2
23		36,7±0,1	36,9±0,1
24		36,7±0,1	36,9±0,1
25		36,6±0,1	36,7±0,1
26		36,7±0,01	36,8±0,2
27		37,0±0,1	36,9±0,3
28		37,0±0,2	37,1±0,1
29			36,9±0,1
30			37,0±0,1

Table 2
Average values of the circadian rhythm of body temperature according to the severity of the condition

Hours	1 group	2 group	3 group
8	36,8±0,1	36,8±0,1	36,9±0,1
9	36,8±0,1	36,8±0,1	36,9±0,1
10	36,8±0,1	36,8±0,1	36,9±0,2
11	36,8±0,1	36,8±0,1	36,9±0,2
12	36,8±0,1	36,8±0,1	36,9±0,2
13	36,7±0,1	36,8±0,1	36,9±0,2
14	36,7±0,02	36,8±0,1	36,9±0,2
15	36,7±0,1	36,8±0,1	36,9±0,2
16	36,8±0,1	36,8±0,1	36,9±0,2
17	36,8±0,1	36,8±0,1	36,9±0,2
18	36,9±0,1	36,8±0,1	36,9±0,2
19	36,8±0,1	36,8±0,1	36,9±0,2
20	36,8±0,1	36,8±0,2	36,9±0,1
21	36,8±0,1	36,7±0,1	36,9±0,2
22	36,8±0,1	36,7±0,1	36,9±0,1
23	36,8±0,02	36,8±0,1	36,9±0,1
24	36,7±0,1	36,8±0,2	36,9±0,1
1	36,7±0,1	36,8±0,1	36,9±0,1
2	36,8±0,1	36,8±0,1	36,9±0,1
3	36,8±0,1	36,8±0,1	36,9±0,1
4	36,8±0,1	36,8±0,1	36,9±0,1
5	36,8±0,1	36,8±0,1	36,9±0,1
6	36,8±0,1	36,8±0,1	36,9±0,1
7	36,8±0,1	36,8±0,1	36,9±0,1

Consideration of the same indicators with the derivation of the average value of hourly body temperature for the observation period made it possible to detect features that indicate the closest to the physiological circadian rhythm of body temperature in children of group 1 with acrophase projection at 18 hours. While for the daily fluctuations in body temperature in group 2, monotony (decrease in the amplitude of daily fluctuations) with a displacement of the acrophase by 16 hours (counterclockwise) turned out to be characteristic (Fig. 2). The hourly level of the average circadian rhythm of body temperature in group 3 was characterized by higher rates both in the daytime and at night (Table 2).

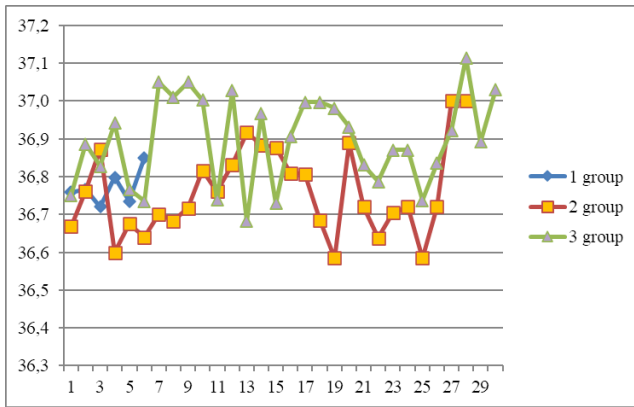


Figure 1. Dynamics of the body temperature mesor depending on the severity of acute renal failure

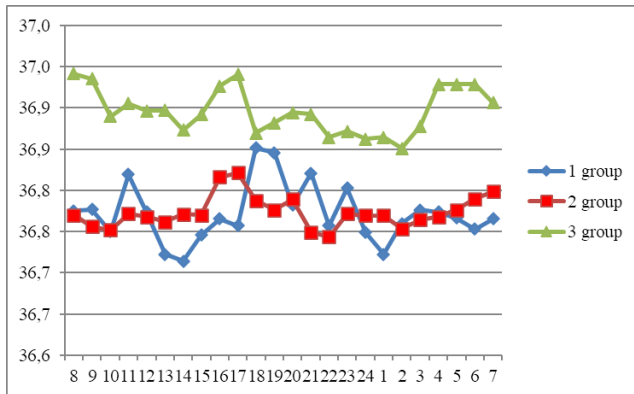


Figure 2. Average values of the circadian rhythm of body temperature according to the severity of the condition

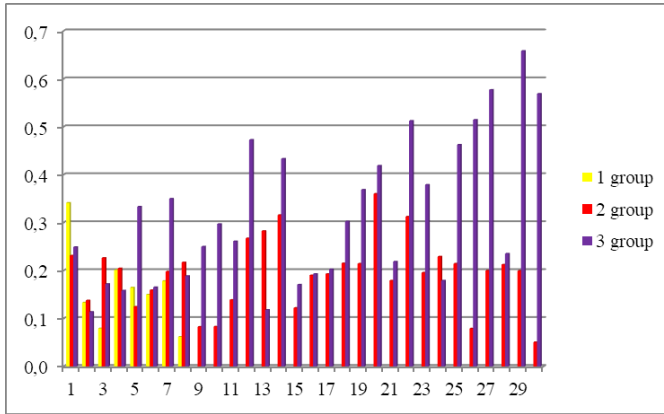


Figure 3. Amplitude of the circadian rhythm of body temperature at the age of 3.1-7 years

Statistically unreliable, but significant for the clinical control of the systemic inflammatory response, changes in the amplitude of the circadian rhythm of body temperature were revealed, indicating the most pronounced instability of temperature regulation in the most severe children of group 3, progressing by 12, after 18 days, despite ongoing intensive anti-inflammatory therapy (Fig.3). The identified feature could be due to a number of factors such as: inadequate antibacterial, anti-inflammatory therapy, ineffectiveness of neurovegetative protection, metabolic failure of the brain thermoregulation centers, ongoing oxygen deficiency due to ventilation modes sparing the inflamed pulmonary parenchyma, despite the level of oxygen saturation above 95%, severe immunodeficiency state, alimentary energy-deficient state with inevitable mitochondrial insufficiency, initially more severe irreversible changes in the functional structures of the kidney parenchyma. The general recommendations available in the literature on enteral and parenteral nutrition for AKI in children are extremely insufficient.

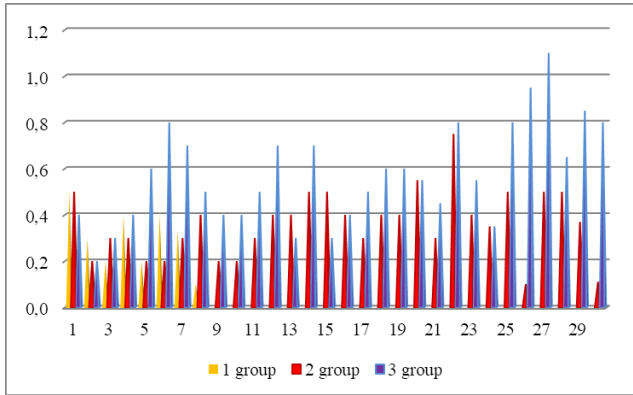


Figure 4. Daily temperature range

Perhaps in this regard, cases of restoration of kidney function are often observed, but a fatal outcome is inevitable. The dynamics of daily fluctuations in body temperature (Fig. 4) confirmed the correspondence between the severity of fluctuations in the severity of the systemic inflammatory reaction in children at preschool age and amounted to 0.5°C in group 1 on day 1, and 0.1°C on day 6. In the 2nd group also on the 1st day - 0.5°C , on the 22nd day - 0.8°C , on the 30th day - 0.1°C , with a repeated increase in instability up to 0.5°C on the 25th, 27th, and 28th days. In the 3rd group on the 1st day - 0.4°C , with the progression of the instability of temperature regulation up to 1.1°C on the 27th day. The findings suggest that the complex anti-inflammatory intensive therapy is not effective enough in children of the 3rd group (Fig. 4).

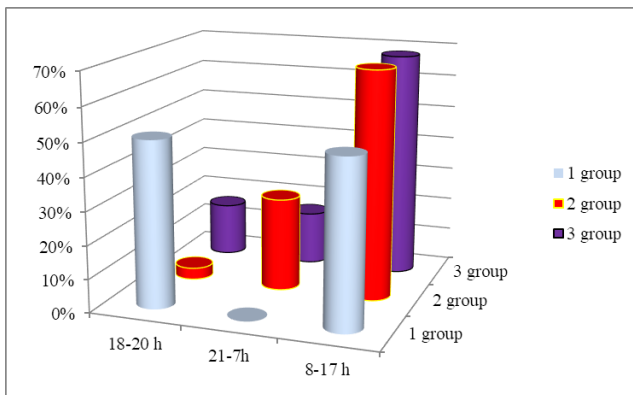


Figure 5. Duration and severity of shifts in the acrophase of body temperature

Despite a more severe systemic inflammatory reaction in children of groups 2 and 3, a moderate shift in the peak of the acrophase of the circadian rhythm of body temperature was revealed (Fig. 5).

Conclusion. On the first day, the mesor of the circadian rhythm of body temperature in children with acute renal failure aged 3.1 to 7 years was within the normal range. In the following days, only in group 3, there was a tendency to increase the average daily level of body temperature on the 7th day, while maintaining the tendency throughout the observation. The hourly level of the average circadian rhythm of body temperature in group 3 was characterized by higher rates both in the daytime and at night. The most pronounced instability of temperature regulation in the heaviest children of the 3rd group progressed by 12, after 18 days. It is assumed that the leading factors for the ineffectiveness of the treatment of acute renal failure in group 3 were a nutritional energy-deficient state with inevitable mitochondrial insufficiency, an immunodeficiency state, and a more significant irreversible damage to the structures of the functional system of the kidney parenchyma.

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碳化硅砂轮磨削过程中磨具磨损产物对钛合金嵌入强度的研究
**INVESTIGATION OF THE INTENSITY OF EMBEDDING OF
TITANIUM ALLOYS BY ABRASIVE TOOL WEAR PRODUCTS
DURING GRINDING WITH SILICON CARBIDE WHEELS**

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抽象的。通过 X 射线微量分析确定, 在 OT4-1、VT6 和 VT22 合金的磨削表面上, 存在碳化硅晶体和陶瓷粘合剂, 卡通化到处理过的表面中。初始晶粒尺寸 F100 时单个晶体的尺寸达到 $20\ \mu\text{m}$ 。根据背散射电子磨削表面图像的数字处理结果, 确定了碳化硅磨具磨损产物对钛合金的漫画化指标。卡通化强度通过三个指标来评价: 卡通化为钛合金的磨具磨损产物的面积 S_r 和数量 N_r 的平均值, 折算为单位加工表面, 卡通化的平均尺寸对象区域 N_g 。钛合金 VT22 磨削过程中获得了最高的卡通化指数。当磨削 OT4-1 和 VT6 合金时, 漫画物体的平均面积没有发现显著差异。 S_r 指标值变化幅度最大。推荐将该指标作为卡通化强度的标准。显示了漫画强度准则与磨具磨损和合金中 β 相含量之间的关系。已经证实, 护理有助于降低卡通强度。

关键词: 磨削、钛合金、碳化硅、漫画、漫画指标、火花。

Abstract. *On the ground surface of OT4-1, VT6 and VT22 alloys, the presence of silicon carbide crystals and a ceramic binder, cartoonized into the treated surface, was established by X-ray microanalysis. The size of individual crystals at the initial grain size F100 reaches $20\ \mu\text{m}$. The indicators of caricaturing of titanium alloys by wear products of an abrasive tool made of silicon carbide were determined based on the results of digital processing of images of a ground surface in back-scattered electrons. The intensity of cartooning was evaluated by three indicators: the average values of the area S_r and the number N_r of wear products of the abrasive tool, cartoonized into a titanium alloy, reduced to a unit of machined surface, and the average size of the cartoon object area N_g . The*

highest values of cartooning indices were obtained during grinding of titanium alloy VT22. When grinding OT4-1 and VT6 alloys, no significant difference was found in the average area of the caricatured object. The values of the Sr index change to the greatest extent. This indicator is recommended as a criterion for the intensity of cartooning. The relationship between the caricaturing intensity criterion and the wear of the abrasive tool and the amount of the β -phase in the alloy is shown. It has been established that nursing contributes to a decrease in the intensity of cartooning.

Keywords: *grinding, titanium alloys, silicon carbide, cartooning, caricature indicators, spark-out.*

Introduction

Titanium and its alloys are promising structural materials with a number of unique properties: high strength at low density, high corrosion and heat resistance.

Titanium alloys are used for the manufacture of critical parts operating under the influence of high temperature and alternating loads, such as turbine and compressor blades. In this regard, special requirements are imposed on the surface quality of titanium products, one of which is the absence of stress concentrators formed as a result of machining [1], which is especially important in final operations, which include grinding.

A distinctive feature of the abrasive tool in abrasive processing and grinding, in particular, is the ability of the abrasive tool to self-sharpen. According to GOST 21445, «self-sharpening is the property of an abrasive tool to maintain its working condition due to the formation of new protrusions and cutting edges at abrasive grains during abrasive processing.» The formation of cutting edges occurs as a result of chipping micro or macro volumes of grain material directly at the contact area of the grain top with the material being processed. In this regard, there is a high probability of the introduction of the wear product of the abrasive tool into the machined surface.

The intensity of cartooning during grinding is influenced by a large number of factors: the properties of the material being processed, the characteristics of the abrasive tool, grinding and dressing modes, cutting fluids, type of grinding, etc. The properties of all interacting materials must be considered taking into account the actual conditions of contact interaction during grinding.

Embedded fragments of abrasive grains are stress concentrators that reduce the performance of products [2-5]. The introduction of abrasive grains occurs during grinding [6, 7] and other types of abrasive processing, for example, during water-jet cutting [8].

The study of caricature of the machined surface by abrasive tool wear products and the development of recommendations for process control are impossible

without a method for quantitative assessment of caricature particles. One of the most common methods for assessing the intensity of transfer of the abrasive tool material to the treated surface is to determine the increase in the concentration of chemical elements that make up the abrasive material and transferred to the treated surface during grinding [9–11]. The content of chemical elements is determined by the method of X-ray spectral analysis of the polished surface at individual points, by scanning along the line and area. The problem arises when grinding with abrasive tools made of superhard materials. Due to the low concentration of boron, nitrogen and carbon during grinding with abrasive tools made of cubic boron nitride or diamond, the error in determining these elements on the treated surface reaches 60-90%.

To control the intensity of caricature of the treated surface during grinding with abrasive tools made of superhard materials, a method based on digital processing of images of the polished surface in back-scattered electrons was developed [12]. Using the method of digital processing of a ground surface in back-scattered electrons, images of silicon carbide crystals and a bond of an abrasive tool, cartoonized into a machined surface, were obtained [10, 13]. The research results indicate the possibility of using the method [12] to determine the intensity of cartooning when grinding with abrasive tools made of silicon carbide, which significantly expands the amount of information obtained.

Purpose of the work: determination of the intensity of cartooning into the treated surface of titanium alloys of wear products of the abrasive tool during grinding with silicon carbide wheels.

Research methodology:

Grinding was performed on a Chevalier Smart B1224-III CNC machine [14]. As a tool, a grinding wheel with a standard size and characteristics of 1350x20x127 54CF100G10V was used, wheel speed $v_k = 30$ m/s, table feed speed $v_s = 12$ m/min, feed to a depth $t = 0.005$ mm/x, allowance $T = 0.5$ mm. Dressing was carried out with a diamond pencil 3908-0061 GOST 607-80, wheel dressing mode $vk = 30$ m/s, cross feed speed $v = 200$ mm/min, feed to depth $t = 0.01$ mm/h. The dimensions of the processed surface of the workpieces are 100×10 mm. For cooling, Lukoil ML2000S universal cutting fluid was used, the preparation concentration was 7%. Coolant supply was carried out by irrigation method, consumption 14 l/min.

Electron microscopic studies were performed on a Versa 3D DualBeam double-beam electron microscope.

The average area S_r ($\mu\text{m}^2/\text{mm}^2$) and the average amount N_r (mm^2) of wear products of the abrasive tool, reduced to the unit of the machined surface, are taken as quantitative indicators of cartooning. As a result of dividing the average

values of the relative indicators Sr/Nr, the average area of the wear product of the abrasive tool Nr (μm^2) cartoonized into the machined surface was obtained.

Results and discussion

Silicon carbide crystals and a ceramic bond were found on the polished surface. There are large fragments about $20\ \mu\text{m}$ in size (Fig. 1) protruding above the workpiece surface. The crystalline body in the central part of the picture is divided into two objects. According to the results of X-ray spectral analysis, it was found that the fragment at point 1 is a grain of silicon carbide. This is evidenced by the chemical composition containing almost equal atomic fractions of silicon and carbon, the total concentration of chemical elements is about 97% (see Fig. 2). The elemental composition of the fragment at point 2 in terms of the main components is close to the chemical composition of the binder [15], in which the O, Si, Al, and K atoms account for about 96% of the atomic fractions.

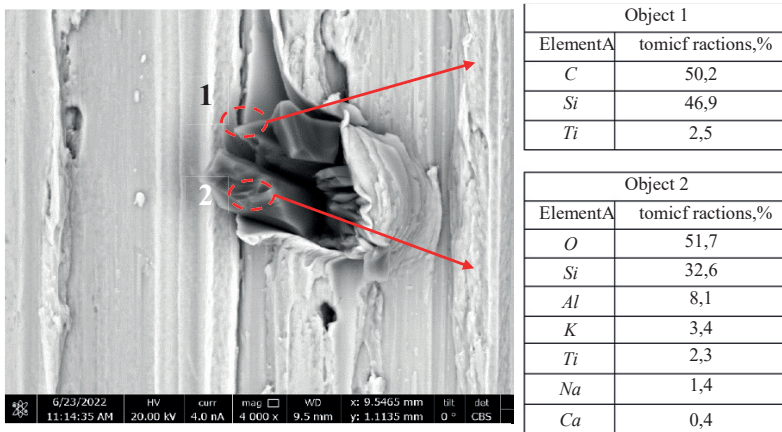


Figure 1. Grain (1) and ceramic bond (2), cartoonized into the machined surface, results of X-ray spectral analysis.

Charging tool wear products, which include SiC crystals and a ceramic bond, were found after grinding of all the alloys under consideration. The highest values shown in fig. 2 indicators, including the radial wear of the tool, were obtained during grinding of the most difficult-to-machine alloy VT22.

The average reduced area of the charging Sr particles during grinding of the VT22 alloy is 2 times greater than that of the VT6 alloy and almost 3 times that of the OT4-1 alloy (Fig. 2a). The average reduced number of charging particles during grinding of OT4-1 and VT6 alloys differs insignificantly; for VT22 alloy,

the Nr index is 1.7 times higher (Fig. 2, b). The average area of a single caricature fragment during grinding of the VT22 alloy is 1.2 times larger compared to the VT6 alloy and 1.6 times larger than the OT4-1 alloy (Fig. 2, c).

From a comparison of the numerical values of the cartooning index obtained during the grinding of titanium alloys VT22, VT6 and VT4-1, it follows that the relative average caricature area changes to the greatest extent: Sr - almost 3 times, Nr - 1.7 times, Sg - 1,6. It should be noted that when grinding titanium alloys VT6 and VT4-1, no significant difference in the values of the Sg index between the alloys was found.

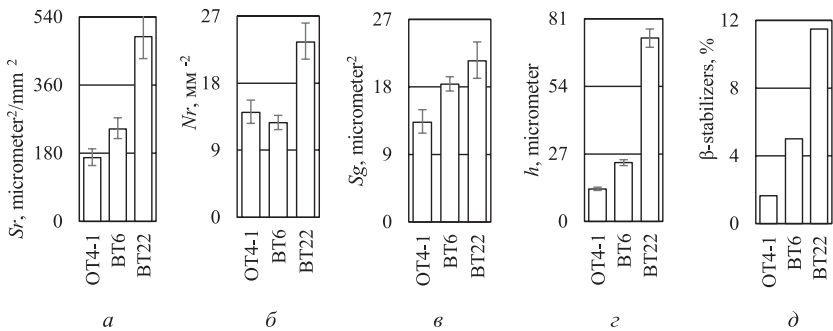


Figure 2. Charging indicators (a, b, c), abrasive tool wear (d) when grinding titanium alloys, concentration of β-stabilizers in alloys (e)

When grinding the VT22 alloy, the wear of the abrasive tool is 3.2 and 5.6 times greater compared to the VT6 and OT4-1 alloys, respectively (Fig. 2, d). The mass fraction of β-stabilizers in the VT6 and OT4-1 alloys is less than in the VT22 alloy by factors of 2.3 and 7, respectively (Fig. 2e). The introduction of β-stabilizers leads to an increase in the concentration of the solid beta phase in the composition, resulting in reduced machinability and increased tool wear.

When grinding titanium alloy VT6, the effect of spark-out on caricature indicators was studied. The number of afterburning strokes was varied from 1 to 10. It is known that in the process of cutting an interference is formed in the machine system, which is developed as the afterburning strokes increase. The cutting force is an indicator of preload reduction (Fig. 3). With each stroke, the components of the cutting force decrease. In this case, the most significant decrease in the main component of the cutting force Pz occurs almost up to the 10th stroke. The presented diagram is approximated by a power dependence $Pz = 7.73 \times x^{-0.92}$, approximation reliability coefficient $R^2=0.99$.

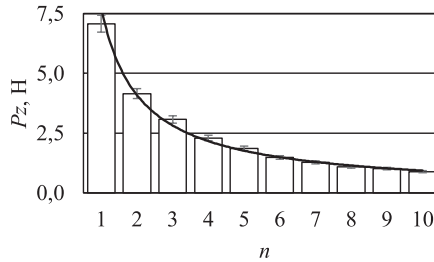


Figure 3. Pattern of change in the force component of the grinding force component P_z on the number of spark-out strokes n , alloy VT6

After nursing, the values of all caricature indicators decrease (Fig. 4). The average value of the relative caricature area S_r decreases to the greatest extent - by 3.1 times, the average relative amount of embedded (caricated) wear products N_r decreases by 2.2 times. To a lesser extent, the average area of a single caricaturing N_g particle decreases by 1.4 times.

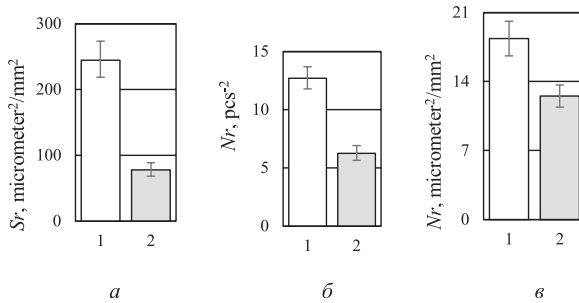


Figure 4. Charging indicators (a , b , c) when grinding VT6 alloy:
1 - before nursing, 2 - after nursing

Conclusion

Using X-ray spectral analysis, the presence of silicon carbide crystals and a ceramic binder on the treated surface of titanium alloys was proved.

The maximum average values of the caricature area S_r ($\mu\text{m}^2/\text{mm}^2$) and the number of embedded objects N_r (mm^{-2}), reduced to a unit area of the ground surface, the maximum average area of the caricature particle S_g were obtained by grinding the VT22 alloy.

The average reduced number of N_g charging particles between the OT4-1 and VT6 alloys does not differ significantly.

Fermentation leads to a decrease in the intensity of caricature of the treated surface: Sr decreases by 3.1 times, Nr - by 2.2 times, Ng - by 1.4 times.

As the main indicator of intensity, Sr ($\mu\text{m}^2/\text{mm}^2$) should be taken - the average values of the caricature area, reduced to a unit area of the treated surface,

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基于带有红外发射器的两流热发生器的空气辐射加热
**AIR-RADIANT HEATING ON THE BASIS OF A TWO-FLOW HEAT
GENERATOR WITH INFRARED EMITTERS**

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抽象的。开发了一种基于双回路热发生器的空气盘管加热系统 (ACHS)，提出了散热风道的方案和形状。结果表明，辐射供暖系统比传统的对流方案更有效。当在我国及其他地区的各种气候条件下使用时，所提出的设计具有极高的技术改进潜力。传统上采暖采用对流方案，散热器安装在靠近地板的位置，工作介质是水。

所提出的 ACHS 的工作介质是空气，基于红外电磁辐射形式的热传递。当前，世界各地正在爆发一场高效、经济地利用自然和能源资源的危机。

ACHS 的开发是俄罗斯第一个在经济和技术上合理的项目，而欧洲的“绿色”能源运动则在经济和技术上不合理地推广了这种能源的使用。萨马拉理工大学的初步计算表明，在俄罗斯境内引入ACHS的经济效益非常高，理论上难以评估。

一种带有红外发射器的高效双回路热发生器已经开发出来，它仅从热交换器的辐射表面散发热量。该系统可以帮助您减少资本投资、运营成本并提高供暖系统的效率。

关键词：盘管传热、对流、热发生器、风道、温度、红外辐射

Abstract. *An air-coil heating system (ACHS) based on a double-circuit heat generator has been developed, a scheme and shape of heat-radiating air ducts has been proposed. It is shown that the radiant heating system is more efficient than the conventional convective scheme. The proposed design has an extremely high technical potential for improvement, when used in various climatic conditions of operation in our country and beyond. Traditionally, a convective scheme is used for heating, in which radiators are installed near the floor, the working medium of which is water.*

The proposed ACHS, in which the working medium is air, is based on the transfer of heat in the form of infrared electromagnetic radiation. Currently, a crisis is flaring up around the world for the efficient, economical use of natural and energy resources.

Developed, ACHS is the first Russian project economically and technically justified, in contrast to the one promoted in Europe, economically and technically unjustified, by the “Green” energy movement for the use of this energy. Preliminary calculations performed at the Samara Polytechnic University showed that the economic efficiency of the introduction of the ACHS on the territory of RUSSIA is so high that it is theoretically difficult to assess.

An efficient two-circuit heat generator with infrared emitters has been developed, which gives off heat only from the radiating surface of the heat exchangers. This system allows you to reduce capital investments, operating costs and increase the efficiency of the heating system.

Keywords: coil heat transfer, convection, heat generator, air duct, temperature, infrared radiation

Coil heating has been known for about two millennia, primarily in the form of heating devices located in walls and floors. Its traces have been found in Asia and Europe on the territory of the Roman Empire. In the air ducts arranged for this purpose, flue gases from the kitchen, and later specially heated air, were used as a heat carrier. In Russia, in 1902, heating was discovered in a way different from the traditional convective method, but due to the abundance of fuel resources in the country, it never received distribution at that time. The effectiveness of this discovery was noted in the West. Water and steam were used as the heat carrier. In 1985, the Hungarian scientist Professor A. Mackasi proposed the idea of using air moving in a closed system as a heat carrier and giving off heat to radiators installed in places that require heating [1]. Radiant energy transfer, *ceteris paribus*, is more efficient than convective, since with radiant heating, energy is freely transferred over long distances in the volume of the room, so heaters can be placed under the ceiling and in fence structures. A product that has no analogues in the world, a heating generator capable of converting the electricity received by the “Green” energy into heat with the maximum possible, i.e. approximately 98.5% effect, for heating any industrial and residential premises at the speed of light, without creating infrastructure system of heat distribution between consumers.

The proposed installation of ACHS uses the method of heat transfer in the form of electromagnetic radiation, not harmful to human health, using a coolant (air), which circulates in a closed circuit [2].

Radiant heating of the ACHS began to be used again only 40-50 years ago, but the use of radiant heating in the modern sense of the word came to the fore only in the 50s. 20th century [3]. Buildings and structures erected in Russia before 2000, unlike those in the West, have a coefficient of thermal resistance $R_0 = 1.2-2.5$ (m^2 $^{\circ}\text{C}/\text{W}$). In Europe, the coefficient of thermal resistance reaches $R_0 = 6-8$ (m^2 $^{\circ}\text{C}/\text{W}$), i.e. in fact, in Russia we heat the atmosphere [4].

In our country, the theory of radiant flows, methods for assessing comfort, methods for calculating radiant heating panels, including the most complex cases of their combination with enclosing structures, have been quite fully developed [5-7]. The main obstacle to the widespread use of this method was the lack of a reliable, economical heat generator for heating air in a closed system.

After conducting many calculations and experiments from 2014 to 2017. (Doctor of Technical Sciences V.V. Biryuk, Doctor of Technical Sciences M.A. Kovalyev, Ph.D. V.V. Panchenko) created and patented a heat source - a double-circuit and shapes of heat-radiating ducts. The technical result of the invention is the creation of a high-temperature and efficient regenerative radiant heating system.

A known radiant heating system (AS No. 1206566, IPC F26D 15/00, BN No. 3.1986), which includes self-linear heating elements and profiled reflectors. The disadvantage of this device is its low efficiency. The closest to our technical solution is a heating system (P. No. 2239130, RU, No. 2239130, C1, 2003), containing a housing in which heat-radiating elements connected to a heat generator are located. The disadvantage of this heating system was also its low efficiency.

The developed heat generator can operate on various types of fuel: firewood, coal, gas, diesel fuel, etc., which does not regulate its use by types of heated rooms and climatic zones, as well as the availability of fuel resources - any wood waste, peat, etc. will do. P. It is also possible to use infrared electric lamps [8]. Their advantage is their ability to vary the surface temperature of heating devices over a wide range from 0 °C to a very high 1200 °C.

An efficient air heater only releases heat from the radiant surface of the heat exchangers. It is different from the currently existing heating devices for the heat-carrying working fluid of air, because already a few minutes after switching on, the heated air flow begins to flow into the heat exchangers. Since the air in the heat exchanger is completely in the closed flow of the primary circuit, it immediately transfers it to the surface of the radiators of the system.

The invention is intended for heating individual zones or workplaces without the need to heat the entire volume of the room [2]. The emitters are suspended from the ceiling without occupying the useful area of the room, and their light weight does not violate the statics of building structures. This achieves significant energy savings in the ventilation of rooms.

The device is safe and durable in operation. The system with radiant heating contains heat-radiating elements connected to a heat generator, a secondary circuit fan communicating with the atmosphere. The heat-radiating elements are made in the form of air ducts connected to the heat generator and forming a closed system with it, in which a smoke exhauster fan is installed. The heat generator is double-circuit. The first circuit consists of a housing with rows of heating elements located in it, covering the second circuit. On fig. 1 shows a general view of the

ACHS radiant heating system, the air ducts of which are located under the ceiling, their length and configuration can vary. On fig. 2 shows a diagram and a general view of the developed double-circuit heat generator for ACHS and describes the elements of the system.

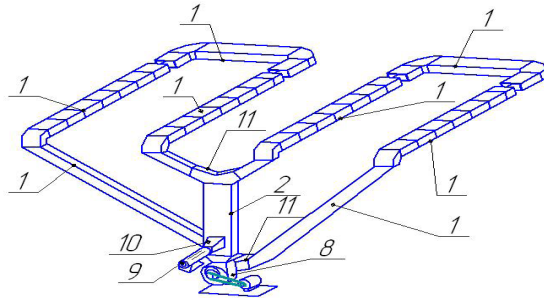


Figure 1. General view of the ACHS

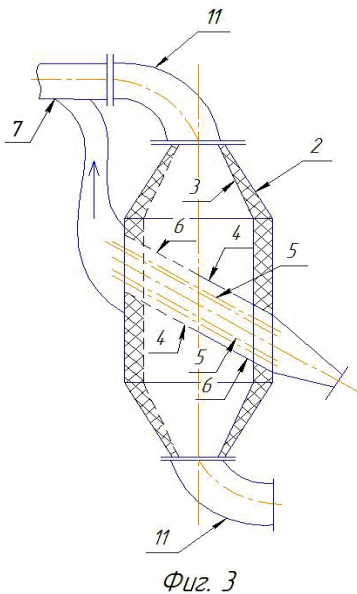


Figure 2. Scheme and general view of a double-circuit heat generator for ACHS

The heat generator consists of a body of the primary circuit 3, in which rows of heating elements are installed, consisting of heat exchangers 4, with built-in quartz halogen heat-emitting lamps 5. The body of the second circuit 6 is installed in the

first circuit 3 and has the ability to communicate with the first circuit 3 through a damper 7. The first circuit 3 is connected to the smoke exhauster 8, the second 6 to the fan 9 through the deflector 10. Air ducts 1 consist of parts connected by transitions 2 and 11 with the heat generator.

This system works as follows. Atmospheric air through the fan 9 enters the second circuit 6 of the heat generator and through the damper 7 into the first circuit 3. The air is heated there with the help of heating elements consisting of heat exchangers 4 and quartz halogen heat-emitting lamps 5 installed in them, and circulates through the air duct 1. Smoke exhauster 8 provides air circulation in a closed cycle. Atmospheric air entering through the fan 9 into the second circuit provides the necessary temperature conditions for the operation of quartz halogen thermal radiant lamps 5. The air duct 1 is made in the form of a box with a radiating surface made of steel and the upper part made of galvanized steel or aluminum to create a screen effect, i.e. . to increase the reflectivity of the heat flux towards the radiating surface. This heating system makes it possible to obtain a temperature of more than 500 °C circulating in the primary air circuit.

The proposed heating system ACHS differs from the known ones in that it does not heat the entire volume of the room, but only the space above which it is installed. This is relevant for buildings and structures in Russia, as they have an extremely low coefficient of thermal resistance and require significant investment for thermal insulation. This system allows you to reduce capital investments, operating costs and increase the efficiency of the heating system.

Conclusions. The experiments performed have shown that, compared with the generally accepted convective scheme, the proposed one is more efficient:

- the air temperature in the room is lower due to the effect of heating only the surfaces, and not the air volume;
- lack of air movement and dust generated during various technological processes, which increases the comfort of the room;
- heat is directed directly to the lower zone of the room, so the surfaces with the highest temperature are the floor and process equipment. For this reason, ACHS units are widely used in rooms with high ceilings;
- the system requires less time to bring it into operation, due to which operating costs are reduced;
- the system allows you to heat individual zones or workplaces without the need to heat the entire room;
- there is no need to build boiler houses and lay heating mains;
- minimal heat loss; since before installing the ACHS in buildings and structures, they are examined using a thermal imager, which gives a complete picture;
- quick assembly and dismantling, transfer of devices (from two days to two weeks);

- system freezing is excluded (lack of water);
- operational heating of the room (15-30 min);
- emitters are suspended from the ceiling without occupying a usable area, and their low weight does not violate the statics of building structures;
- the system allows you to program the day, night or weekly mode of maintaining the required temperature;
- Significant energy savings are achieved when ventilating rooms, as the upper, less heated part of the air is removed.

In addition to space heating, ACHS can be used in technological processes for drying painted metal products, since the metal is heated, not the paint; drying of surfaces painted with powder paint, where a heat impulse of 250-280 ° C is required for 1.5-2.5 minutes; drying of buildings and structures, including the underground part, after flooding, etc.

In connection with the above, a bureau of research and development works (R&D) was created, whose activities will ensure a reduction in the energy intensity and material capacity of heating equipment by 50% or more, depending on the climatic conditions of the region of application.

Training production workshops of the “Samara National Research University named after Academician S.P. Korolev” are equipped with equipment necessary to continue research work in the amount of: 25,800,000 rubles.

Co-financing is required to complete experimental, design work (creation of a full-size utility model in the workshops of a technical school).

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基层学生图形文化发展机制
**THE MECHANISM OF DEVELOPMENT OF GRAPHIC CULTURE
OF STUDENTS AT THE BASIC SCHOOL LEVEL**

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注解。文章探讨了教育数字化条件下学生图形文化培养过程中出现的主要问题及解决途径。此外，还分析了研究概念装置的各种方法。在数字化社会深度发展的条件下，不同教育体系学生的文化教育问题显得尤为重要。作者提出了一套有助于学生图形文化形成的教学条件。

关键词：图形文化、学生、教学条件、模式、教育体系。

Annotation. *The article discusses the main problems that arise in the process of developing the graphic culture of students in the conditions of digitalization of education, as well as possible ways to solve them. In addition, various approaches to the conceptual apparatus of the study are analyzed. The issues of cultural education of students in different educational systems in the conditions of an intensively developing digital environment of society are becoming especially important. The authors propose a set of pedagogical conditions that contribute to the formation of the graphic culture of students.*

Keywords: *graphic culture, students, pedagogical conditions, model, educational system.*

Introduction

The relevance of the research on the formation of graphic culture of students in different educational systems is determined by the strategy of development of Russian education, namely, the National Doctrine of Education of the Russian Federation and the Concept of Modernisation of Russian Education. In the present situation graphic culture acquires the role of the “second literacy” (M.V.

Pokrovskaya), becomes a central phenomenon of the general culture of a modern person.

Significant achievements in the field of modern information, communication and computer technologies justify and update the necessity of basic graphic education of the new generation of specialists. Young people must be able to work competently and efficiently with the ever-increasing amount of information presented in graphic form and have the basic skills to transform it.

Education in the region is characterised by multiculturalism and ethnic diversity, and the importance of addressing this issue is particularly acute. It is caused by the following aspects: firstly, the analysis of the educational situation in the society shows a rather low level of graphic knowledge of graduates and freshmen, which determines one of the main tasks of the general education system, i.e. to provide future school leavers with abilities to master information and to use it in educational activity; secondly, the rather large possibilities of sign systems in information transmission cause a special form of their teaching.

Scientific bases of contents of graphic culture and methodical approaches to teaching of graphic activities in general school have been sufficiently developed by S.M. Ganeev, S.I. Dembinsky, I.A. Roitman, etc. The technology of formation of graphic culture of students is established and implemented in technical higher schools (A.V. Kostyukov, M.V. Lagunova, V.P. Molochkov, etc.). Methodological aspects of formation of graphic culture of students are presented in mathematics (S.M. Abramovich, L.M. Lopovok, A.A. Lyamina, etc.), drawing (E.I. Korzinova, S.I. Linnik-Botova, N.G. Mikhailov, etc.), informatics (M.V. Apalkova, P.V. Bepalov, N.A. Reznick, etc.). The possibilities of using information technologies in graphic processing and educational information transfer are reflected in the works of L.S. Afanasyeva, G.G. Granatova, M.V. Pokrovskaya, V.Yu. The latter have shown that the rational use of information technologies contributes to the formation of the graphic culture of schoolchildren and helps to bring the modern educational process to a new qualitative level by expanding the possibilities of visual-image support of the learning process.

The analysis of researches on the problem of formation of graphic culture in the educational system (B.F. Lomov, A.M. Novikov, Y.N. Stolyarov, N.F. Chetverukhin, I.S. Yakimanskaya, etc.) showed the importance and necessity of system research of this phenomenon in the early stages of personality formation at the general school.

Scientific research is based on the concepts of the process of acquisition of graphic knowledge, skills and abilities (A.D. Botvinnikov, N.F. Chetverukhin, I.S. Yakimanskaya, etc.); works devoted to the development of the educational system from the point of view of cultural integration (V.V. Arshavsky, S.V. Rotenberg, etc.); researches in the field of pedagogical psychology, development of the ed-

ucational system (V.V. Arshavsky, S.V. Rotenberg, etc.); studies in educational psychology (F.I. Kopelovich, B.F. Lomov, E.I. Nikolaeva, etc.); studies in the use of information technology (A.V. Kostyukov, M.V. Lagunova, V.P. Molochkov, V.E. Steinberg, etc.); theories of the organisation of teacher training (L.F. Alexeeva, N.G. Dairy, I. Ilyasov, etc.) and others.

The study of various approaches (philosophical, sociological, pedagogical, culturological) to the concept of “culture” shows its multi-dimensionality, multi-dimensionality and breadth. With the development of society, this concept acquires more and more new varieties and interpretations. The basis of the concept of “culture” lies in the development of man’s creative activity and versatile abilities, his susceptibility to the highest achievements of culture, as man is considered as a cultural-historical being. All of the above approaches to the concept of culture allow us to highlight the most essential aspect - the relationship between society and culture and the process of education.

An important part of a person’s general culture is graphic culture, which is considered from various points of view. N.I. Kalnitskaya defines a person’s graphic culture as the highest level of graphic literacy. According to S.I. Linnik-Botova and V.V. Stepakova, who note the importance of plotting, graphic culture is directed to formation of creative potential of a person, connected with graphic ways of information transformation. S.A. Smirnov characterises graphic culture as a mechanism of efficient use of graphic representations. A.A. Lyamina studies graphic culture from the point of view of the activity approach, emphasizing that the formation of graphic culture of students is based, first of all, on the mastery of graphic language, thinking and creative potential of a personality. V.G. Burrov, N.G. Ivantsivskaya, N.I. Kalnitskaya, S.P. Shulyaev take the same stand and show that one of the basic components of graphic culture of students is spatial thinking. V.P. Molochkov understands graphic culture as a set of skills used in the process of information technology application. M.V. Lagunova defines graphic culture as a basic element of the professional sphere of human activity. Thus, the concept of “graphic culture” is very diverse in the pedagogical vocabulary. With the help of different definitions we specify the concept of graphic culture of high school students: “*Graphic culture of high school students is a set of their personal achievements in mastering and applying graphic methods and ways of information transformation*”.

The revision of the content of graphic education in secondary schools (L.N. Anisimova, V.A. Gerver, V.V. Stepakova, etc.), as well as the researches of M.V. Lagunova et al. allow to consider the process of formation of graphic culture of schoolchildren from the position of systemic (Y.K. Babansky, M.V. Lagunova, V.N. Sagatovsky, etc.) and activity-based (B.G. Ananyev, L.S. Vygotsky, A.N. Leontiev, etc.) approaches. On the basis of the above-mentioned approaches dif-

ferent stages of development of the graphic culture of the student are defined: from the elementary graphic education to the possible fuller mastery and creative understanding of ways of implementation in educational activity.

Elementary graphic education implies the level of graphic methods and ways of information transformation, when students know only the basic minimum acquired at the primary stage of school education. *Graphic literacy* is characterised by the achievement of a certain level of information transformation, which corresponds to the secondary level of education. Pupils are able to transform information with little use of information technology. *Graphic literacy* reflects the acquisition by students of graphic methods and techniques for obtaining, transforming and applying information using information technology, creating creative projects in the disciplines of the school course. *Graphic competence* is understood as the level of mastery of graphic methods and ways of transforming different types of information using information technologies, both in educational and other activities, with their successful application at different stages of the learning process. *Graphic culture* implies an orientation towards continuous self-improvement in the environment of graphic information technology, which predetermines the restructuring of learning activity on the basis of research, creative approaches [1, p. 12].

The transition from one level to another does not imply the negation of the previous one, but occurs as a result of saturation with new graphic learning information. Thus, the elementary knowledge that prevails in the early stages is reinterpreted in the process of the subsequent graphic activity, thus there is a transition to a qualitatively new level of graphic education. Through graphic activities, the knowledge, skills and abilities acquired contribute to the formation of new abilities that contribute to this transition. Moreover, the synthesis of practical skills and deepened theoretical knowledge leads to the improvement of the newly acquired ways of activity and transforms them into qualitatively better structures of consciousness, which are the basis for their creative and systematic application in practice. This is also confirmed by the data of psychological and pedagogical researches, according to which the process of formation of graphic culture of schoolchildren is closely connected with the development of special ways of information perception: spatial and visual thinking, spatial representation, spatial imagination.

The main means of the process of graphic culture formation of high school students are computer graphics, educational visualisation (drawings, diagrams, etc.), graphic language (international communication language based on the system of methods and ways of graphic representation, transmission and storage of various information), interdisciplinary materials, contents of academic subjects (graphics, geometry, plotting, etc.).

At the preparatory stage it was found out that the existing position of graphic culture formation of senior pupils in schools is at a rather low level, which requires organisational and pedagogical measures for its formation.

Research results

Formation of graphic culture of high school students is a specially organised pedagogical process aimed at acquisition by high school students of a set of personal achievements in the field of development and application of graphic methods and ways of transformation of information. These include: work with terminology in the process of transition from verbal description to graphic objects and vice versa; mastery of modern information technologies in the construction of graphic images; application of existing knowledge in non-standard situations; possession of algorithms of construction of graphic objects and compilation of generalised algorithms; development of spatial thinking, spatial imagination and spatial representation; mastery of techniques of construction and reading of graphic information transformations.

The structural-functional model designed to perform motivational, pedagogical and developmental functions was selected from a number of existing models. The constructed model of formation of graphic culture of senior pupils includes three main components (motivational, theoretical, practical) which are realised by means of implementation of organisational and pedagogical conditions providing formation of graphic culture of senior pupils in the educational process. The motivational component carries out the motivational function which expresses the focus on formation of interest of high school students in the problem of formation of graphic culture and includes the needs (personal, social and regional orders of society), the purpose, goals and principles aimed at implementation of the process of formation of graphic culture of high school students. The theoretical part fulfils the pedagogical function, which expresses the focus on the mastering of a set of personal achievements of senior students in the field of mastering and application of graphic methods and ways of information transformation necessary for the formation of graphic culture in the learning process. The practical component has a developmental function, which manifests itself in the development of spatial thinking, spatial imagination and spatial representation; work with graphic terminology in the process of transition from verbal description to graphic constructions and vice versa; possession of algorithms for constructing drawings and creating generalised algorithms; possession of the technique of constructing and reading graphic transformations of information; use of modern information technologies in the construction of graphic images and use of graphic methods and ways of transforming information in a non-standard situation when creating creative projects.

In the process of constructing a model for the formation of a graphic culture of high school students, the following principles were identified as fundamental: Visibility, which means the improvement of the process of perception, understanding and generalisation of the studied material by the students; Consistency of graphic knowledge, which represents a step-by-step process of acquisition of educational graphic information by the students; Computerisation of education; Practical orientation, which is focused on the practical application of the totality of personal achievements of the students in the field of mastering graphic methods and ways of information transformation; Individual creative approach, which means meeting the interests and needs of each student in individual and collective creative activities in order to create creative projects.

The following organisational and pedagogical conditions for the formation of graphic culture of senior pupils have been identified: priority of graphic activity in the learning process, which is carried out at the expense of learning activity, i.e. the process of acquiring new knowledge, skills and abilities or modifying the existing ones; visual activity, i.e. a type of activity aimed at obtaining visually perceived information (diagrams, tables, drawings, etc.), and conceptual and terminological activity, i.e. a type of activity aimed at forming conceptual and terminological vocabulary among students, which indicates a rather high level of mastery of the pedagogical; orientation towards creative activity, which is understood as an activity aimed at creating and transforming new graphic information and involving the self-organisation of students (development of creative projects presentations prepared independently by students in any academic discipline, with the obligatory use of drawings, diagrams, tables, etc.); the use of information technologies in the learning process, including the implementation of information transformation activities and the application of information technologies; teacher training for the formation of graphic culture of senior pupils, aimed at professional development in educational programmes, etc; resource provision of the process of graphic culture formation of senior pupils, which is focused on the practical implementation of the teaching and methodological complex and is aimed at the graphic culture formation of senior pupils.

The analysis of psychological and pedagogical literature (M.V. Lagunova, B.F. Lomov, V.P. Molochkov, N.F. Chetverukhin, I.S. Yakimanskaya, etc.) allowed us to determine the criteria for the formation of graphic culture of high school students. These are: the use of terminology in the transition from verbal description to graphic objects and vice versa; the use of modern information technology in the construction of graphic images; the use of available knowledge in non-standard situations; the mastery of algorithms for the construction of graphic objects and the creation of generalised algorithms; the development of spatial thinking, spatial imagination and spatial representation; the mastery of techniques

for the construction and reading of graphic transformations. The development of each criterion was assessed at three levels (low, medium and high). The results of the formation of graphic culture were also evaluated at three levels: critical (C), acceptable (D), optimal (O).

The aim of the experimental work was to verify in practice the effectiveness of our model [1, p. 14] of the formation of graphic culture of senior students and the effectiveness of the organisational and pedagogical conditions identified during the study, which ensure the formation of graphic culture of senior students. The objectives were achieved with the help of the methods of questioning, testing, interviews carried out both by the researcher himself and by the teachers under his supervision. The following problems were solved: study of the state and development of the problem of formation of graphic culture of senior students in the conditions of modern educational process; development of training and methodological complex for teachers and students to use the approach of formation of graphic culture of senior students in teaching; study of educational materials aimed at transformation of information in the conditions of the proposed methodology; testing the effectiveness of the proposed model of formation of graphic culture of senior students. Implementation of the model of graphic culture formation of high school students included four stages: preparatory, theoretical, practical, analytical.

Discussion of the results

The composition of the experimental classes was based on the representativeness of the sample of students. The experiment included students from municipal educational institutions, students from the Gorno-Altai State University, students from the Institute of Professional Development of Educators of the Republic of Altai. In total, 426 pupils, 254 students and 82 teachers took part in the work. At the stage of the experiment we received data on rather low level of graphic culture formation of secondary school students: the critical level – experimental classes (EC) 55,2 %, control classes (CC) 69,6 %; the admissible level – EC 44,8 %, CC 30,4 % (Table 1). The tested criteria for the formation of the graphic culture of high school students are defined at low and medium levels.

Table 1
Levels of graphic culture formation of senior pupils in the ascertainment phase of the experiment

Class	N	Levels of graphic culture formation of senior pupils					
		I (C) level		II (D) level		III (O) level	
		κ	%	κ	%	κ	%
CC average	79	55	69,6	24	30,4	0	0,0
EC average	128	71	55,2	57	44,8	0	0,0

The aim of the forming experiment was to approve the designed model of graphic culture formation of senior pupils, providing the increase of the level of graphic culture formation of senior pupils. In order to achieve the goal the pedagogical and methodical complex (curriculum, syllabus, test tasks, criterion-diagnostic apparatus, electronic resources, pedagogical and methodical handbook “Graphic culture as a condition of learning efficiency”, lectures, development of practical, independent and control works) was developed and implemented on an experimental basis.

The work was carried out on the example of school disciplines: geometry, physics, geography. The use of information technologies and the application of Microsoft PowerPoint and Microsoft Word in the development of the graphic culture of high school students made it possible to involve children in active, independent work on the transformation of information and the creation of creative projects. By developing their graphic culture in this way, the secondary school students mastered appropriate graphic methods and ways of information transformation, which they need to participate adequately in modern educational communication. According to the results of the educational experiment the positive dynamics of the level of graphic culture formation of the senior students was observed (Table 2). The results of the formation phase of the experiment allowed us to observe an increase in the graphic culture formation criteria of the older students.

Table 2

Levels of graphic culture formation of senior pupils in the formative stage of the experiment

Class	N	Levels of graphic culture formation of senior pupils					
		I (C) level		II (D) level		III (O) level	
		κ	%	κ	%	κ	%
CC average	79	51	64,5	28	35,5	0	0,0
EC average	128	44	34,2	58	45,2	26	20,6

The comparative analysis of the data obtained in the course of ascertaining and formative experiments clearly shows the dynamics of growth of the average value of the level of formation of graphic culture of senior pupils. Thus, the critical level of graphic culture formation of senior pupils in the experimental classes decreased by 21%, while in the control classes it decreased by 5.1%. There is an insignificant increase of the admissible level in the experimental classes by 0.4% and in the control classes by 5.1%. The optimal level of graphic culture formation of senior students in experimental classes increased by 20.6% (Table 3).

Table 3

Summary indicators of changes in the level of graphic culture formation of senior pupils

Class	N	Developmental stages of senior pupils' graphic culture (identifying and forming experimental stages)					
		I (C) level, %		II (D) level, %		III (O) level, %	
		stating	forming	stating	forming	stating	forming
CC average	79	69,6	64,5	30,4	35,5	0,0	0,0
EC average	128	55,2	34,2	44,8	45,2	0,0	20,6

Thus, according to the results of the comparison of levels of formation of graphic culture of senior pupils we can conclude that the implementation of organisational and pedagogical influence on the process of formation of graphic culture of senior pupils within the framework of the model designed by us allows to speak about positive dynamics.

In the course of the experimental work the hypothesis H_0 was tested – the proposed model of formation of graphic culture of senior pupils is ineffective. The alternative hypothesis H_1 – the proposed model of formation of graphic culture of senior pupils is effective. Statistical processing of the research data was carried out using Fisher's distribution criterion. Comparing F_{fact} and F_{crit} for significance level $\alpha = 0.05$, we concluded that $F_{\text{fact}} > F_{\text{crit}}$ ($2.49 > 1.40$), so at significance level $\alpha = 0.05$ the null hypothesis H_0 is rejected and the alternative hypothesis H_1 is accepted. The comparative analysis of the absolute frequencies in the samples shows that the process of graphic culture formation is more effective among the students in the experimental classes than among the students in the control classes.

Conclusion

The results of theoretical analysis and experimental work allowed to draw the following conclusions:

1. The research of the state of the problem of formation of graphic culture of senior pupils in the theory and educational practice shows the necessity of the organisation of the educational process providing formation of graphic culture of senior pupils in the system of general (secondary) education. In the course of the research it is proved that the organisation of the process of formation of graphic culture is conditioned by ethno-cultural, regional, scientific-technical, socio-economic needs of modern society and is the important factor of human development of the new millennium.

2. Graphic culture of high school students is a set of their personal achievements in the field of mastering and applying graphic methods and ways of information transformation.

3. The designed model of formation of graphic culture of senior pupils implements social, regional and personal orders, includes a number of structural components (goal, objectives, principles, organisational and pedagogical conditions, pedagogical and methodical complex) and provides formation of graphic culture of senior pupils.

4. Organisational and pedagogical conditions provide formation of graphic culture of senior pupils. They include priority of graphic activities in the educational process, emphasis on creative activities, use of information technologies in the educational process, training of teachers for formation of graphic culture of senior pupils, provision of resources for the process of formation of graphic culture of senior pupils.

5. The criterion-diagnostic apparatus of the research of the process of formation of graphic culture of senior pupils includes the following components: operation with terminology in the process of transition from verbal description to graphic objects and vice versa; mastery of modern information technologies in the creation of graphic images; application of available knowledge in non-standard situations; mastery of algorithms for creation of graphic objects and compilation of generalised algorithms; development of spatial thinking, spatial thinking, spatial thinking, spatial thinking.

6. The experimental work carried out in accordance with the aims and objectives of the research has shown that the implementation of the organisational and pedagogical conditions within the framework of the model of graphic culture formation of senior pupils designed by us has a positive dynamic.

7. The effectiveness of the developed pedagogical and methodological complex, contributing to the formation of the graphic culture of senior pupils and tested on the materials of a number of scientific disciplines (geometry, physics, geography), is confirmed by the results of diagnostic activities.

In the conditions of digitalisation of education the development of graphic culture of students acquires special importance. In this regard, different mechanisms and interpretations of its components in different educational contexts are possible [2; 3]. At the same time, the conducted study does not exhaust all possibilities of using different mechanisms of students' graphic culture development and is a prospect for further research in this field.

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提升程度和提取根源的图解方法
**GRAPHICAL METHODS OF RAISING TO A DEGREE AND
EXTRACTING ROOTS**

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注解。本文证实并建议使用视觉和简单的几何方法来进行乘法、两个数字的除法、求数字的度数（包括分数）。结果表明，借助不同直径的圆在零点处相互接触，可以以图形方式执行乘法、除法、取幂和开根运算。

关键词：几何，提升程度，图解问题法

Annotation. *The article substantiates and proposes to use visual and simple geometrical methods of multiplication, division of two numbers, finding degrees of a number, including fractional ones. It is shown that with the help of circles with different diameters, touching each other at the zero point, it is possible to graphically perform operations of multiplication, division, exponentiation and root extraction.*

Keywords: *geometry, raising to a degree, graphical method of problem solving*

The proposed article substantiates and offers to use visual and simple geometric methods of multiplication, division of two numbers, finding the degrees of a number, including fractional ones.

Graphical method of extracting the square root of a number greater than one

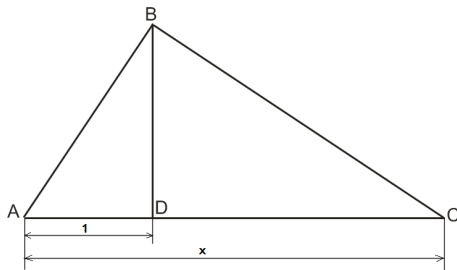


Figure 1

From the similarity of triangles ABC and ADB (Fig. 1) the equality is inferred

$$\frac{AB}{AD} = \frac{AC}{AB},$$

From which it follows that

$$AB^2 = AD \cdot AC = 1 \cdot x,$$

$$\text{и } AB = \sqrt{x}.$$

By constructing rectangular triangles so that the hypotenuse of AC is a numeric line, A coincides with zero on this line, and AB's leg projection on on the numeric line is 1, it is possible to extract the square root from any numerical values of AC exceeding one (fig. 2).

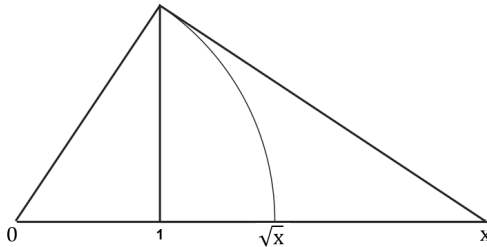


Figure 2

Graphical method of finding inverse fractions

Let it be necessary to find a number that is the inverse of x.

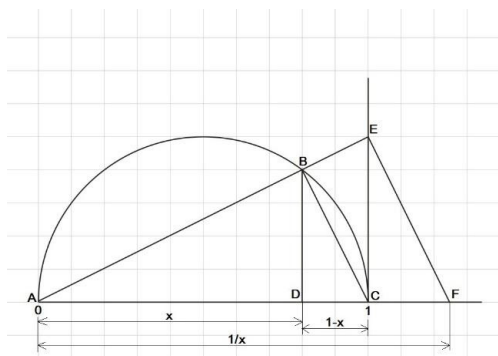


Figure 3

The similarity of the triangles ABD, AEC, EFC, AFE and BCD (fig. 3) implies that

$$AF = \frac{1}{x},$$

а также, что $BD = \sqrt{x \cdot (1-x)}$, $BC = \sqrt{1-x}$, $EC = \sqrt{\frac{1-x}{x}}$.

Geometric method of extracting a square root from a number less than 1

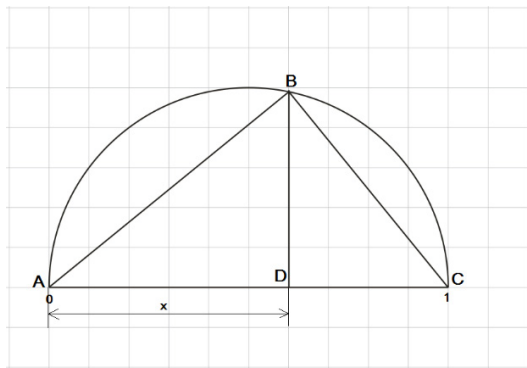


Figure 4

The similarity of the triangles ADB and ABC (fig. 4) implies that

$$\frac{AB}{AC} = \frac{AD}{AB}$$

и $AB^2 = AD \cdot AC = x \cdot 1,$

i.e.,

$$AB = \sqrt{x}.$$

Thus, with the help of a circle with unit diameter we can easily find on the number line the point corresponding to the square root of a given number from zero to one (Fig. 5a), and also do the reverse and find the values corresponding to the second, fourth and eighth degrees of a given number from zero to one (Fig. 5b).

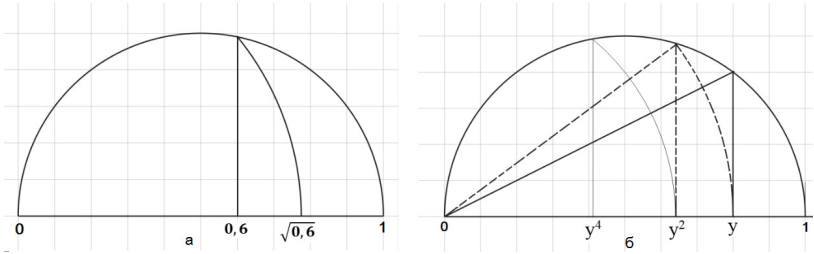


Figure 5

Geometric method of finding fractional degrees of numbers

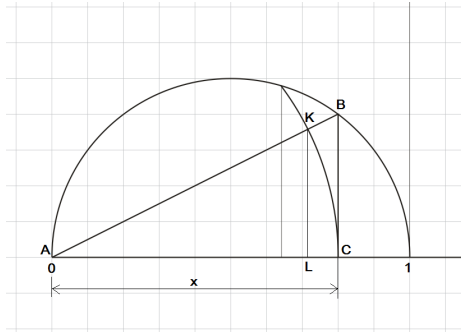


Figure 6

From the similarity of triangles AKL and ABC (Fig. 6) it follows that

$$\frac{AK}{AB} = \frac{AL}{AC} .$$

Since - as it was shown above – $AB=\sqrt{x}$, the equality takes the form

$$\frac{x}{\sqrt{x}} = \frac{AL}{x} ,$$

which implies that

$$AL=x^{\frac{3}{2}} .$$

Similarly, we can graphically find other degrees of numbers, including inverse degrees (Fig. 7):

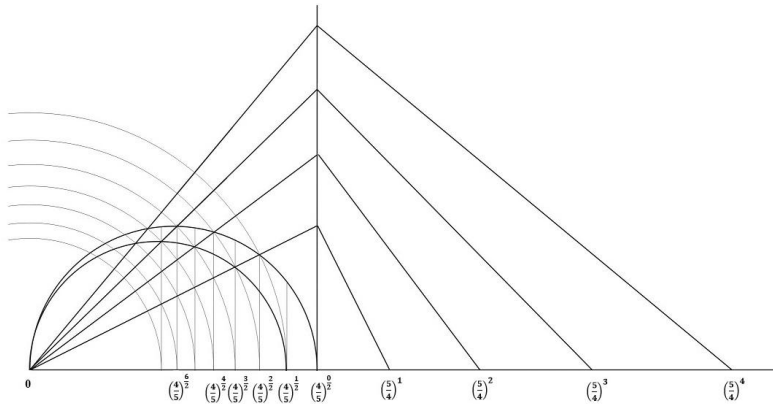


Figure 7

The above geometric methods of multiplication/division and degree expansion/root extraction have a significant limitation: it is necessary to know in advance which segment is taken as a unit, because operations with numbers less than one and greater than one are performed differently.

When finding the point of intersection of circles (Fig. 8) we managed to get rid of this drawback - we can work with any diameters in the same way.

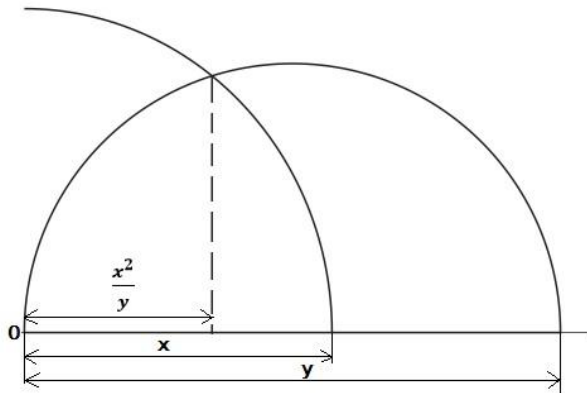


Figure 8

Thus the following relations can be obtained (Fig.9):

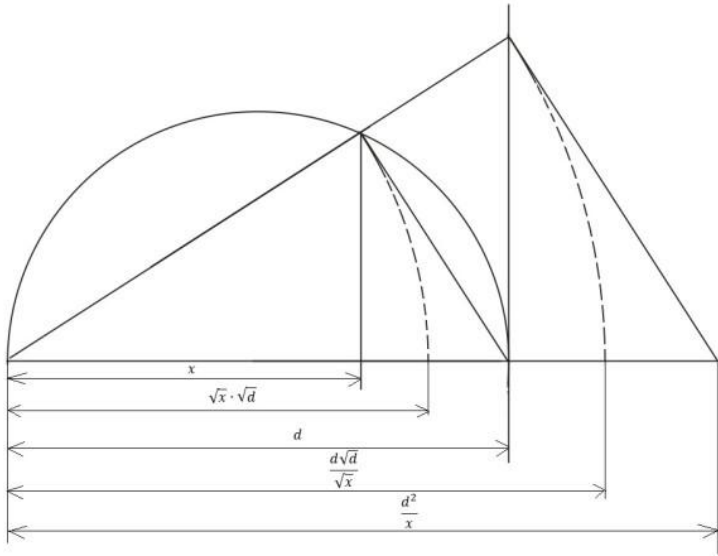


Figure 9

Conclusion

In this article the application of visual methods of geometric finding of results of arithmetic and algebraic operations has been justified. The use of these methods allows us to take a new look at the interrelation of operations of raising to degree and root extraction.

“垂直城市”作为“垂直动态城市主义”概念的基础
“VERTICAL CITY” AS THE BASIS OF THE CONCEPT OF
“VERTICAL DYNAMIC URBANISM”

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抽象的。文章提出了垂直城市主义的概念，通过运用最现代的建筑理论和技
术，确保“垂直城市”的不断转型。概念和技术的相互关系构成了动态垂直都市主
义的基础：基于机器人的设计、开放式建筑概念、模块化建筑和工业装配、现场自
动化和建筑信息建模。提出了一种“垂直城市”的新结构，或者换句话说，动态垂
直城市主义，涵盖建筑对象的整个生命周期，其特点是通过使用最新的建筑技术
不断进行垂直改造。

关键词：动态垂直城市主义、垂直城市、开放式建筑、模块化建筑、建筑信息模
型。

Abstract. *The article presents the concept of vertical urbanism, which ensures the constant transformation of the “vertical city” through the use of the most modern building theories and technologies. The interrelationship of concept and technology forms the basis of dynamic vertical urbanism: robot-based design, open building concepts, modular construction and industrial assembly, on-site automation and building information modeling. A new structure of the “vertical city” or, in other words, dynamic vertical urbanism, is proposed, covering the entire life cycle of a building object and characterized by constant vertical transformation through the use of the latest building technologies.*

Keywords: *dynamic vertical urbanism, vertical city, open construction, modular construction, building information modeling.*

Cities are the place of residence of half of the world’s population, their archi-
tecture, structure and ecology have a significant impact on residents. When
creating new spaces in cities, architects take into account past experience and offer
solutions in accordance with modern requirements [1,2]. The urban form of settle-
ment is a spatial organization of interaction between the life processes of residents
and the surrounding space. Of interest are the patterns of space formation: func-

tional and territorial zones, central spaces, structural and functional relationships [2]. There are many theories about the structure of the city. But no matter what path or theory cities have developed, for many centuries all over the world they have been united by one thing: the presence of high-rise and low-rise buildings.

Despite progress in the field of high-rise construction, the horizontal growth of cities increases the number of problems:

- Urban development captures more and more new territories, while the local flora and fauna are gradually disappearing. This means the complete destruction of ecosystems that have been formed over the centuries.

- Urban space is used irrationally, which creates transport and social problems. In almost any city during rush hour, you can observe the congestion of all transport systems.

- Presence of industrial zones in the central part of the city. This situation is due to the fact that factories built on the outskirts of the city in the past are today located in the central part due to the high rate of urban expansion. In addition to environmental pollution, a negative factor is the irrational use of industrial space, taking into account urban development trends.

As cities grow, there is a need for new concepts and approaches to urban space planning. High-rise construction has served as a powerful impetus for the further development of construction and related technologies necessary for the development of mega-high-rise clusters in which people can stay for a long time without having to leave it. In the 21st century there are enough prerequisites for the implementation of a new concept of development in the form of vertical cities [3, 4].

The idea of a “vertical city” comes from the practice of building skyscrapers and is a combination of interconnected several high-rise buildings by building horizontal high-rise links that serve as pedestrian-transport communications between the towers. The division of urban territorial-functional zones and city-wide processes into underground and above-ground levels, which are subdivided according to the principle of functional belonging and may include several floors. Such high-rise complexes are self-sufficient, capable of accommodating hundreds of thousands of people in a comfortable urban environment. The “vertical cities” built in this way will be able to transform following the constantly changing needs as a full-fledged city with changes in the functions and forms of urban life. To implement this idea, a concept is proposed for the design and construction of multi-level urban complexes of the “vertical city” using modern design and construction technologies..

Currently, there are a number of technologies that can improve the level of comfort when living in high-rise complexes. Special technologies are being developed, parts of structures are made to special orders, and the installation process itself takes into account the climate, the shape of the building, construction time

and other specific factors. It can be said with confidence that developers have fully mastered high-rise construction and they can solve any problems that arise, using modern design and engineering solutions, using existing equipment and specialists. Thanks to modern technologies, a possible solution to the further growth of urban space will be the emergence of “vertical cities”, various concepts of which are actively proposed today by architects and urban planners.

“**Vertical dynamic urbanism**” is a complex process of formation of a functional-spatial system of dynamically developing high-rise complexes, which ensures the constant transformation of the “vertical city” both up and down. Six interrelated concepts and technologies form the basis of vertical dynamic urbanism: structural-functional elements of the city, robotic design, the concept of open construction, modularity and prefabrication, local automation, building information modeling (Fig. 1).



Figure 1. Scheme of the concept of “Vertical Dynamic Urbanism”.

Building factories on site play a crucial role in the development of vertical dynamic urbanism. In order to ensure the continuous erection of the building, it is essential to implement automated building assembly factories on the construction site. Such a factory is designed to assemble a building with minimal human intervention. The use and application of on-site assembly factories will improve the

efficiency and safety of construction. The vertical material transport platform is controlled by a lifting planning system, which creates a lifting plan based on data such as floor height, distance, accelerations, manipulation reduction time, number of stops, construction material feeding speed, lifting cycle, material moving speed and waiting time. The necessary data can be collected from sensors located on the building structure or embedded in building materials [5, 6]. The base of each tower will function as a loading, sorting and collection station for materials during construction.

Process Information Modeling Platform. To create the “central nervous system” of the proposed concept of the “vertical city”, the concept of information modeling of processes based on the accumulated progress in BIM technologies is proposed [7]. Process Information Modeling will provide a collaborative way to plan, design, manufacture, assemble, and manage throughout the life cycle of a construction project. The main goal of information modeling is to implement the current BIM technology [8] and supplement it with a database platform that is process-oriented, ensuring the smooth transfer of data, as well as facilitating the smooth and constant exchange of data between all construction participants. The information modeling platform will collect real-time information from dedicated data clusters and then store, classify, process and distribute the most important information to the right stakeholders at the right time. Based on the current progress of BIM technology research, a system architecture of the proposed information modeling platform for the development of the entire life cycle of a vertical city has been preliminary developed.

Usually the construction of buildings is carried out from the bottom up, starting from the ground part. In the proposed concept, it is supposed to start building the building down according to the “Top-Down” technology - “from top to bottom” [9, 10]. Modern technologies make it possible to build multi-storey buildings underground and divide city-wide processes into underground, aboveground and aboveground levels [11]. Such building complexes will also be divided into levels: railway stations and other transport communications, including underground parking lots, will be located on the lower levels. The middle level will house shopping malls, cinemas and other public functions. At the ground level, there will be streets for ground-based high-speed transport. Above is the level for slower vehicles, and the next level is for pedestrians.

Thus, the “vertical city” is a multifunctional multi-level structure, the height of which prevails over the built-up area of the land and requires a solution to the issue of the functioning of horizontal links connecting high-rise complexes to each other. The solution with additional pedestrian streets raised to the upper elevated level will be the so-called “sky bridges”.

“Sky Bridges” serve as the main horizontal communications, paths and streets connecting different levels of the towers of vertical complexes, as well as a gathering place for urban communities for various events. The overpasses must be connected to each other on both sides using integrated retractable mounting systems. Sky Bridges can also perform various functional and planning tasks within a comfortable urban environment: recreational, sports grounds, open terraces and alleys with landscaping, bike paths and swimming pools. An elevated street may include public gardens with a system of pedestrian paths connecting commercial facilities, cinemas, restaurants, hotel complexes, etc. Sky Bridges connect residential apartments and townhouses with cultural and community facilities with medical, sports and other public functions.

Thanks to the concepts of automation in the construction of the “vertical city” and the application of the concept of open construction, continuous transformation of the city and the ability to adapt in response to urban transformations can be achieved. A “vertical city” can develop and grow both up and down, expand by creating transport networks underground and pedestrian “sky bridges” above the ground, combining high-rise towers and thereby creating a full-fledged vertical city structure (Fig. 2).

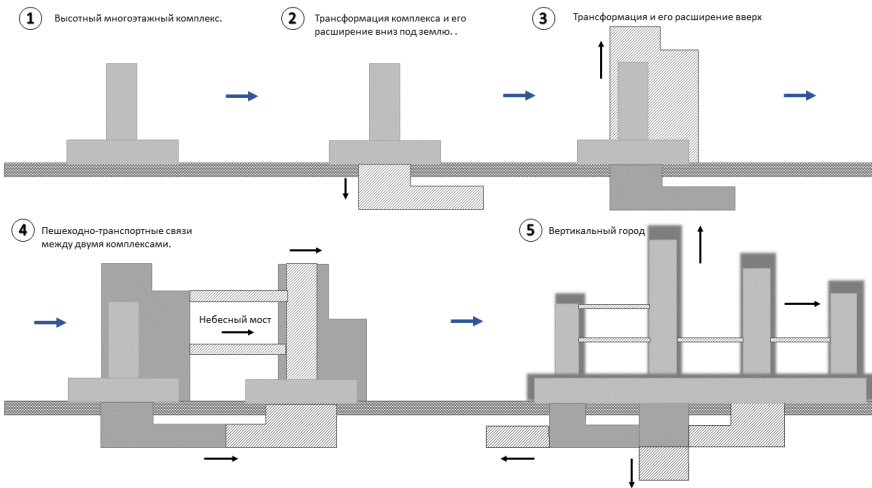


Figure 2. Conceptual scheme of the continuous development of the “vertical city”.

Following the concepts of open construction [12] and modular construction, the vertical city building process can be divided into four subsystems: structures,

non-load-bearing components, services and construction. When a building reconfiguration is required, the interior can be easily changed; when relocation and deconstruction is required, deconstruction can be carried out in the reverse order of the construction process. Many possible scenarios for future development are being created throughout the entire life cycle of the complex according to the principles of vertical dynamic urbanism.

The proposed concept of a “vertical city” has many advantages in terms of production, construction, economy, operation and sustainability. Building land can be effectively used. On an urban scale, the concept reflects the vibrant essence of a city that is constantly evolving and meeting the needs of its inhabitants.

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DOI 10.34660/INF.2023.62.84.151

应用外生地质过程和工程地质条件解释方法来绘制克拉斯诺达尔边疆区度假城市索契市区的危险地质过程和工程地质条件分区

APPLICATION OF THE METHODOLOGY OF INTERPRETATION OF EXOGENOUS GEOLOGICAL PROCESSES AND ENGINEERING-GEOLOGICAL CONDITIONS FOR MAPPING HAZARDOUS GEOLOGICAL PROCESSES AND ZONING OF ENGINEERING-GEOLOGICAL CONDITIONS OF THE URBAN DISTRICT OF THE MUNICIPAL FORMATION OF THE RESORT CITY OF SOCHI OF THE KRASNODAR KRAI

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抽象的。本文讨论了“破译外生地质过程和地质条件”技术，用于创建危险地质过程和工程地质条件图，以用于规划度假城市索契市区的城市规划活动，克拉斯诺达尔边疆区。

关键词：危险地质过程、机载激光扫描、数字高程模型、滑坡、泥石流、岩溶、解译。

Abstract. *The article discusses the technique of “Deciphering exogenous geological processes and geological conditions” used to create maps of hazardous geological processes and engineering-geological conditions for their use in planning the urban planning activities of the urban district of the municipality of the resort city of Sochi, Krasnodar Krai.*

Keywords: *hazardous geological processes, airborne laser scanning, digital elevation model, landslide, mudflow, karst, interpretation.*

Introduction

The urban district of the municipal formation of the resort city of Sochi is one of the largest and most developed tourist centers in Russia. It is located in a sub-tropical climate and is characterized by high seismic activity, as well as the presence of dangerous geological processes such as landslides, mudflows, avalanches, etc. To ensure the safety and comfort of city residents, it is necessary to conduct research and map hazardous geological processes (HGP) in order to identify the most vulnerable areas and develop measures to protect them. In 2021, work was carried out to compile maps of hazardous geological processes of the estimated zoning of engineering-geological conditions (EGC) in areas of built-up territory and potential construction, excluding zones with special conditions for the use of territories, or protected zones such as nature reserves, protected zones of water intakes, etc.

Goal of the work

The purpose of this scientific article is to describe the application of the methodology for deciphering exogenous geological processes and engineering-geological conditions for compiling maps of hazardous geological processes for the estimated zoning of engineering-geological conditions M 1:10,000.

Research methods

To achieve this goal, the following research methods were used:

- Study and analysis of geological documentation obtained from various sources (archival materials, reports on engineering and geological research, scientific publications, etc.).
- Application of methods for deciphering data from airborne laser scanning and high-resolution aerial photographs for HGP and determining their activity potential.
- Use of cartography methods and GIS-technologies for creation of HGP maps and EGC zoning.

General information

The described region is located in the area of the northwestern subsidence of the crystalline core of the Greater Caucasus and the Black Sea adjacent to it. Administratively, the territory is part of the Krasnodar Krai.

Orographically, the land is divided into two unequal parts - mountainous and coastal gently undulating. The mountainous part includes the Main Ridge and the spur of the Rocky Ridge, elongated in the meridional direction. The water system is formed by the rivers of the southern slope. All rivers are mountainous, have a significant slope and are characterized by an unstable regime, usually associated with the amount of precipitation. The rivers of the southern slope - Mzymta, Sochi, Shakhe, Psezuapse, etc. - flow into the Black Sea. The marine part of the leaf covers the shelf, the continental slope, and a fragment of the deep-sea basin.

The shelf has a width of 0.5 to 14 km, usually 7-12 km. The edge of the shelf is located at depths from 30 m in the eastern and up to 180 m in the western parts of the study area.

The area of work is characterized by a complex and very complex geological structure, and varying degrees of outcrop (poor, fair and good) (Figure 1). When preparing the HGP map, airborne laser scanning data (LSD) and aerial photographs (APG) were used, while preparing the EGC zoning map, materials of the study of the territory of past years, materials from remote sensing of the Earth (RSE), LSD and AFS with the prepared HGP map were used. Airborne laser scanning was carried out from a height of 2500 m at a density of points of laser reflections (PLR) no worse than 5 PLR per 1 square meter with a root-mean-square error of 2.5 cm.

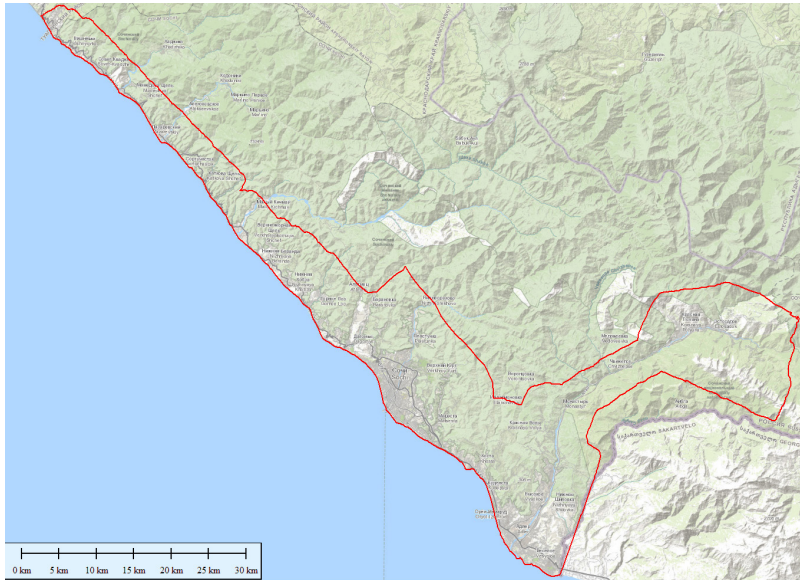


Figure 1. Scheme of the laser scanning area for mapping the HGP

Methodology for performing work

The use of LSD data for the construction of a digital elevation model (DEM) can significantly increase the reliability of the detection of the GEO, as well as the APS, which can complement the picture and, in some cases, remote sensing [1-4].

These VLSs are also subject to certain requirements in order to obtain a PLR array that satisfies these requirements [2, 3]. High-quality terrain scanning, combined with APG, allows you to get a digital terrain model (DTM) as close to reality as possible.

Methodology for deciphering dangerous geological processes

DTM for interpretation, after adjustment and classification of the PLR array, is formed from PLR with the class ground or ground surface in a GIS or other software product that allows you to visualize a 3D relief and draw primitives (points, lines and polygons) [5]. Briefly what it looks like is shown in Figure 2.

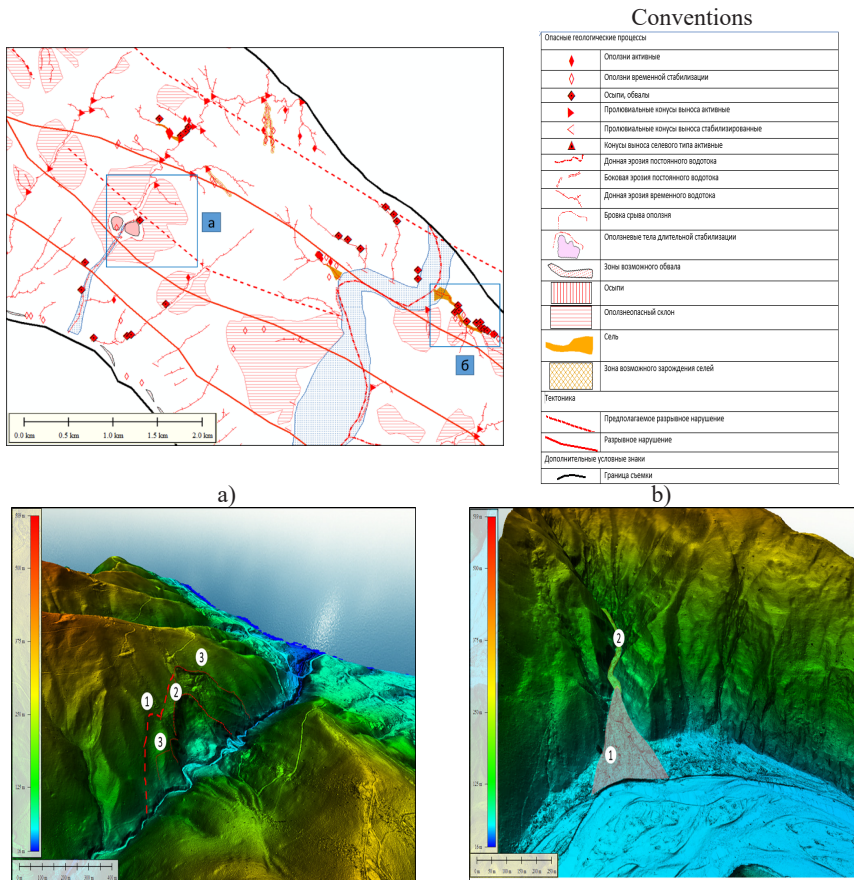


Figure 2 is a fragment of the HGP map. Lazarevsky district, urban district of the municipality of the resort city of Sochi. Blue rectangles indicate: a) DEM. Seismogenic landslide. 1 - the edge of the collapse of an ancient landslide; 2 - landslide break edge of the second generation of long-term stabilization; 3 - the edge of the breakdown of the third generation of temporary stabilization; b) - DEM. The mud pool. 1 - alluvial cone, partially reworked by the river; 2- channel.

The interpretation of data according to the special morphological features of any GCP implies the selection of typed primitives:

- “to identify landslide phenomena: edge failures, landslide cirques, ditches of settlements, tongues of landslide structures, stepped-block surfaces, bulges and influx, slopes of collapses and erosion, depressions and hillocks”;
- “to detect landslide phenomena: the surfaces of the departments of the collapsed masses, shapes and sizes, slopes, areas of transit, etc. are revealed”;
- to identify karst phenomena: determination of carr, depressions, funnels, saucers, ridges, etc.;
- and other EGP, manifested in any form on the surface, developing prone to freezing, thawed and permafrost soils.

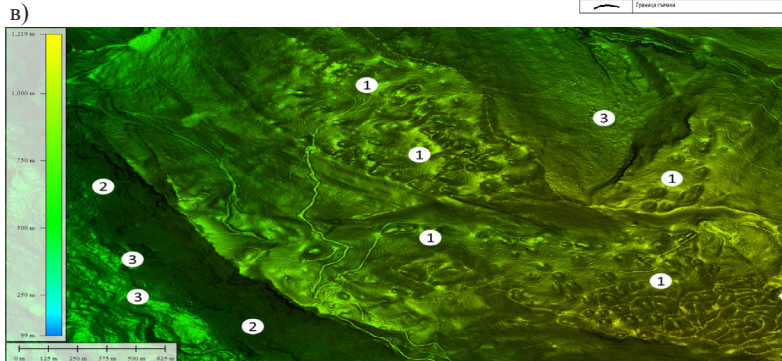
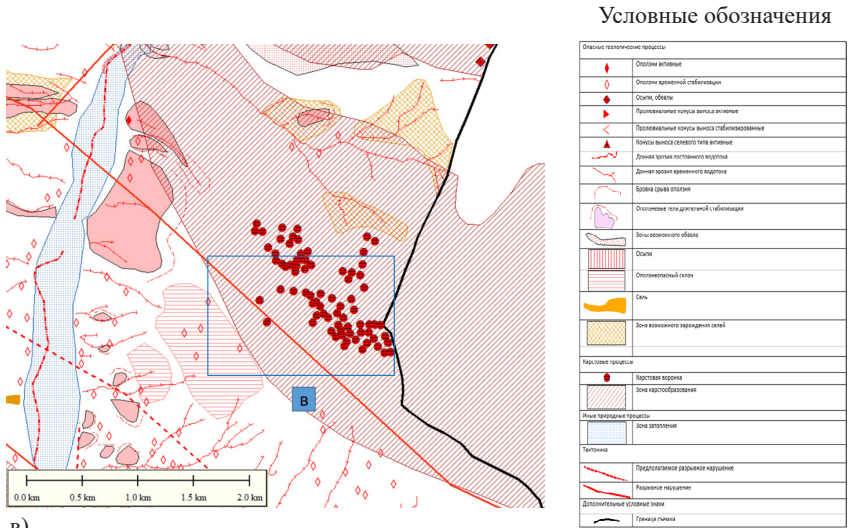


Figure 3 is a fragment of the HGP map. Adlersky district, urban district of the municipality of the resort city of Sochi. Marked with a blue rectangle: c) Karst relief. 1- karst funnel; 2-sceee; 3 - landslide.

A special feature of soil deposits (geological bodies that have manifested themselves in the relief and landforms): talus, landslides, alluvial fans, deluvial plumes, weathering crusts (non-displaced weathered soils), zones of transits and deposits of soil masses, etc.

The work itself on the identification of HGP on the DEM was carried out according to the patent for invention No. 2655955 “Method for deciphering exogenous geological processes and engineering-geological conditions.

Methodology for compiling a map of engineering-geological conditions zoning

Engineering-geological zoning is the identification in space of territorial units (taxonomic units, taxa) of a different order that have some common engineering-geological features, their restriction from territories that do not have these features, their description and mapping [6].

When compiling zoning maps, various methodological approaches are used, presented in Table 1.

Table 1
Methodological approaches used in engineering-geological zoning

Engineering-geological zoning	Types	Kinds	Variety
	Genetic-morphological (natural-historical)	Regional	General
		Typological	General
			Special
		Mixed	General
			Special
		Estimated	Comparative (qualitative and quantitative)
	Special		
	Geological and economic (quantitative)		Special

In this case, when preparing the zoning map, it was used by type - estimated, by type - comparative (qualitative and quantitative), by variety - special.

Estimated zoning (Table 1) is performed to assess the engineering-geological conditions of various territories based on the use of qualitative or quantitative indicators, geomorphological, geological, hydrological, hydrogeological and the totality of the flowing EGP (Figure 3).

When performing engineering-geological zoning, the following principles should be observed:

- zoning is carried out according to engineering-geological features, reflecting the main patterns of spatial changes in engineering-geological conditions;
- the sum of the areas of the selected taxonomic units should be equal to the area of the divided territory;
- territorial units (taxa) identified at a certain stage of zoning should be of the same level (order);
- classification features should be chosen so that each point of the territory under study falls into only one of the allocated territorial units (taxa) and none of them could fall into several units of the same rank (the allocated areas of the territory cannot intersect);
- each boundary between the allocated territorial units (taxa) should be drawn according to a well-defined feature (group of features).



Figure 3. Fragment of the map of engineering-geological zoning. Adlersky district, urban district of the municipality of the resort city of Sochi.

УСЛОВНЫЕ ОБОЗНАЧЕНИЯ				
Условие	Надкласс		N	Описание оврагавола
	Район	Подрайон		
Безопасные	I	Б	1.6	Наличие эрозии, уклон до 5 град, грунты устойчивые, проявление других ОГМ минимальное.
		В	1.8	Наличие эрозии, уклон до 5 град, грунты специфически малой прочности (до 1м), проявление других ОГМ минимальное.
Условно-близкоопасные	II	А	10.А	Отсутствия активного геологического процесса, уклон до 10 град, грунты устойчивые, проявление ОПГ минимальное.
		Б	10.Б	Наличие эрозии и мелких оползней грунта, уклон до 10 град, грунты устойчивые, проявление других ОГМ минимальное.
Близкоопасные	III	А	10.А	Наличие эрозии, мелких оползней грунта и мелких оползней, уклон до 15 град, грунты условно устойчивые. Проявление небольших оползней на склонах и склонах, проявление других ОПГ минимальное. Наличие карстуемых пород (глубокого заложения (около 20 м от дневной поверхности) в котловых образованиях гроты, пещеры. Занесение территории...
		Б	10.Б	Оползневый и оползневый склон, уклон от 15 до 35 град, грунты слабые, проявление других ОПГ. Наличие карстуемых пород (глубокого заложения (около 20 м от дневной поверхности) в которых образования гроты, пещеры. Участки подзащитные полностью при аномально большом выпадении осадков.
Высоко-опасные	IV	А	10.А	Облагодородный и осколочный склон, уклон от 35 град, грунты неустойчивые, проявление других ОПГ. Наличие карстуемых пород (глубокого заложения (около 20 м от дневной поверхности) в которых образования гроты, пещеры. Участки подзащитные полностью с полным учетом гни аномально большое выпадение осадков.
		Б	10.Б	Сложные участки, участки подзащитные полностью и динамично водных масс с гравелистыми потоком при аномально большом выпадении осадков. Наличие карстуемых пород (глубокого заложения (около 20 м от дневной поверхности) в которых образования гроты, пещеры.
Высоко-опасные	IV	А	10.А	Оползневый склоны с крупными субгоризонтальными оползнями без проектной активности и отсутствии геологической нагрузки, неустойчивые грунты, проявление активного поверхностного и приповерхностного карта (до 20 м от дневной поверхности).

Figure 4. Symbols for Figure 3

Conclusion

The developed methodological principles (Patent No. 2655955), consisting of methods for deciphering, determining the qualitative and quantitative characteristics of the HGP, made it possible to develop maps of the HGP and engineering-geological conditions suitable not only for urban planning, but can also be used in the future as a starting point in monitoring the HGP on the territory urban district of the municipality of the resort city of Sochi

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上合组织国家的科学研究：协同和一体化

国际科学大会的材料

2023 年 8 月 9 日。中国北京

编辑A. A. Siliverstova

校正A. I. 尼古拉耶夫

2023 年 8 月 9 日。中国北京

USL。沸点：98.7。 订单253. 流通500份。

在编辑和出版中心印制

无限出版社

