



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

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这些会议文结合了会议的材料 – 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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CONTENTS

ECONOMIC SCIENCES

上合组织国家价值取向的共轭性：二次分析的经验

Conjugacy of value orientations in the SCO countries: experience of secondary analysis

Falkovskaya Ksenia Igorevna9

数字化对高科技企业经济绩效影响因素

Factors influencing the impact of digitalization on the economic performance of high-tech enterprises

Nestiagin Pavel Nikolaevich15

JURIDICAL SCIENCES

俄罗斯的民事诉讼和司法通信

Civilist proceedings in Russia and judicial communications

Latysheva Natalia Arkadyevna23

PEDAGOGICAL SCIENCES

健身健美操队健康指标数字化

Digitalization of health indicators for fitness aerobics teams

Mikhailova Elvira Ivanovna, Mikhailov Nikolay Georgievich, Derevleva Elena Borisovna30

航海数学发展的主要方向

Main directions of development of mathematics in navigation

Amineva Elena Hrisanfovna, Pankina Svetlana Ivanovna, Voronina Maria Sergeevna35

高等教育中实施人工智能的困难

Difficulties in implementing artificial intelligence in higher education

Tedoradze Teona Guladiyevna, Paul Amadi Ikenna43

PHILOLOGICAL SCIENCES

跨平台媒体语境下的现代话语实践（以《共青团真理报》为例）

Modern discursive practices in the context of cross-platform media (using the Komsomolskaya Pravda publication as an example)

Terentyeva Elena Vitalyevna, Alsufyeva Miloslav Maksimovna51

后启示录类型现代文学中的神话元素

Mythologems in modern literature of the post-apocalypse genre

Cheremina Ekaterina Arkadievna.....57

缔结国际条约的语言结构特征（以英国法和俄罗斯法为例）

Linguostructural features of concluding international treaties (on the example of British law and Russian law)

Solonenko Kristina Mikhailovna, Mokhosoeva Marina Nikolaevna65

PHILOSOPHICAL SCIENCES

关于内村完藏作品《基督徒的慰藉》的理解困难

On the difficulty of understanding Uchimura Kanzo's work "The Consolation of the Christian" (Kirisuto shinto no nagusame)

Matushanskaya Yulia Grigoryevna, Faryakhutdinov Aidar Ilhamovich, Zilber Ksenia Sergeevna73

俄罗斯复杂的人道主义法医检查：方法论问题

Complex humanitarian forensic examination in Russia: problems of methodology
Bignova Marina Rinatovna, Nebytov Konstantin Vladimirovich79

CULTURAL STUDIES

“一带一路”倡议下中俄跨文化交流可持续发展模式研究

Research on the sustainable development model of Sino-Russian cross-cultural exchange under the belt and road initiative

Ma Haijun, Batyshcheva Elena Vladimirovna.....88

SOCIOLOGICAL SCIENCES

多民族青年环境中的宽容（以俄罗斯联邦民族大学学生为例）

Tolerance in a multi-ethnic youth environment (on the example of students of RostGMU)

Mkrtycheva Karine Borisovna, Bezverbnaya Narine Aramovna.....95

现代世界的数字通信

Digital communications in the modern world
Dorenko Ksenia Sergeevna99

ART HISTORY

东方音乐理论观念中的神话诗学与声音学说（方法论与实践问题）

Mythopoetics and the Doctrine of Sound in the musical and theoretical concepts of Eastern countries (issues of methodology and practice)

Arsenyeva Olga Olegovna104

从作曲家的角度看音乐创作：音乐创作的艺术与技术

Composing from a composer's perspective: the art and technology of music creation
Hu Jing Jing.....112

音乐表演与作曲视角下的高等职业教育研究

Research on higher vocational education from the perspective of music performance and composition

Hu Jing Jing, Qin Jia Ming..... 116

美术与外国艺术文化：跨文化艺术对话

Fine arts and foreign art cultures: a cross - cultural artistic dialogue

Lyu Si Chen 120

HISTORICAL SCIENCES

弗拉基米尔·玛丽亚·亚西尼娅公主：民族血统和精神壮举

Princess Vladimirskaia Maria Yasynya: ethnic origin and spiritual feat

Tsallagova Zarifa Borisovna..... 123

MEDICAL SCIENCES

为农村地区的外籍工人提供初级卫生保健的特点：障碍及其克服方法

Features of providing primary health care to foreign workers in rural areas: barriers and ways to overcome them

Moskvicheva Aleksandra Stanislavovna, Davidov David Rudolfovich, Shikina Irina Borisovna 137

根管治疗中医源性错误消除方法分析

Analysis of methods for eliminating iatrogenic errors in endodontic practice

Rozhkova Elena Nikolaevna, Postnikov Mikhail Alexandrovich, Ippolitov Yuriy Alekseevich, Sushchenko Andrey Valerievich, Shishkina Victoria Viktorovna, Mamedov Sarkhan Eldar ogly..... 143

临床实践中三联疗法和根治性膀胱切除术后5年总生存率的回顾性分析

Retrospective analysis of 5-year overall survival after trimodal therapy and radical cystectomy in real clinical practice

Zhuravskii Dmitrii Alexandrovich, Novikov Andrei Ivanovich, Moiseenko Vladimir Mikhailovich, Chubenko Vyacheslav Andreevich, Gorelov Andrei Igorevich 148

冠心病患者和高残留血小板反应性患者死亡率的关键预测因素

Key predictors of mortality in patients with coronary heart disease and high residual platelet reactivity

Nurmukhammad Friiba Nasrullakzy, Zhangelova Sholpan Bolatovna..... 157

未分化结缔组织发育不良与青少年胆道功能障碍的相互关系

The interrelation between undifferentiated connective tissue dysplasia and functional disorders of the biliary tract in adolescents

Bobrysheva Anna Aleksandrovna, Sirotenko Tamara Anatolievna, Bobrysheva Inessa Venidiktovna..... 165

TECHNICAL SCIENCES

卫生陶瓷生产中泥釉均匀性的探讨

Investigation of the uniformity of slips in the production of sanitary ceramics
Lozovaya Svetlana Yuryevna, Bashcheva Ekaterina Sergeevna.....169

确保矿棉生产的方法和设备

Methods and equipment for ensuring the production of mineral wool
Lozovaya Svetlana Yuryevna, Teslya Sergey Viktorovich.....176

采用摩擦化学包覆法提高针织设备摩擦部件的使用寿命

Increasing the service life of parts of friction units of knitting equipment by the friction-chemical method of cladding
Korneev Alexey Alekseevich, Beresneva Valeria Leonidovna.....181

使用模糊逻辑实时预测和确定电信网络设备状况的优势

Advantages of using fuzzy logic to predict and determine the condition of telecommunication network equipment in real time
Medelyanova Aleksandra Vitalievna.....186

神经网络集成：概述和应用

Integration of neural networks: overview and applications
Achilov Nikita Rustamovich.....193

AGRICULTURAL SCIENCES

饲喂大白猪时添加饲料添加剂“Acidomurine”对大白猪肌肉组织化学组成的影响

Chemical composition of muscle tissue of large white pigs when using the feed additive "Acidomurine" in their feeding
Skripin Petr Viktorovich, Svinarev Ivan Yuryevich, Chernyak Alexander Alexandrovich, Gekhaev Rasul Nasrudievich.....198

不同灌溉制度下克拉斯诺达尔地区稻田土壤氮素动态

Dynamics of nitrogen in soils of rice fields of the Krasnodar region under different irrigation regimes
Prikhodko Igor Alexandrovich.....205

EARTH SCIENCES

图瓦共和国克孜勒市城市固体废物填埋场影响区土壤重金属和砷污染水平评估

Assessment of the level of soil contamination with heavy metals and arsenic in the zone of influence of the municipal solid waste landfill in Kyzyl, Republic of Tyva
Kara-Sal Irina Darymaevna, Kuzhuget Sayana Kodur-oolovna, Ondar Svetlana Nachynovna214

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上合组织国家价值取向的共轭性：二次分析的经验

CONJUGACY OF VALUE ORIENTATIONS IN THE SCO COUNTRIES: EXPERIENCE OF SECONDARY ANALYSIS

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注释. 本文基于“世界价值观调查”(WVS)第七轮研究项目框架内获得的关于上合组织国家的二手分析数据。该项目汇聚了世界各地的社会学家,致力于研究价值观及其对社会文化生活的影

关键词: 价值取向, 上合组织国家, 世界价值观调查。

Annotation. *The article presents secondary analysis data on the SCO countries obtained within the framework of the 7th wave of the research project “World Values Survey” (WVS), which unites sociologists around the world studying values and their impact on social and cultural life.*

Keywords: *value orientations, SCO countries, World Values Survey.*

In the modern world, international integration is becoming an increasingly important factor in the development of states. It allows countries to pool their resources, exchange experience, knowledge, and most importantly, to jointly seek answers to the global challenges of modern reality.

Initially, in 2023, the author’s research was devoted to identifying the characteristics of work behavior and professional motivation of young people in Russia, the Republic of Belarus and the Republic of Kazakhstan [1]. All these countries have common goals and objectives in the field of international integration, one of the key areas of which is economic cooperation, for which they actively participate in various international organizations and projects.

Today, Russia, the Republic of Belarus, and the Republic of Kazakhstan are members of the SCO. The main goals of this organization include strengthening stability and security, as well as promoting economic growth, social and cultural development.[2]. In the economic sphere, the SCO countries are developing trade, investment, and transport and logistics links. They create favorable conditions for

business, eliminate trade barriers, and stimulate the development of small and medium-sized businesses. Since this organization includes a number of other member countries (India, Iran, China, Kyrgyzstan, Pakistan, Tajikistan, Uzbekistan), the author set a goal to study the value orientations in all SCO countries.

The secondary analysis was carried out on the basis of data from the World Values Survey Wave 7 (2017-2022) [3]. Considering the conjugation of the values of the countries, we note the following of them: “family”, “friends”, “leisure time”, “politics”, “work”, “higher education as a guarantor of success”. There is no data available for the Republic of Belarus, as it joined the SCO in July 2024.

Let us consider the results of the responses to the positions presented above, which allow us to assess the degree of value congruence of the SCO countries (see Tables 1-6).

Table 1

Distribution of responses to the general question about the importance of individual factors in the lives of the population of the SCO countries (in %)

factor country	family			
	very important	rather important	not very important	it doesn't matter at all
Kazakhstan	93.5	6	0.5	0,1
Russia	93.2	5.9	0.7	0
India	94.4	4.4	0.8	0.3
Iran	93.9	5.2	0.8	0,1
China	86.2	13	0.6	0
Kyrgyzstan	92.4	7.5	0,1	0
Pakistan	92.6	6	0.9	0.5
Tajikistan	95.9	3.9	0.2	0
Uzbekistan	92.8	6.5	0.5	0.2

Table 2

Distribution of responses to the question about the importance of friends in the lives of the population of the SCO countries (in %)

	Friends			
	very important	rather important	not very important	it doesn't matter at all
Kazakhstan	43.7	41.1	12.2	2.4
India	54	28.4	11.8	5.2
Iran	29.8	53.1	10.9	6.1
China	34.5	57	8	0.3
Kyrgyzstan	52.3	39.4	7.4	0.5

Pakistan	58.5	29.7	7.7	3.9
Tajikistan	50.1	39.9	8.8	1.2
Uzbekistan	29.9	48.3	20	1.5
Russia	41.6	43.5	12	2.4

Table 3

Distribution of responses to the question about the importance of leisure time in the lives of the population of the SCO countries (in %)

	rest time			
	very important	rather important	not very important	it doesn't matter at all
Kazakhstan	35.5	44.4	16.1	3.3
India	39.6	34.8	12.7	12
Iran	40.4	51.1	5.7	2.6
China	20.6	50	27.5	1.6
Kyrgyzstan	41	37.5	18.6	2.9
Pakistan	30.8	31	18.3	19.1
Tajikistan	27.7	33.2	32.2	6.8
Uzbekistan	26.8	31.3	33	8.4
Russia	37.2	44.3	14.3	3.3

Table 4

Distribution of responses to the question about the importance of politics in the lives of the population of the SCO countries (in %)

	policy			
	very important	rather important	not very important	it doesn't matter at all
Kazakhstan	13.5	30.7	35.7	19
India	21.5	25.1	23.3	27.3
Iran	22.6	35.6	19.3	22.2
China	15.1	38.5	38.6	7
Kyrgyzstan	14	21.1	42.2	21.7
Pakistan	19.9	23.3	22.1	33.2
Tajikistan	23.9	27.4	37.2	11.4
Uzbekistan	31.8	35.8	22.2	8.9
Russia	12.5	25.2	39	22.5

Table 5

Distribution of responses to the question about the importance of work in the lives of the population of the SCO countries (in %)

	Job			
	very important	rather important	not very important	it doesn't matter at all
Kazakhstan	48.2	36.8	9.6	3.6
India	76.4	17.2	3.2	2.6
Iran	77.5	18.6	1.9	1.7
China	44.5	43.9	8.7	2.5
Kyrgyzstan	55.5	31.9	10	2
Pakistan	63.1	20.2	8.4	7.9
Tajikistan	57.9	30.4	8.6	3.1
Uzbekistan	56.7	34.9	6.2	2
Russia	40.7	33.3	13.5	4.9

Table 6

Distribution of responses to the question about the importance of higher education as a guarantee of success in life of the population of the SCO countries (in %)

	Higher education as a guarantee of success			
	guarantee of success	is of great importance	not very important	Higher education does not matter
Kazakhstan	18.8	47.1	27.5	4.9
India	52.6	27.1	8.6	4
Iran	21.9	59.9	10.8	6.1
China	27.3	63	8	0.5
Kyrgyzstan	13.9	50	22.1	10.9
Pakistan	50.9	29.8	10	7
Tajikistan	39.3	37.8	15.5	3.5
Uzbekistan	29.4	44.9	19.4	5
Russia	17	47.4	18.8	8.1

Of primary interest are the correlation estimates across countries and the corresponding question positions (see Table 7).

Table 7
Correlation responses by country according to value position

	family	Friends	rest time	policy	Job	education
Kazakhstan	0.0039	0,0320	0.0248	0,0737	0.0924	0.0945
India	0.0195	0,1974	0,1320	0,1872	0.4056	0.4243
Iran	0,0100	0.1569	0.1144	0.2446	0.4141	0.1576
China	0.0997	0.1591	0.2203	0.2059	0.1247	0.2289
Kyrgyzstan	0,0189	0.1249	0.0891	0.0547	0.1555	0.0592
Pakistan	0,0081	0.2229	0.2199	0.2141	0.2662	0.3921
Tajikistan	0,0340	0.0984	0.2337	0,1616	0,1821	0.2493
Uzbekistan	0,0077	0.1499	0.2555	0.3086	0,1790	0,1304

The results of the conjugacy assessment are presented in a petal diagram (see Fig. 1).

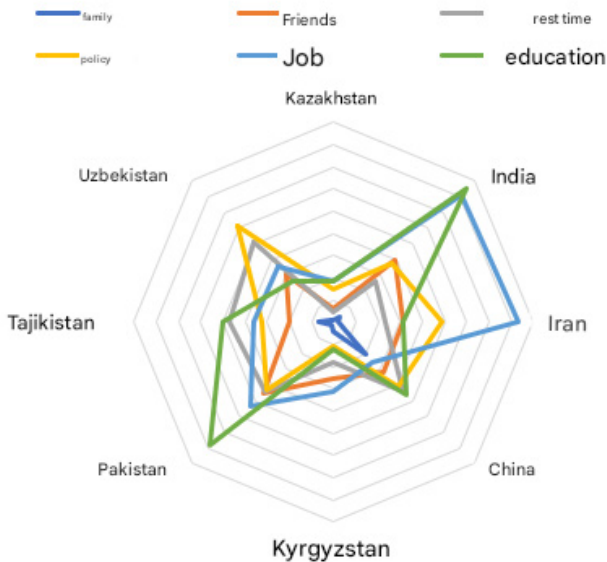


Figure 1. *Conjugation of the values of the SCO countries with Russia¹*

The calculation data show that the maximum value conjugacy of countries is determined by the position of “family”, and, conversely, the maximum different positions in matters of education and employment. Thus, it is possible to draw a

¹ Calculated by the author. The higher the indicator, the greater the divergence of the corresponding values (in this case, the SCO countries with Russia).

conclusion about the difference in professional orientation and motivation depending on the society (state), and accordingly, the knowledge management mechanisms in relation to the formation of the workforce in different countries will be different. This also confirms the fact of the uniqueness of the educational path of Russia and the need to seek its own systems of professional training in accordance with the requirements of society and the peculiarities of the development of the state.

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数字化对高科技企业经济绩效影响因素
**FACTORS INFLUENCING THE IMPACT OF DIGITALIZATION
ON THE ECONOMIC PERFORMANCE OF HIGH-TECH
ENTERPRISES**

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注释.在现代条件下,知识密集型组织的数字化是提升并保持其在全球经济现实中的竞争力和效率的关键驱动力之一。本主题的相关性源于数字技术的快速发展和推广,这些技术被迅速引入到生产流程和管理中,为知识密集型行业的企业创造了新的机遇,也带来了严峻的挑战。本文旨在全面分析影响数字化对这些企业经济绩效的因素。在研究过程中,我们发现了科学文献中存在的矛盾之处,这些矛盾之处与评估数字化解决方案对知识密集型行业不同领域重要性的不同方法以及企业自身对技术实施和使用的不同看法有关。作者得出结论,成功实现特定企业数字化需要系统的方法,包括整合新技术发展和人力资本发展、提高战略灵活性以及实施有效的决策支持系统。本文提供的材料将对数字经济领域的研究人员、知识密集型组织的管理者以及数字工具实施方面的专家有所帮助。

关键词: 战略适应性、知识密集型企业、生产流程、决策支持系统、数字化、数字技术、人力资本。

Annotation. *Digitalization of knowledge-intensive organizations in modern conditions is one of the key drivers for increasing and maintaining their competitiveness and economic efficiency in the realities of the global economy. The relevance of the topic under discussion is due to the rapid development and promotion of digital technologies, which are quickly introduced into production processes and management, creating new opportunities and serious challenges for companies in the knowledge-intensive sector. The goal of this article is a comprehensive analysis of the factors influencing digitalization on the economic performance of these entities. In the course of the work, contradictions were identified in the scientific literature, which are associated with different approaches to assessing the significance of digital solutions for different sectors of the knowledge-intensive industry and differences in views on the implementation and use of technologies depending on the specifics of the companies. The author concludes that successful digitalization of the characterized enterprises requires*

a systematic approach, including both the integration of new technological developments and the development of human capital, increased strategic flexibility, as well as the implementation of effective decision-making support systems. The materials presented in the article will be useful to researchers in the field of digital economy, managers of knowledge-intensive organizations, and specialists in the implementation of digital tools.

Keywords: *adaptability of strategy, knowledge-intensive enterprises, production processes, decision support systems, digitalization, digital technologies, human capital.*

Introduction

The modern economy is undergoing a profound transformation associated with the penetration of digital technologies into production, management, and research processes. The impact of digitalization on the activities of knowledge-intensive enterprises is especially noticeable, for which intellectual resources and technological innovations form the “foundation” of competitiveness.

However, despite the obvious advantages of digital solutions, their impact on the performance of the organizations in question is ambiguous - both successful growth cases and cases of decreased efficiency due to suboptimal integration of innovations are recorded.

The problem is the need to identify and systematically understand the factors that determine the nature of the impact of digitalization on the economic indicators of knowledge-intensive structures. The lack of a unified conceptual framework complicates the development of effective transformation strategies, which increases the relevance of an analytical study of the relevant issues.

Materials and methods

In the course of studying the topic, a number of key areas covered in scientific literature were identified. Based on the approaches presented by the authors, it is advisable to group the sources into several thematic categories:

- human capital management;
- decision support systems and design of digital platforms;
- implementation of digital technologies and their impact on the efficiency of business entities;
- use of artificial intelligence and neural networks.

Thus, I.A. Alekseeva, N.N. Trofimova in their work focus on the need to train specialists with high digital competencies to work in a rapidly changing technological environment [1]. It is important that their approach emphasizes the role of educational institutions in the formation of personnel capable of adapting to innovations and the implementation of new developments.

The next aspect covered in the literature concerns the creation and implementation of decision support systems. D.A. Belov, A.A. Lavrishchev consider their

role in increasing the manageability and adaptability of knowledge-intensive organizations; it is noted that their correct use allows for the effective management of innovation processes [2]. A similar approach is considered in the work of A.V. Chichagov, who focuses on the design of digital platforms for knowledge-intensive microenterprises, emphasizing the importance of integrating technologies into the process of supporting start-ups [9].

Digitalization of enterprises is directly related to improved operational efficiency and profit growth. In studies, for example, in the article by A.S. Ponikarova, I.N. Ponikarova, the basic aspects of digital transformation of knowledge-intensive companies are discussed, including process optimization, increased productivity through the introduction of new digital tools [4]. S.S. Chebotarev, O.G. Kedadze provide data on increasing the performance of organizations through the use of digital solutions in resource management [8].

Modern publications also touch on the topic of using artificial intelligence and neural networks in relation to optimizing knowledge-intensive production. I.I. Shkarubo, T.N. Shushunova analyze the prospects and risks of their use, noting the potential for establishing production cycles, but also pointing out possible problems - the high cost of implementation and the need to provide data for training models [10].

Contradictions in the literature are usually related to differences in the assessment of the role of technological solutions. For example, some authors argue that digitalization is the main driver of the development of the Russian economy and knowledge-intensive enterprises [6], while other researchers focus on the complexity and risks of introducing relevant developments into practice [2, 8], which requires a more detailed analysis of the negative consequences for business.

While many publications address issues related to the effective implementation of digital technologies and their potential to improve production processes, most studies provide little insight into the long-term impact of these technologies on the sustainability of knowledge-intensive businesses in the face of market uncertainty and global upheavals.

To cover the topic within the framework of this article, various methods are used - the tools of the systems approach, the analysis of business processes and models of digital platforms, comparative and content analysis, and the processing of statistical information.

Results and discussion

Digitalization in the context of knowledge-intensive organizations manifests itself not only in the automation of processes, but also in a fundamental revision of value creation models. The introduction of artificial intelligence, cloud computing, Big Data technologies, and the Internet of Things allows for the intensification of R&D activities, optimization of interactions between departments, and a significant reduction in costs at the stage of prototyping and testing innovative products.

It is useful to start by looking at the statistics. The digital transformation technology market is projected to grow at a CAGR of 23.1% from 2022 to 2030, reaching \$3.81 trillion, reflecting the rapid adoption and integration of relevant developments across industries. Despite these achievements, a significant skills gap remains a major challenge [11]. It is estimated that by 2030, the global skills shortage will reach 85 million people, potentially resulting in \$8.5 trillion in lost annual revenue if left unchecked [11]. Table 1 summarizes the data globally.

Table 1
Key aspects of the impact of digitalization on business strategies and company performance (compiled by the author based on [11])

Indicator	Meaning
Percentage of senior executives who view digital transformation as a strategic priority	87%
Percentage of executives who recognize digitalization as critical to business growth	60%
Increased likelihood of achieving business goals for digitally oriented companies	+64%
Percentage of executives reporting increased profits due to digital improvements	56%
The main areas in which the characterized innovations have a positive impact	Operational efficiency, go-to-market, customer satisfaction

According to the results of domestic statistical studies, which are based on an analysis of the current state and the experience of foreign colleagues, by 2030, science-intensive enterprises in Russia, through digitalization, will be able to speed up product release times by 35%, reduce equipment maintenance costs by 25%, and reduce production capacity downtime by 30% [6].

The integration of digital solutions requires the adaptation of organizational structures and production practices. In enterprises with outdated management systems or hierarchical decision-making models, digitalization sometimes initiates internal conflicts, contributing to the fragmentation of business processes. Therefore, one of the key factors that influences the results is the degree of institutional readiness for change.

The parameter under consideration includes not only the availability of technological infrastructure, but also the ability of personnel to master new competencies, and management to rethink strategic guidelines. In knowledge-intensive companies, where the innovation cycle is inextricably linked with the creative initiative of employees, the flexibility of corporate culture plays a decisive role [1, 4]. Organizations that successfully build mechanisms for continuous learning and

encouragement of experimental activity, as a rule, demonstrate sustainable growth in economic indicators after digital transformations.

Conversely, ignoring the need to transform the corporate environment leads to new technological solutions being used fragmentarily, without having a significant impact on productivity and profitability. In some cases, the effect of “pseudo-digitalization” is observed, when investments in information developments are not accompanied by changes in management practices, which devalues the potential benefits.

Knowledge-intensive economic entities are highly dependent on the efficiency of knowledge management. In the context of digitalization, the key issue is the integration of information flows, accumulation, processing, and dissemination of critical information [9]. The formation of end-to-end management systems supported by digital platforms helps to accelerate the generation of new ideas and reduce the time it takes for innovations to enter the market.

Incomplete development of digital management tools in relation to knowledge leads to the fact that a significant part of internal resources remains unclaimed or is lost in the process of transfer. This, in turn, significantly slows down the rate of growth of labor productivity and increases operating costs, creating obstacles to achieving positive economic results [3, 7].

The effectiveness of digitalization of the analyzed enterprises is largely determined by the quality of leadership at all levels. Managers who are able not only to declare the importance of changes, but also to form real motivation among employees, significantly increase the likelihood of successful implementation of initiatives.

The presence of “transformation agents” within the company who have a high level of digital literacy and strategic thinking skills becomes the most important asset in the process of the described changes. On the contrary, the absence of such leaders entails that even technologically advanced solutions are implemented formally, without any real impact on key indicators [1, 6].

It should be taken into account that digitalization requires significant investments, especially at the stage of creating integrated platforms and the transition to real-time data. Knowledge-intensive organizations, especially in sectors with high scientific uncertainty, often face a limited resource base. The shortage of financial and human resources sometimes significantly slows down or even stops digital transformation processes.

In addition to the above, excessive enthusiasm for digital innovations without a thorough assessment of their economic feasibility naturally leads to overspending, an increase in the debt burden and, as a consequence, to a deterioration in overall economic performance [2].

One of the determining factors influencing the performance of the studied enterprises in the context of digitalization is the ability to develop adaptive strategies

[5, 9]. The rapidly changing technological environment requires flexibility in planning combined with a demonstrated readiness to promptly revise stated priorities.

Companies that build strategies on the principles of modular business processes, horizontal integration, and an emphasis on rapid hypothesis testing tend to adapt more easily to new market demands and show better results than organizations that adhere to rigid, hierarchical development models.

Below is Table 2, which systematizes the characterized factors in relation to the author's proposals.

Table 2

Factors influencing digitalization on the economic results of knowledge-intensive enterprises and recommendations for their accounting (compiled by the author)

Factor	Description of impact	Author's recommendations
Institutional readiness	The ability of companies to integrate digital technologies into existing processes without disrupting organizational integrity is determined.	Conduct regular digital maturity audits, create employee competency development programs, and transform corporate culture towards flexibility and innovation.
Knowledge Management	The ability of an organization to collect, systematize, and effectively use internal and external knowledge to accelerate innovation.	Develop digital platforms for knowledge management, stimulate information exchange between departments, and implement mechanisms for the rapid dissemination of best practices.
Leadership in Transformation	The presence of leaders within knowledge-intensive companies who are capable of initiating and supporting transformations, motivating the team to do so.	Form internal teams of "digital champions", develop leadership programs that focus on digital competence and strategic thinking.
Resource security	Sufficient financial, technological and human resources to implement initiatives.	Prioritize projects based on profitability criteria, build partnerships with external technology companies, actively attract venture capital financing, as well as government subsidies.
Adaptability of strategy	The ability of an enterprise to flexibly respond to technological changes and adjust its strategic targets in real time.	Implement strategic planning models based on scenario analysis, develop competencies for rapid testing of innovations, and accelerated launch of new products to the market.

Thus, the effectiveness of the transformation under consideration is determined not only by the implementation of technologies, but also by the organization's readiness for their systemic integration. Success depends on the competent use of a systemic approach – it is necessary to develop institutional and human resources, build a culture of knowledge exchange, maintain leadership in the relevant area, and ensure strategic flexibility.

Conclusions

An analysis of the factors influencing digitalization on the economic results of knowledge-intensive enterprises shows the multifaceted nature of this process. What is decisive is not the fact of implementing certain developments, but the quality of their integration into the organizational “fabric” of the company. Institutional readiness, knowledge management efficiency, the presence of digital change leaders, the ability to adaptive strategic planning, adequate resource provision are the basic determinants that determine rapid progress towards success.

Ignoring even one of the aspects considered can neutralize the potential benefits of innovation and result in a deterioration in economic dynamics. Consequently, knowledge-intensive business entities are recommended to approach digitalization as a comprehensive program of organizational changes that requires balanced decisions and systemic support at all stages of implementation.

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俄罗斯的民事诉讼和司法通信

CIVILIST PROCEEDINGS IN RUSSIA AND JUDICIAL COMMUNICATIONS

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注释。司法沟通的组织是保障民事诉讼程序顺利进行的重要环节。司法沟通的发展水平体现了司法的可及性。俄罗斯现代司法沟通的显著特征是纸质文件流转的延续，以及通过平台解决方案实现的司法信息传输新技术。克服司法活动组织方面的主要问题包括：提高司法服务的可靠性参数；确保信息交换的安全，包括通过用户身份验证和电子文件认证；消除信息重复，即在诉讼参与人同意使用电子文件作为信息载体的情况下，拒绝使用纸质媒体；不断发展司法管理工具，作为将人工智能成果引入司法活动的有效模式。

关键词：司法活动，司法沟通，民事诉讼中的司法行为。

Annotation. *The organization of judicial communications is an important element in ensuring civil legal proceedings. The level of development of judicial communications characterizes the accessibility of justice. The continuing traditions of paper document flow and new technologies for the transfer of judicial information, implemented through platform solutions, are the defining characteristics of modern judicial communications in Russia. Overcoming the main problems in the organization of judicial activity in this aspect consists of: improving the reliability parameters of judicial services; ensuring secure exchange of information, including through user authentication and authentication of electronic documents; eliminating information duplication, that is, refusing to use paper media in the event of the consent of the participants in the proceedings to use electronic documents as information carriers; continuous development of judicial administration tools as an effective model for introducing the achievements of artificial intelligence into judicial activity.*

Keywords: *judicial activity, judicial communications, judicial acts in civil proceedings.*

Forensic communications are one of the many types of social communications. The paradigm of social communications has a developed system of views and ideas. The main patterns and conceptual-categorical apparatus are defined. Modern authors distinguish various types of communications. For example, by the type of use of semantic means, speech, paralinguistic and material-sign communications are distinguished [6, p. 20]. All authors are unanimous in the opinion that any communication model presupposes the interest of the sender of the message (in any form) in the fact that the message will be received through the communication channel chosen in each specific case [1, p. 76].

At the same time, the theory of judicial communication has not received due development in scientific ideas about judicial activity. However, the circle of subjects interested in participating in judicial communications is large. Only civil legal proceedings in Russia in courts of general jurisdiction at the end of 2024, based on the data of the Judicial Department, are characterized by the following current indicators [7]. During the specified period, about 29.1 million civil cases were accepted for proceedings, considered according to the rules of the Civil Procedure Code of the Russian Federation (hereinafter referred to as the CPC RF) [3], of which more than 28.2 million cases were considered with the issuance of a court decision (court order). In the course of applying the Code of Administrative Procedure of the Russian Federation (hereinafter referred to as the CAS RF) [5], more than 4.8 million administrative cases were accepted for proceedings, in 4.7 million of which court decisions (court orders) were issued. Thus, in reality, the implemented judicial communications, taking into account the possibility of repeated, multilateral and multi-level interaction of courts with the parties, other participants in the proceedings, have significant quantitative volumes, both expressed in official statistical indicators and being latent for the program of statistical observation in the courts. At the same time, all judicial acts issued within the framework and following the results of the justice carried out, in essence, are the result of judicial communications - the reception and receipt of judicial information, which is a list of documents of procedural significance. Thus, the study of the organization of judicial communications in the civil process, which refers to the most popular type of legal proceedings in Russia, creates the need to establish individual areas of judicial communications and their organizational trends.

The method of structural analysis allows us to consider judicial communications as spatial-structural units that form a system or model that consists of a multitude of communication acts, the emergence of which is based on the application of legislation and by-laws in the sphere of judicial activity. The result of judicial communication, as a communicative action, consists in the reception and transmission of judicial information through communication.

Participants in civil proceedings, having this legal status, are simultaneously members of the information society. In modern conditions, the functioning of the

information society is based on the use of communication tools, which are understood as technical and software tools that meet the following characteristics:

- 1) the specified means can be used to generate, receive, process, store, transmit and deliver messages;
- 2) the following may be used as means of communication: postal items, telecommunications, and other technical and software means;
- 3) communication facilities may be used in the provision of communication services or in ensuring the functioning of communication networks, which also include technical systems and devices with measuring functions.

This understanding of the means of communication is regulated in Article 2 of the Federal Law “On Communication” [9]. The presented legal characteristics are transformed into the content of the tools for organizational support of the courts. As a result, a model of judicial communications is formed within the framework of the management operations of judicial administration. Before the introduction of automated information systems into the activities of the courts, judicial communications were formed on the basis of the existing letter-keeping system, when information was transmitted from the court, as a source of information operating in the local office work system, in writing using forms of court summonses, or by telegrams or telephone messages. For example, obtaining copies of court decisions in civil proceedings, according to the Civil Procedure Code of the RSFSR, adopted at the third session of the Supreme Soviet of the RSFSR on June 11, 1964 [2], was possible only for those parties and other persons who participated in the case, but did not appear at the court hearing. This rule was recorded in Article 213 of the said law, which was called - “Sending copies of decisions and orders of the court to persons participating in the case.” The listed persons were to be sent copies of the court decision, as well as the rulings on the suspension or termination of proceedings on the case or on leaving the claim without consideration, no later than three days from the date of the decision or ruling. At the same time, the method of such sending was not specified, based on its only option, as was the procedure for issuing judicial acts to those participants in the proceedings who were present at the court hearing.

With the development of procedural norms and technological capabilities in the developing information society, the methods of judicial communications in civil proceedings have expanded significantly. For example, Article 214 of the current Civil Procedure Code of the Russian Federation “Issue and Sending Copies of a Court Decision” provides for several methods of organizing communication channels when providing copies of a decision: 1) delivery against signature; 2) sending on paper by mail (by registered letter with acknowledgment of receipt); 3) by posting in electronic form in the established manner on the information and telecommunications network “Internet” in limited access mode; 4) sending

through the State Services service. Thus, the purpose of modern judicial communications is to organize convenient and prompt access to justice, including preserving the traditional paper approach to the form of transmission of judicial acts.

Judicial communications allow solving the tasks of civil legal proceedings, ensuring the resolution of judicial disputes. Procedural rules are the basis for creating a model of judicial communications, their varieties in the course of successive stages of legal proceedings. Judicial communications in civil legal proceedings are a process of exchanging judicial information, during which the basis for implementing the tasks of legal proceedings, performing the functions of the judicial branch of state power is created.

The Code of Civil Procedure of the Russian Federation, as well as the Code of Administrative Procedure of the Russian Federation, directly define the possibility and procedure for implementing judicial communications in the content of the rules that regulate legal relations. When ensuring the activities of the court of first instance in civil proceedings, judicial communications, under generalized conditions, find their application in the following procedural rules: on filing appeals to the court (Article 3 of the Code of Civil Procedure of the Russian Federation); on the language in which legal proceedings are conducted, which is important for judicial communications that are verbal in nature (Article 9 of the Code of Civil Procedure of the Russian Federation); on the transfer of cases accepted for proceedings in one court to another court (Article 33 of the Code of Civil Procedure of the Russian Federation); on the rights and obligations of persons participating in the case (Article 35 of the Code of Civil Procedure of the Russian Federation); on notifying the prosecutor participating in the case (Article 45 of the Code of Civil Procedure of the Russian Federation); on the rights of a representative (Article 54 of the Code of Civil Procedure of the Russian Federation); on sending judicial letters rogatory (Article 62 of the Code of Civil Procedure of the Russian Federation); on the return of written evidence (Article 72 of the Code of Civil Procedure of the Russian Federation); On the return of audio and video recording media after the entry into force of a judicial act in a civil or administrative case — a court decision based on a court ruling (Article 78 of the Code of Civil Procedure of the Russian Federation); On the content of a court ruling on the appointment of an expert examination (Article 80 of the Code of Civil Procedure of the Russian Federation); On the organization of court notifications (Articles 113–120 of the Code of Civil Procedure of the Russian Federation); On the form of filing an application for the issuance of a court order, for notifying the debtor of the issuance of a court order, for canceling a court order and issuing a court order to the claimant (Chapter 11 of the Code of Civil Procedure of the Russian Federation); On filing a claim, an administrative claim (Chapter 12 of the Code of Civil Procedure of the Russian Federation); On the organization of notifications by the court on the meas-

ures taken to secure the claim or by the court to the relevant state bodies or local government bodies that have the authority to carry out registration actions with property (Article 140 of the Code of Civil Procedure of the Russian Federation); on the actions of the parties in preparing the case for trial, including when the plaintiff or his representative submits copies of evidence, as well as the defendant and his representative submit written objections to the statement of claim (Article 149 of the Code of Civil Procedure of the Russian Federation); on the approval by the court of a settlement agreement in terms of organizing the appearance of persons participating in the case at the court hearing (Article 153.10 of the Code of Civil Procedure of the Russian Federation); on the organization of the issuance and sending of copies of the court decision (Article 214 of the Code of Civil Procedure of the Russian Federation); on the sending by the court of a court decision considered in simplified proceedings to persons participating in the case (Article 232.4 of the Code of Civil Procedure of the Russian Federation); on the procedure for sending a copy of a default judgment (Article 236 of the Code of Civil Procedure of the Russian Federation), etc.

The given list of actions related to the implementation of communications in the civil process, which is incomplete, verifies the provision on their determining importance in the implementation of judicial activities of an auxiliary nature, which is the subject of the powers of the court staff. At the same time, the implementation of operations occurs on the basis of the specification of the rules of activity in the by-laws of the Judicial Department, approved by orders in the form of instructions, procedures and regulations. For example, one of such acts is the order of the Judicial Department dated November 2, 2015 No. 335, which, in particular, determines the procedure for posting depersonalized judicial acts on the official websites of courts on the Internet [8]. The most compact form of presentation of the procedure for judicial communications in district (city, inter-district) courts, which are the most numerous links in the judicial system of the Russian Federation, is the Instruction on office work in the district court, approved by order of the same federal government body dated April 29, 2003 No. 36 (as amended on March 20, 2025).

Conclusions and suggestions. The current stage of organizing judicial communications that ensure civil legal proceedings is characterized by the expansion of remote opportunities for interaction with the court, which corresponds to the concept of accessible legal proceedings, regardless of the territorial location of the court and the time of day. To organize such communications, additional notification actions of interested participants in the proceedings are necessary - for example, filing an application that meets the established requirements through the State Services portal. When filing such an application in civil legal proceedings, signing it with an enhanced qualified signature (EQES) is not required.

At the same time, traditional options for interaction in the exchange of judicial information are maintained, which include sending copies of judicial decisions by courts and participants in legal proceedings on paper via postal services (in possible cases, through the activities of couriers or messengers).

The model of modern judicial communications in civil proceedings is formed on the basis of the development of the functioning of protected, safe judicial services. The uninterrupted operation of these resources ensures the guarantee of the optimal implementation of judicial communications and the timely opportunity to implement their information purpose. This, in turn, allows to comply with the procedural deadlines for the consideration of court cases. In this regard, in the content of judicial administration, the most problematic issues are the creation and maintenance of the requirements of the communication process in the aspects of the communicative time of reception and transmission of judicial information and the effective length of the judicial communication space.

Judicial communications, as a type of social communications, are carried out with the participation of state civil servants under the guidance and control of judges. In connection with the development of automated information systems and their software, the most pressing issues in organizing judicial communications are the acquisition of digital competencies by responsible specialists of the court apparatus, including through the online training system organized by the Federal State Budgetary Institution IAC of the Judicial Department. At the same time, the capabilities of modern judicial services should be known and understandable to a wide (unlimited) circle of interested parties, which can be realized through the resources of official court websites, court pages on social networks.

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健身健美操队健康指标数字化

**DIGITALIZATION OF HEALTH INDICATORS FOR FITNESS
AEROBICS TEAMS**

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注释. 本文旨在探索评估不同项目类别（踏板操和健美操）的健身健美操队准备状态的新标准。我们提出了一些指标来描述运动员的健康状况和心理状态。本研究证明了这些新指标在评估大学竞技健身健美操队成员的健康参数和心理准备状态方面的适用性。

关键词: 数字化、运动训练、健身健美操、健康、心理状态。

Annotation. *This article focuses on identifying new criteria for assessing the readiness of fitness aerobics teams competing in different event categories: step aerobics and aerobics. We propose metrics that characterize athletes' health status and psychological condition. The study demonstrates the applicability of these new indicators for evaluating both health parameters and psychological preparedness of members in university competitive fitness aerobics teams.*

Keywords: *digitalization, sports training, fitness aerobics, health, psychological state.*

Introduction. Recently, the processes of digitalization of sports training have become increasingly widespread and it is necessary to obtain comprehensive information about the state of his health and psychological preparation.

Usually, the system of pedagogical control evaluates the indicators of physical, technical, tactical, psychological and integral types of training of female athletes [2, 5]. At the same time, the health indicators of candidates for membership in the national team of a sports and educational organization, namely, the Moscow City

Pedagogical University, are of great importance. But health indicators usually do not figure in the system of pedagogical control, but are replaced by indicators of physical fitness, which are considered by some authors as health indicators [4].

The scientific school “Theory and Methods of Aerobics”, registered in the Russian Academy of Natural Sciences [7], continues to form at the Moscow City Pedagogical University (MCPU - hereinafter). One of the areas of work of this scientific school is scientific support for the MCPU National Team, which successfully competes in the Moscow Student Spartakiad. This article is devoted to the search for new criteria for the readiness of fitness aerobics teams, which compete in different nominations of competitive activities: step aerobics and aerobics.

The article summarizes the work of the scientific school team in the 2023-2024 academic year, using the example of comparing teams performing in the step aerobics and aerobics categories.

Purpose of the study consisted of studying the criteria of health and psychological preparedness of the Moscow State Pedagogical University fitness aerobics teams.

Methods and organization of the research This study was conducted at a university with a combined step aerobics team and an aerobics team. The data for the step aerobics team, consisting of seven members and one reserve member, are presented in Table 1. Similar data for the aerobics team are presented in Table 2. The aerobics team was composed of senior female students, while the step aerobics team was composed mainly of first-year students.

Table 1
Composition of the IEST step aerobics team

No. p/p	Full name of the athlete	Year of birth	Sports category	Course of Study
	G.D.A.	20	II category	3
	E. A. A.	21	II category	1
	K. A.A.	21	II category	1
	S. A.Y.	20	II category	1
	U.M.A.	19	II category	1
	Ch. D. Yu.	20	II category	2
	Sh. M.D.	21	II category	2
Spare:				
1.	O. V.P.	22	II category	1

When determining the health indicators, the MediScreen express health screening technology was used, based on measuring the health parameters and body systems of female athletes at bioactive points. Three health indicators were used for

the analysis, characterizing metabolic processes, psychoemotional processes and the state of the musculoskeletal system of female athletes [1].

Table 2
Composition of the IEST Aerobics Team

No. p/p	Full name of the athlete	Date of birth	Sports category	Course of Study
	G.D.A.	20	II category	3
	K. E.I.	19	III category	1
	K. A.A.	19	II category	1
	O. V.P.	20	II category	1
	GARDEN.	19	III category	1
	I. V.V.	19	III category	2
Spare:				
1.	V. D. A.	19	III category	3

Additionally, the indicators of the psychological preparedness of the athletes were determined using the Luscher test, which included mental performance, vegetative coefficient and deviation from the autogenic norm [6]. These indicators allow us to add quantitative indicators of the observed mental state of the athletes to the qualitative psychological characteristics of the athletes.

Research results and discussion The results of the survey of the step aerobics and aerobics team are presented in Table 3.

Table 3
Comparison of the indicators of preparedness of IEST teams in fitness aerobics

Item No.	Indicator	Step aerobics n=7	Aerobics n=6	Student's t-test	Reliability of difference, p
1	Average energy level, mcA	22.86±6.73	24.27±7.79	0.36	>0.05
2	Metabolic coefficient, mka	1.10±0.22	1.09±0.25	0.08	>0.05
3	Psycho-emotional coefficient, mka	0.94±0.23	0.93±0.27	0.07	>0.05
4	Musculoskeletal coefficient, mka	0.98±0.18	1.00±0.13	0.14	>0.05
5	Psychological performance, Σ places	11±4	12±3	0.71	>0.05
6	Vegetative coefficient, n/r	1.2±0.4	0.9±0.5	1.18	>0.05

7	Deviation from the autogenous norm, Δ places	15 \pm 7	16 \pm 8	0.24	>0.05
8	Age, years	19.8 \pm 1.0	20.6 \pm 0.7	1.64	>0.05

The average age of the aerobics team was 20.6 \pm 0.7 years and did not differ significantly from the age of the step aerobics team, which was 19.8 \pm 1.0 years ($p>0.05$).

In the aerobics team, the average value of hypoenergetics varies within the range from 12.22 μ A for subject S.A.D., which may reflect a decrease in the body's defenses, to 30.71 μ A for subjects G.D.A. and O.V.P., which falls within the corridor of normative health indicators, which are within the range from 25 to 55 μ A.

In the step aerobics team, the average hypoenergetic value varies within the range from 14.67 μ A for subject S. A.Y. to 32.14 for subject C. D.Y. Comparison of group values of the average energy level is unreliably higher in the aerobics team and is 24.27 \pm 7.79 μ A versus 22.86 \pm 6.73 μ A in the step aerobics team ($p>0.05$). The value of this indicator for representatives of both teams is below the standard value of 25 μ A. This is probably due to limitations in the training process caused by significant workloads of female students in their academic and work activities, which is confirmed by a study of the motivation of students at various universities in Moscow [3].

The average values of the metabolic, psycho-emotional and musculoskeletal coefficients f are within the normal range and characterize teams whose health indicators correspond to the norms of a healthy person. At the same time, the teams do not have reliable differences in these indicators between the two teams ($p>0.05$). This fact confirms the adequacy of the team staffing in accordance with the health indicators of its members.

The level of psychological performance is 12 \pm 3 places in the aerobics team and 11 \pm 4 places in the step aerobics team. In both cases, this value characterizes the level of psychological performance as average and indicates the absence of reliable differences ($p>0.05$).

The vegetative coefficient characterizing the ratio of excitation and inhibition processes in the nervous system of the aerobics team athletes is 0.9 \pm 0.5 versus 1.2 \pm 0.4 for the step aerobics team. This characterizes the aerobics team as calmer, and the step aerobics team as calmer. At the same time, there are no reliable differences in this indicator between the teams ($p>0.05$).

Finally. The deviation from the autogenic norm is 16 \pm 8 places in the aerobics team versus 15 \pm 7 places in the step aerobics team. This corresponds to the norm of this indicator for both teams, and no reliable differences are observed either ($p>0.05$).

Summarizing the results of the assessment of the selected indicators, we can conclude that both teams are fully staffed with Moscow State Pedagogical University students and demonstrate an optimal level of readiness for the 2023-2024 competition season.

The aerobics team took first place in the Moscow student Spartakiad, and the fitness aerobics team took third place.

Conclusion. In the context of digitalization of sports training, it is necessary to form new indicators of the health of female athletes. For this purpose, it is proposed to use the coefficients: metabolic, psycho-emotional and musculoskeletal, determined by the Mediscrine method, and indicators: psychological performance, vegetative coefficient and deviation from the autogenic norm, determined using the Luscher test. The proposed set of indicators characterizes the health of female athletes and their psychological state and allows the coach to make changes to the training management process.

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航海数学发展的主要方向

MAIN DIRECTIONS OF DEVELOPMENT OF MATHEMATICS IN
NAVIGATION

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注释。本研究的主题涉及船舶运动控制系统和过程的数学模型日益复杂，因此需要提高学生的数学素养。这包括运用各种数学和信息方法，在特定情况下影响决策过程。

本文回顾了数学在海事发展中应用的科学成就的历史事实。本研究旨在展示在航海演进发展的各个阶段，数学在航海中的应用模式和机制。本文确定了数学在航海相关领域的发展特点，并探讨了在建模和相关极限导航中应用现代数学方法的可能性。最后，概述了数学在培养航海专家中的作用。

关键词：数学，航海数学，历史事实，数学在海事中的应用。

Annotation. *The topic of the research is related to the increasing complexity of mathematical models of real systems and processes of ship motion control, and, in this regard, the need to improve the mathematical training of students. This includes the use of various mathematical and information methods that influence the decision-making process in specific situations.*

The article examines historical facts of achievements in science in the aspect of using mathematics for the development of maritime affairs. The purpose of the study is to show models and mechanisms of using mathematics in navigation at all stages of the evolutionary development of navigation. The features of the development of mathematics in areas related to navigation are determined. The possibilities of using modern mathematical methods in modeling and in correlation-extreme navigation are shown. In conclusion, the role of mathematics in the training of marine specialists is outlined.

Keywords: *Mathematics, mathematics in navigation, historical facts, applications of mathematics in maritime affairs.*

Mathematics is a universal language of science that helps solve professional problems in various fields. The use of mathematics in maritime affairs is encountered at every step: in maritime practice, in shipbuilding, in calculating the stability of ships, in assessing sea waves and other areas.

Mathematics as a tool is used in various sciences related to navigation. Firstly, in navigation calculations it allows navigators to find effective methods for solving navigation problems, which ensures a more accurate calculation of the vessel's course and an assessment of the accuracy of observation. Secondly, when calculating cargo operations and the stability of a vessel, it requires compliance with certain rules based on mathematical analysis and many years of professional experience. Thirdly, when calculating the pitching of a ship in rough seas, knowledge of the basics of hydrodynamics and the theory of "small" oscillations of a rigid body is necessary. Finally, ship design requires an understanding of structural mechanics, which includes strength calculations, knowledge of elasticity theory, and the study of oscillatory motion of elastic systems based on knowledge of mathematics.

Insufficient preparation of future navigators in the field of mathematics can lead to an increase in errors in navigation and, as a consequence, to emergency situations.

The relevance of the research topic is due to the increasing complexity of mathematical models of real-life systems and processes for controlling ship movement, the need to improve students' mathematical knowledge, and various mathematical and information methods that influence the decision-making process in specific situations.

The aim of the study is to show the models and mechanisms of application of mathematics in navigation at all stages of the evolutionary development of navigation.

Theoretical significance is to systematize historical facts on the use of mathematical methods in solving navigation problems.

Practical significance – to reflect, using examples, the stages of development of mathematics in maritime affairs.

Research objectives:

- to study the main trends at each stage of shipping development;
- to generalize and systematize information in chronological order on the formation of mathematical foundations in navigation;
- demonstrate the use of mathematics in maritime affairs at every stage of development.

The first described example of a floating craft was “Noah’s Ark”, built by the biblical character Noah, 300 cubits long, 50 wide and 30 high, which withstood 40 days of flood (“Great Flood”). It is difficult to reliably establish the time period of construction and use of the vessel, but it can be noted that all sources indicate dates long before the Common Era and earlier than Archimedes’ law. Mathematics allows us to translate the dimensions of the ark into modern values: the height of the vessel is 22.86 m, the width is 28.96 m and the length is 124.97 m. Today, there are several projects recreating the ark, in particular in the Netherlands, Hong Kong and Kentucky (USA) [1].

Distance, time and speed are the most important characteristics that every captain should be able to determine. One of the oldest traditions of measuring speed is measuring with a log - a rope with knots fixed to it at equal distances, which originated with the development of sailing (first mentioned in the 15th century). The knots were tied in such a way as to correspond to miles. Today, a distinction is made between a nautical mile (the length of an arc equal to one minute of the length of the equator or 1852 meters) and a terrestrial mile (1000 steps or 1475 meters, later 1609 meters).

Historical facts reflecting the directions of development of mathematics in maritime affairs are grouped into five main stages.

Table 1
The main stages of development of mathematics in maritime affairs

Stage	Key achievements
Stage 1: Ancient civilizations	Use of simple calculations for navigation (azimuth, rhumb, primitive dead reckoning, astronomical navigation, determination of latitude and longitude, etc.), development of the first astronomical instruments (e.g., astrolabes)
Stage 2: Middle Ages	Development of processes for applying mathematical methods for cartography (surface processing, working with contour structures, processing linear structures, analyzing point structures, modeling geographical phenomena, etc.) and trigonometry, which plays an important role in ship navigation, including using spherical geometry to determine the location of a ship.
Stage 3: The Age of Great Geographical Discoveries	Improvement of navigational instruments (cyclops, sextant), allowing optimization of methods for determining latitude and longitude.
Stage 4: 18th–19th centuries	Development and improvement of mathematical models of ship movement: <ul style="list-style-type: none"> The first-order Nomoto model takes into account the speed and direction of the vessel’s movement, the influence of external factors and allows for a quick assessment of the vessel’s behavior.

	<ul style="list-style-type: none"> • The second-order Nomoto model is more complex and takes into account, in addition to the current state of the vessel, the dynamics of its movement under changing conditions. • The nonlinear models of Norbin and Bech are more complex, taking into account angular velocities that affect the maneuverability and stability of the vessel, and the influence of hydrodynamic factors.
Stage 5: 20th century and modern times	Scientific research is related to hydrodynamics (study of the hydrodynamics of droplet flows, modeling of averaged turbulent motions, study of heat and mass transfer, study of ice cover formation, study of the hydrodynamics of nonlinear fluids (rheology)) and the use of computer technologies for navigation (use of neural networks to automate the setting of a vessel's course, use of navigation and information systems, creation of navigation and marine simulators, use of artificial intelligence in the control of marine robots).

The greatest mathematician, who lived in 287 BC – 212 BC – Archimedes, had a huge influence on the development of shipbuilding and shipping. Archimedes' law (a body immersed in a liquid is pushed upward with a force equal to the force of gravity of the liquid displaced by it) was the basis of shipbuilding. The weight displacement is the main characteristic of a vessel responsible for buoyancy. The situation is different with submarines, when submerged, the ballast systems collect a quantity of water equal to the reserve buoyancy, and as a result, the same Archimedes' force is triggered [1].

In the 18th century, the phenomenon of stability was described in more detail by Leonid Euler, a member of the St. Petersburg Academy of Sciences, in his work "Ship Science." Since the mid-18th century, mathematics has been closely linked to hydrostatics, ship stability, and navigation [2].

An important concept in modern maritime affairs, where mathematics is used, is the "vessel's heel angle". Such problems are solved using homogeneous trigonometric equations and ranked variational series. Incorrect calculations of the vessel's landing caused by the movement of cargo can lead to an emergency situation and even to the loss of the vessel [3].

Mathematics was then used primarily to optimize the shape and size of ships in parallel with the development of the direction of minimizing the external impact on a ship from storm waves and hurricane winds. Guyon, Stokes, Gerstner, and others considered and studied waves in different ways. But the French mathematician Lagrange generalized these studies and mathematically described vortex gravity surface waves, deriving exact solutions using variables [4].

A floating vessel is subject to rolling under the movement of external forces, and therefore modeling is possible taking into account hydrodynamics and the theory of "small" oscillations of a rigid body, i.e., integrated sets of linear differ-

ential equations appear. Any seaworthiness of ships (vessels) is determined by the accuracy of mathematical calculations in structural mechanics, and in some cases (bending, compression, plate stability) a more complex mathematical apparatus of elasticity theory is required, including biharmonic equations (for example, the Fourier series) [1].

The modern fleet differs significantly from medieval ships and steamships due to the development of engines that allow maneuvering and prevent the hull from being captured by a storm wave. Therefore, at present, a large number of current problems of modeling the movement of a vessel are solved with the help of mathematics in order to determine the possibility of maneuvering under various external conditions. The task is complicated by the fact that it is necessary to arrive at a given point with the required values of the course and drift angles, linear and angular speed [5].

New directions for the application of mathematics in maritime affairs have also appeared, for example, correlation-extreme navigation, which is associated with the routing of a vessel's movement along isolines, combining the tasks of mathematical reconstruction of a map of a geophysical field and orientation along isolines. Comparison of the current image (coming from a special onboard navigation system) with a reference image (made in advance and loaded into the onboard computer) in autonomous mode increases the accuracy of determining the location of a marine mobile object. This technique is a real alternative to satellite navigation [6].

Mathematics is used not only in the design of engines, the development of the theory and practice of navigation, but also in logistics, rigging and search and rescue. As an example, we can cite the research of American mathematicians Colin C. Adams (scientific work "The knot book") and J. Alexander (scientific work "Topological invariants of knots and connections") and Russian mathematicians V.O. Manturov (scientific work "Theory of knots") and A.B. Sosinsky (scientific work "Knots and braids") in the field of knots as mathematical objects [7].

In search and rescue, mathematics is used in methods for constructing expert preferences for distributing subareas between the means involved in the operation. The methodology is based on a visual-interactive approach to forming preferences between alternative distributions. To solve the problem, a criteria approach, an approach based on binary preference relations, and using a choice function can be used [8].

The considered examples of the use of mathematics in solving problems in maritime affairs are presented in Table 2.

Table 2*Examples of the use of mathematics in maritime affairs*

Example	Authors	The essence of the mathematical problems to be solved
Weight displacement	Archimedes	Archimedes' law
<i>Ship stability</i>	Leonhard Euler	Euler considered the measure of stability of a ship or other floating body as a section of the floating body in the form of a vertical plane perpendicular to the centerline of the ship
<i>Vessel's roll angle</i>	Ryabchenko V.K., Kucher Y.P.	Algorithm for solving homogeneous trigonometric equations by factorization
<i>Water level</i>	Poryadin I.A.	The basis of water level measurement is the operation on numbers (statistical series, variation series, ranked variation series, relative frequencies of values)
<i>Minimizing external impact on the ship from storm waves and hurricane winds</i>	P.-L. Guion, J. G. Stokes, J. Gerstner, J.L. Lagrange	Based on the equations of two-dimensional hydrodynamics. Corrections to the wave velocity are used in quadratic and cubic approximations taking into account the evolution of the breather profile for various values.
<i>Simulation of vessel movement with required values of heading and drift angles, linear and angular speed</i>	Sotnikov I.I., Yudin Y.I., Sereda A.V.,	Purely empirical models of the motion of one specific vessel and semi-empirical mathematical models for some classes of vessels are used.
<i>Correlation-extreme navigation</i>	Yuyukin I.A.	Mathematical synthesis of a fragment of a geophysical field is implemented on the basis of a proven hybrid spline model
<i>The Mathematical Side of Knots in Rigging</i>	K.S. Adams, J. Alexander, Manturov V.O., Sosinsky A.B.	Nodes are represented as mathematical objects
<i>Expert preferences for subarea distributions among the means participating in the rescue operation</i>	Drake Y.Y.	A visual interactive approach to forming preferences between alternative distributions

The importance of mathematics in maritime affairs can be reflected by a historical example related to the opening of the first military-specialized educational institution - the Moscow School of Mathematical and Navigational Sciences. A special role in the development of the school was played by the mathematician

L.F. Magnitsky. Initially, the school was under the jurisdiction of the Armory Chamber and on December 15, 1706, by decree of Peter I, was transferred to the department of the Navy [9].

The historical aspects of the application of mathematics, considered in the work, provide an understanding of the need to obtain fundamental knowledge in the areas of higher mathematics, the need to study and apply mathematical methods in solving typical and non-standard professional problems in navigation.

Teaching higher mathematics is an integral part of training specialists in the maritime fleet. Cadets of maritime educational institutions develop a clear understanding of its role in developing the theoretical foundations of navigation, ship theory and management. In addition, the course in higher mathematics promotes the development of high mathematical culture, logical, abstract and algorithmic thinking, and prepares students to apply modern mathematical methods in professional and practical activities.

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高等教育中实施人工智能的困难
**DIFFICULTIES IN IMPLEMENTING ARTIFICIAL
INTELLIGENCE IN HIGHER EDUCATION**

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注释。当前，全球范围内正蓬勃发展着数字化进程。其中最具前景的技术之一是人工智能（AI）技术，其特点是数字、物质和社会人文技术与实践（包括教育领域）的相互渗透。作为这一进程的一部分，数字经济正在形成，并成为职业教育与培训领域目标设定的主要来源。数字化条件要求生产流程逻辑发生变化，这反过来又要求职业教育与培训体系的员工和毕业生在数字技术领域和通用技能（软技能）方面获得全新的能力，从而为在数字领域有效工作做好准备。

本研究结果的理论意义在于，它们可以作为识别在教育中实施多因素人工智能应用模型的难点的基础。

本研究结果的实践意义在于，识别在教育中实施人工智能的难点可以为设计更有效、更具适应性和创新性的教育环境（包括大学环境）提供指导。

研究方法论基础：系统化方法（将教育环境的数字化转型视为将人工智能引入教育过程的系统过程和组织条件）、基于能力的方法（将教师和学生在使用人工智能的能力纳入考量）、以人为本的方法（将人工智能视为一系列个性化教育过程的机会）以及概率统计方法（将克服人工智能在教育中应用的困难视为一个随机过程）。研究方法：分析科学文献和人工智能应用的最佳实践、建模、调查方法。

关键词：人工智能、教育环境、应用困境、创新技术。

Annotation. *Currently, there is an active process of digitalization in the global context. One of the most promising is artificial intelligence (AI) technology, characterized by the interpenetration of digital, material, and socio-humanitarian technologies and practices, including educational aspects. As part of this process, the digital economy is being formed, which is becoming the main source of goal-setting in the field of vocational education and training. The conditions of digitalization entail changes in the logic of the production process, which, in*

turn, requires employees and graduates of the vocational education and training system to acquire fundamentally new competencies, both in the field of digital technologies and in the field of universal skills (soft skills), contributing to their readiness for effective work in the digital space.

The theoretical significance of the results of this study lies in the fact that they can be the basis for identifying the difficulties of implementing multifactorial models of AI application in education.

The practical significance of the results is that identifying the difficulties of implementing AI in education is a guideline for designing more effective, adaptive and innovative educational environments, including university ones.

Methodological foundations of the research: a systematic approach (considers the digital transformation of the educational environment as a systemic process and organizational condition for the introduction of AI into the educational process), a competence-based approach (considers the competencies of teachers and students using AI in education), a personality-oriented approach (considers artificial intelligence as a set of opportunities for individualizing the educational process) and a probabilistic and statistical approach (considers overcoming the difficulties of implementing AI in education) as a stochastic process). Research methods: analysis of scientific literature and best practices in the use of AI, modeling, survey methods.

Keywords: artificial intelligence, educational environment, difficulties of implementation, innovative technology.

Introduction. It is known that students of higher education, as a rule, do not have sufficient training to independently use the potential of the digital educational environment [4]. The creation of a digital educational environment, the introduction of artificial intelligence, saturated with diverse possibilities, is a necessary, but not sufficient condition for the organization of a pedagogically effective digital educational process. To achieve this goal, it is necessary to develop a system for organizing students' learning activities in a digital environment.

Only a specially organized digital educational process can contribute to solving the problem of students' learning motivation. Firstly, wide opportunities for individualization of the content, pace of learning, methods of presentation of the material and the level of support create the conditions for achieving success in the education of each student. Secondly, the immediate feedback provided by the use of digital technologies acts as a powerful motivating factor. Thirdly, the use of digital technologies in the educational process is more adequate to the perception of the digital generation. Fourth, within the framework of the digital educational process, the range of specialized methods for managing learning motivation is significantly expanding. It is known that Artificial Intelligence and machine learning

are currently actively used in the educational field [7]. The concept of introducing AI into the educational process is aimed at personalizing the system, adapting to the abilities of students, as well as monitoring the social component, convenience and practicality of use [5, 10].

At the same time, the introduction of artificial intelligence in education, including higher professional education, is associated with a considerable number of difficulties, which prevents the full potential of such a promising technology as AI technology. **The problem of the research** is the question: how to reduce the role of such a negative factor as the difficulties of introducing Artificial Intelligence in the organization of the educational process? **The purpose of the study** is to highlight the difficulties of introducing AI in the educational process and substantiate ways to overcome them. **The object of research** is Artificial Intelligence in education, the subject of research is the difficulties of introducing AI in the educational process.

The results of the study. It is well known that artificial intelligence is not just abstract algorithms or fantastic inventions of the distant future. These are real and available technologies here and now that can make our lives easier, more interesting and meaningful. And it is in our power to learn how to use them for our own good [3,6]. The use of innovative technologies in teaching most disciplines, including elements of artificial intelligence, is of significant scientific and practical interest and is one of the key characteristics of modern education [2,8]. To assess the prospects for integrating these elements into pedagogical practice, it is necessary to conduct a study of their implementation in the educational process, identify new pedagogical and information technology solutions, and analyze their impact on the effectiveness of the formation of competencies provided for by educational standards of higher education [1].

From the point of view of the authors of this article, the difficulties of forming the competence of AI technology (as well as other components of socio-professional competence) can be conditionally divided into groups: technical, pedagogical, ethical and legal, social and financial difficulties.

The first difficulty is the infrastructure needed for development in modern computers and networks to support the introduction of AI technologies in education. There are also difficulties in integrating AI with existing educational systems and platforms. Many educational platforms use outdated technologies, which makes it difficult to integrate modern AI solutions. The need to adapt old systems to new technologies may require significant resources and time. AI also requires large amounts of high-quality data for learning and functioning. Educational systems may lack structured and relevant data, making it difficult to use AI. Recall that Digital transformation is a deep reorganization of the sociotechnical system, which implies a transition from traditional information technologies focused on

solving individual tasks using digital tools, including artificial intelligence, to a new paradigm of open systems. The main goal of digital transformation is to introduce an updated sustainable model of the educational environment in the context of the digital economy. The key objective of this process is to create a single integrated information environment based on digital technologies, which will help support all types of AI implementation activities in education. Understanding the problems associated with the integration of AI allows us to develop more effective strategies and implementation methods, which contributes to improving the quality of education and increasing its accessibility.

The second aspect of the difficulty is pedagogical, which requires a revision of methodological approaches to teaching, which consists in developing new methods that take into account the specifics of artificial intelligence. This includes adapting curricula and programs to integrate AI-based solutions. There are also shortcomings in the development of models and criteria for the introduction of AI into the educational process, as well as in methods that could provide a synergistic effect from combining traditional and modern e-learning to stimulate students' interest in STEM disciplines. This problem is objective in nature and is related to the need to train teachers to implement AI in the educational process. There is also resistance, both active and passive, on the part of educators to innovative processes in education. It should be noted that the introduction of AI technology in education is an innovative approach that is a symbiosis of pedagogical and digital technologies. In turn, the digital transformation of the educational environment in which this technology is implemented is a higher-order process. The reasons for the rejection of innovations and resistance to them in the educational sphere include the lack of willingness of teachers to introduce advanced technologies and the low level of their socio-professional competence, which hinders the effective use of modern digital educational tools.

It is impossible to ignore the potential impact of artificial intelligence on the teaching profession. At the moment, AI is already capable of performing many routine tasks, such as checking homework, creating educational materials, and answering standard questions. In the future, they can become a tool that allows you to personalize the educational process, adapting it to individual levels, perception styles and interests of students [9]. However, this does not mean that AI will be able to completely replace the teacher. Rather, to bring teachers to new requirements, to professional skills. Lecturers should act as mentors, inspirers and support the emotional state of their students. In an environment where information comes from multiple sources, including AI, lecturers become navigators in a vast ocean of data. This will require them to develop critical thinking, creativity, and emotional intelligence qualities that are currently unavailable to machines.

The third difficulty is ethical and legal, firstly it is related to confidentiality, protection of students' personal data and compliance with confidentiality laws.

Artificial intelligence functions based on data. The abundance of information about students, including their academic performance, behavioral characteristics, interests, and emotional reactions, allows for more personalized and adaptive educational approaches. However, as the volume of data collected increases, so does the risk of data leakage, misuse, or malicious use. Consider, for example, the use of AI to analyze video recordings of training sessions in order to assess student engagement, reactions, and the effectiveness of teaching materials. Despite the potential benefits of such initiatives, collecting personal data, especially concerning students, imposes significant responsibilities. The issues of ensuring confidentiality, controlling access to this information and its possible use in the future are becoming extremely relevant. Modern society is not ready for the consequences of widespread “datafication” of the educational process. We remind you that trust is a key factor in education. If students and their parents do not feel that their data is securely protected, it will undermine the effectiveness of any AI-based innovation.

With the development of AI technologies, which are becoming more and more advanced in the field of dialogue, content generation and demonstration of emotional reactions, there is a need to understand the ethical aspects of students’ interaction with them. Previously, computers were perceived as soulless mechanisms, but modern artificial intelligence systems increasingly resemble intelligent interlocutors, which causes new ethical dilemmas [3]. For example, when using a GPT-based chatbot for individual student support, the question arises about the boundaries of such interaction. Is it possible for a student to perceive a neural network as a friend, entrusting his personal secrets and experiences to it? How can we explain the difference between artificial and true intelligence, simulated empathy, and real understanding of emotions? In addition, if we use generative neural networks to create educational content, the question arises about the degree of trust in the factual accuracy and impartiality of the generated materials. How can I avoid generating false or manipulative information? Is it always necessary to disclose the “authorship” of content created by artificial intelligence?

It is obvious that we need to develop clear ethical principles and norms for interaction with advanced AI, both for university lecturers and students. It is important to maintain critical thinking, fact-checking, and be aware of the limits of neural network capabilities. AI can be a great learning assistant and partner, but it should not completely replace human communication, judgment, and responsibility.

Legal policy and strategies have not yet been formed. Regulation of the legal aspects of artificial intelligence is at the stage of active formation both at the level of individual states and in the international arena. Despite the differences in the approaches of different countries, there is a general trend aimed at ensuring transparency, control and responsibility in the use of neural networks.

For education professionals, this means the need to be aware of current trends and take them into account in their activities. When introducing AI into the educational process, the primary priority should be the well-being and rights of students, including the protection of their data, the explainability of assessment algorithms, and the ability to choose and opt out of using AI systems. There are also difficulties regarding the authorship of AI-generated texts and related intellectual property rights. In particular, it is necessary to determine who is the true author: the person using AI to generate the text, or the developers of the AI itself. It is also important to consider the mechanisms for protecting the rights to materials created with AI.

The fourth group of difficulties is social and financial. Social difficulty concerns the inequality of access, the difference in access to technology for different groups of students, which can exacerbate social inequality. Insufficient level of information competence (digital competencies) of a number of students, which prevents the successful use of digital tools. And also, cultural barriers, different perceptions of AI in different cultures and countries.

The financial difficulties are the cost of implementation, which require high initial investments in technology and training. Maintaining and updating technologies can also require significant resources.

Once again, we recall that readiness for the latest technologies is the most important integrative factor in the success of an individual's further educational activities [4]. Let N - be the number of components of socio-professional competence (including the competence of AI technology) for which there is an insufficient level of development in education at the subsequent stage, S_i and s_i are, respectively, the proper and actual level $\alpha_i = S_i - s_i$, of the i -th component, then the difference between the proper and actual level, the probability of overcoming difficulties, we express the logistic function

$$\rho_i = \frac{\alpha_i \cdot B_i \cdot e^{\alpha_i}}{A_i + \alpha_i \cdot B_i \cdot e^{\alpha_i}}$$

the probability of overcoming, according to the incompatible events theorem

$$p_i = 1 - \rho_i = \frac{A_i}{A_i + \alpha_i \cdot B_i \cdot e^{\alpha_i}}$$

and the probability of overcoming all "difficulties", according to the independent event theorem

$$P_i = \prod_{i=1}^N p_i$$

Here: A_i and B_i are some parameters, N is the symbol of the product. But the probability is always less than one, therefore, the greater N , the lower the probability of overcoming all difficulties.

A survey of 1st-year students of Kuban State Technological University (n=150, 2024 enrollment years) and Master's degree programs students of the University of Port Harcourt (n=55, 2023 enrollment year) showed that there are serious difficulties in introducing artificial intelligence in the educational process, but universities (namely the holistic educational meta-environment) are ready to overcome them. The students of both universities were asked the question: what prevents your successful application of AI in educational activities? The survey results are as follows: nothing hinders – 22.7% (47 out of 205), poor accessibility of the Internet environment – 29.3% (60), low level of competence in using AI in learning – 24% (50), lack of expediency in using AI in the educational process – 9% (19), poor command of digital tools – 12% (24), other reasons – 3.3% (17). As can be seen, the greatest difficulty determined by the educational environment is the insufficient level of digital tools used in learning. At the same time, this difficulty can be overcome.

Conclusion. The introduction of innovative technologies into the educational process inevitably involves certain difficulties, and artificial intelligence is no exception. Overcoming the obstacles associated with the integration of AI is possible only if an integrated (systemic) approach is applied. Awareness of the problems that arise during the implementation of AI contributes to the development of more effective strategies and techniques, which in turn leads to an improvement in the quality of education and its accessibility. Identifying difficulties allows educational institutions to adapt curricula and courses to meet modern requirements and use the capabilities of AI to improve the level of student training. Knowing about the obstacles associated with the introduction of AI helps to train teachers more effectively with new technologies, which, in turn, contributes to the successful integration of AI into the educational process. Analyzing the difficulties of implementing AI makes it possible to identify and eliminate barriers such as lack of funding, lack of technical infrastructure, or resistance from educators, which contributes to a smoother and more efficient process of digitalization of education. The results obtained can serve as a basis for the development of educational strategies aimed at supporting the introduction of AI and the modernization of the educational system.

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跨平台媒体语境下的现代话语实践（以《共青团真理报》为例）
**MODERN DISCURSIVE PRACTICES IN THE CONTEXT OF
CROSS-PLATFORM MEDIA (USING THE KOMSOMOLSKAYA
PRAVDA PUBLICATION AS AN EXAMPLE)**

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摘要. 本文以《共青团真理报》为例，探讨了跨平台媒体对话语实践转型的影响。文章认为，跨平台性作为媒体领域发展现代阶段的显著特征，催生了各种内容消费和传播模式。

关键词: 话语实践，跨平台媒体，内容传播，《共青团真理报》版。

Abstract. The article shows the influence of cross-platform media on the transformation of discursive practices using the example of the Komsomolskaya Pravda publication. It is concluded that cross-platformity as a distinctive feature of the modern stage of media sphere development has led to the emergence of various formats of content consumption and distribution.

Keywords: discursive practices, cross-platform media, content distribution, Komsomolskaya Pravda edition.

In the context of cross-platform media, modern discursive practices, which we understand, following G. V. Lukyanova, as the processes of content creation and its perception, are undergoing significant changes [Lukyanova, 2010]. The distribution of content through various media platforms and channels inevitably gives rise to new forms and formats of its presentation [Babura, 2017]. The discourse-forming parameters of a media product (features of production, design, genre characteristics, target audience) are changing significantly. Let us consider, as an example of the implementation of modern discursive practices, the publication Komsomolskaya Pravda (KP), which is celebrating its centenary this year. Despite such a venerable age, KP successfully uses cross-platform, which has already been noted by researchers [Makashova, Loshmanova 2024]. “KP” active-

ly distributes its content through social networks, blogs and video hosting sites (Yandex.Zen, VKontakte, Odnoklassniki, Telegram, Rutube, Yappy, Moi Mir), its own radio station <https://radiokp.ru/> and through the website <https://www.kp.ru/>.

In order to identify the specifics of the discursive practices of “Komsomolskaya Pravda” in a cross-platform environment, the content of the publication was analyzed from January 1 to January 31, 2025 on the four most popular distribution channels. The materials published in Telegram - 1271, VKontakte - 5208; Odnoklassniki - 5347, Yandex.Zen - 66963, website - 70169 were analyzed. The empirical material was selected using a systematic sampling method. The objectives of the work included identifying the genre and format specifics of cross-media content, methods of its cross-platform adaptation for each of the platforms, as well as analyzing the features of content distribution from the site to other platforms, taking into account such discourse-forming parameters as genre and format characteristics, methods of cross-media adaptation of content.

Genre characteristics of the cross-media content of the publication “KP”

The results of the analysis of the cross-media content of the publication “KP” from the point of view of genre representation are reflected in Fig. 1.

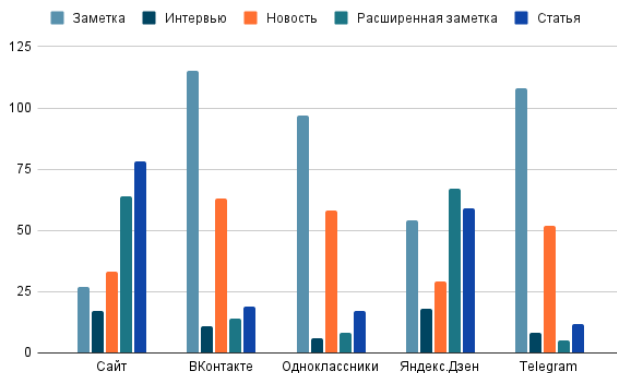


Figure 1. Genre representation on the “KP” platforms

As can be seen from the diagram, the dominant genre on the VKontakte, Odnoklassniki and Telegram platforms is the note. Articles and extended notes prevail on the site and in Yandex.Zen. Interviews are significantly inferior to the named genres on all platforms.

The identified genre priorities are determined by the technical characteristics, specifics of the work and the target audience of each platform. Short materials are

more popular on the VKontakte, Odnoklassniki and Telegram social networks. Full versions of materials are posted on the publication’s website and the Yandex. Zen platform.

Format representation of cross-media practices of the KP publication

The cross-platform publication Komsomolskaya Pravda creates materials of various formats.

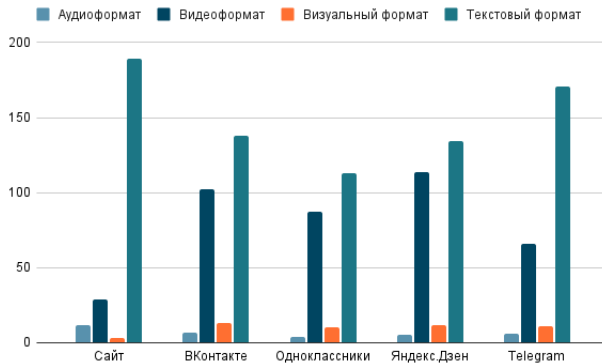


Figure 2. Presentation of formats on “KP” platforms

The publication creates mainly text materials. Videos are filmed and edited for the VKontakte, Odnoklassniki, Yandex.Zen and Telegram platforms.

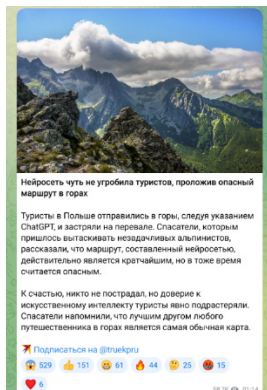


Figure 3. Example of a note from the Telegram channel “KP”,

Visual content in most cases performs illustrative functions and does not carry additional information.

Methods of cross-media adaptation of the content of the publication “KP”

The volume of materials is one of the methods of cross-platform adaptation of content. Having analyzed the number of characters in each material for the specified period, we found that the arithmetic mean is 3021.

Table 1
Volume of materials

Genre	Average value
Note	579
Interview	3547
News	763
Extended Note	4821
Article	5397
Overall Average:	3021

The increase or decrease in the volume of materials is due to their adaptation to different platforms. For example, in Telegram, users prefer short notes that convey the essence of the news. Thus, the article “Russia’s enemies were scared by the lifting of sanctions: these are the restrictions Trump may lift first” from 01/10/2025 [Plotnikov, 2025], posted on the site, contains 2972 characters excluding spaces, and in the Telegram channel - 947, that is, almost three times less.

Cross-media practices of content distribution of the KP publication

Research has shown that most of the content from the site is published in the Yandex.Zen blog (76.5%). Due to the specifics of maintaining the VKontakte, Odnoklassniki and Telegram platforms, the share of cross-posting (relative to the share of materials posted in Yandex.Zen) is significantly less: 9.6%, 8.0% and 5.9%, respectively.

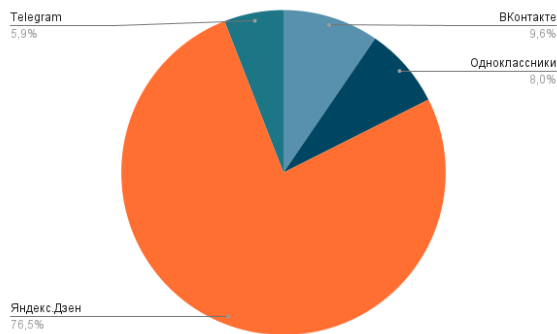


Figure 4. *Content distribution channels of the “KP” publication*

As a rule, people choose one specific social network to view news. Taking this into account, the media can make minor modifications to materials from the site and post them on several platforms at once. The post in the VKontakte group “Children will be protected from computer cruelty and eroticism: seven categories by which video games are proposed to be labeled in Russia” consists of one sentence and a link to the full article. The original text is large and describes the problem in detail.

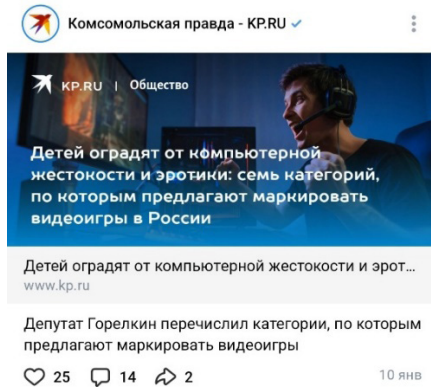


Figure 5. Screenshot of the VKontakte note “Children will be protected from computer cruelty..”

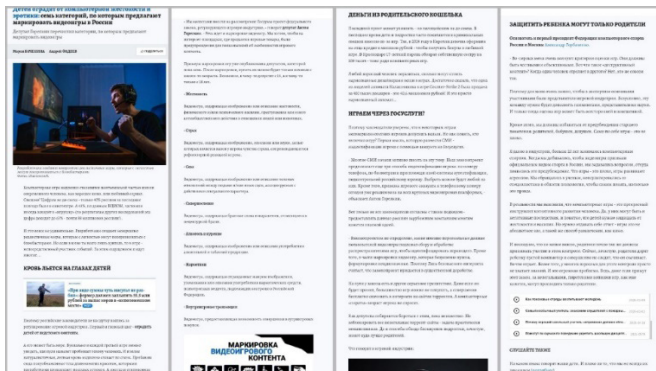


Figure 6. Screenshot of the article “Children will be protected from computer cruelty and eroticism...” from the “KP” website

The Komsomolskaya Pravda publication is a striking example of a successful cross-media approach to creating and promoting content in the modern media space. The publication manages not only to publish articles on the site and redirect them to different channels, but also creatively and competently, from the point of view of content marketing, to develop third-party platforms, not forgetting about interaction with subscribers (periodic surveys on VKontakte and Telegram) and increasing the audience and traffic.

This approach allows you to quickly respond to current events, adapt content to various consumption formats, which is especially important in the context of a rapidly changing information space.

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后启示录类型现代文学中的神话元素
**MYTHOLOGEMS IN MODERN LITERATURE OF THE POST-
APOCALYPSE GENRE**

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摘要. 本文探讨了现代后启示录小说的诗学问题, V·索罗金小说《特洛里亚》的诗学独创性, 探讨了后启示录的神话元素、V·索罗金小说《特洛里亚》中的末世论主题、V·拉斯普京小说《告别母亲》中的末世论话语迹象, 以及后启示录小说的场所、时空体和情节特征。

关键词: 后启示录, 弗拉基米尔·索罗金, 《特洛里亚》, 瓦伦丁·拉斯普京, 《告别母亲》, 末世论, 后启示录神话元素, 后启示录诗学, 后启示录主义。

Abstract. *The article examines the issues of poetics of the modern novel of the post-apocalyptic genre, the poetic originality of V. Sorokin's novel "Telluria", examines the mythologems of the post-apocalypse, eschatological motifs in V. Sorokin's novel "Telluria", signs of eschatological discourse in V. Rasputin's novel "Farewell to Matora", characteristic details of the locus, chronotope and plots of the genre of the post-apocalypse.*

Keywords: *post-apocalypse, Vladimir Sorokin, "Telluria", Valentin Rasputin, "Farewell to Matora", eschatology, mythologems of the post-apocalypse, poetics of the genre of the post-apocalypse, post-apocalypticism.*

In the postmodern tradition, the consciousness of a modern type of person is called "torn", "rhizome", vague, indistinct. The very phenomenon of the modern worldview lies in the too rapid alternation of attitudes of different generations, in a certain fluidity of the world, which D. Harms wrote to us about. The mythological part of consciousness is present in every person, regardless of age and education. And it is always interesting to explore mythologems, that is, the constituent elements of a mythological plot that is transferred to a modern work of fiction. A mythologeme is any part of a myth that is used in a different context, in isolation from the myth itself. For example, in the literature of the post-apocalyptic genre, a stable mythologeme will be the end of the world, or the state of the world in a post-apocalyptic state, or the mythologeme of the Savior that humanity is wait-

ing for. It's connected with the universality of any mythologeme. Examples: the mythologeme of the first man, the mythologeme of the world tree, etc. The term "mythological archetype" (C.G. Jung) is also used. In modern science, the word "mythologeme" was introduced into scientific use in 1941 by C. G. Jung and K. Kerenyi ("Introduction to the essence of Mythology").

Mythology is the most ancient level of human worldview, and modern mythology is by no means static, it is capable of transformation. Eschatological motives in modern literature are associated with the concepts of the end of the world, the finiteness of life, and the exhaustion of humanity's energy potential.

Some signs of eschatological discourse in modern literature:

1. Mythogenicity. Most often, echoes of biblical, Christian, Buddhist, pagan and other myths are subjected to artistic interpretation.

2. The crisis of the hero's consciousness and thinking, the triumph of the madness of anti-logic. Ethics are based on the inability to set limits to one's desires, an immanent fear of the future, the instinct to destroy the world around oneself, and a suicidal complex. Sometimes the instinct to destroy the world and the suicidal complex are veiled in bestiality or necrophilia (hence the favorite plot in the post-apocalyptic - the walking dead, zombies).

3. Energy collapse, which determines the hopelessness of a formally open, but nevertheless tragic ending.

4. Aesthetic ugliness, ugliness, prevailing over beauty and harmony.

5. The activity of the bestial motive. For example, in the works "Avaron" by V. Sorokin, "Kys" by T. Tolstaya.

Some works of modern Russian literature that contain eschatological motifs: this is "Farewell to Matera" by V. Rasputin (1976). The eschatological theme is stated from the very beginning of the story: "It was not easy to believe that this would actually be the case, that the edge of the world, which frightened the dark people, was now really close to the village. But now it was the last summer left: the water would rise in the fall."

Some eschatological motives of the work:

1. The death of the island as a part of natural existence. The island of Matera is like a "felled tree", "rooted out", "gone out of its usual course".

2. Preparation for death. There is too much preparation for death on the island, which portends a catastrophe, all the elements become hostile (water — flooding, fire — madness).

3. The conflict of Eternity and Time, culture and civilization, nature and man, life and death, good and evil.

4. The motive of duty to the family. Daria feels personally responsible to those who lived before her. Reflecting on the devastation of the cemetery, the woman comes to the conclusion that it is for her, as a representative of a generation living during such eschatological changes, to be responsible for everything that happens.

“Post—apocalyptic is a subgenre of science fiction combining elements of science fiction, science fantasy, dystopia and horror, in which the plot develops in a world that has experienced a global catastrophe. Post-apocalyptic is also called a creative style that carries a mood of desolation, loneliness and horror in the images of aged and abandoned machinery or buildings. The most popular plot in the post—apocalyptic world is the zombie apocalypse or the Third World War.”[2].

The term “post-apocalyptic” was first used in 1978 by the American critic Alan Frank in the magazine SciFiNow. The term, however, came into use at the turn of the 1990s and 2000s, and became firmly rooted in literary and film studies.[2]

Works about the global catastrophe gained wide popularity after the Second World War due to concerns about the use of nuclear weapons, but chronologically the genre of the post-apocalypse originated in the 19th century.

The main idea of this genre in literature is that a characteristic feature of post-apocalypticism is the development of a plot in a world (or a limited part of it) with a special story. In the past of this world, civilization reached a high level of social and technological development, but then the world experienced a kind of global catastrophe, as a result of which civilization and most of the wealth it created were destroyed. The catastrophe that destroyed the world most often includes: the Third World War with the use of weapons of mass destruction (nuclear, chemical or biological), the invasion of aliens, the uprising of machines led by artificial intelligence (robots; see also. the problem of artificial intelligence control), a pandemic, an asteroid fall, the mass appearance of some monsters (including those created by humans, from a parallel universe, prehistoric or from other times, alien or others), climatic, caused by exposure from another time, cosmic nature (inanimate) or other disasters. [2].

A typical post-apocalyptic plot begins to develop, as a rule, a considerable time after the catastrophe, when its “damaging factors” themselves have already ceased to act. In one form or another, the history of society from the moment of the disaster is usually presented to the reader in a condensed form: it is immediately followed by a period of savagery, then the survivors concentrate around the remaining sources of life support, and certain new social structures are spontaneously formed. By the time the story begins, this process has usually been completed, a certain conglomerate of communities has been created on a habitable territory, and a more or less stable balance of power has developed.

Post-apocalyptic works do not describe the event of the end of the world, but a catastrophe leading to the end of human civilization. Most people die. Further events develop “outside of civilization”. It is these events that are interesting to the reader.

In this genre, the three most common scenarios of the death of almost all people have been established.:

1. The pandemic. In the modern literary tradition, one can single out the zombie apocalypse as a special case of it. Mutation of people, animals, viruses.

2. The atomic war after the political crisis. This story appeared already in the second half of the 20th century, after the end of the Second World War.

3. Natural disasters. The fall of an asteroid, an unexpected cold, a volcanic eruption, etc.

4. Man-made disaster.

5. Space disaster, alien conquest of the Earth.

The action in literature of this genre often takes place in large cities or even more significant territorial entities. Usually, such cities are not affected or little affected by the disaster, having preserved the “old” way of life, which is gradually changing under the influence of external factors.

The description of the scene usually contains locations: abandoned, partially destroyed cities, enterprises, military installations, underground territories, subways, vast deserts on the site of previously inhabited territories. Territories that were previously on land, but were flooded by the sea as a result of the disaster. Buildings and man-made objects are located on the seabed. These are places that are partly dangerous and partly useful, but usually just serve as a backdrop for the narrative.

There are mutated people, animals, plants, and entire mutant forests in the works (interesting versions of mutant people in Tolstoy’s “Kisi”).

The plot can be built around the adventures of heroes in the world, in particular, the hero’s journey to a place or object that will provide him with a long and comfortable life, will give him the opportunity to save his own community on the verge of destruction, or can help in the revival of the entire civilization. Sometimes the means and technologies that led to the disaster are considered forbidden in society, and the tranquility of such a pastoral society is undermined by young rebels intent on reviving the forbidden technology.

Apocalypticism is often combined with post-apocalypticism in one work, and the depiction of disaster as such is combined with the depiction of its immediate consequences and its impact on the lives of survivors. Sometimes the narrative examines a cross-section of modern reality through the prism of the perception of distant generations. In literature, this genre is closely related to and sometimes mixed with cyberpunk.

Post-apocalyptic images can also be called abandoned territories, shut down enterprises, “ghost towns”, built in the past and living an active life, but for one reason or another abandoned by the population - with dilapidated buildings overgrown with grass, with rusty skeletons of machinery and mechanisms lying here and there.

“Telluria” is the tenth novel by Vladimir Sorokin. It was released on October 15, 2013 by Corpus Publishing house. He was awarded the second Big Book Award (2013-2014 season).

The book lacks a coherent plot and is divided into 50 chapters without titles (short stories), numbered in Roman numerals. The characters of the chapters rarely intersect. The novel is assembled according to the collage principle. The action of this novel takes place in the middle of the 21st century in the territory from Altai to Madrid. After the World War with the Wahhabis, Europe returned to the level of the Middle Ages, and the Knights Templar came to power. Russia broke up into principalities, in some of which Orthodox communism was realized.

In the genre of post-apocalyptic literature, it is customary for heroes to live in isolated high-tech compact communities formed on the basis of large military bases, science towns, orbital stations, and sometimes shelters created specifically in anticipation of a catastrophe. Sorokin’s novel contains descriptions of different types of societies: democratic, totalitarian, run by radical military or scientists, or controversial political figures. In their hands are the most dangerous technologies preserved from before catastrophic times. As a rule, such communities maintain isolation from the outside world whenever possible.

It is in space that times coexist, it is through space that a multi-temporal existence appears as a simultaneous existence. The opening of local chronotopes is carried out through the conditional timelessness of space, and the text of “Telluria” embodies this chronotope with its device. [1] The artistic time of the novel conditionally belongs to the time “after” the catastrophe.

One of the central operating locations is Altai. The Altai republic of Telluria is located there. In this republic, magic nails are made from the rare material tellurium, which are in great demand all over the world. This is a powerful drug: if you hammer such a nail into the head in a strictly defined place, you can experience incomparable pleasure. From now on, the most sought—after profession is a carpenter, who hammers tellurium nails quickly and painlessly. In this mythological element of the novel, there is a direct reference to Ottavio Vannini’s art painting “Jael and Sisera”, which gave the idea of “Telluria”.

“Telluria” is a magnificent panorama of ruins. The space-states are all full of artifacts of a lost civilization: ruins, stones and boulders, rusty iron, bones, fragments of shards of a Russian stove pot, bricks from the wall that once surrounded Muscovy. The novel has two “preliminary novels”. Sorokin deliberately refers the reader to “The Day of the Oprichnik” and “The Sugar Kremlin,” where the origin of this wall (then still intact) is described in detail.

In modern literature, a mythologeme is often referred to as a mythological motif consciously transferred to the world of modern art culture. In “Telluria” there is a mythologeme of “Anglo-Saxon sobriety” and a mythologeme about a certain highly developed West, revealed in chapter 2 of the novel.

“See you in your native neo-Imperial skull, full of brain fog and Anglo-Saxon sobriety,” Leo’s hero writes in chapter 2 in a letter to the West. His writing and homosexual orientation are an allusion to the Marquis de Custine. Marquis Astolphe de Custine visited Russia in 1839 and wrote a book about his impressions of Moscow, Yaroslavl, St. Petersburg and other cities. The Marquis de Custine was a staunch monarchist, conservative, and reactionary. He was afraid of democracy in France, afraid of the power of the crowd. In Russia, Custine hoped to find arguments against a democratic form of government, but he was shocked by the Russian form of autocracy.

Astolphe de Custine’s book “Russia in 1839” was banned in Russia by the decision of Emperor Nicholas I. For this purpose, the Marquis’ alleged homosexuality was even invented. This was due to the fact that the work contained unflattering reviews about the emperor and the Russian order. The book caused a reaction of rejection in Russia. In tsarist and Soviet Russia, the full text of Custine’s book could only be viewed from French originals illegally imported into the country.

Sorokin stylizes all the significant genres of Russian, European, and American literature in turn. These are epic, folk tale, chivalrous novel, socialist realist production novel, Orthodox prayer, communist advertisement, love plot, reportage, eulogy. The eulogy is parodied in honor of tellurium, a “fragile silvery-white metal” that fulfills all desires. This technique is constant in all 50 chapters.

Sorokin carefully describes a social system that contains elements of feudalism, communism, and theocracy. Progress in genetics has finally made it possible to separate classes not only financially, living standards, but also physiologically.

1. The upper class of society is the little people. Their height is the size of a beer bottle. They don’t work themselves, they have a paradoxical ability to enslave others.

2. The middle class - people of the usual physiological type.

3. Hard workers are stupid and often weak-willed giants who do the most menial work for pennies.

4. Service personnel – others (zoomorphs and others).

After the catastrophe, the countries broke up into small republics, orders and principalities. Social injustice is no longer perceived by anyone as a personal insult. But the man of the future has the only happiness - a tellurium nail. The special metal, interacting with the shell of the human brain, gives complete and absolutely controlled happiness. Put such a nail in your head and do what you’ve only wanted to do all your life. This is an allegory of the ideology of self-denial, of being in the name of a higher idea, that is, by the type of ideology, a very strong allusion to communist ideology and the Russian philosophical idea.

This is tellurium, the metalloid that gave the book its name. This is a propaganda metaphor that can be hammered into anyone, a metaphor for ideology, a meta-

phor for the religion of Sufism. People want to use nails made of tellurium metal, for this they drive them into their heads. The nails driven in are undoubtedly an allusion to ideology, without which people in Russia will not be happy. Happiness is replaced by only one tellurium nail.

Sorokin, through fascinating allusions, gives messages to our time. In his work, the author not only warns us what awaits us if the world does not change, but also suggests looking at these changes through the eyes of a person from the post-Soviet space.

The zoomorphs in Sorokin's novel lead a more honest lifestyle than humans, they are imbued with ideas of social equality and the meaning of life. A man who has enjoyed himself in abundance has lost the moral image that he was artificially proud of in the twentieth century.

It is also possible to note the energetic and repeatedly realized genre of dystopia by writers. Vladimir Sorokin is also interested in this genre. The ideas of dystopia and the "dark future" can be used in the post-apocalyptic genre. Dystopia is characterized by the presence of an undesirable society (community, influential group of people), dehumanization, and other characteristic features of decline, collapse, and disintegration of society, a totalitarian form of government, and an environmental catastrophe. Dystopia addresses the real problems of society that exist in politics, religion, technology, and economics.

The main feature of the poetics of V. Sorokin's novels is fabulation. This term came from psychology and means a mixture of the fictional with the real in speech and memory. The postmodern writer specifically emphasizes free fiction and pure creativity. The second main feature of Sorokin's work is intertextuality. He perceives the existing world as a text, and the inclusion of one work into another is inevitable (the matryoshka principle), since the artist in postmodernism is only the bearer of a huge dictionary from which he draws information. In Sorokin's texts, intertextuality manifests itself on different levels: semantic, stylistic, and direct quoting.

In Sorokin's new, secular apocalyptic mythologeme, one can see the features of the stylistics of postmodernism. The material for this is the "serial" plots of the apocalypse. The post-apocalypse makes the most extensive use of postmodern concepts of imaginary nostalgia for the past.

The novel "Telluria" is a mixture of alternative history and social fiction in the style of postmodernism.

Post-apocalypse embodies two facets of postmodernism: the feeling of time without a future and the past. The narrative in the genre of the post-apocalypse in literary works is based on myths, archetypes, eternal plots, and the stories of the characters are outlined as special cases of "quests" within a larger storyline. Post-apocalypse has the character of a relaxed role-playing game with already

identified and well-known mythologems, which does not require becoming an “initiate.”

The fictional world is always bleak: in “Telluria” we find ourselves in the atmosphere of developed cities, where the ideas of feudalism reign. Religious orders are flourishing, and there is a difficult and bloody war going on against the Mujahideen invaders who have taken over most of Europe and Asia. The Chinese bought out the Moscow region and took root in the East of Russia. New crusades are taking place, involving robots rather than humans. In this new world, small-scale industries and manufactories are flourishing. The change in the production regime led to a different consumption regime.

The world of the novel has the effect of reality pretending to be a game, the world of “Telluria” is a role-playing “universe” with many different conflicts and relief decorations.

Post-apocalyptic fiction is one of the components of eschatological discourse reflecting the collective fear of the future. The pictures of the death of mankind are present in all

At the beginning of the 21st century, society and writers are increasingly concerned about post-apocalypticism, which is reflected in the development of the science fiction genre in the direction of post-apocalypticism, and soon the latter stands out as an independent subgenre of literature and cinema, with its own artistic and thematic features.

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缔结国际条约的语言结构特征（以英国法和俄罗斯法为例）
**LINGUOSTRUCTURAL FEATURES OF CONCLUDING
INTERNATIONAL TREATIES (ON THE EXAMPLE OF BRITISH
LAW AND RUSSIAN LAW)**

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注释。本文考察了英国和俄罗斯法律体系中缔结国际条约的语言结构特征。分析了两大法律体系中法律文本的结构要素、语言结构、文体和形式特征。并提出了规范措辞和制定统一标准的建议，以减少起草和解释国际条约时的法律风险和冲突。

关键词：语言结构特征、国际条约、英国法、俄罗斯法、执法。

Annotation. *The paper examines the linguostructural features of concluding international treaties in the systems of British and Russian law. Structural elements, language constructions, stylistic and formal features of legal texts in the two legal systems are analyzed. Recommendations are offered for standardizing formulations and developing uniform standards to reduce legal risks and conflicts in drafting and interpreting international agreements.*

Keywords: *linguostructural features, international treaties, British law, Russian law, law enforcement.*

One of the most famous international treaties in British and Russian law is the First Beijing Convention of 1860, a series of agreements concluded between the Chinese Qing Dynasty and Great Britain, France and the Russian Empire. Since then, states have developed their own approaches to drafting and formalizing international treaties. Today, the analysis of the linguistic and structural features of international treaties in the British and Russian legal systems is becoming relevant due to significant differences in the formation of legal texts that affect the process of their conclusion, interpretation and application.

Considering that international treaties are a source of law regulating relations between states, their linguistic and structural specificity determines the effectiveness of the implementation of legal provisions in international practice. Studying the features of linguistic constructions, stylistic and formal aspects allows not only to increase the accuracy of translation and interpretation of treaties, but also to suggest ways to overcome existing problems in the linguistic-structural sphere. The lack of uniform standards in the formation of texts of international treaties in various legal systems creates difficulties in their understanding, often leads to incorrect interpretation of legal norms and the emergence of conflicts.

The starting point in the history of British law is considered to be 1189, since which it was consolidated as a system of common law, not civil law. Law was not codified into separate collections, and judicial precedents filled the character of mandatory rules for application in future proceedings. In 1215, King John Lackland signed the Magna Carta, which regulated the rights and privileges of free estates, established rules for collecting taxes and legal proceedings, and limited the arbitrariness of royal power. In 1266, Henry III granted the Hanseatic League a charter for trade in England, and *Lex mercatoria* – trade law – was formed. The signing of the union treaty of England and Scotland in 1707 led to the creation of the Kingdom of Great Britain.

Today, the British legal system is based on the principles of the Anglo-Saxon tradition, characteristic of the Common Law system (the main source of law is recognized as judicial precedent). As noted by E. M. Alexandrova, O. A. Astafieva, I. A. Bashkirova and T. A. Koloskova, the texts of international treaties are formed according to the model of standard legal documents containing a set of clichés, established phrases and template formulas [1, p. 88]. The style of treaties in the British tradition is distinguished by high formalization, the use of phraseological clichés, such as “the Parties agree as follows” or “in witness whereof”, ensuring legal clarity and unambiguity.

International treaties, which, in accordance with the British legal tradition, are based on the principles of Common Law and employ a high level of formalism and standardization, are drawn up according to the following structure: 1) preamble – defines the parties, their legal status, the objectives of the treaty and references to relevant international norms; 2) main body – contains the obligations of the parties, conditions, procedure for performance and liability; 3) sections and subdivisions – detail individual aspects of the treaty, classify provisions by topic; 4) appendices – contain additional documents, technical data or wording.

An important feature is the use of passive constructions, which enhance the formality and impersonality of the text: “The obligations herein contained shall be fulfilled by the Parties” or “the terms of this Agreement shall be interpreted in accordance with the laws of England».

The linguistic and structural peculiarity of British agreements is the use of conditional constructions. They express the possibility or conditions of fulfilling obligations. For example, “if either Party fails to perform its obligations, the other Party shall have the right to terminate this Agreement».

Another distinctive feature, according to H. Wang, is the use of polysemantic units and borrowings from Latin, such as “status quo”, “de jure”, “de facto” [2, p. 17]. Their use enhances the authority of the text and reduces the risk of misinterpretation. Such features are found in the Arano-Southern Treaty concluded between Great Britain and Argentina on November 24, 1849 [3], and the Anglo-Russian Convention of 1907 [4].

A significant role in the structure of such treaties is also played by the vocabulary, consisting of established phraseological units and clichés to denote legal concepts: “on behalf of”, “hereinafter referred to as”, “notwithstanding anything to the contrary”. In addition, the texts widely use abbreviations and acronyms denoting legal institutions or normative acts: “UCC” (Uniform Commercial Code), “The Law of Contract”. It should be noted that the frequent use of abbreviations in the text of international treaties complicates the translation and interpretation of the content of the treaties for the participating states.

Another feature is punctuation and spelling. British contracts widely use lists separated by periods or semicolons to facilitate structuring of information. Also, British contract law uses the format “month.date.year”, while Russian law uses “date.month.year”.

We should now move on to examining the specifics of concluding international treaties in Russian law.

The history of the Russian legal system began with the creation of the “Russian Truth” (in the period from about 1019 to 1054) - the main ancient Russian source of law. In 1497, the first legislative code of the Russian state was adopted - the Sudebnik of Ivan III, which laid the foundation for the judicial system. In 1550, a new Sudebnik appeared during the reign of Ivan IV the Terrible. The adoption of the Declaration of State Sovereignty of the RSFSR on June 12, 1990, and the Constitution of the Russian Federation on December 12, 1993 marked the development of modern Russian law.

The legal system of the Russian Federation belongs to the Romano-Germanic, continental tradition, characterized by high normative detail, formalism, and strictness in the use of language. The languages of official treaties and normative documents, notes A. V. Sibiryakov, are characterized by high accuracy, strict structuring, and clarity of formulations [5, pp. 55-56]. In the context of international treaties, special emphasis is placed on the accuracy of definitions, the use of normative terms, and the formulation of relevant legal obligations.

The structure of Russian treaties includes a preamble, main body, sections, subdivisions, appendices and signatures of the parties. An important linguistic fea-

ture is the use of complex definitions and terms that ensure legal clarity. Thus, in the Resolution of the Government of the Russian Federation of 27.10.2001 N 750 “On the signing of the Agreement between the Government of the Russian Federation and the Government of the United Kingdom of Great Britain and Northern Ireland on the provision by Great Britain of assistance in the implementation of the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction in the Russian Federation” the following is noted: “the agreement is concluded with the aim of establishing, regulating and ensuring the fulfillment of obligations stipulated by the Convention on the Prohibition of Chemical Weapons” [6]. In such cases, complex constructions are used expressing conditions, obligations, exceptions.

A feature of the language structure in Russian contracts is the wide use of definitions and formulations in the form of “undertakes”, “provides for” and “implements” in order to reflect direct legal obligation. The style of the text is official and businesslike, without emotional overtones, with high precision and unambiguity. An important aspect is the transfer of conditional and hypothetical constructions. Russian contracts use words and phrases expressing conditions and exceptions: “in case”, “exclusively subject to”, “taking into account”.

To enhance impersonality, when drafting international treaties in accordance with Russian law, passive constructions are used, in particular: “The obligations under this agreement are fulfilled by the parties” or “The rights and obligations of the parties are determined by this agreement.” Similarly, the use of the constructions “subject to execution” and “is established” in the text of agreements lays down the inevitable nature of the obligations and the process of their fulfillment.

Comparing the linguistic and structural features of British and Russian treaties, one cannot help but note a number of similarities and differences (Table 1).

Table 1

Peculiarities	British law	Russian law	Problems and difficulties in drafting international treaties
1. Legal family:	Anglo-Saxon.	Romano-Germanic.	Differences in legal systems and definitions: in the Romano-Germanic legal tradition, the main source of law is the law, in the Anglo-Saxon tradition, it is judicial precedent (court decision).
2. The legal definition of the term “contract”:	A contract is an agreement that the law recognises as creating an	A contract is an agreement between two or more persons to establish, change	The term «promise» in English law does not have an exact equivalent in Russian law.

	enforceable obligation (The Contracts (Rights of Third Parties) Act 1999) [8].	or terminate civil rights and obligations (Article 420 of the Civil Code of the Russian Federation of 30.11.1994 N 51-FZ) [7].	
3. Agreement structure:	Introductory part, sections, final part, transitional provisions, appendices.		
4. Stylistic features:	Concreteness, clarity, accuracy, logic, absence of emotionally expressive means.	Concreteness, clarity, precision, logic, absence of emotionally expressive means, presence of officialness.	In international treaties concluded by the Russian Federation, official jargon is used, the exact equivalents of which are not available in British law: 1) «настоящий договор» – «this Agreement», 2) «в целях исполнения обязательств» – «to fulfill obligations»; 3) «настоящим подтверждается» – «confirmed».
5. Spelling and punctuation features:	Commas are used to indicate large thousands (e.g. “£1,000,000” (one million pounds)). The name is separated on both sides by upper quotation marks (“The Equality Act 2010”). The word «Number» or the abbreviation «No.» is used instead of the symbol «№».	To indicate large thousands, dots are used (for example, «1.000.000 rubles” (one million rubles)). The name is separated on both sides by double quotation marks (“Forest Code of the Russian Federation” dated 04.12.2006 N 200-FZ). The symbol «№» is sometimes replaced by «N».	The main problem in drafting international treaties is the need for precise and uniform use of symbols.
6. Lexical features:	Set expressions («on behalf of»), borrowings («status quo»), abbreviations, terms in the literal sense, double synonyms («claims and	Set expressions («от имени» – «on behalf of»), borrowings («аккредитив» – «letter of credit»), abbreviations (УПК РФ – Criminal	The rendering of double synonyms in English involves searching for an equivalent in Russian. For example: «claims and differences» (in British law) – «claims and disagreements» (претензии

	differences»), polysemantic units («premises», «claim»).	Procedure Code of the Russian Federation), terms in their direct meaning, official, limited lexical compatibility.	и разногласия) (in Russian law).
7. Grammatical features:	Complex sentences, passive voice, simple complex sentences, «shall» to express responsibility, various forms of transferring responsibility, complex infinitive constructions.	Complex sentences, passive voice, simple complex sentences, performatives («гарантирует» – «guarantees», «обязуется» – «undertakes»), constructions with derivative prepositions.	The transfer of performatives from Russian to English necessitates the use of modal verbs («shall», «undertake») or other constructions. For example: «Продавец обязуется поставить...» («The seller shall undertake to supply...») (in Russian law) – «Seller shall be obliged to supply...» (in British law).
8. Transmitting conditions:	The use of «should», «where», «in the event (of)», «in case (of)», «provided that», «unless», «except as otherwise provided».	The use of «in case», «if», «provided».	Choosing the most appropriate construction to convey the condition in English. For example: «в случае изменения размера...» («in case of a change in size ...») (in Russian law) – «In the event of a change in the size ...» or «Should the size change ...» (in British law).

The main problem of drafting international treaties is the distinctive features of the linguistic and structural construction of documents. In the same way, the use of passive constructions in Russian law, in contrast to active ones in British law, complicates the precise transfer of content in translation. Thus, it seems appropriate to propose standardization of linguistic formulas and structural elements for drafting texts of international treaties. The development of universal models that take into account the features of the Anglo-Saxon and Romano-Germanic legal systems (families) will reduce the misinterpretation of the “letter of the law”.

The development of a single stylistic and structural standard for international treaties in the two legal systems will not only minimize linguistic and structural differences, but will also contribute to greater legal clarity and predictability. It is necessary to take into account the peculiarities of the linguistic cultural tradition, to apply universal legal clichés and formulas that have already proven their effectiveness in the international practice of concluding agreements.

Summarizing the above, we can conclude the following. Linguistic and structural features of the conclusion of international treaties largely determine their legal force, interpretation and application in legal practice. British law is dominated by formalism, standardization of language structures and a high level of use of clichés and phraseological units, ensuring the accuracy and unambiguity of the text. At the same time, Russian law is characterized by ambiguous definitions of concepts, passive constructions and formulations reflecting a strict normative approach and a high level of detail in the text of an international treaty. Thus, there is a need to develop unified standards for the formulations and structural elements of the text of an international treaty, taking into account the features of the British and Russian legal systems, in order to reduce the risks of misinterpretation and the emergence of legal conflicts.

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关于内村完造《基督徒的慰藉》的理解困难
**ON THE DIFFICULTY OF UNDERSTANDING UCHIMURA
KANZO'S WORK "THE CONSOLATION OF THE CHRISTIAN"
(KIRISUTO SHINTO NO NAGUSAME)**

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摘要. 本文探讨了理解内村完造作品《基督徒的慰藉》的问题。首先，由于内村完造的著作中没有直接提及任何历史事件，作者也未对其进行阐释，而只是间接地暗示，这使得理解该作品的背景更加困难。其次，《基督徒的慰藉》与内村完造早期其他作品联系紧密，因此，理解一部作品必须置于其他作品的背景之中。本文试图揭示该作品创作历史的独特之处：民族主义情绪的滋长、民族主义者与基督徒之间的冲突以及内村完造个人的负面经历，并揭示该作品与这位思想家其他著作的相似之处。

关键词：内村完造，《基督徒的慰藉》，基督教，日本，日本基督教。

Abstract. The article explores the problem of understanding Uchimura Kanzo's work "The Consolation of a Christian". First, the fact that Uchimura's book does not contain any direct indications of historical events and the author does not interpret them, only indirectly hints - makes it much more difficult to understand the context of the work. Secondly, "The Consolation of the Christian" is in close connection with other early works of Uchimura, therefore, to understand one book it is necessary to immerse oneself in the contexts of other books. In this paper we have tried to reveal the peculiarities of the history of the book's creation: the growth of nationalist sentiments, the conflict between nationalists and Christians, Uchimura's personal negative experience - and to reveal in what aspects parallels with other books of the thinker are revealed.

Keywords: *Uchimura Kanzo, Consolation of the Christian, Christianity, Japan, Japanese Christianity.*

Understanding “The Consolation of the Christian” through a historical context

Uchimura Kanzo (1861-1930) is a prominent Christian thinker in late nineteenth- and early twentieth-century Japan; he is one of the pioneers of this endeavor along with such figures as Ebina Danjo and Uemura Masahisa. His journey of becoming a Christian, his struggle with his own doubts and Japanese values allowed him to form a unique philosophical system, an important part of which is the concept of non-church Christianity (Mūkyokai). And to better understand the work of Uchimura Kanzo, and in our case to study it, we need to immerse ourselves in the historical context.

The reason for this necessity is that in the book Uchimura describes his own experiences and emotions without any factual details. This is a remarkable feature of the narrative, because unlike his subsequent work “How I Became a Christian”, Uchimura gives virtually no preamble to the material presented, but speaks metaphorically or alludes to certain events without specifics (year, place, names, etc.), stating the essence of the problem, but not the circumstances preceding it. Perhaps in this way Uchimura is trying to distance himself from the events of which he was accused, so as not to be defamed again after the book’s publication for using names; or he is trying to distance himself from the facts in order to generalize the text as much as possible and make it more understandable and close to the audience. Both interpretations, in our view, have a place both separately and in combination. However, this approach by Uchimura complicates the understanding of the text, which also necessitates immersion in history.

The Christian thinker was born in 1861 into a samurai family, so he received an appropriate Confucian education, about which he spoke highly in adulthood. From childhood Uchimura was characterized by a high degree of religiosity, and his autobiography shows with what reverence and zeal he regarded shinto rites and deities. His first introduction to Christianity was not fully realized and was prompted by an interest in the exotic culture of the West. As he writes himself, a friend invited him to a meeting where beautiful women sang and a man with a beard shouted and howled [Uchimura 1908, 10].

In 1877, Uchimura enrolled in a Methodist institution, the Sapporo Agricultural School, founded in 1876 by William Smith Clark. This was five years after his first forays into the Christian ministry, and for his first year he was encouraged to embrace his faith in Christ. After accepting Christianity, Uchimura was relieved that he no longer had to worship eight myriads of kami, but only one God. Together with his six companions in his second year, he formed a “little” church within the institution, where they took turns acting as pastors [Uchimura 1908, 23-24].

Already at these first steps in school life, Uchimura saw the weakness and inconsistency of denominational existence, reflecting on the obscurity of the distinction between the Methodist and Episcopal churches, for they all worship the same God and are uniformly baptized. He and his friends tried to form an independent church, but his attempts were unsuccessful due to opposition from other churches, which only nurtured Uchimura's thinking about the wrong church structure.

From 1884 to 1888, Uchimura studied in the United States, where he first encountered the lie about the kingdom of God that had already come upon the Christian land of the West. He became disillusioned with Christ, for America was quite different from the way it had been described: theft, rudeness, poverty, greed, and contempt for Asians were what he encountered there [Uchimura 1908, 104-105]. But he was soon able to regain his faith, thanks to a married Quaker couple.

When Uchimura returned home after his trip to the United States, he took a job as a teacher at the preparatory institution of Tokyo Imperial University, the First High School - that is when the incident of Uchimura Kanzo's disrespect occurred. It was connected with the adoption of a rescript on education to which educators were to pay religious honors, since the emperor of Japan was identified with a deity. For a Christian this is impossible, so many Christian educators simply did not show up on the appointed day, citing illness. Uchimura, however, showed up and made a brief nod toward the rescript, which caused discontent both from the Christian churches, who saw it as a betrayal of Christ, and from Japanese nationalists like Inoue Tetsujiro, who saw the brief nod as a sign of disrespect for the emperor. Inoue writes in one of his works on this subject: "The disloyal and unfaithful Uchimura Kanzo has already insulted the Son of Heaven, and such a person is no longer a citizen of Japan" [Inoue 1891, 65]. After the incident, Uchimura was dismissed, his second wife, Uchimura Kazuko, died of illness, and he suffered poverty, despised by Christians and countrymen alike, which resulted in his first semi-philosophical, semi-autobiographical work, "The Consolation of a Christian" (*Kirisuto shinto no nagusame*).

As we can see, the origins of Uchimura's first Christian work lie simultaneously on two planes. On the one hand, this systematic process, the idea of rejecting the church; the realization that Japan needs its own version of Christianity, stems from his biography, from the life circumstances in which he had to exist and which, having reached an extreme point, culminated in the book. In fact, the content of the book focuses directly on the solution of the problems he faced: When you lose the beloved [lit. When you lose what you love] (*Aisurumono no useshi toki*); When your compatriots abandon you (*Kokujin ni suterareshi toki*); When you leave the Church (*Kirisuto-kyokai ni suterareshi toki*); When your business collapses (*Jigyō ni sippaisheshi toki*); When poverty approaches (*Hin ni semarishi toki*); When a terminal illness strikes [lit. When sick with an incurable disease] (*Fujin no yamai*

ni kakarishi toki). On the other is the pressure of the historical situation, the rise of nationalist views and conflict between Christian and nationalist intellectuals, and Uchimura's sense of guilt for remaining aloof from these disputations. In "The Consolation of a Christian" he metaphorically alludes to this: "If the battle for Zion is in full swing, I am a useless soldier in it, that sits at home alone and watches the sweating horses run from east to west, and only hears the war cries and the rattle of drums somewhere in the distance" [Uchimura 1893, 117].

Understanding "The Consolation of the Christian" through other early writings by Uchimura

In addition to the historical context in understanding the book, it is necessary to delve into the creative context, that is, to relate "The Consolation of a Christian" to Uchimura's other early works such as "In Search of Peace" (*Kyūanroku*) (1893), "How I Became a Christian" (1895), and "Japan and Japanese"² (1894). "How I Became a Christian", "The Consolation of a Christian", and "In Search of Peace" are three autobiographies by the author that touch on common themes and complement each other's content. And since they were all written at the same time, even though they were published at different times, rhetoric runs through them as a through thought. Thus in "How I Became a Christian" we see the origins of Uchimura's churchlessness reflected in the philosopher's school years, while in "The Consolation of a Christian" he already presents a more mature and meaningful view of the church. When reading the books separately, it is not always possible to understand the content, because what is described in one work is not described in another. For example, in chapter five, Uchimura writes:

"I ask you, rich man of this world, does your brocade, your pavilion, your table, your 'house' (if you also have a 'house') give you pleasure or not?" [Uchimura 1893, 112-113]. The word "home" here is spelled *homu* "ホーム", thus alluding not to a dwelling or building, but metaphorically denoting a certain place where one finds one's peace of mind.

However, we cannot understand this from the content, since he describes "hōmu" in "*Kyūanroku*": "Home is not the place where I seek peace, but the place that gives it; home is the place where happiness is preserved, not the place where it is obtained; the home that is sought will always be destroyed; the home that is given is the only happy home" [Uchimura 1947, 56-57].

Or another example that reveals the meaning laid down by the author. "The cherry blossoms in Todai and the wisteria in Kameido pollute themselves with ochre." Todai is probably the Buddhist temple of Toji, popular for its cherry blossoms, and Kameido the shinto temple of Kameido Tenjin, which is popular for its wisteria blossoms and which Uchimura very likely went to as a child. The deity worshipped at Kameido Temple is Tenma Daijizai Tenjin, also known as the

² In other editions of "Representative men of Japan".

deity of knowledge. In his autobiography, Uchimura writes, “The god I revered and adored most was the god of knowledge and writing” [Uchimura 1922, 8]. Given that both Uchimura’s childhood residence and the temple were located in approximately the same neighborhood of Edo (Tokyo) - in modern parlance the Bunkyo district - it is likely that he was referring to this deity and this temple. The phrase implies the fixation of religions on the cult of ancestors and funeral rites. We think so because ochre is spelled *kūwado* and alludes to funeral ceremonies, as in many cultures, including Japan, the body of the deceased was sprinkled with ochre. Also, the archaic meaning of *kūwado* is the afterlife; a person who has gone underground, etc.

Regarding the book “Japan and the Japanese”, thanks to it we can distinguish the objects of Uchimura’s inspiration, as it is dedicated to old Japan and focuses on prominent people of the country, to whom Uchimura definitely gravitates: Saigo Takamori Uesugi Yozan, Nonimiya Sontok, Nakae Toju and Nichiren. Thus, we can trace the influence of Saigo’s texts on Uchimura on the issue of patriotism. At the beginning of the second chapter, Uchimura writes: “Love of the motherland is a loyalty embedded in human nature” [Uchimura 1893, 23]. In our opinion, this expression is similar to that in the work “Instruction of Nanshu” (Nanshu *ōikun*) by Saigo Takamori. Saigo writes: “The extensions of human wisdom are love of the motherland” [Saigo 1893, 5]. In this case, “wisdom” is Chinese. *zhì* 智 - should be understood in the Confucian sense. According to Uchimura, Saigo was a follower of the school of neo-Confucian philosopher Wang Yamning, who understood wisdom as knowledge given to man from birth, and the attainment of this wisdom is possible through self-cultivation turned to one’s own heart. Thus, Uchimura’s and Saigo’s statements take on an identical character, for love of the motherland comes from the essence of man in the one case and the potential wisdom within the heart in the other. This idea is also emphasized by Uchimura’s further words that patriotism is inherently inherent, not taught from the outside. Confucianism, like Neo-Confucianism, divides knowledge into innate and learned knowledge, thus in both cases patriotism is equated with the same innate knowledge.

As we can see, immersion in Uchimura’s other writings is also an important factor in understanding his thought, as is historical context. Uchimura’s florid and sometimes circuitous thought is leveled and becomes clear when we embrace it in its entirety rather than in isolation.

Conclusion

In conclusion, let us summarize the results of our study. We have tried to summarize Uchimura’s life before writing his first book and to highlight those moments that are reflected in *The Consolation of a Christian*.

First, his journey of becoming a Christian, and where he encountered misunderstanding of the church and contempt of Asians in the West.

Second, the incident of disrespect followed through the difficulties in the thinker's life - death of his wife, poverty, illness, etc. - to which his first work is actually dedicated.

The second aspect is a parallel proofreading of ideas from other early works by Uchimura, where each epitomized a particular part of his life. The most consonant with the work under study in the matter of ideas, in our opinion, is "How I Became a Christian", as it already re-emphasizes and supplements the thoughts that the author presented in "The Consolation of a Christian"; they are emphasized by him from the point of view of historical retrospect. "Japan and the Japanese" and "In Search of Peace" are a little more detached, but the former contains Uchimura's sources of inspiration and between the lines complements his nationalistic statements; and the latter is more related to Christian philosophical thought and further reveals its compensatory function.

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俄罗斯复杂的人道主义法医检查：方法论问题
**COMPLEX HUMANITARIAN FORENSIC EXAMINATION IN
RUSSIA: PROBLEMS OF METHODOLOGY**

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摘要. 本文致力于分析俄罗斯复杂人道主义法医鉴定的方法论，探讨其在司法实践中如何落实《俄罗斯联邦刑法典》第282条，并批判性地探讨其他作者提出的方法论解决方案和方法技巧。复杂法医鉴定需要运用两门或多门学科的方法来查明犯罪的情节和性质，这要求对专家的权限进行严格划分。本文指出了与评估不同专业领域专家知识界限相关的典型问题。

关键词: 法医鉴定、宗教学、语言学、心理学、宗教极端主义、专业划分。

Abstract. *The article is devoted to the analysis of the methodology of complex humanitarian forensic examination in Russia, related to the implementation in judicial practice of Article 282 of the Criminal Code of the Russian Federation and criticism of the methodological solutions and methodological techniques proposed by other authors. Complex forensic examination involves the use of methods of two or more sciences that allow establishing the circumstances and nature of the commission of a crime, which presupposes a significant delimitation of the powers of experts. The article indicates typical problems of this kind related to the assessment of the boundaries of expert knowledge of different specialties.*

Keywords: *forensic examination, religious studies, linguistics, psychology, religious extremism, demarcation of specialties.*

The problem of complex expert opinions has attracted the attention of scientists and practitioners almost since the emergence of forensic examination. It is certain that humanitarian examination before the start of procedural regulation of forensic expert activity was extremely uncertain, and at present this situation is aggravated by various methodological problems. At the time of preparation of this article, more than 120 articles devoted to the regulation of complex humanitarian

forensic examinations were found in the Russian database of scientific publications, but most of them boil down to a retelling of the relevant articles of Russian procedural legislation and/or an analysis of the role of a linguist and special linguistic knowledge in their preparation.

However, in the practice of criminal cases related to Article 282 of the Criminal Code of the Russian Federation, it is often necessary to turn to religious studies and psychological expertise, where experts of the relevant specialties are involved to perform tasks related to their professional competencies.

In modern legal practice, work with evidence requires the use of professional or special knowledge that the subjects of legal proceedings do not have. The use of such knowledge and the implementation of proof have a common nature for all types of offenses, which allows for the formation of a comprehensive examination that allows for the evaluation of evidence in a case from the point of view of various sciences.

It should be remembered that the use of examinations carried out within the framework of individual scientific disciplines does not always require combining them into one expert opinion. According to Russian legislation, several examinations can be carried out on the same case, assessing different circumstances of the case, including the mental state of the subject who committed the crime (psychiatry), the presence of motives for committing the crime (psychology), his religious views and their compliance with the ideology of a certain religious association or religious movement (religious studies), the presence or absence of signs of extremism in texts and statements (linguistics), etc. Such examinations are carried out independently, as separate conclusions, and can be used as a set of evidence.

Also, a study carried out by a committee of experts of one specialty should not be considered a comprehensive examination, since it does not include reference to the achievements of other sciences. Thus, a study of religious literature can be carried out by religious scholars to prove its religious nature (philosophy and methodology of religious studies), to establish affiliation with a certain religious structure (comparative religious studies), to assess the possibility and quality of influence on the consciousness of the subject (psychology of religion), but in general, all of the above parts of the study constitute a complex of religious studies and are carried out by religious experts or one specialist with the necessary competencies. The study can be carried out either by one expert who is proficient in these methods, or by different experts, each of whom specializes in a particular method, but all of them, being specialists in fingerprint examination, are proficient in other research methods.

A comprehensive examination is usually called a study, the issues of which cannot be resolved on the basis of one branch of expert knowledge, boundary tasks, where the solution of boundary issues is necessary to establish the circum-

stances of the case. Such an examination is carried out by several experts of different specialties. The procedure for its production in the Criminal Procedure Code of the Russian Federation is determined by Article 201, and the procedural status is fixed by Article 23 of the Federal Law “On State Forensic Activity in the Russian Federation”.

Thus, a comprehensive examination may be appointed if it is necessary to conduct research using specialized knowledge related to various types (types, sub-types) of examinations. The conclusion must indicate what research was conducted and what conclusions were obtained by each of the experts. At the same time, the comprehensive nature of the examination is determined by the presence of a general question that is not related to the specialty of each of the experts, which allows integrating the conclusions of the examination.

This understanding of a comprehensive forensic examination is confirmed by paragraph 12 of Resolution of the Plenum of the Supreme Court No. 28 of December 21, 2010 (PPVS) an explanation was given: “In necessary cases, when the study goes beyond the competence of one expert or a commission of experts, in accordance with Article 201 of the Criminal Procedure Code of the Russian Federation, a comprehensive examination may be ordered, carried out by several experts using different specialized knowledge. In this case, the experts draw up a joint conclusion. The experts’ conclusion must indicate what studies each expert conducted, what facts he personally established and what conclusions he came to.”³. Thus, it was emphasized that what is common to experts of different specialties participating in a comprehensive examination is the subject of the study, which consists of the question posed to the experts.

For example, in the production of an examination of a case of an extremist organization, the following experts may be involved: a religious scholar, a linguist, and a psychologist, who establish sequentially: a religious scholar - the presence of a connection between the materials under study and the doctrine and social attitudes of a certain religious organization, a linguist, who establishes the fact of the presence of incitement to hatred and enmity in the materials, and a psychologist, who establishes their direction. Such a comprehensive examination is called sequential, here the experts solve intermediate tasks with the formation of intermediate conclusions and form a final conclusion about the connection between incitement to hatred and enmity with the doctrine of a specific religious organization. Final tasks are understood as “tasks that are the main ones in this specific case and which, in essence, constitute the main meaning for the investigator (court) for the process of proof. Intermediate tasks include, without the solution of which it is

³ <https://rg.ru/documents/2010/12/30/postanovlenie-dok.html>

impossible to answer the final question”⁴ falls within the competence of an expert of only one specialty.

This approach gives rise to problems of the admissibility of an expert going beyond the limits of his/her special knowledge. It is important to note that an expert with special knowledge in certain sciences, for example, psychology and religious studies, which is confirmed by qualifying documents, can conduct an examination independently, without the participation of other experts, but from a procedural point of view, this is not a comprehensive examination. Thus, in the explanation of paragraph 12 of the Resolution of the Plenum of the Supreme Court of the Russian Federation it is noted: “If an expert has sufficient knowledge necessary for a comprehensive study, he/she has the right to give a single conclusion on the issues he/she is examining.” But the reference to Article 23 of Federal Law 73 of the Russian Federation clearly indicates the need for a commission of experts of different specialties⁵. In this case, the attitude of forensic experts to the issue differs. Thus, Y.K. Orlov, G.P. Arinushkin, Y.G. Korukhov and others believe that a comprehensive examination is primarily a legal concept and cannot be carried out by one expert, since this violates its specificity as a commission examination. A number of other authors N.A. Selivanov, R.S. Belkin, E.R. Rossinskaya approach a comprehensive examination from the standpoint of epistemology, where the defining feature is the need for cooperation of knowledge and the sole conduct of an examination should not cause obstacles.

The most relevant area of application of complex examinations is the analysis of speech and communication products that constitute the generalized object of examination of information materials, which requires an assessment of the information contained in the material (linguist) and their focus (psychologist). In the case of analysis of materials of a religious association, it is necessary to establish the third component: whether the information aimed at promoting exclusivity is theological or social. This is due to the key feature of any religion: its claims to its own exclusivity and sacred status, which presupposes a negative assessment of other faiths.

Currently, there are no approved methods for conducting complex humanitarian forensic examinations, and in this case, the expert study is primarily not formalized and represents a heuristic search for a solution to the problem posed to the expert.⁶ But such a search is associated with the risk of making errors that may prove critical for formulating the conclusions of the final study. Here are some examples.

⁴ Usov A.I., Edzhibov L.G., Miklyaeva O.V., Karpushina E.S. Problems of complexity in the theory and practice of forensic examination (theoretical analysis). Moscow: Federal Budgetary Institution RFCSE under the Ministry of Justice of Russia, 2015. – pp. 33–34.

⁵ <https://rg.ru/documents/2010/12/30/postanovlenie-dok.html>

⁶ Averianova T.V. Forensic examination. General theory course. Moscow: Norma, 2008. – p. 370.

The first example is related to the specifics of religious studies research. A.E. Nikitina in the article “Using the Results of a Comprehensive Linguistic-Religious Studies Forensic Examination in Investigating Crimes Under Article 282.2 of the Criminal Code of the Russian Federation” indicates that when ordering a comprehensive linguistic-religious studies forensic examination, investigators allow for a mixture of legal, linguistic, and religious studies knowledge and offers her own list of questions for the religious scholar in accordance with the objectives of Article 282 of the Criminal Code of the Russian Federation: 1) does the content of the presented objects relate to the activities of a religious association; 2) do the presented objects contain information of an extremist nature; 3) is the presented object material distributed among adherents of a religious organization; 4) Do the materials submitted for research contain information about any forms of activity of the religious organization’s functionaries (for example, conducting “daawat” (calls for extremist activity); issuing “takfir” (accusing Christians, Jews and Muslims of unbelief); using “bara” (rejection, disagreement, removal from “mushrikeen”, including physical punishment using a stick for beating), etc.); 5) Do the materials submitted for research contain theses from ideological sources and mention of the actual ideological sources of the religious organization; 6) Do the materials submitted show signs of cohesion, unity of purpose, hierarchy and structure, etc.⁷.

This list of questions is a typical “transfer” of questions related to the specifics of a particular religion to other religious communities. The social structure of a community is not always associated with extremist ideas; they may be the result of absolutization of individual ideas that are not shared by all representatives of the community; the need to establish the fact of their connection with the dogmatic provisions of the doctrine of this community is ignored, as well as the existence of religious communities whose affiliation with a religion is determined through the presence of ontological, rather than structural, foundations. Thus, the idea of the need to recognize Satanism as an extremist movement is not shared by all representatives of the Russian Orthodox Church, and this requirement is in no way connected with the dogmas of Orthodoxy, and representatives of a number of new religious movements, for example, recognized as an extremist organization Elle Ayat, do not consider themselves a religion, do not have a social structure characteristic of religious communities (division into several categories of believers in relation to access to the sacred), but, nevertheless, are a religious community from the point of view of ontological reality, recognized by believers.

⁷ Nikitina A.E. Use of the results of a comprehensive linguistic and religious forensic examination in the investigation of crimes under Article 282.2 of the Criminal Code of the Russian Federation // Improving criminal procedural and forensic measures to combat crime: materials of the international scientific and practical. conf. (November 29, 2022) / pred. editorial board M. M. Gorshkov. - Omsk: Omsk Academy of the Ministry of Internal Affairs of Russia, 2023. - pp. 140-143.

Thus, the author of the article offers an unfounded generalization of particular cases known to him from his own practice and the publications of colleagues on a common problem that cannot be solved within the framework of posing typical questions, since religious studies presupposes a significant variability of research objects. Of course, individual cases serve as a basis for the formation of typical methods, but it is important to take into account the boundaries of the professional competence of an expert within his specialty, as well as the diversity of narratives within the discipline.

Another case of the problem of expert research is associated with an attempt to form a methodology for religious studies research using methods of another expert specialty. Thus, M.V. Kashchayeva in the article “Linguistic paradigm of religious studies expertise (on the example of texts of meetings of “Jehovah’s Witnesses”)” suggests using methods of linguistic analysis in the practice of religious forensic expertise to evaluate the texts of confessional meetings⁸. However, the proposed approach is in conflict with the legal regime of expert activity, since it ignores the boundaries of expert competence, which is obvious when compared with Article 8 of Federal Law No. 73-FZ of 31.05.2001 “On State Forensic Activity”, which establishes the key limits of expertise.

It is interesting that the author suggests using a non-specific methodology under the pretext of weak evidence of the subject of religious studies expertise, the author suggests that religious scholars use methods of linguistic analysis, since we are talking about a text, and a text cannot be studied by a non-linguist. If we evaluate this maxim from the position of epistemology, then, in this case, the functioning of religious studies as a science is limited to the study of rituals presented as a text that can only be read by a religious scholar, who in turn does not have the opportunity to cognitively evaluate the doctrine that serves as the source of the ritual, since it is a text. In reality, in religious life there is no separation of practice and text, the specificity of religiosity is manifested in their relationship. The author limits himself to analyzing only the texts of meetings, ignoring the context of cult practice, organizational, legal and historical circumstances.

⁸ Kashchayeva M.V. “Linguistic paradigm of religious studies examination (on the example of texts of meetings of “Jehovah’s Witnesses”)” // *Siberia in the focus of historical, oriental and legal research. Proceedings of the Third All-Russian scientific conference dedicated to the memory of the famous scientist, teacher, educator and public figure, doctor of historical sciences, professor Alexander Vladimirovich Startsev (1956-2019)*. Barnaul, 2024. Pp. 103-113.

The author's position	Legal and methodological reality
Offers a religious scholar should conduct a semantic-stylistic, frequency, and discursive analysis of vocabulary ("hyperbolization of eschatological metaphors," "establishment of presuppositions," etc.).	According to Article 8 of 73-FZ, an expert is obliged to "conduct research... within the relevant specialty." Religious studies are related to the humanities and history, not to applied linguistics. The principle of «narrow competence» is violated.
Claims that linguistic tools are "sufficient" for religious studies conclusions.	In practice, the court receives a conclusion that cannot be re-checked without the involvement of an additional linguist; thus, the expert abdicates from the requirement of "verifiability" of the conclusions of the same Article 8 (clause 2: conclusions must be based on generally accepted data).

Another significant problem with the text is the incorrect appeal to psychological criteria of the influence of the text: the expert begins to deduce psychological effects, although this is the subject of competence of a forensic psychologist.

The author evaluates: "the intensity of emotional impact"; "the formation of an attitude of submission to authority"; "the level of cognitive isolation of the audience". These criteria relate to the psychological analysis of the influence of the text on the individual. But, Article 8 of 73-FZ again requires staying within the boundaries of the specialty. In judicial practice, such issues are resolved either by a comprehensive examination (religious scholar + linguist + psychologist), or by successive examinations of different types.

The author's lack of qualification in psychology and linguistics entails the risk of recognizing the conclusions as unfounded. The article demonstrates a violation of the principles of objectivity and completeness of expert research (Article 8 73-FZ). Linguistic techniques (semiotics, corpus modeling) are used that are not verifiably described by the author; there is no list of linguistic sources and programs, which excludes replication. The following principles of conducting examinations are ignored:

Objectivity – reliance on verifiable, scientifically recognized methods – a religious scholar who does not possess the principles of linguistics, as well as a linguist who is not a religious scholar, cannot verify the conclusions of a colleague;

Completeness – the research is "in full", the author does not cite any sources other than textual ones, which is unacceptable for religious studies analysis within the framework of a forensic examination under Article 282 of the Criminal Code of the Russian Federation;

Comprehensiveness – the question of the need for a comprehensive examination is not raised, although the conclusions themselves are based on mixed disciplines.

In judicial practice, the described errors entail the recognition of this examination as inadmissible evidence - the conclusion can be excluded due to exceeding the limits of competence (Part 3 of Article 17.3 of the Code of Administrative Offenses of the Russian Federation, Part 2 of Article 55 of the Civil Procedure Code of the Russian Federation, Part 1 of Article 75 of the Criminal Procedure Code of the Russian Federation) and the appointment of a repeat/additional examination.

Thus, conducting a comprehensive humanitarian forensic examination is one of the most important practices of modern legal proceedings, necessary for establishing all the circumstances of the case, and the quality of the methodological approach of experts to solving the tasks set before them requires not only specialized knowledge within the framework of the expert's own specialty, but also a significant amount of legal competence.

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“一带一路”倡议下中俄跨文化交流的可持续发展模式研究

**RESEARCH ON THE SUSTAINABLE DEVELOPMENT MODEL
OF SINO-RUSSIAN CROSS-CULTURAL EXCHANGE UNDER THE
BELT AND ROAD INITIATIVE**

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本文聚焦“一带一路”倡议背景下中俄文化艺术合作，旨在全面剖析其发展现状、深入挖掘面临挑战并提出针对性推进路径。相关研究契合“一带一路”促进中俄两国文化交流发展的时代需求，对深化中俄人文合作、丰富两国文化艺术交流理论与实践具有重要意义。创新性在于系统梳理中俄文化艺术合作历程，全面分析合作过程中多维度挑战，并从构建交流机制、加强人才培养合作、提升民间交流深度广度等层面创新性提出综合性推进策略，为中俄艺术文化合作持续发展提供新思路与理论支撑。

关键词：一带一路、中俄文化艺术合作、可持续发展模式、跨文化交流。

Abstract. *This paper focuses on the cooperation in culture and art between China and Russia under the background of the Belt and Road Initiative, aiming to comprehensively analyze its current development situation, deeply explore the challenges it faces and put forward targeted promotion paths. The relevant research meets the needs of the times for the Belt and Road Initiative to promote cultural exchanges and development between China and Russia, and is of great significance for deepening the humanities cooperation between China and Russia and enriching the theories and practices of cultural and artistic exchanges between the two countries. The innovation lies in systematically sorting out the history of cooperation in culture and art between China and Russia, comprehensively analyzing the multi-dimensional challenges in the cooperation process, and innovatively proposing comprehensive promotion strategies from the aspects of building an exchange mechanism, strengthening cooperation in talent cultivation, and enhancing the depth and breadth of civil exchanges, thus providing new ideas*

and theoretical support for the sustainable development of cultural and artistic cooperation between China and Russia.

Keywords: *Belt and Road Initiative, China-Russia cultural and art cooperation, sustainable development model, cross-cultural communication.*

I. New Developments in the Cooperation between Chinese and Russian Art and Culture under the Belt and Road Initiative

The construction of the Belt and Road Initiative adheres to the principles of extensive consultation, joint contribution and shared benefits. Its core goal is to promote economic cooperation and development between China and neighboring countries, help neighboring countries achieve development on a broader and deeper level, and thus form a development path with Chinese characteristics. In this initiative, cultural exchange occupies a crucial position. The Belt and Road Initiative attaches great importance to cultural exchanges between China and neighboring countries, aiming to promote the transformation and development of Chinese culture through cultural interaction and integration, and at the same time build a bridge of trust for countries along the line, enhance mutual understanding and friendship.

Against this macro background, Sino-Russian cooperation has attracted much attention from the national leadership in recent years. Driven by relevant policies, Sino-Russian relations have shown a good trend of stable development, exchanges between the two countries have become increasingly frequent, and cooperation in the field of art and culture has also been continuously strengthened. To further promote exchanges in art and culture between the two countries, the cultural departments of China and Russia signed the “Cooperation Plan between the Ministry of Culture of the People’s Republic of China and the Ministry of Culture of the Russian Federation for 2011 - 2013” [1], providing a solid policy guarantee for the exchange of art and culture between the two countries. Under such circumstances, exploring the construction of art and culture between China and Russia has become an inevitable trend in the exchanges between the two countries, and talent cultivation in universities plays a key role. Universities should be oriented towards the friendly relations between China and Russia, explore characteristic school-running models, and promote the friendly exchange and construction of art and culture between China and Russia.

Both China and Russia have in-depth research on the development of realistic fine arts and contemporary art. Artists of the two countries are committed to presenting their own traditional culture and real life, enabling the public to deeply understand the inheritance and development of ancient Silk Road art in the contemporary era, and looking forward to the future of the fine arts cause of the Belt and Road in the integration of tradition and reality. Under the Belt and Road Initiative,

excellent traditional culture has been widely spread abroad. The inclusiveness of culture enables China and Russia to learn from each other in excellent culture, laying a solid foundation for the diversified development of culture and the construction of art and culture in the two countries [2]. At the same time, the Belt and Road Initiative has built an important platform for cultural exchanges between the two countries. Rich and diverse cultural activities have promoted further integration of the cultures of the two countries, deepened the mutual understanding of the traditional cultures of the two peoples, and played a positive role in enhancing the friendship between the two countries.

Since the 21st century ushered in the Putin era in Russia, the strategic partnership between China and Russia has been continuously deepening across multiple dimensions. Political mutual trust has soared to unprecedented heights, serving as a solid foundation for advancing cooperation in military, economic, trade, and particularly cultural realms. Russian President Putin has consistently pursued a balanced foreign policy that prioritizes China, evident from his first overseas visit to China in July 2000 following his inauguration. During this pivotal visit, the two nations' leaders signed the "Beijing Declaration of Asia," charting a comprehensive framework for bilateral development in the new century. The subsequent signing of the "Treaty of Good-Neighborliness, Friendship and Cooperation between China and Russia"[3] in 2001 by then Chinese President Jiang Zemin and Putin not only legally enshrined the promotion of exchanges and cooperation in diverse fields such as culture, education, health, information, tourism, sports, and law but also injected substantial momentum into the all-round development of Sino-Russian relations, marking a historic milestone. Subsequent joint statements, including those in 2002, 2009, and 2010, have consistently emphasized the critical role of cultural exchanges, such as the "Language Year" initiative, in enhancing mutual understanding, trust, and friendship between the two peoples, thereby further consolidating the strategic partnership.

Since 2012, Sino - Russian cultural and people - to - people exchanges have witnessed remarkable progress under the leadership of Presidents Putin and Xi Jinping. After Putin's re - election in 2012, then Chinese President Hu Jintao's visit in June of the same year led to the issuance of a joint statement, which commended the successful humanities cooperation through events such as the Year of Russia, the Year of China, and the Tourism Years. These events not only retained national features but also facilitated mutual learning. In 2013, newly - elected President Xi Jinping and Putin signed a joint statement highlighting the importance of youth exchanges, which gave rise to the "Year of Youth Friendship." In June 2016, during Putin's state visit to China at Xi's invitation, they released a new joint statement that recognized the positive influence of previous cultural years (including the National, Language, Tourism, and Youth Friendship

Exchange Years) in promoting extensive exchanges in the humanities field and enhancing mutual understanding between the two peoples. From 2016 to 2017, the “Media Exchange Year” injected new energy into Sino - Russian cultural exchanges. The two countries committed to promoting cooperation in multiple fields like education, culture, health, sports, media, tourism, film, archives, and youth exchanges via official and folk platforms. Russian Foreign Ministry spokesperson Maria Zakharova pointed out that after the 2016 - 2017 Media Exchange Year, there would be seamless cooperation continuation in the media and humanities fields [4], and she also emphasized the need to increase reciprocal reporting intensity, which had been insufficient in the 1990s.

China - Russia cultural cooperation upholds the “bringing in” and “going global” principle. From 2018 - 2022, at Russia’s State Historical Museum’s invitation, Shaanxi History Museum planned to hold its treasure exhibition there to mark the Russian museum’s 150th anniversary, aiming to boost bilateral cultural exchanges and cooperation, with negotiations on details like exhibition period and artifacts, and hopes for further ties in museum management and cultural relic protection[5]. In March 2023, during Xi Jinping’s state visit to Russia, the two countries’ presidents signed a statement to expand cooperation in multiple fields and promote humanities exchanges[6]. In 2024 - 2025, the China - Russia Cultural Year was established, with the “China - Russia Cultural and Art Exchange Organizing Committee” set up at its unveiling and a youth calligraphy and painting art exchange exhibition launched[7]. In February 2025, Jilin Provincial Artists Association and Saint Petersburg Artists Association signed a strategic cooperation agreement in Changchun to promote art - creation exchanges and the integrated development of Chinese and Russian fine arts.[8]

II. Challenges and Promotion Paths of Cultural and Artistic Exchanges between China and Russia

From the initial stage of cultural and artistic exchanges between China and Russia to the in-depth cooperative development under the Belt and Road Initiative, although remarkable achievements have been made, this process has not been smooth sailing. At present, cultural and artistic exchanges between China and Russia still face multiple challenges, which are specifically reflected in the following aspects:

(1) Limitations and misunderstandings in cultural cognition

Despite deepening political and economic ties, significant cultural gaps persist between the Chinese and Russian people, hindering mutual understanding. Many Chinese, especially the younger generation, still associate Russian culture primarily with 19th-century icons like the “Natural School” in literature, the “Peredvizhnik” in painting, and Eisenstein’s montage in film[9], while remaining largely unfamiliar with contemporary Russian cultural achievements. Similarly, Russian

perceptions of Chinese culture often lag behind modern realities, with some harboring outdated views or even prejudices, as evidenced by a 2016 Russian TV poll showing 69% of respondents viewing China as a threat[10]. Such cognitive biases obstruct cultural exchanges, underscoring the need—emphasized by Chen Haosu, head of the Chinese People’s Association for Friendship with Foreign Countries—for stronger civil society foundations to complement the high-level governmental partnership.[11]

(2) Imbalance in cultural and artistic exchanges between China and Russia

Despite growing official cultural exchanges between China and Russia—including frequent agreements, festivals, and exhibitions—the focus remains heavily on state-level initiatives, leaving grassroots cultural interaction relatively weak. This imbalance means that while governments promote collaboration, ordinary citizens lack meaningful platforms to engage deeply with each other’s traditions, perpetuating misunderstandings and cultural divides. The core issue lies in both nations’ insufficient direct exposure to each other’s arts and insufficient grassroots connectivity, which hinder the organic breakdown of stereotypes and mistrust.

In order to effectively promote the harmonious coexistence of Chinese and Russian culture and art, and explore the rational path and sustainable development model of contemporary cultural and artistic exchanges and integration between China and Russia, the following aspects can be considered:

(1) Build an equal and mutually beneficial cultural and artistic exchange mechanism

Cultural exchanges between China and Russia should uphold equality, mutual respect, and inclusiveness. China must strengthen cultural self - confidence during such exchanges, inheriting and innovating its traditional culture while learning from Russia without excessive imitation. When promoting Chinese culture globally, it should share traditional values and enhance international influence via exchanges. Meanwhile, Russia should respect China’s cultural features, better understand contemporary Chinese culture, and foster the joint development of both countries’ cultures on the basis of difference - respect. An equal and mutually beneficial exchange mechanism is needed to prevent one - sided cultural flows and ensure in - depth, sustainable China - Russia cultural and artistic exchanges.

(2) Strengthen cooperation in the cultivation of Chinese and Russian art talents

Talent cultivation is vital for long - term cultural and artistic exchanges between China and Russia. The two nations should jointly foster art talents with an international perspective by deepening educational cooperation. In higher education, they need to enhance college - to - college exchanges, especially build cross - border art research platforms to facilitate teacher - student interaction, enabling art students to quickly grasp each other’s art traditions and innovative achievements. Moreover, social art education matters too. Joint art exhibitions, touring

performances, and festivals should be held to encourage artists to practice in society, spread their cultures, and through bilateral and multilateral art - exchange platforms, cultivate art disseminators with international vision and cross - cultural backgrounds.

Conclusion

Under the impetus of the Belt and Road Initiative, the prospects for cooperation in art and culture between China and Russia are broad, and phased achievements have been made. Policy guidance has led to frequent official cultural exchanges between the two countries, creating a good platform. However, at present, the cooperation is facing challenges such as limitations in cultural cognition, imbalanced exchanges, and the influence of the market on artistic creation. In response to this, building an equal and mutually beneficial exchange mechanism is the foundation, strengthening cooperation in the cultivation of art talents is the key, and enhancing the depth and breadth of civil cultural and artistic exchanges is the core. The coordinated advancement of multi-dimensional strategies will enable the cooperation in art and culture between China and Russia to break through bottlenecks and achieve in-depth and sustainable development. It will not only enrich the connotations of the art and culture of the two countries and enhance the friendship between the people, but also inject cultural impetus into Sino-Russian relations, provide a model for cultural exchanges under the Belt and Road Initiative, and promote the common prosperity of diverse cultures.

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多民族青年环境中的宽容（以俄罗斯联邦民族大学学生为例）
**TOLERANCE IN A MULTI-ETHNIC YOUTH ENVIRONMENT
(ON THE EXAMPLE OF STUDENTS OF ROSTGMU)**

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摘要. 本文探讨了全球化背景下年轻一代的社会适应问题。社会原子化和生活数字化的环境加剧了破坏性行为的危险，因此，作者从心理、社会和教育角度探讨了如何培养相互尊重、政治正确性和同理心。本文还分析了一项社会学研究的结果，该研究旨在探讨俄罗斯国立管理大学（RostSMU）大三和大四学生的宽容度及其影响因素。

关键词： 宽容、不宽容、适应、多民族环境。

Abstract. The article examines the current problem of social adaptation of the younger generation in the context of globalization. Social atomization, digitalization of life is an environment in which the risks of destructive behavior increase, therefore, the authors consider the psychological, social and educational aspects of fostering respect for each other, political correctness, empathy. The article also analyzes the results of a sociological study devoted to the study of the level of tolerance of students of junior and senior courses of RostSMU, and the factors influencing it.

Keywords: tolerance, intolerance, adaptation, multiethnic environment.

Young people today, thanks to modern technologies, live in a situation of constant interaction with representatives of other cultures, races, ethnic groups, studying, doing business with them, or simply communicating on the Internet. This communication is truly multifaceted and diverse. At this age, young people are particularly susceptible to the destructive stereotypes that already exist in their family or friendly environment. In 2021, UNESCO conducted a study according to which 40% of young people face ethnic prejudice at school. Ethnic problems are exaggerated by the digital environment in which they are totally immersed. On the

Internet, filter bubbles often radicalize extreme views and marginalize minority opinion. The lack of personal communication exacerbates the situation, especially in areas with low mobility and lack of social elevators. The lack of opportunities to compare cultures, cyberbullying, and the dominance of extremist content pose risks of insufficient political correctness and empathy for the unfamiliar. Currently, in contrast to the processes of globalization, ethnic factors are being actualized, leading to an increased impact of ethnicity on public consciousness, which can provoke an increase in intolerant sentiments in society, creating a risk of conflicts on ethnic grounds and thereby threatening the political stability of society and the integrity of the state. This determines the necessity and importance of interethnic tolerance among representatives of all peoples inhabiting Russia.

Tolerance is considered as the highest achievement of any civilized society in the field of interpersonal communication[1]. Nowadays, tolerance is one of the core values that are essential for strengthening civil society in Russia. The problem of developing tolerance is one of the most urgent. Young people are a strategic resource of the state and it is important to develop their ability to be tolerant. In our multiethnic region, it is of particular importance. Successful socio-psychological adaptation contributes to the harmonious development of a young person. "The process of socio-psychological adaptation starts automatically from the moment a teenager enters a new environment and includes several stages:

- the first stage is introductory, when familiarization with the new social environment, rules and norms of behavior inherent in this environment, etc. occurs;
- the second stage is status –role, in which the individual learns the roles corresponding to his own a new status;
- and the third stage is integrative – the stage of complete, harmonious inclusion and functioning of an individual in a given social environment (self-affirmation, self-identification)" [2, p. 123].

The purpose of the study is to study the level of tolerance among the students of RostSMU. Hypothesis. We assume that modern students are generally quite tolerant in interethnic interaction, but their level of tolerance varies and depends on the stage of social adaptation of the respondents at which they are currently. The research was conducted in 2 stages: 1st - the study and analysis of scientific sources on this topic, 2nd - empirical research and analysis of the data obtained. The object of the study were students of RostSMU. The sample consisted of 182 respondents (n=182), selected by the method of typical representatives. The respondents were divided into 2 groups: Group 1 - junior students (1st-2nd year) and group 2 – senior students (5th-6th year). The study used a questionnaire method, the tool was a questionnaire, which was compiled in accordance with the methodology of sociological research, using the principle of validity and including semi-

closed, closed and ranked types of questions. The comparative analysis method was applied in the analysis of the obtained results.

Considering the essence of the term “tolerance”, the majority of respondents (96% of the first group and 89% of the second group) defined it as tolerance. The level of tolerance, according to 70% of senior course respondents, depends on upbringing, and 59% of junior course survey participants consider the level of intelligence to be dominant. While the level of education, the region of residence, the views of parents and the social environment surrounding the individual were pushed back several positions by the respondents of both groups of respondents and scored almost the same number of votes – 13-15% each.

The absolute majority of respondents (99% in both groups) agreed with the statement that “there are no good and bad ethnic groups, but there are good and bad people.” Most of the survey participants rated their own level of tolerance on a 3-point scale at 2 points - 62% of senior respondents and 67% of junior respondents, and those who subjectively consider themselves “absolutely tolerant” should also be noted, such as 30% among junior respondents and 35% among senior respondents..

When determining attitudes towards interethnic marriages, the opinion of the respondents was divided. A significant part of the junior students - 45% - expressed a negative attitude towards them, and 40% - a neutral one. While the majority of senior respondents (58%) have a positive attitude towards interethnic marriages and only 22% are neutral, which indicates a higher degree of their adaptation in a multiethnic environment.

The majority of students in the first group identify themselves as a Russian citizen – 74%, while students in the second group identify themselves as both a Russian citizen and a citizen of the world – 59%.

Determining their level of adaptation in a multiethnic student community on a 10-point scale, the vast majority of respondents in both the first and second groups - 83% - chose a range from 7-10 points.

The most effective measure to increase tolerance and strengthen ties among multinational students, respondents of both groups consider holding joint holidays and events that introduce the customs, traditions and cuisine of various ethnic groups – 52% of undergraduates and 40% of undergraduates.

However, that’s why the undergraduates suggested fighting Nazi acts and punishing them harshly, and the senior respondents suggested entering into more interethnic marriages.

Young people understand tolerance as active respect, willingness to engage in dialogue, and rejection of destructive stereotypes. Of course, this is facilitated by university educational programs, which include many courses in cultural studies, history, political science, sociology, philosophy, geopolitics, etc. Joint social and scientific projects, debates, role-playing games, and trainings are the opportuni-

ties provided by higher education to expand the social, cognitive, and emotional horizons of young people.

In the course of the research, we were able to confirm the hypothesis put forward, and now we can safely say that as students grow up, their level of social responsibility increases, and their desire to strengthen tolerance in society increases. In our opinion, the institute of education plays a major role in the formation of interethnic tolerance among young people, which has a significant impact on the process of socialization of adolescents and youth.

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现代世界的数字通信

DIGITAL COMMUNICATIONS IN THE MODERN WORLD

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摘要. 本文探讨了数字通信在当今世界发展的意义及其特点。文中，作者关注数字技术发展的主要领域。本文探讨了数字通信发展的关键趋势——从通信网络的技术创新到社交平台的转型，以及人工智能融入通信流程的特点。

关键词： 数字通信、人工智能、数字化、新现实、数字技术。

Abstract. *The article discusses the relevance and features of the development of digital communications in the modern world. In the article, the author pays attention to the main areas of development of digital technologies. This article discusses the key trends in the development of digital communications - from technological innovations in communication networks to the transformation of social platforms, as well as the features of the integration of artificial intelligence into communication processes.*

Keywords: *digital communications, artificial intelligence, digitalization, new reality, digital technologies.*

Digital communications in the modern world have acquired the status of an integral infrastructure covering the majority of the world's population. Such a widespread use of digital communications has radically changed the ways in which people, organizations and states interact - from everyday communication in instant messengers to transnational business communications in real time.

However, the level of connectivity varies significantly in different regions and social groups. Internet use is closely related to the level of economic development. This gap highlights the need for further infrastructure development and digital literacy. However, the overall direction of progress is clear: digital communications are becoming more accessible and widespread.

One of the leading trends is the continuous growth of network coverage and population involvement in the digital space. The global Internet and mobile infrastructure is expanding in geographic coverage and bandwidth. In recent years,

there has been an accelerated connection of developing regions and remote areas to the Internet. It is important to emphasize that universal access has not yet been achieved, especially in the poorest countries and rural areas. However, the gap is gradually narrowing. At the same time, global initiatives such as UN programs and national digital development strategies are aimed at expanding infrastructure (e.g. laying submarine cables, launching satellite communication networks) and reducing the cost of access. The result of this trend is a gradual approach to the goal of universal connectivity, when everyone can take advantage of digital communications. In addition to human-to-human communications, machine communications are experiencing explosive development – the exchange of data between devices without human intervention, better known as the Internet of Things (IoT). The number of devices connected to the network is already in the tens of billions and continues to grow rapidly. These figures highlight the scale of the ongoing technological transformation, within the framework of which sensors, detectors and “smart” devices capable of independently exchanging information are being deployed everywhere. Examples of IoT implementation surround us everywhere. In everyday life, these are smart devices (thermostats, speakers, surveillance cameras) connected to the Internet and interacting with each other. In industry – sensors on equipment that collect telemetry and transmit it to centralized platforms for monitoring and analytics. In urban areas – intelligent control systems for lighting, traffic, energy and water supply that respond to changes in the environment in real time. The growth in the number of IoT devices poses new challenges for the digital communications infrastructure. The trend is clear - machine-to-machine communication is rapidly expanding. The Internet of Things is creating a new digital environment where data continuously circulates between objects in the surrounding world - almost without human intervention - creating the basis for autonomous systems and intelligent solutions. In the field of interpersonal and mass communications, the key trend of the last two decades has been the dominance of social networks and digital platforms. If in the beginning, the main means of online communication were email and forums, today the communication landscape is determined by global social media, instant messengers and video platforms. Current statistical studies demonstrate the scale of this phenomenon. Social networks have become a universal communication channel, comparable in coverage to mobile communications and television.

Digital communications are increasingly shifting towards multimedia and interactive content. In the era of broadband access, users prefer to share photos, videos and streaming broadcasts. Social networks are actively introducing new interaction tools - live broadcasts, interest groups, reactions and emojis, disappearing messages - expanding the arsenal of ways in which people can exchange information and emotions in the digital environment. One of the noticeable changes

has also been the way news and socially significant information are distributed through social platforms: today, a significant part of the audience gets news from social networks, where traditional media coexist with user-generated content. The rapid growth of social media has led not only to positive effects, but also to a number of problematic phenomena. Firstly, the volume of user information has given rise to the problem of information overload: it is increasingly difficult to identify reliable and valuable information in the flow of news and messages. Researchers note the phenomenon of “information inflation”, in which the value of an individual message decreases due to an excess of data. Secondly, the digital environment has proven vulnerable to the spread of false information and falsified content. Modern technologies make it easier to create “deepfakes” – photos, videos or audio that imitate real people – and other fake materials. This threatens the integrity of the content and user trust: there is a need to develop methods for verifying sources and checking the authenticity of information. Artificial intelligence is being integrated into communication processes on a large scale. Artificial intelligence (AI) is becoming an increasingly influential factor in the evolution of digital communications. Machine learning algorithms have long been used to select news feeds on social networks, recommend content and target advertising. The latest trend is the introduction of generative AI and intelligent agents directly into communication platforms. A striking example is the emergence of advanced chatbots and assistants that can maintain a meaningful dialogue with a person. The applications of AI in communications are diverse. In the corporate sector, chatbots take on the first line of communication with clients, automatically responding to typical requests and consultations. As a result, the efficiency of communication increases and the workload on staff decreases. Another example is machine translation systems, which overcome language barriers almost in real time, allowing people to communicate in dozens of different languages. AI also helps with content moderation: algorithms automatically filter spam, identify signs of insults or extremism in messages. Finally, generative models (in addition to text, they now create images, video, voice) open up new communication formats - from virtual interlocutors to personalized media messages generated for the interests of a specific user. In connection with these trends in the development of the digital environment, issues of security and privacy in digital communications are becoming especially relevant. As more and more personal and business interactions move online, the importance of data protection, encryption and trust between communication participants increases. One of the positive trends of recent years has been the introduction of widespread end-to-end encryption of data transmission. Thanks to the efforts of the tech community and initiatives like Let’s Encrypt, by 2023, over 80% of web traffic is encrypted (HTTPS protocol), and in the Google ecosystem of services, up to 95% of traffic is protected by encryption. That is,

the vast majority of connections on the Internet now occur over secure channels, which significantly complicates unauthorized interception of messages and theft of personal data. Likewise, popular instant messengers (WhatsApp, Signal, Telegram in secret chats, etc.) have implemented end-to-end encryption of messages, guaranteeing the privacy of correspondence for billions of users.

Great importance is also attached to the digital literacy of users: the ability to recognize suspicious messages, critically evaluate sources and adherence to basic rules of cyber hygiene when communicating online. Thus, ensuring security and trust is a prerequisite for the sustainable development of digital communications. Current trends in this area are aimed at ensuring that the communication environment remains secure, reliable and trustworthy for all participants. An analysis of digital communications development trends shows that we are in a phase of unprecedentedly fast and multifaceted progress. Global connectivity is steadily growing, approaching the goal of universal Internet access. Next-generation mobile technologies provide unprecedented speed and scale of connection, while communication between devices (IoT) is shaping a completely new information environment. Social platforms have changed the nature of human interaction, making it more open and instantaneous, but at the same time giving rise to a number of social and ethical challenges. The integration of artificial intelligence promises to further transform the ways of communication – from the automation of routine dialogues to the emergence of fundamentally new forms of content created by neural networks. In parallel with these opportunities, issues of security, privacy and information reliability have come to the forefront, requiring comprehensive solutions at the level of technology, education and policy. It is safe to say that digital communications have become the central nerve of modern civilization, connecting people, organizations and devices around the world. The trends discussed in this report – infrastructure expansion, 5G/6G implementation, the expansion of the Internet of Things, the rise of social media, the introduction of AI and increased security measures – mutually reinforce each other and set the vector of development for the next decade. By 2030, the digital space is expected to become even more comprehensive: almost all aspects of life – from the economy to private life – will be mediated by digital communication networks. Scientists and specialists are faced with the task of guiding this process as effectively and responsibly as possible. Continued research, exchange of best practices and international cooperation are needed to ensure that technological advances in communications benefit society while preserving humanistic values and the rights of every individual in the global information community.

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东方音乐与理论观念中的神话诗学与声音学说（方法论与实践问题）
**MYTHOPOETICS AND THE DOCTRINE OF SOUND IN THE
MUSICAL AND THEORETICAL CONCEPTS OF EASTERN
COUNTRIES (ISSUES OF METHODOLOGY AND PRACTICE)**

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摘要. 本文探讨了印度佛教地区国家（印度、中国、日本）的音乐艺术流派中，声音现象及其作为主要结构和语义单位的特殊态度。在这种态度的形成过程中，与语言符号特殊属性相关的东方思维方式、各国人民的神话观念以及佛教都发挥了特殊作用，这些因素对印度教徒、中国人和日本人的心态、文化，尤其是音乐艺术产生了重大影响。我们将按以下顺序进行探讨：首先，神话诗学中关于音乐起源于宇宙声音原型的概念，这些概念在神话集锦中得到阐述，这首先证实了音乐艺术整体的神圣宇宙性，其次，我们从音乐之外的角度论证了音乐音调通过单一初始原则（万物源于单一的粒音，发展并回归于此）而“解放”的理念；然后，我们再来探讨音乐艺术起源的实际音乐美学理论及其特征中的声音学说，这再次证实了这一理念。值得注意的是，所有音乐美学理论都强调音乐形成的阶段性——从自然到“艺术”。由此，作者得出结论：在神话诗学中，音乐被解读为“最高语言”，是最高和谐的体现。在音乐和美学理论中（神话音乐宇宙起源论的一种投射），音乐仍然“首先被认为是古人智慧的表达，然后才实现了其作为应用专业知识的实际目的”，这需要深入研究和应用“绝对语境性”（A.O.）原则。该原则假设：学科的性质与其研究方法相符。

关键词：神话诗学、声音学说、那达-宾度（nada-bindu）、声明（shōmyō）、琴（qin）。

Abstract. The article examines the phenomenon of sound, the specific attitude towards it as the main structural and semantic unit in genres representing the musical art of the countries of the Indo-Buddhist region (India, China, Japan). In the establishment of such an attitude, a special role was played by: the Eastern type of thinking associated with the special properties of the linguistic sign, mythological ideas of the peoples of the countries and Buddhism, which had a significant influence on the mentality, culture and, in particular, the musical art of the Hindus, Chinese and Japanese. The following are considered in sequence: mythopoetic concepts of the origin of music from a cosmic sound prototype, set

out in mythological collections, as the first confirmation of the sacred cosmic character of musical art as a whole and extra-musical justification of the idea of the “emancipation” of musical tone by a single initial principle (everything arises from a single grain-sound, develops and returns to it), then, the actual musical-aesthetic theories of the origin of musical art and the doctrine of sound in its features, as the second confirmation of this idea. Attention is drawn to the fact that all musical-aesthetic theories emphasize the stage-by-stage nature of its formation - from natural to “artful”. As a result, the author comes to the conclusion that music, interpreted in mythopoetics as the “highest speech”, a manifestation of the highest Harmony, in musical and aesthetic theories (a kind of projections of mythological musical cosmogony), continued to be “thought of, first of all, as an expression of the wisdom of the ancients, and only then fulfilled its practical purpose of applied, specialized knowledge”, requiring a deep approach to the study and application of the principle of “absolute contextuality” (A.O.), which assumes: the correspondence of the nature of the subject to the methods of its study.

Keywords: *mythopoetics, the doctrine of sound, nada-bindu, shōmyō, qin.*

Each musical culture has its own “intonation image”. This “intonation image”, living in a variety of musical forms, musical genres, is traditionally fixed in performing practices, carried by the people throughout history and determines the originality of the “face” of the entire culture. To hear culture in intonation, that is, to see and draw what is heard in sound - this is the meaning of perceiving music as part of culture. This is what ethnomusicologists see as their goal, focusing their programs on studying “world music” on “identifying the main stylistic features of the main body of music of a certain society as part of its culture” [1, p. 5].

This article is devoted to the task of identifying one, but essential, specific feature of the musical art of the countries of the Indo-Buddhist region (India, China, Japan).

As is known, the music of any traditional culture is divided into music of high tradition, folk art and music of religious ritual.

When perceiving musical genres of the “high” tradition, such as Indian ragas or the music of *yayue* and *gagaku*, pieces for *qin* and *shakuhachi*, Indian, Chinese or Japanese versions of Buddhist chants (respectively *bombai*, *fanpai*, *sho:myo:*), as well as individual genres of folk songs of the aforementioned countries, one’s attention is drawn to the obvious “emancipation” of a separate musical sound in relation to the integral musical structure. Sound is the main structural and semantic unit of this music, and not a melody, as in Western musical culture, oriented toward discursive, logically linear-directed thinking. The concept of sound in Eastern music is based on the idea of its intrinsic value. A continuous sound is a micro-

cosm, that singularity through which a person cognizes the One. It is obvious that the Eastern type of thinking, connected with the special properties of the linguistic sign, mythological ideas of the peoples of the named countries and Buddhism, which had a significant influence on the mentality, culture and, in particular, the musical art of the Hindus, Chinese and Japanese, played a role in the establishment of such a specific attitude to sound. The Sanskrit sign and hieroglyph, possessing the properties of discreteness, polysemy and symbolism, in their own way influence the idea of isolating a separate tone. "The culture of the line (brushstroke) in calligraphy and painting has an analogy with the culture of a separate sound in music, which is not "direct", as in European music, but has many ways of reproduction, similar to the movement of a brush" [2, p. 166].

Buddhism as a special culture of experiencing space and time (the essence of the forms of a special type of psychological perception of an Eastern person) in its own way influenced the idea of the "emancipation" of musical tone. "In Buddhism, space is not really an "abstract receptacle of actions", but is a value-saturated environment where up and down, near and far, left and right are essentially different and are experienced differently" (quoted from [3, p. 334]). "The task of the individual is to fill it with his ontologically fixed "worlds-states". Time in this sense is thought of as a change of mental phenomena, and the "atom of time" - as eternity, a projection of the Absolute that must be lived through" [3, p. 336].

In the natural philosophical myths about AUM (OM), Udgitha and the goddess of speech Vach in the "Vedas" [4, p. 86-90], in the myth of Dao-de and the deeds of one Kui (ugly dragon) in "Lüshi Chunqiu" (a treatise by Lü Buwei, completed around 240 BC [5, pp. 54 - 60]), in the Japanese myth of the dance of the goddess of music Ame-no Uzume, which returned Beauty to Japan - the goddess of the Sun Amaterasu, the idea of musical cosmogony presented in mythopoetic form is emphasized and the theory of the original sound that arose from the sound prototype is presented. Note that the Japanese mythopoetic cosmogony is presented in the mythological annals of the "Kojiki" ("Notes on the deeds of antiquity", 712 AD) "Nihonshoki" (720 AD) and in the poetic anthologies "Man'yōshū" ("Collection Myriad Leaves, 60-70 years of the 8th century AD) and «*Kokinwakashū*» («*Collection of Ancient and New Japanese Songs*», 1st half of the 10th century AD) Researchers of ancient Japanese poetics, raising and revealing the issue of syncretism of music and poetry, come to the conclusion that "the magical role of a homophone (similar-sounding, O.A.), and consonance in general, was preserved in Japanese culture for centuries" [6, p. 58]. They distinguish categories similar to Indian and Chinese: the first sound - exclamations like "heya-heya", the first movement - *hayashikotoba* (rhythmic word forms with lost meaning), musical words-images like "aware" (a chanted homonymous trope - *kakekotoba*), used in various genres of Japanese poetry. *Kakekotoba* was called the "source of poetry,"

and *makurakotoba* (“heading word,” “beginning word-song”) were “words of the age of the gods,” called the “alphabet of the world,” since they contained a cosmological description, the basic concepts that make up the picture of the universe,” which was later revealed to the poets of classical *waka* poetry [7, p. 138, 139]. It is obvious that the idea under consideration also works in Japanese culture, but to construct it categorically to the end is the task of the author’s next research, whereas Indian musical aesthetics, which took shape in Hindu ritual [8] and is connected with the “Vedas”, *mantra-shastra* (mystical teaching about language) and *sangit* (theory of musical arts), as well as Taoist-Chinese musical cosmogony in “*Lüshi Chunqiu*” in unity with the theory of *lū-lū* (*yin-yang* - *interpretation of modes in music*) allow us to precisely construct correlative mythopoetic and musical-theoretical terminological series (see Tables 1, 2). Music is interpreted in mythopoetic studies as “highest speech”, a manifestation of the highest Harmony connected with the laws of rhythm (periodicity) and proportionality (proportionality, consonance). In the musical mythopoetic cosmogony, on the one hand, the power of the impersonal Principle that creates sound, harmonious in its nature, is emphasized, and on the other hand, the magical power of the sound itself, which in turn harmonizes the Cosmos, Nature.

Mythopoetic concepts of the origin of music from a cosmic sound prototype are the first confirmation of the sacred cosmic character of musical art as a whole and extra-musical justification of the idea of the “emancipation” of musical tone by a single initial principle: everything arises from a single grain-sound, develops and returns to it.

Actually, musical-aesthetic theories of the origin of musical art and the doctrine of sound in their own peculiarities are the second confirmation of this idea.

The Hindu concept of *nada* (hum) - *bindu* (drop of thought) (“drop of thought merged with sound”, ed. - A.O.) within the framework of the doctrine of *mantra-shastra*, the Chinese theory of *lu*, the theory of sound production in *sho:myo:* within the framework of the Buddhist concept of *muge* (Japanese “not - I”) - is a kind of projection of mythological (musical) cosmogony into the field of music science, which at that time was interpreted in India, China and Japan in the same way. It was “thought of, first of all, as an expression of the wisdom of the ancients, and only then fulfilled its practical purpose of applied, specialized knowledge” [8, p. 25, 43]. It should be noted that from the point of view of musical aesthetics, all musical and aesthetic theories, considering the phenomenon of sound, emphasize the stage-by-stage nature of its formation (*nada* - *shruti* - *swara*, *zhang* - *sheng* - *lu*, *heya* - *aware* - *hayashikotoba* - *tone sho:myo:*) and the division in this regard into natural sounds (*nada* - *shruti*, *zhang* - *shang*, *heya* - *aware* - *hayashikotoba*), which are primary, and artificial - “cultivated” (*swara*, *lu*, *tones sho:myo:*, and *tone qin*), which are derivative. The special qualities of natural intonation,

such as roughness, blurred pitch of sound, are not only the norm, but an aesthetic criterion of true beauty associated with nature, a special kind of sophistication. This intonation is “musicality” as the quality of the sound of Nature and Space. Artificial sounds are the essence of the artist’s art of creating sounds, including natural sounds. Here the uniqueness of the manifestation of the “properly musical-aesthetic” is connected with:

- the skill of performing different types of sounds (the essence is the technique of “ornamentation” of simple (straight) sounds): *shuddha* (natural, pure) - *vikrita* (raised or lowered) and *tana* (straight) - *kuta* (curved) in *raga* [8], *sugu* (straight) - *yuri* (trembling) - *iro* (colored) in *sho:myo*: [9], the touch of *tan* (“simple touch” using many shades, but without intense vibrato) - *qing* (pure, transparent, without side sounds) or *vibrato* (among them *chan yin* - wide vibrato, *qi yin* - shallow vibrato, *ting yin* - vibrato with a practically motionless finger (only its tip pulsates) on *qin* [10, p. 26],

- using all the various ways of producing sound (the question of articulating sound is connected with the techniques of *gamaka* in *raga*, 33 ways of vibration on *qin*, specific techniques of producing sound - *sugu*, *yuri*, *iro*, etc. in *sho:myo*:), and finally - with a unique ability to plastically feel music. It is “contemplated” as a gesture, pose, movement, color, image. For example, the movement of the hands or voice is a “peculiar dance” on the *qin*, the prototypes of which we find in the movements of animals and birds [10, p. 27], and the sound of *swara* or *tone sho:myo*: is a tone-image “self-shining” with its multifaceted psychophysiological, philosophical and symbolic characteristics, resonating with others [9]. It becomes obvious that if the level of an individual tone and the following levels of inter-tone connections and motivic formations are very important, then the structural division at the level of the whole in musical form plays a certain, but not decisive role.

Using the example of considering the issue of musical sound in theories, we can conclude that the methodology of research in the field of oriental studies is based on the principle of “absolute contextuality” (*razr.-A.O.*). It assumes: the correspondence of the nature of the subject to the methods of its study (when considering any phenomenon of the musical culture *of the named countries*). Its application is an indispensable condition for comprehending the spirit of the entire culture through musical art.

This approach assumes a certain system of training an ethnomusicologist - a comprehensive education that includes the study of language, a number of special disciplines (ethnography, socio-cultural anthropology, history of the country’s culture). By changing the system of training specialists in ethnomusicology in conservatories, we can approach the solution to the issue of the effectiveness of teaching oriental studies in courses on the history of world music.

Table № 1
MUSICAL MYTHOPOETICS IN THE “VEDAS”,
MUSICAL-AESTHETIC CONCEPT OF NADA BINDU
(CORRELATION SERIES)

AUM (Aditya)	UTGITHA (Song)	VAC (Speech)
Boundless, beginningless, endless, eternal God-Sun	The great song of creation in the mouth of Saraswati (Goddess of Speech)	The sacred word of graceful Saraswati
Akshara - inexhaustible word-creation		Richi (recitation) – mantras with metrical feet, unfold in cyclical metrical movement
		Samanas (songs) – mantras in the form of chants
		Yajus (spells) – mantras read “continuously”, devoid of cyclical movement
Natural sounds		
AUM (Bindu)	Shruti	Nada
Sound prototype of the world, a drop of thought	Audiences of the Natural World	Voice hum
		«Self-shining tone”. Its properties: Svara-shuddha (natural, pure); Svara-vikrita (increased or decreased); Svara-tana (“straight movement”); Svara-kuta (crooked movement); Gamaka (colored)
		Svara
		«Artificial» sounds (mental)
		Varna
		Depictive speech movements: “the thinnest – navel thin – chest full – voice hollow – head artificial – mouth” [8, p. 81].
		Grana
		«Sound settlements» or «musical cells»; the basic sound series in antiquity
		Murkhlana
		Clutches, «derivative scale»

Table № 2
NATURAL PHILOSOPHICAL MUSICAL COSMOGONY
(BY «LUSHI CHUNQIU»)
SOUND - SOUNDING - MUSIC

Unmanifested			Manifested				
Jimo	Qi (liang i)	Miao	Dao (gong)	Zhang	Sheng	Wen (Yin)	Lui (Gong)
Silence, «formless silence», «the silence of space»	Sound prototypes of unmanifested things, «yin-yang» in the pre-existent word»	««Transformation», «Secretly feminine»; Chaos, fermentation; invisible process preparing the birth of living things	«The subtlest jing», «subtle qi» (energy) Noise-Demiurge is the source of vibration of the harmonic ether carrying information; an onomopoetic sound image that sounds undivided, the doer of things, arriving between the manifest and the unmanifest	A unit of structured time and space, a measure of length; onomopoetic rhythmic prototypes of things (phenomena) of nature such as Hun-Hun-Dun-Dun,	“Voice” of things of the manifested world, sound-a certain tone, (has <i>du</i> -height and <i>liang</i> -volume); possesses	«Pattern» imposed on the «nature» originally created by heaven-nature; musical phrase, melos, melody	Measure, norm, law; rule Sound standard in music, step of the Chinese chrom. scale, 12-step scale as a whole

Compiled: table No. 1 on Ancient Indian Philosophy. M. 1963. [11], table No. 2 on Tkachenko G. Space, music, ritual. M. 1990 [5].

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从作曲视角看音乐创作的艺术与技术

**COMPOSING FROM A COMPOSER'S PERSPECTIVE:
THE ART AND TECHNOLOGY OF MUSIC CREATION**

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摘要. 本文从艺术家的视角出发, 探讨作曲家的概念与创作手段。通过对作曲过程中灵感来源、旋律构建、和声运用、节奏设计以及情感表达的分析, 研究作曲家如何将抽象的音乐构思转化为具体的作品。文章还讨论了现代音乐技术对作曲的影响。本文旨在为音乐创作领域的研究者和从业者提供有益的参考, 以提升音乐创作的理论与实践水平。

关键词: 作曲; 音乐创作; 艺术; 技术; 情感

Abstract. *This paper views the concepts and means of a composer from the viewpoint of an artist. It examines how composers take abstract musical ideas and transform them into concrete works by analyzing the sources of inspiration, melody construction, harmonic application, rhythmic design and emotional expression in the composing process. It also discusses how modern music technology affects composition. The purpose of this article is to serve as a useful reference for researchers and practitioners in the field of music creation in heightening the theory and practice of it.*

Keywords: *Composition; Music Creation; Art; Technology; Emotion.*

I. Introduction

It is very important for humans to express how you feel, guess what is one of the ways of doing it? You put all that into music and guess what is the center of creating music in music you are composing. Musical language has the capability of placing musical thoughts, imaginations, feelings into forms of artistic value. From composer's point of view music creation is not only an art but a sophisticated process that includes a set of technical skills as well. In order to develop such music which is both emotionally engaging and artistically profound, composers are required to strike a balance between their artistic inspiration and technical norms.

II. Sources of Inspiration for Composition

It is often from different parts of life that composers are inspired. It could be a natural landscape, an historical and cultural event, a social issue or a personal experience that sponsors creative ideas. For instance, Beethoven's Symphony No. 6 is the 'Pastoral Symphony', which was inspired by his beloved nature. The music turned out to be an expression of his admiration and reverence for the countryside. Further, other art forms, such as literature, painting and dance may also be rich sources of inspiration of composers. Composers can extend their artistic conceptions in their musical works when they understand and transform the various art forms so that their emotions can be included in the works. But the soul of music is Melody, and through Melody the composer expresses his emotions and ideas.

III. Melody Construction and Harmonic Application

Composers need to consider things such as direction, rise and fall, rhythm and interval relationships in the process of composing the melody. Often a beautiful melody is merely a simple and varied melody for the listeners to resonate with. For instance, it can be perfectly demonstrated through the main theme on Tchaikovsky's "Swan Lake". It has smooth lines, great tunes and succeeds to reflect an image of a swan that is a classic. Music frame, rich colors and the melody support.

It allows composers to create different musical atmosphere and affect through selecting, arranging, and transitioning chords. Though traditional harmonic rules offer a healthy basis for the composer's craft, many contemporary composers study new harmonies and even make up their own to finally get away with the confines of traditional harmony and write some novel, even more individual and more innovative music. A good example of this would be that in Debussy's works, such as whole tone chords and ninth chords often form a nontraditional harmonic progression that creates a dreamy and hazy musical atmosphere.

IV. Rhythmic Design and Emotional Expression

Music has dynamism and vitality, thanks to rhythm, which gives it life. Rhythm can be designed to express itself as well as the composer. The rhythm used can convey other emotions and moods; all depending on the pattern. For instance, fast rhythms express cheerful and passionate feelings while the slow ones provide you with a feeling of a calm in melancholic atmosphere. Composers also employ complex and totally novel rhythmic changes and polyrhythms to generate unique musical effects in some modern music works. Music generations and the communication between composers and the listeners is based on emotion. Music helps composers to express their emotions by the organic combination of melody, harmony, rhythm and other musical elements. The venting of the composer's emotions is not limited to the emotional expression of the composer's emotions; it is a resonance and transmission of common human emotions. In other examples, Chopin's 'Nocturnes' are the series of delicate emotions and beautiful melodies

that expresses the composer's deep feeling of love, friendship and even patriotism which moved thousands of listeners.

V. The Impact of Modern Music Technology on Composition

Due to the continuous development of technology, modern music technology gives composers more creative means and possibilities. The composers have been able to break through the boundaries of traditional instruments and performance methods through electronic music production software and audio editing tools and music synthesizers thus achieving new musical timbres and forms. For instance, music software allows composers to sample natural sounds and environmental effects sensory inputs into the music by using a sampling function of music software and make music more layers and richer in fresh senses.

Additionally, technology of Computer Aided Composition (CAC) has offered new ideas and approaches to the composer. Computer algorithms can be used by composers to generate musical materials, but the composers can then create and modify further on such materials. In addition to enhancing the efficiency of composition, this technology provokes innovatively in the creativity of composers to create new musical gestures and expressive techniques.

VI. Conclusion

From the point of view of a composer, music creation is a total and a great in the artistic way of the composition, being made by the capture of inspiration, building a melody, applying harmonic parts, designing rhythm and expressing the feeling. Art and technology each has its role to play in terms of how composers bring their inner intriguing emotions and ideas into musical language for the audience to sense what they feel. However, modern music technology lends the composers in more creative possibilities, but also leaves the composers in the responsibility of keeping the epithalamia of art and intonations of emotion valid. In this way only can they make music that is also artistically valuable as well as modern, and help extend the musical art.

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音乐表演与作曲视角下的高校职业教育研究

RESEARCH ON HIGHER VOCATIONAL EDUCATION FROM THE PERSPECTIVE OF MUSIC PERFORMANCE AND COMPOSITION

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摘要. 在高校职业教育中,音乐表演与作曲是相互关联且相互促进的重要领域。作曲为音乐表演提供了丰富的曲目资源,而音乐表演则是对创作音乐的呈现。这两个领域对课程设置和教学方法有着重要的影响,进而也影响着学生的职业发展。然而,当前的教学过程中仍存在问题,包括教学内容单一以及理论与实践脱节等,亟待解决。

关键词: 音乐表演, 职业教育, 作曲, 教学过程, 职业发展

Abstract. *In higher vocational education, music performance and composition are important fields related and mutually reinforcing. Composition is a rich repertoire for music performance, which is the presenting of worked out music, i.e., music performance. The fields above have a good impact on curriculum and teaching methods which in effect leads to that on student's career. Nevertheless, it still presents some problems in current teaching process, including a single content of the teaching and the disconnection of the theory and practice which should be solved.*

Keywords: *Music performance, vocational education, composition, teaching process, vocational development.*

I. Introduction

Music education is the core of music education that deals primarily with music performance and composition, aid greatly in teaching a student's musical literacy, practical skills. Channels of music performance courses are usually often related to traditional repertoire study and are carrying out the training of the basic skills. But it leaves the modern performance techniques unexplored. Generally, the composition courses are based on western compositional theories and not much inte-

grated with the traditional Chinese elements. The teaching model adopted cuts off students from being able to combine and successfully effect the two in real performance and creation, limiting their musical expressiveness and creation.

II. Current Status of Music Performance and Composition Teaching

In higher vocational education, music performance and composition courses face several challenges that impact the quality of education and students' professional development.

A. Music Performance Teaching Status

The typical music performance courses tend to be courses in various directions i.e. vocal and instrumental music and involved study of classic repertoire and training of basic skills. However, the guidance for individual expression of students is insufficient, which results in innovation and expressiveness in their performances being lacking. Also, the curriculum does not study all the modern music performance techniques and it does not respond to the desires of the modern music market.

B. Composition Teaching Status

The systematic curriculum based on Western compositional theories is typical for composition courses. On the other hand, however, the use of traditional Chinese musical elements is not integrated well enough. Traditional Chinese music elements often combine poorly with modern compositional techniques, leading the students to make works that are not strongly national characteristics. In addition, the teaching of composition is loosely related to the performance of music. As opposed to practical opportunities, students' compositions do not have adequate chances for realizing effective feedback and improvement.

III. Analysis of Teaching Problems

A. Single Content

Music performance includes only traditional repertoire with little study of modern works. The study of conventional Chinese musical elements is insufficient in the composition teaching dealing with students' reflection on their national characteristics in their productions. This single content does not act as a stimulus for students' interest and creativity.

B. Disconnection between Theory and Practice

For instance, in music performance teaching and in music composition teaching, the linkage (the combination) of theoretical knowledge and actual performance or creation is not closed enough. The separation between theory and practice in performance and creation is essentially caused by students' inability to transform the theoretical knowledge they have learned into practical skills.

C. Lack of Innovative Awareness

The teaching model is in the conservative direction, but has not been in preparation for innovative thinking of students. In music performance and composition,

students usually do not have their own expression, and little awareness of innovation, causing such works and performances to be of no uniqueness and appeal.

IV. Strategies for Teaching Improvement

A. Enrich Teaching Content

Increase the proportion of modern music performances used in teaching music performances and encourage students to discover new styles and ways of presenting. In composition courses, it can further strengthen the study of traditional Chinese musical elements and call on students to capture some national characteristics and integrate them into their works in order to enrich the connotation and expressive qualities of their works.

B. Strengthen the Combination of Theory and Practice

Students can apply the theoretical knowledge that they have learned by following the teaching activities with practical teaching activities including compositions showcase, performances competitions, concerts. At the same time, stimulate students in music performance and composition activities. They can improve and improve their professional level and this is through practical back feed help.

C. Cultivate Innovative Awareness

It will encourage students to experiment on music performance and composition in new forms to be able to cultivate the innovative thinking and individual expression. Case analysis and creation guidance can help teachers lead students to break out of standard thinking and to have a new approach to musical expression.

D. Enhance Interdisciplinary Cooperation

To be more coupled with other disciplines like musicology and music education, music performance and composition teaching should increase cooperation. Interdisciplinary teaching models expand students' knowledge and vision, cultivate their comprehensive quality, and develop their interdisciplinary ability.

V. Conclusion

Higher vocational education considers an important role music performance and composition teaching. It can improve the quality of teaching by enriching the teaching content, enhancing the combination of theory and practice, awakening of innovative awareness, and also promoting interdisciplinary cooperation. By following this approach, we will grow up the composite music talents to have an excellent professional background and creative abilities, which are conducive to the inheritance and development of traditional Chinese music culture.

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美术与外国艺术文化：跨文化艺术对话
**FINE ARTS AND FOREIGN ART CULTURES: A CROSS -
CULTURAL ARTISTIC DIALOGUE**

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摘要. 美术作为人类文化不可或缺的一部分，蕴含着不同国家和民族独特的艺术精神与文化意义。本文聚焦于美术领域，探讨外国艺术文化，分享来自不同文化背景的多样化艺术风格与创作理念，并讨论文化交流对美术发展的深远影响。通过分析西方古典艺术、现代艺术以及亚洲艺术文化中的经典案例，本文从跨文化视角揭示了美术的共性与差异，并强调了艺术作为跨文化交流桥梁的重要性。

关键词：美术；外国艺术文化；跨文化；艺术风格；文化交流

Abstract. *Fine arts, as the necessary part of human culture, has its unique artistic spirit and culture meaning of different countries and peoples. This paper examines the fine arts and focus on foreign art culture and share various artistic styles and creative philosophies which come from different cultural backgrounds and discuss the influence of cultural exchange on the development of the fine arts. The paper explores fine arts as manifested in the classical cases of the Western classical art, those modern art and those of Asian art cultures, which reveal commonalities and differences in fine arts by means of a cross-cultural perspective and mentions the importance of art as a bridge for the cross-cultural communication.*

Keywords: *Fine Arts; Foreign Art Cultures; Cross - Cultural; Artistic Styles; Cultural Exchange.*

I. Introduction

Fine arts are one of the most important ways for humans to express emotions, thoughts and aesthetic concepts. As an art culture in the process of globalization, it has opened up to and represented the interaction and collision of art cultures from various countries and regions, resulting in a colorful and richly diverse view of artistic landscapes. The uniqueness of different cultural circles is reflected on fine arts as a kind of visual art; fine arts also show the unity of the common artistic efforts of all mankind. Comparing and analyzing fine arts and foreign art culture

provides us the opportunity to understand the diversity and commonality of art and the mutual influence of different culture.

II. Diversity of Fine Arts and Foreign Art Cultures

Stylistically, the artistic styles, and the creative philosophies in different countries and regions are very diverse. Western fine arts are based upon ancient Greek and Roman traditions of realistic representation of nature and the accurate representation of the human form. In the Renaissance, the new heights of realism were achieved by the artists who employed scientific perspective and anatomical studies. The Western classical art's quest for detail and proportion can be seen in trying examples such as Leonardo da Vinci's 'Mona Lisa' and Michelangelo's 'David'.

On the contrary, Eastern fine art places greater emphasis on the expression of artistic conception and spiritual connotations. In Chinese painting, brush and ink serve as a means to convey ideas, express the painter's emotions, and reflect philosophical thoughts. For example, a famous representative work of Chinese art is Huang Gong Wang's "Dwelling in the Fuchun Mountains," which is renowned for its simple yet powerful contrasts and dynamic lines. Such diversity is closely related to different cultural backgrounds, including philosophical thoughts, religious beliefs, and social environments.

Human forms are the primary focus in Western art in the form of realistic representations due to the Christian emphasis on the humanity, while the more expressive style in Eastern art comes from the influence of the Taoist and Zen Buddhist philosophies, so considerable, as quite different in essence, that within Taoism there is no such thing as a human being, only the living universe. Although the styles of art were different, fine arts would never have grown in the absence of the cultural exchange.

III. The Impact of Cultural Exchange on Fine Arts

The opening of the Silk Road was historically when the East was able to communicate with the West. The introduction of Chinese silk, porcelain, and painting to the West affected the Renaissance of Europe. In the meantime, Western painting techniques and artistic ideas began to spread in Asia, causing changes in themselves of local artistic styles.

In today's times, cultures are more integrated and moving, as we call it, at the speed of globalization. Countless artists have crossed the cultural divides and have emerged themselves in various artistic works. For instance, in the case of Fauvism, French painter Henri Matisse was partly stimulated by African and ancient art to simplify form and use the free use of color. Yayoi Kusama is a Japanese artist who juxtaposes Eastern and Western modern artistic concepts within Japanese art traditions, resulting in bizarre visual art creations. This form of cross - cultural artistic practice does not only enrich the forms of fine arts, but it also offers to promote the mutual understanding and respect between

different cultures. Art has become a language that we can all understand no matter what our language or culture is, because it has made sense of spiritual connotations of other cultures through visual perceivable means.

IV. Fine Arts as a Bridge for Cultural Exchange

Both the products of artistic creation and important vehicles of cultural exchange are fine art works. There are many museums and art exhibitions for works of different countries and areas for the purpose of cultural dialogue. The British Museum has also introduced an exhibition for Western audiences to enjoy Chinese culture through exhibitions by its collection of Chinese cultural relics and artworks. Chinese art galleries also have a fair number of international art exhibitions to show Chinese visitors different global art styles.

Art education, as well, is a major aspect of cross-cultural exchanges. Students can be trained to learn artistic styles and creative techniques of different countries and regions, and in this way, they broaden the artistic horizon and do cross cultural artistic thinking. But this educational approach also helps in educating such artists with an international outlook and spreading and understanding the integration of diverse cultures.

V. Conclusion

The fine arts' collective relationship with foreign art cultures is the challenging and diverse. While it is true that arts styles and artistic philosophies vary from one culture to another, exchange and integration of culture has paved way for fine arts as an effective means of transcending cultural barriers. Today in the era of globalism, artists from all across the world use cross cultural practices to further develop their practices, to make new forms, new ways of expression in art. As the carriers of whatever cultural exchange, fine art works help to create mutual understanding and respect among various cultures. It is time to be an open minded and embrace and research about the different art cultures, utilizing arts to promote the cultural interchange and bring us together and jointly forge ahead of the progress of the human art.

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弗拉基米尔·玛丽亚·亚西尼娅公主：民族血统和精神壮举
**PRINCESS VLADIMIRSKAYA MARIA YASYNYA: ETHNIC
ORIGIN AND SPIRITUAL FEAT**

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注释。本文献给古罗斯的著名女性——弗拉基米尔公主玛丽亚·亚辛（1158-1206），旨在梳理研究其族裔起源、禁欲主义和精神功绩等问题及版本相关科学家的观点和资料。本文从研究问题的视角，对出版物中引用的俄罗斯顶尖民族学家、考古学家、语言学家、宗教学者和人类学家的科学著作进行了分析性回顾，使我们能够得出结论，证明弗拉基米尔公主阿拉尼亚（亚斯基）血统的科学事实的合理性和无可争辩性，而玛丽亚·亚辛娅的血统在古俄罗斯编年史中广为人知。玛丽亚·亚西尼娅的精神功绩得到了公主同时代人的赞赏：她虔诚地抚养了十二个孩子（这些孩子的后代中有十三位俄罗斯圣人），建造了东正教教堂，并热心慈善事业，这些都为编年史家所证实。这些都使她在剃度归真后不久就被当地尊崇为弗拉基米尔圣人。

关键词：玛丽亚·亚西尼娅，民族血统，精神功绩。

Annotation. *The article, dedicated to the famous woman of Ancient Rus', Princess Maria Yasyn of Vladimir (1158-1206), sets the task of considering the points of view and materials of scientists who investigated the issues and versions of her ethnic origin, as well as her asceticism and spiritual exploits. The analytical review of the scientific works of leading ethnologists, archaeologists, philologists, religious scholars, anthropologists of the country given in the publication, given in the perspective of the problem under study, allows us to draw conclusions about the reasonableness and indisputability of scientific facts testifying to the Alanian (Yassky) origin of Princess Vladimirskaia, known from ancient Russian chronicles like Maria Yasyunya. As for her spiritual feat, it was appreciated by the contemporaries of the princess: the efforts of Maria Yasyunya in the pious upbringing of her twelve children (among whose descendants there are thirteen Russian saints), in the construction of Orthodox churches and charity, testified by the chroniclers to personal piety, became the basis for her veneration as a locally revered Vladimir saint shortly after her monastic tonsure and death.*

Keywords: *Maria Yasyunya, ethnic origin: spiritual feat.*

Historical memory is not only a complex and profound phenomenon of a person's inner spiritual life, but also a factor that shapes the reality around him, as well as a means of programming his future. In science, any important historical fact, any person, any event receives many explanations and interpretations. Often, interpretations are based not on documentary evidence (especially when there is none at all or it is deliberately hidden or destroyed), but on stereotypes that have become habitual errors, biases, intuitive insights, and sometimes even deliberately distorted facts. Therefore, when considering problems related to historical memory, it is important to consolidate the community of scientists, their broad cooperation on the platform of an established methodology of historical research and constructive dialogue.

Most of all, such an open dialogue is needed to discuss issues related to the life and work of people who left a mark on the history of an ethnic group and the history of a state. During the project "Name of Russia", initiated in 2008 by the TV channel "Russia" and the TV company VID and aimed at choosing the most significant personalities for Russia, large-scale surveys of Russians determined the primacy of Alexander Nevsky. Almost 100 years ago, Lev Gumilev, the author of a laudatory historiosophy about Prince Alexander, suggested seeing him not only as a warrior, a soldier, a protector, but also as a savior, a diplomat, a strategist, whose successful and beneficial decisions for Ancient Rus' determined its future fate for centuries. Patriarch Kirill is sure that without Nevsky there would be no Russia and Russians, there would be no "our civilizational code," which the prince defended with "very subtle and courageous diplomacy": "He was 20 years old when he defeated the Swedes, 22 years old when he drowned the Livonians on Lake Peipus... A young, handsome guy!.. Brave, decisive, strong. But the most important thing is that, being a politician, strategist, military leader, Alexander Nevsky became a saint, who collected in himself all the best that personifies the savior and organizer of Russia!" [1]. Not only Alexander Nevsky himself, but also many of his ancestors and descendants, including women, set an example worthy of imitation. Back in the early 19th century, the famous historian N.M. Karamzin proposed creating a gallery of portraits of "Russian women, famous in history or worthy of this fate." A bibliographic review of books and articles about Russian women written over the past 200 years, published in 2002 by Professor N. L. Pushkareva, included more than 1000 works, but most of them relate to the New and Contemporary Periods [2]. As for the women of Ancient Rus, few authentic sources relating to this period have survived. That is why the written (chronicles) and material (temples, icons, frescoes, seals, jewelry, household items) monuments, church and chronicle traditions that have come down to us are so valuable. Of particular interest to researchers has always been and is the historical portrait of an outstanding woman of the turn of the 12th–13th centuries, the grandmother

of Alexander Nevsky – Maria Shvarnovna Vsevolozhskaya (named after her husband Vsevolod) Yasinya (an Alan by ethnic origin; from the Old Russian name for the Alans – Yasy). Maria was the wife of Yuri Dolgoruky’s youngest son, the Grand Duke of Vladimir Vsevolod (1154-1212), whom they married when they were almost teenagers by today’s standards. In this marriage, 12 children were born, and thanks to his large family, Prince Vsevolod went down in history under the nickname Big Nest.

During her not very long life, Maria Yasinya (1158-1206) not only built a Big Nest, becoming a faithful and loving wife, giving birth to eight sons and four daughters for her husband, but was his co-ruler, supervising the construction of new cities, churches, cathedrals, monasteries in the Vladimir-Suzdal land in the absence of her husband, who was away on military campaigns, helping those in need, raising children in piety. From the big nest of Vsevolod and Maria Yasinya came offspring that determined the fate of Russia over the next centuries and left their contribution to the history of the Fatherland. Among Maria’s descendants are 13 revered Russian saints and the Grand Dukes of Vladimir, Yuri (George) Vsevolodovich, Alexander Yaroslavich Nevsky (grandson) and Mikhail Yaroslavich (Prince of Tver), and Moscow, Daniil Alexandrovich (great-grandson), Ivan I Danilovich Kalita (great-great-grandson), Dmitry Ivanovich Donskoy, Rostov Prince Vasilko Konstantinovich and his son Belozersk Prince Gleb Vasilkovich and many others, who left a great mark on the history of the Fatherland. “Maria is a stunning example of how a representative of a strong, proud people influenced the fate of Russia,” said Archpriest Vsevolod Chaplin, Chairman of the Synodal Department for Church and Society Relations of the Moscow Patriarchate, in his speech on November 10, 2014, at a conference held as part of the World Russian People’s Council in the Cathedral of Christ the Savior and dedicated to this amazing woman [3]. Perhaps, the descendants responded to the vector of spiritual orientation of the princess, who was not only an outstanding, socially active person, respected by representatives of all classes, but also a deeply religious person. Relying on the materials of chronicle sources allowed experts to conclude that “... Maria always had a special disposition towards monasticism. And, perhaps, this was her secret desire, but only marital and maternal duty did not allow her to take the tonsure earlier. But after the birth of her last son, Ivan, she fell ill and, not wanting to be a burden to the family, decided to go to a monastery. At her request, Prince Vsevolod the Big Nest laid the foundation for the center of the ensemble of the future monastery - the stone Assumption Cathedral ... »[3]. The above quote belongs to S.E. Melnikova, director of the Vladimir-Suzdal Museum-Reserve, who spoke at a conference dedicated to Maria Yasina, which took place on November 10, 2014, as part of the World Russian People’s Council in the capital’s Cathedral of Christ the Savior. The information she presented, based on histori-

cal sources, indicates that the Grand Duchess of Vladimir was an extraordinary person, she enjoyed the respect of representatives of various social strata, and was able to combine a number of features of the ideal image of a Russian medieval co-ruler: a faithful and wise assistant to her husband, a righteous mentor to children, a patroness of the disadvantaged and an organizer of monasteries. The exceptional piety, patronage of the church, generosity and mercy of Princess Maria, recorded in the Laurentian and Trinity Chronicles, give, according to leading experts in the history of the 14th-17th centuries, grounds to assume the confidence of the authors of the chronicle works in the certainty of her canonization as an all-Russian saint. The rich materials of the archive of the Vladimir diocese contain information about the history of the veneration of Princess Maria by the Orthodox Church as a locally venerated saint in the Council of Vladimir Saints. Undoubtedly, the next step would have been her general church canonization, but soon after her death, internecine princely strife, and then the Tatar-Mongol invasion postponed the formal resolution of this issue for several centuries.

This is how the leading expert in the history of the 14th-17th centuries, Doctor of Historical Sciences, leading researcher at the Institute of Russian History of the Russian Academy of Sciences L.E. writes about this. Morozova in her study "Great and Unknown Women of Ancient Rus": "The first wife of Vsevolod the Big Nest, Maria Yasynya, was undoubtedly an interesting person and was respected by her contemporaries. Evidence of this is a real panegyric in her honor in the Laurentian and Trinity Chronicles. In it, she is glorified for an exceptionally pious way of life, patronage of the church, generosity and mercy. The author of this work, apparently, assumed that the princess would be canonized as an all-Russian saint. The basis for this was Maria's godly activity, and the founding of the Assumption Convent for women in Vladimir, and the construction of a church in it. However, her official canonization never took place, and she remained a locally venerated saint. The reason, obviously, was not that there were insufficient grounds for proclaiming the Vladimir princess a pan-Russian saint, but that soon after her death, civil strife began between her sons in the Vladimir-Suzdal principality, and then the Mongol-Tatar invasion dealt such a powerful blow to the traditional way of life of the Russian people that they could not get rid of its consequences for several centuries. At that time, the Orthodox Church had no time for the canonization of the righteous, since there were too many martyrs who died in battles with the steppe dwellers [4]. Now, eight centuries later, this issue, which requires compliance with the formalities and conditions of the canonization commission, actualizes the consideration of the totality of all materials related to the life of Maria Shvarnovna Yasynya. Recent research on this subject has led to the conclusion that all medieval authors who wrote about the princess noted her spiritual feat in the name of the Christian faith, her devotion to Orthodoxy and the

Russian land. It was she who “... was the first of the wives of Russian princes to build, at her own expense, having bought land in Vladimir, a women’s monastery in the name of the Dormition of the Most Holy Theotokos. She was canonized among the first Russian saints, famous for her piety and wisdom” [5, p. 93].

The author of the research article “On the Issue of the Alanian Princess in the Context of Russian History”, chief researcher at the Institute of Russian History of the Russian Academy of Sciences, N.A. Soboleva, presented the richest historical, architectural, folklore, etymological materials, in the “medieval interior” of which the life path of Maria Shvarnovna Yasynya is especially clearly outlined. N.A. Soboleva analyzes all known chronicles and works of Russian historians covering the life of the princess, and summarizes: “The only thing that united all the authors (who wrote about the princess. - Ts.Z.) was her spiritual feat in the name of the Christian faith, devotion to Orthodoxy and the Russian land. She was the first of the wives of Russian princes to build, at her own expense, having bought land in Vladimir, a women’s monastery, which went down in history as the Knyagin in the name of the Dormition of the Most Holy Theotokos. She was canonized among the first Russian saints, “famous for her piety and wisdom” found imitators, in particular, the famous wife of Dmitry Donskoy, Princess Evdokia Dmitrievna” [5, p. 73].

Cited by N.A. The opinions of various scientists, including famous historians, archaeologists, art historians, and philologists, help to “...form an idea of the life partner of the Vladimir Grand Duke Vsevolod the Big Nest, the grandmother of the famous Alexander Yaroslavich Nevsky, known to every Russian... recreate the era in which the Russian prince and the Ossetian princess lived, reveal the cultural and historical commonalities of their earthly life, to a certain extent explaining the principles of their long-term union. The image of Maria Yasynya, presented in a historical context, allows us to illuminate her spiritual world, the traditions that created it, which were understandable to the Russian prince, uniting him with the Ossetian princess with common spiritual bonds. The chroniclers were not particularly interested in them, but the Russian Orthodox Church understood them, elevating Maria Yasynya forever to the saints of the Russian land” [5, p. 90–91]. Continuing on this topic, we note the study of G.N. Gorbachuk (in 2007–2017, rector of the Vladimir Theological Seminary), who presented the history of the issue of the canonization of Grand Duchess Maria of Vladimir based on materials from the archives of the Vladimir diocesan administration and a number of other sources. According to him, the Christian life of the princess vividly and convincingly testifies to her spiritual greatness and holiness and meets the basic criteria for general church glorification. However, there was no official act of her canonization, and the Grand Duchess is revered as a locally venerated saint in the Council of Vladimir Saints. The scholar cites evidence that Metropolitan Evlogy

of Vladimir and Suzdal began the preparatory process for the general church canonization of Maria [6].

Returning to the research of N.A. Soboleva, we note that a thorough knowledge of the historiography of this problem, as well as the scientific qualifications of the author gave her the opportunity to argue in a reasoned manner against the opinion established in the historical literature about the Czech origin of Princess Maria. A competent analysis of Czech sources allowed her to state that among the representatives of the ruling dynasty of the Přemyslids in the 12th century, the name “Švarn” is “not visible”; according to N.A. Soboleva, attributing Czech origin to the princess is a mistake of chroniclers/copyists of a later time (16th century), who interpreted the Iranian name of her father in a peculiar way. And, of course, one cannot fail to note the brilliant use by the author in substantiating her position of heraldic symbols and a wide range of chronicle evidence, archaeological finds and archival materials [5, pp. 71–94]. Important arguments in the controversy over the ethnic origin of the princess are given in the study by Z.K. Kusaeva “On the issue of the etymology and ethnic attribution of the onomastic forms Shvarn/Kshvarn/Kshevarn”, based on the analysis of the basic ideological concepts of the Indo-Iranian world *xsar* (military valor) and *farn* (divine grace), which are quite widespread in the Yassian (Ossetian) onomastics and in the folklore and ethnographic tradition of the Ossetians. Z.K. Kusaeva provides an etymological interpretation of the forms of the name of the father of Grand Duchess Maria of Vladimir found in various sources. The author of the article, in substantiating her conclusions, along with the etymological ones, also uses materials from scientific research in other areas: folklore studies, ethnolinguistics, history, source studies. The results of her comparative analysis allowed her to attribute the name Shvarn/Kshvarn/Kshevarn to the Scythian-Sarmatian-Alanian onomastic fund (*Æxsarfarn*) [7].

The problem of the ethnicity of Princess Maria was also studied by A.A. Kuznetsov, head of the Department of the History of Medieval Civilization at IMOMI NNSU. According to the conclusions of his study, presented in his article “Grand Duchess Maria of Vladimir: Iassian or Czech origin”, the version of the Czech origin of Vsevolod the Big Nest’s wife, which appeared in the late chronicles of the 15th–16th centuries, has not been verified, which was confirmed by the scientist’s analysis of sources and a critical assessment of the texts that testified in favor of this version [8].

A.V. Kuzmin agrees with him, scientific editor of the Great Soviet Encyclopedia, author of the article “Maria Yasynya - the first wife of the Vladimir Grand Prince Vsevolod III Yuryevich the Great Nest”, explains that representatives of the Alanian nobility, to which the scientist also includes Maria’s family, played a significant role in the life of medieval Rus’: Alanian cultural contacts, political and dynastic ties covered almost its entire territory in the last quarter of the 12th - first

third of the 13th century. The author was able to draw this conclusion thanks to a broad approach to the problem: using the example of the fates of Princess Maria's relatives, A.V. Kuzmin shows the process of integration of representatives of the military nobility of the Don Alans into the ruling and service elite of Rus' on the eve of the Mongol invasion. The author suggests that the mother of the boyar of Vladimir Prince Vsevolod III (Vsevolod III Yuryevich the Great Nest) Yakov was the sister of Grand Duchess Maria Yasynya [9]. Summarizing the arguments of the authors of the existing versions of her ethnic origin, we note that most of them argue in a reasoned manner against the opinion about the Czech origin of the princess. A competent analysis of Czech sources allowed specialists to state that among the representatives of the ruling Czech dynasty of the Přemyslids in the 12th century, the name of Maria's father "is not visible", and attributing Czech origin to the princess is a mistake of later (16th century) scribes who interpreted the Iranian (Alanian) root of her father's name Shvarna in a peculiar way. The arguments about "the dubiousness of Vsevolod's marriage to a person of princely or even more so royal dignity, attributed to the European aristocracy, also seem logical, since there is no mention of this dynastic marriage in European, in particular Czech, historiography" [10, p. 272]. According to the scholar, who examined all versions of the chronicle sources, Vsevolod was probably married to the daughter of one of the representatives of the local nobility, which could have included the nobility of the ethnic Alans who lived in the area of the Saltovo-Mayaki culture of the Don region. This opinion is based on the fact that earlier chronicle records, testifying to her Alanian (Ossetian) origin, are the most reliable, while information about Maria's genealogy, contained in later chronicle lists and containing indications of her Czech roots, is politically motivated.

This assumption does not contradict a large-scale analysis of the circumstances, situations and chronicle evidence of the corresponding era: "One of the internal springs of the topic under discussion is the Alanian presence in the history of Rus'. Chronicle evidence clearly indicates the participation of the Yassian/Alanian families in the formation of the ancient Russian elites" [11, p. 224].

The use of the latest methods of artifact research (spectral and carbon analysis, dendrochronology, craniology, etc.) made it possible to reach a new level of solving the issue of the ethnic origin of Princess Maria.

The information presented in the study "Comprehensive study (forensic, anthropological, genetic) of the remains from the Holy Dormition Princess Convent in Vladimir" - as reported by the authors S.B. Borutskaya (senior researcher of the Department of Anthropology of the Biological Faculty of Moscow State University), S.V. Vasiliev (Head of the Physical Anthropology Center of the IEA RAS), O. Loreil (Leading Specialist of the DNA Identification Laboratory of the US Department of Justice), S.A. Nikitin (Expert of the Forensic Medical Examination

Bureau of the Moscow City Health Department), T.D. Panova (Chief Researcher of the Moscow Kremlin Museums), S.Yu. Friesen (Specialist of the Physical Anthropology Center of the IEA RAS) – were the result of a complex and multi-stage procedure that involved following special rules, as well as seeking the appropriate permission from Metropolitan Evlogy of Vladimir and Suzdal, and the assistance of forensic expert S.A. Nikitin [12].

The comprehensive anthropological-genetic and forensic medical conclusion provided grounds to identify the remains from the Holy Dormition Princess Convent in Vladimir as belonging to Princess Maria. And their further comparative craniological comparison with the remains from a number of synchronous burials in the Eastern European area allowed us to conclude that Maria has much in common with the population of medieval Alania. The materials from the identification tables were compiled by scientists into a dendrogram, which shows that the skull of Maria in question lies in a cluster next to the skulls from the North Ossetian village of Zmeyskaya: a comparative analysis of the skull from “... the Holy Dormition Princess Monastery with the female skulls of the medieval Alanian Zmeysky burial ground (Republic of North Ossetia-Alania) confidently demonstrates their anthropological similarity and indicates with a high degree of probability the identity of their origin” [12, p. 215]. It should be noted that this study also presents the stages of graphic reconstruction of the portrait of Grand Duchess Maria Yasnaya based on the skull [12, p. 214: Fig. 7, 8, 9] – reconstructions based on craniofacial dependencies discovered and published between 1950 and 2009 by M.M. Gerasimov, G.V. Lebedinskaya and S.A. Nikitin. Summarizing the results of this detailed anthropological examination, the chief researcher of the Institute of Archaeology of the Russian Academy of Sciences, Corresponding Member of the Russian Academy of Sciences M.V. Dobrovolskaya in her article “Princess Maria, the wife of Grand Duke Vsevolod Yuryevich. Anthropological identification: questions and answers” confirms that the remains from the Vladimir Knyaginina Monastery belong to Maria, the wife of Vsevolod Yuryevich: “This is indicated by gender and age. The biological age of skeleton 1, determined by specialists, is 45–50 years. According to information known to historians, the wife of Vsevolod Yuryevich was born around 1158 and died in 1206. Therefore, the age of skeleton 1 determined by the examination corresponds to the age at which the princess passed away” [11, p. 219].

The author asks the question: what is known about the appearance and physical characteristics of the princess? And turns to the «History of the Russian State» by N. M. Karamzin, who wrote about Maria based on the texts of the Laurentian and Trinity Chronicles. Following the author of the article, we will turn to the words of the great Russian historian: «His first wife was Maria, by birth Yasnaya, famous for her piety and wisdom. In the last seven years of her life, suffering from a seri-

ous illness, she showed amazing patience, often compared herself to Job and took monastic vows 18 days before her death; preparing to die, she called her sons and adjured them to live in love, reminding them of the wise words of Yaroslav the Great that civil strife destroys Princes and the fatherland, exalted by the labors of their ancestors; «she advised children to be pious, sober, generally friendly and especially to respect elders, according to the Bible saying: in much time comes wisdom, in much life comes knowledge. Chroniclers also praise her for decorating churches with silver and gold vessels; they call her the Russian Elena, Theodora, the second Olga. She was the mother of eight sons, two of whom died in infancy» [13]. From the description of N.M. Karamzin it follows that the princess suffered from some chronic disease, which at least limited her mobility. M.V. Dobrovolskaya writes: «In the detailed anthropological examination (mentioned above. - Ts.Z.) there are detailed descriptions of multiple arthrosis of the joints of the extremities, arthrosis of the hip and knee joints ... which manifest themselves in severe pain, swelling and edema of the legs. Coxarthrosis significantly changes a person's gait, ... significantly limits mobility in general. Thus, a chronic disease accompanied by severe pain is a situation that equally corresponds to both the chronicle data and the results of the examinations conducted» [11, p. 219–220]. Turning further to the issue of determining the ethnicity of the remains, the author notes that, when studying the features of the appearance under study, the anthropologist invariably compares them with those that are “associated with certain ethnic groups at a certain time and in a certain territory” [11, p. 221]. In order to assess the extent to which the features of the appearance reconstructed from the remains correspond to the anthropological uniqueness of some medieval peoples and ethnic groups, the scientist compares the parameters available in the expert opinion with similar parameters of a number of groups of the European Slavic and Alan population. In this case, M.V. Dobrovolskaya emphasizes: “It is important to repeat that comparing individual data with group data is not a research step, since it contradicts the foundations of the theory of craniological research. In this case, we discuss the external appearance of the alleged historical person and compare its morphological parameters with the average statistical “appearances” of some medieval groups” [11, p. 221]. As comparative materials, M.V. Dobrovolskaya used data from female groups of medieval Vistulians, Czechs, Moravians, Slovaks, North Caucasians, as well as data obtained from studying the remains from the Novokharkiv, Dmitrievsky and Verkhne-Saltovsky (Verkhniy Saltov IV) burial grounds. These materials were taken from large-scale craniological summaries published in the monographs of T.I. Alekseeva “Ethnogenesis of the Eastern Slavs Based on Anthropological Data”, I.K. Reshetova «The Population of the Donetsk-Don Interfluvium in the Early Middle Ages» and the collective monograph «The Novo-Kharkov Burial Ground of the Golden Horde Era». The comparison

allowed the author «... to state that in the external appearance of the woman from the Knyagin Monastery there are practically no craniological features that could indicate an external similarity with medieval groups from Central Europe. <...> The craniological features of the generalized group from the territory of the Czech Republic have no common features with the anthropological appearance of the individual from the Knyagin Monastery, to whom the series from the burial grounds of Zmaysky, Verkhny Saltov-4 and Dmitrievsky turn out to be closer [11, p. 224].

For the first time introducing these data into scientific circulation and into the historical and cultural context associated with the personality and era of Maria Yasyina, the author of the publication speaks of them as a reflection of an important stage in the work on the problem of the ethnic origin of the princess and her role in the history of medieval Rus'. Understanding the multifaceted nature and complexity of the topic encourages the author to approach its study "in a balanced and responsible manner" and especially to the study of "one of its internal springs" – the Alan presence in the history of Rus'. Nevertheless, M.V. Dobrovolskaya speaks of chronicle evidence that clearly indicates the participation of Yassian/Alan families in the formation of ancient Russian elites, and that the classics of Russian paleontology (G.F. Debets, V.P. Alekseev, T.S. Konduktorova) singled out the "Saltovsky anthropological variant" associated with the medieval Alan population on the Middle Don and Northern Donets. At one time, quite clear conclusions from extensive research materials on this subject were made in her book dedicated to the archaeological and historical-cultural study of the monuments of the Saltovo-Mayaki culture by the laureate of the USSR State Prize, Soviet and Russian historian and archaeologist, Doctor of Historical Sciences S.A. Pletneva: «The Saltovo-Mayaki culture was undoubtedly based on the Sarmatian-Alan culture. At the same time, the greatest role was played by the culture of the North Caucasian Alans, who came to the Don region in the 8th century. They brought with them an already established agricultural and cattle-breeding way of life and some crafts. ...In addition to the vast territory outlined above, where Saltovo-Mayatsky monuments are found (Don region, Azov region, Dagestan, Crimea, Dnieper region, North-Eastern Bulgaria, Middle Volga region, etc.), North Caucasian Alania also became in the 8th-9th centuries a region of the Saltovo-Mayatsky culture in one of its many variants" [14, p. 185-186].

Returning to the reasoning and scientific calculations of M.V. Dobrovolskaya, we can state that they at least do not contradict the assumption that the anthropological appearance of the individual from the Knyagin Monastery may well belong to a woman of Alanian origin, associated with the southern Russian (Don region and Podontsovy) Alanian population - the heir to the Saltovo-Mayatsky archaeological culture, which, as a result of endogamy, preserved its anthropological type until the 13th century.

Ossetian scholars, discussing the medieval dynastic marriages of the Alans, which related them to the ruling houses of other countries, always had in mind the name and personality of Maria Yasinya along with the names of the Alanian princess Burdukhan, the wife of the King of Georgia George and the mother of Queen Tamara, as well as Satenik, the Alanian princess, the wife of the King of Armenia Artashes I, and others. The authoritative Ossetian ethnologist, chief researcher of the IEA RAS, Doctor of Historical Sciences B.A. Kaloyev, was also interested in the problem of interdynastic marriages. Due to the lack of time to closely study this topic, according to the head of the Yaroslavl Ossetian community, Professor Tamara Vladimirovna Dadianova, during their last meeting at the Alanian metochion - the Church of the Nativity of the Holy Mother of God on Kulishki in Moscow, he instructed/ordered her to search the archives of Yaroslavl and Vladimir for historical materials related to the personality and descendants of Maria Yasinya. She managed to summarize the results of her twenty years of scientific research and archival work in a number of media appearances and scientific publications [15; 16; 17; 18; 19; 20; 21; 22; 23, etc.]. And most importantly, she attracted other researchers to solve the problem and captivated the public with the idea of the need to use the scientific, patriotic and educational potential of this phenomenal personality. She was the first to come up with the initiative to perpetuate the image of the Vladimir princess, proposing to erect a monument to Maria Yasina on one of the squares of Yaroslavl.

In 2015, a foundation for promoting the revival of spiritual, cultural and family values named after Grand Duchess Maria Yasinya was created in Ossetia itself (headed by Z.K. Kusaeva, E.I. Karazhaeva). Largely thanks to the initiatives of the foundation, research work by leading specialists in the country was launched, which was included in the collection of scientific papers “Grand Duchess of Vladimir Maria Yasinya in Russian History”, published in 2019 by the Institute of Russian History of the Russian Academy of Sciences and the North Ossetian Institute of Humanities and Social Research of the VSC RAS. Thanks to the study of a wide range of sources, as well as the use of the latest anthropological and genetic methods, the authors contributed to the coverage of the life path and personality of this legendary woman, clarified the issue of her ethnic origin, which had long been the subject of scientific debate [24; 25]. It is difficult to overestimate the role of the data related to the personality and era of Princess Maria Vladimirskaia, which have been introduced into scientific circulation and into the historical and cultural context for the first time in recent decades. Undoubtedly, they will become a reliable platform for further work on the problem of the ethnic origin of the princess, her role in the history of medieval Rus’, as well as on the problem of the Alan presence in the history of Rus’. It is also undoubted that the real image of the holy woman is worthy of being reflected in

books (including for children, school, home reading), in granite, bronze, painting, films - to become a widely sought-after educational ideal of a perfect personality. Such a high presence in the everyday habitat of the younger generations will form a healthier, more correct, useful, life-giving educational space than the images of even the most perfect fictional heroes and the most wonderful plots.

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为农村地区的外籍工人提供初级卫生保健的特点：障碍及其克服方法
**FEATURES OF PROVIDING PRIMARY HEALTH CARE TO
FOREIGN WORKERS IN RURAL AREAS: BARRIERS AND WAYS
TO OVERCOME THEM**

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摘要. 本文致力于研究居住在俄罗斯联邦农村地区的外籍工人获得初级卫生保健的障碍，并提出克服这些障碍的建议。这项研究的意义在于，随着大量移民涌入俄罗斯，其中一部分移民居住在农村地区，由于基础设施、文化和法律因素，农村地区的医疗服务获取变得复杂。本研究旨在评估外籍工人获得医疗保健的不可及性，并找出主要障碍（法律、经济、文化）以及影响健康的社会决定因素。在莫斯科州进行的一项横断面研究（2024年7月至10月）中，研究人员对36名从事制造业、农业和贸易的外籍工人和41名当地居民进行了调查。问卷内容涵盖工作条件、保险不可及性、语言障碍、发病率、心理健康（PHQ-9、GAD-7问卷）以及对医疗服务的满意度。研究结果显示，各群体之间存在显著差异：仅有8%的外籍工人拥有强制医疗保险（而当地居民则为100%），80%的受访者指出存在语言和文化障碍，75%的受访者不知道自己有权享受免费紧急医疗服务。外籍工人的工作和生活条件（58%的工人生活条件不理想，每天工作时间超过10小时）是慢性病（高血压64%、糖尿病61%）和精神疾病（抑郁症44%、焦虑症33%）高发病率的原因之一。基于数据，研究提出了一些措施来促进外籍工人获得医疗服务：引入有文化调解员参与的流动医疗队，对医务人员进行跨文化交流培训，以及创建多语言信息资源。研究强调，需要加强预防工作以及与非政府组织的合作，以克服社会孤立感并改善医疗服务的不可及性。该研究有助于制定战略，使医疗保健系统适应农村弱势群体的需求。

关键词： 劳动力流动人口、农村人口、初级医疗保健、获取障碍、跨文化交流。

Abstract. *The article is devoted to the study of barriers to access to primary health care for foreign workers living in rural areas of the Russian Federation, as well as the development of recommendations for overcoming them. The relevance of the work is due to the intensive migration influx into the country, part of which falls on rural areas, where access to health services is complicated by infrastructural, cultural and legal factors. The purpose of the study was to assess the availability of health care for foreign workers, identify key barriers (legal, financial, cultural) and social determinants of health. During a cross-sectional study (July-October 2024) in the Moscow Region, a survey was conducted among 36 foreign workers and 41 native residents employed in manufacturing, agriculture and trade. The questionnaire covered working conditions, access to insurance, language barriers, morbidity, mental health (PHQ-9, GAD-7 questionnaires) and satisfaction with health services. The results revealed significant differences between the groups: only 8% of foreign workers had compulsory medical insurance (versus 100% of local residents), 80% of respondents noted language and cultural barriers, 75% did not know about the right to free emergency care. The working and living conditions of foreign workers (58% unsatisfactory conditions, 10+ hours of work per day) contributed to the high prevalence of chronic diseases (arterial hypertension - 64%, diabetes - 61%) and mental disorders (depression - 44%, anxiety - 33%). Based on the data, measures were proposed to facilitate foreign workers' access to medical care: the introduction of mobile medical teams with the participation of cultural mediators, training health workers in intercultural communication, and the creation of multilingual information resources. The need to strengthen preventive work and cooperation with NGOs to overcome social isolation and improve access to services is emphasized. The study contributes to the development of strategies for adapting the healthcare system to the needs of vulnerable groups in rural areas.*

Keywords: *labor migrants, rural population, primary healthcare, access barriers, intercultural communication.*

Introduction.

The Russian Federation is one of the leading countries in terms of the intensity of migration influx. Every year, about 450,000 people come to it. The migration increase is mainly observed in cities, but some foreign workers choose to live in rural areas if they can find work there [1].

Providing medical care in rural areas is associated with certain difficulties that are not encountered in cities [2]. At the same time, receiving medical care by foreign workers is also not without its peculiarities.

The international literature discusses the following barriers to foreign workers' full access to health care: lack of adequate insurance and the need to obtain health care on a commercial basis [3]; language and cultural barriers that reduce the qual-

ity of health care [4; 5; 6]; low awareness of their rights and available health services [3]; poor working and living conditions, which increases the risks of chronic diseases and injuries [3; 7]; limited access to prevention and low motivation to implement it [7; 8]; mental health issues and high risk of depression and anxiety due to the traumatic experience of migration and social isolation [9].

Since foreign workers are initially in a vulnerable position and have less access to health care [7], a detailed study of the barriers that arise when receiving health care in this social group, taking into account the characteristics of rural areas, and the development of ways to overcome them are relevant.

Purpose of the study.

To assess the access of foreign workers living in rural areas to health services and identify barriers (legal, financial, cultural) and social determinants of health, develop recommendations for improving the integration of migrants into the compulsory health insurance system and increasing the availability of health care.

Material and methods.

A cross-sectional study was conducted in July-October 2024 in the urban district of Dzerzhinsky in the Moscow region (Russia). A questionnaire was conducted comparing foreign workers and native rural residents. The population of the selected settlement, which is classified as a rural area, is 436 people. When selecting survey participants, the possibility of unskilled labor employment at the workplace of both a foreign citizen and a local resident was taken into account. In order to include the main professions of foreign workers, the spheres of manufacturing, agriculture and trade/services were selected. A total of 36 foreign workers and 41 native rural residents took part in the study. Consent to participate in the survey was obtained from the respondent verbally before filling out the questionnaire. There was no possibility of identifying the respondent based on any items of the questionnaire form. There were no refusals to participate in the survey.

The questionnaire form was developed by the authors personally. When compiling the questions, the goal was to cover the areas of health and lifestyle (working and living conditions; previously identified diseases; access to health insurance and knowledge of rights; frequency of requests for emergency/planned care; language barriers and satisfaction with the quality of services; mental health according to the PHQ-9 and GAD-7 questionnaires; assessment of the availability of medical care and problems arising in receiving it). Native speaker volunteers were present during the questionnaire completion for possible assistance in translating the questions. After completion, the questionnaire forms were processed statistically.

Results and discussion.

The presence of a compulsory health insurance policy in the study was found in all participants from among the native residents (100%) and only in some for-

eign workers (8%). The lack of full insurance is typical for this social group. For example, in China, 19% of rural migrants have insurance, while among urban residents this figure reaches 68% [3]. This situation leads to more frequent requests for medical care on a commercial basis.

Language and cultural barriers contribute significantly to the reduced accessibility of health care, reported by 80% of respondents among foreign workers. Studies in Denmark and the EU show that migrants face difficulties in communicating with health workers, which reduces the quality of care. For example, in Mexico, 42% of psychological consultations for migrants were related to the consequences of problems with food, housing and access to health care. This requires cultural sensitivity and adaptation to the needs of the social group when planning health services [4; 5]. In Russia, this is relevant for migrants from Central Asia and the former Soviet Union, where language differences and traditions affect help-seeking [7].

Low awareness of their rights and available health services was typical for both groups of respondents. The difference between foreign workers and the native population was in the opposite expectations regarding the available volume of health care: foreign workers tended to initially underestimate it, while native residents tended to increase it. Many foreign workers (75%) were unaware of the possibilities of receiving free emergency care and reported that in the event of a health threat, they would use medical services on a commercial basis, borrowing money from relatives and friends. In comparison with the study in China, 47% of migrants did not want to participate in insurance programs due to mistrust of the state system or insufficient information. It can be assumed that similar problems in the Russian Federation may be associated with the lack of systematic educational work among foreign workers living in rural areas.

The specific working and living conditions that are typical for foreign workers may have a negative impact on health. Unsatisfactory living conditions were reported by 58% of the foreign worker group and 17% of the native group. Foreign workers worked longer hours on average (10+1.7 hours versus 8+1.3 hours for the native population). A comparison with a study from China shows similar results: rural migrants in China worked up to 12 hours a day, lived in overcrowded spaces, which increased the risk of chronic diseases and injuries [3].

In EU countries, mobile clinics and cooperation with non-governmental organizations (NGOs) have become key tools for reaching vulnerable groups [4;5]. In the Russian Federation, when conducting a survey in this study, foreign workers showed lower awareness of the possibility of seeking help from NGOs (19% knew about it), compared to native residents (88%). In rural areas, such assistance is especially relevant due to a number of restrictions on access to planned and preventive care.

This study found a high prevalence of chronic non-communicable diseases (compared to local residents) in expatriates. Thus, expatriate workers often had arterial hypertension (64% versus 51%), diabetes mellitus/impaired glucose tolerance (61% versus 59%), obesity/overweight (64% versus 56%), and other chronic diseases (42% versus 37%) compared to local residents. Somatic diseases in expatriate workers are often associated with mental illnesses. According to research, they are at high risk of depression and anxiety due to the possible traumatic experience of migration and social isolation [9]. This study found anxiety disorders in 33% of expatriate workers (versus 17% of natives) and depressive disorders in 44% of expatriate workers (versus 24% of local residents). Mental disorders in general have a high risk of development in rural areas, under the influence of certain unfavorable factors and require special attention from the health care system [10].

Conclusion.

Organizational work to improve assistance to the social group of foreign workers is necessary, including in the direction of identifying barriers to access to medical care for them. In our study, the main obstacles were low awareness of the possibility of receiving free medical care, language and cultural barriers. The negative impact on the health of foreign workers was shown by the frequent occurrence of chronic non-communicable diseases, unsatisfactory working and living conditions, low knowledge of prevention and low motivation to carry it out. Key tools can be the introduction of mobile medical teams reinforced by cultural mediators from among NGO volunteers, training health workers in the basics of intercultural communication, the creation of multilingual information resources on the rights and opportunities of foreign citizens for medical care.

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根管治疗中医源性错误消除方法分析
**ANALYSIS OF METHODS FOR ELIMINATING IATROGENIC
ERRORS IN ENDODONTIC PRACTICE**

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摘要。 尽管由于创新根管治疗系统、放大操作以及各种冲洗和充填方案的出现，根管治疗的质量得到了显著提高，但牙科中医源性并发症的问题仍然存在。最常见的并发症包括硬组织穿孔、器械碎裂、充填材料挤压到邻近解剖区域，例如上颌窦和下颌根管。所有这些都可能导致严重的并发症，需要在医院进行专门护理。本文分析了在根管治疗过程中避免医源性失误（例如器械碎裂）的最常用方法。

关键词：重复根管治疗，根管治疗，断器械拔除，医源性失误，医源性并发症。

Abstract. Despite the significant improvement in the quality of endodontic treatment due to the emergence of innovative systems for canal treatment, work under magnification, and the development of various irrigation and obturation protocols, the problem of iatrogenic complications in dentistry remains relevant. The most common complications are perforation of hard tissues, fragmentation

of instruments, extrusion of obturation material into adjacent anatomical areas, such as the maxillary sinus and mandibular canal. All this can lead to serious complications requiring specialized care in a hospital setting. This article presents an analysis of the most commonly used methods for eliminating iatrogenic errors, such as instrument fragmentation during endodontic treatment.

Keywords: repeated endodontic treatment, endodontics, extraction of a broken instrument, iatrogenic errors, iatrogenic complications.

Endodontics is a complex type of therapeutic treatment with a high risk of complications, which takes up most of the dentist's working time, and the positive result does not exceed 50-70%, while patients with complicated forms of caries make up to 50% of those seeking dental care. Of the many iatrogenic errors that entail complications in endodontic practice, two main ones are distinguished - perforation of hard tooth tissues and instrument fractures. Attempts to remove a broken instrument can lead to the formation of "steps", excessive expansion and displacement of the treated root canal, as well as its perforation. Fragmentation of an endodontic instrument inside the root canal system is one of the most unpleasant situations that a doctor can encounter. This is often a consequence of improper use of instruments. When solving such a problem, a dentist considers several options. These options may include leaving the fragment at the fracture site, including it as part of the final obturation, or removing it from the root canal. Once the decision has been made to remove the broken instrument, the clinician must understand that this procedure may be one of the most difficult.

The algorithm for removing broken instruments from root canals may include the following manipulations and techniques [1]:

- 1) using special clamps and forceps;
- 2) instrument braiding technique;
- 3) "lasso" technique;
- 4) passing close to the fragment and removing it using Microdebrider instruments and H-files;
- 5) Masseran technique using a trepanation bur;
- 6) using Endo Extractor instruments;
- 7) technique of using a hollow needle and H-file;
- 8) using Canal Finder instruments; 9) the use of ultrasonic devices with RT (EMS, Switzerland), ProUltra (Dentsply, USA), Sonic Flex Endo System (Kavo, Germany) and other attachments;
- 10) a combination of the above methods.

The results of the analysis of publications by foreign authors show that none of the known and tested methods for removing broken instruments is superior to the other in terms of overall success and removal time [3, 4]. The location and type

of the broken instrument do not significantly affect the likelihood of successful extraction. Therefore, further research should be focused on determining a fast and effective removal procedure that minimizes damage to root dentin.

A method for extracting a fragment of an instrument is known [5], which consists of the following sequential actions: an ultrasonic endodontic file is applied to the fragment of the instrument, creating a groove around it, then a solution of ferrihydrite nanoparticles with adsorbed ethylenediaminetetraacetic acid is introduced into the space between the fragment and the tooth, the fragment of the endodontic instrument is magnetized, and low-intensity magnetic laser resonance therapeutic radiation with a wavelength of 0.85 μm , a pulse power of 5 W, a pulse repetition rate of 2000 Hz, a pulse duration of 40 ns, and a magnetic induction of at least 50 mT is applied to the root canal of the tooth and the fragment, followed by extraction of the fragment from the root canal of the tooth; the action is carried out under the control of an operating microscope and an X-ray. It should be noted that the disadvantages of this method are as follows:

- 1) the method is applicable only in wide root canals with direct access, since the ultrasonic tip must work parallel to the fragment and coincide with the axis of the canal. If it is deflected, due to its aggressive effect on dentin, there is a high risk of forming steps in the canal, perforations;
- 2) the thermal effect when ultrasound is applied to a fragment of an instrument leads to an increase in the fragment in volume and its further jamming in the canal;
- 3) with a wide apical opening, ultrasound exposure can provoke migration of the fragment into the periapical tissues, which in such a situation can only be corrected surgically;
- 4) the method is not applicable for extracting nickel-titanium instruments;
- 5) due to the high intensity of ultrasound, a fragment of the instrument fragment at the time of extraction can get into other canals that are not closed with a temporary obturating material.

A method for removing a fragment of an endodontic file is also known [6], in which an instrument containing an elongated tubular rod with proximal and distal ends is used to remove a fragment of an endodontic file, the rod having an internal diameter in the area of the proximal end exceeding the external diameter of the open part of the file to be removed. When implementing the method, the proximal end of the instrument is telescopically placed on the open end part of the file fragment to be removed, glue is introduced into the internal part of the instrument through the distal end of the rod, which is drawn there by the capillary effect, and after the glue hardens, the instrument with the file fragment stuck to it is removed from the root canal of the tooth.

Analysis of the technique showed that this method has a number of disadvantages:

1) the instrument for implementing the described technique can only be used in wide root canals with direct access; 2) the outer and inner diameters of the instrument exceed the outer diameter of the open part of the file being extracted, which inevitably entails an increase in the canal and the formation of a step in it;

3) in the case of severe jamming of the file fragment to be extracted, the adhesive properties of the adhesive composition may be insufficient to extract the fragment;

4) the adhesive composition may leak beyond the inner diameter of the instrument into the root canal cavity, which is associated with the risk of an additional iatrogenic factor.

A more advanced, in the opinion of the authors, is the method of extracting fragments of endodontic instruments from the root canal of a tooth, presented by B.N. Zyryanov in 2009 [7], which consists of first taking an X-ray to determine the location of the fragment, expanding the root canal of the tooth with a diameter twice as wide as the root canal was, up to the fragment and further along the fragment, after which they take a K-file or Protaper as an extraction tool, the diameter of which will be larger than the fragment being extracted, but smaller than the root canal of the tooth, insert it deep behind the fragment of the instrument and with lever-like rotational movements dislocate it from the root canal of the tooth.

The known method has the following disadvantages:

1. During radiographic examination, there is a high risk of diagnostic error due to the summation effect of a 2-dimensional image. It is impossible to identify a canal with a fragment of an instrument in multi-rooted teeth, due to the overlap of root canals during the examination.

2. It is impossible to use the invention in case of an instrument fracture with jamming in the apical part of the root, since in the proposed method, in order to extract the fragment, it is necessary to remove an endodontic instrument of a larger diameter deep beyond the fragment to be removed, i.e. beyond the apex of the root. This will lead to apical perforation, which will significantly complicate the necessary medicinal treatment and obturation due to the risk of the disinfectant solution leaking out and the filling material leaking out into the periapical tissues.

3. Widening the root canal significantly more than the initial size will lead to significant resection of root dentin, which increases the risk of strip perforations in roots with an oval and bean-shaped cross-section, is an iatrogenic factor and can serve as an indication for tooth extraction.

4. An instrument with an active tip, such as a ProTaper, requires special care when working with it, due to the high risk of perforation of the root wall when the instrument deviates from the canal axis in the presence of an obstacle in the canal in the form of a broken instrument.

5. To widen the canal 2 times more than the initial size, it is necessary to work with instruments of high taper and large diameter, which, due to an increase in the

contact area of the instrument surface with the canal walls and the fragment, leads to a significant increase in torsional load and the risk of instrument breakage.

6. High taper of the instrument required for widening the canal is associated with a decrease in its flexibility. That is, the instrument in the canal tends to straighten out, which leads to the formation of steps and complicates further processing of the canal.

7. The large taper of the instrument itself complicates its advancement deep into the root canal, leading to an increase in the axial force required to perform cutting. As a result, the likelihood of canal transportation and perforation increases, which may lead to the need to extract the tooth.

8. The method is not applicable when working in curved, sclerotic canals, canals with complex anatomy and limited access.

Conclusion. Analysis of existing methods for removing fragments of an endodontic file showed that it is necessary to search for and develop an effective non-invasive method for removing a jammed and broken off fragment of a canal filler (instrument) in the tooth canal when treating destructive forms of periodontitis.

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临床实践中三联疗法和根治性膀胱切除术后5年总生存率的回顾性分析
**RETROSPECTIVE ANALYSIS OF 5-YEAR OVERALL SURVIVAL
AFTER TRIMODAL THERAPY AND RADICAL CYSTECTOMY IN
REAL CLINICAL PRACTICE**

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摘要。引言。根治性膀胱切除术 (RC) (联合或不联合盆腔淋巴结清扫和新辅助化疗) 仍然是非转移性肌层浸润性膀胱癌 (MIBC) 的标准治疗方法。然而, 由于并发症发生率高且术后早期和晚期生活质量较差, 为了保留膀胱, 已提出了一种替代的三联疗法。该疗法包括膀胱肿瘤最大限度经尿道切除术 (TUR) 联合放化疗。临床研究表明, 三联疗法 (TMT) 可实现与现代 RC 方法相当的长期总生存率 (OS)。本文回顾性分析了 T2-3N0-3M0 MIBC 患者在临床实践中接受 RC 或 TMT 治疗后的 5 年总生存率 (OS)。研究目的

比较 MIBC 患者接受 TMT 和 RC 治疗后的 5 年总生存率 (OS)。

材料与方法: 基于一项纳入174例MIBC患者的多中心队列回顾性研究的结果, 对TMT与RC治疗后的5年OS进行了比较分析。

结果: 无论年龄、性别、T和N如何, TMT治疗后患者的5年OS均显著高于RC治疗组: 46.0% vs 36.0%, $p < 0.01$ 。TMT治疗后, 60岁以下组的5年OS略高, 而60岁以上组的5年OS无论采用何种治疗方法均相当。对于非转移性MIBC (T2N0M0), TMT治疗后患者的5年OS显著高于RC组: 59.5% vs 51.9%, $p = 0.04$ 。

结论。在实际临床实践中, TMT 后的 5 年总生存率 (OS) 与 RC 相当, 因此对于不适合 RC 的局部性非转移性肌层浸润性膀胱癌 (MIBC, T2N0M0) 患者, TMT 可能是一种合理的替代方案。

关键词: 膀胱癌, 三联疗法, 根治性膀胱切除术, 5 年总生存率。

Abstract. Introduction. Radical cystectomy (RC) with or without pelvic lymph node dissection and neoadjuvant chemotherapy remains the standard treatment for non-metastatic muscle-invasive bladder cancer (MIBC). However, due to the high complication rate and poor quality of life in the early and late postoperative period, an alternative trimodal treatment option has been proposed to preserve the bladder. It consists of maximum transurethral resection (TUR) of the bladder tumor in combination with chemoradiation therapy. The results of clinical studies have shown that trimodal therapy (TMT) allows achieving long-term overall survival (OS) comparable to modern RC methods. The article presents a retrospective analysis of 5-year OS in patients with T2-3N0-3M0 MIBC after RC or TMT in real clinical practice. Objective of the study

To compare 5-year overall survival (OS) of patients with MIBC after TMT and RC.

Material and methods: Based on the results of a multicenter cohort retrospective study of 174 patients with MIBC, a comparative analysis of 5-year OS after TMT and RC was performed.

Results. It was found that regardless of age, gender, T and N, 5-year OS was significantly higher in patients after TMT compared to RC: 46.0% versus 36.0%, $p < 0.01$. After TMT, 5-year OS was slightly higher in the group under 60 years of age and comparable regardless of the treatment method in groups over 60 years of age. In non-metastatic MIBC (T2N0M0), 5-year OS was significantly higher after TMT: 59.5% versus 51.9% in the RC group, $p = 0.04$.

Conclusion. In real-life clinical practice, 5-year OS after TMT was comparable with RC and may therefore be a reasonable alternative in carefully selected patients with localized non-metastatic MIBC (T2N0M0) who are not suitable for RC.

Keywords: bladder cancer, trimodality therapy, radical cystectomy, 5-year overall survival.

Introduction

Bladder cancer (BC) ranks 10th in men and 17th in women in the structure of oncopathology [1]. Muscle invasion is diagnosed for the first time or against the background of superficial tumor progression in every fourth patient with BC [2,3]. RC with pelvic lymph node dissection, neoadjuvant chemotherapy or without it is still considered the standard of care for non-metastatic MIBC [4]. RC is not performed in 50% of patients for various reasons and alternative treatment options should be considered in comorbid patients, especially in the elderly. [5]

Since the 1990s, the results of continuous (single) and split-course TMT have been published [6-7], as well as the results of completed RTOG protocols and a number of meta-analyses of clinical trials, which showed that TMT allows preserving the bladder and achieving an acceptable level of 5-year and long-term survival comparable to modern RC methods [8].

A systematic review and meta-analysis devoted to oncological outcomes showed no statistically significant differences in OS rates between patients after RC or undergoing TMT [9].

The proportion of TMT in the structure of radical treatment methods for MIBC is steadily increasing worldwide. In the UK, about 50% of newly diagnosed cases of MIBC in the country undergo primary TMT [10]. Modern TMT protocols demonstrate comparable efficacy to RC in terms of key oncological indicators with a significantly lower complication rate [11], so in a certain category of patients, TMT can be considered as first-line therapy for localized MIBC. The main provisions of the TMT consensus were formulated and published by a group of scientists from St. Petersburg in 2022 [12].

Objective of the study

To compare the overall 5-year survival of patients with MIBC after TMT and RC.

Materials and methods

A multicenter cohort retrospective study of the medical records of 174 patients with T2-3N0-3M0 MIBC was conducted. The average age was 61.44 ± 10.19 years (35-92 years), there were 145 men and 29 women. All patients were divided into 2 groups. The first group included 100 patients after RC (89 men, 11 women, aged 35 to 75 years, the average age was 59.21 ± 8.54), the second group - 74

patients who underwent TMT (56 men, 18 women, the average age was 64.45 ± 11.46 years).

All patients underwent a standard examination. The extent of spread and stage of the tumor process were assessed based on the data of MSCT of the chest, abdominal cavity and MSCT/MRI of the pelvic organs with intravenous contrast. Histological assessment of the tumor material was carried out based on the 2017 TNM classification approved by the International Union for Cancer Control (UICC) (8th edition) with the definition of the tumor type, degree of malignancy and depth of invasion. Staging was carried out according to the TNM system. In group 1, patients underwent RC in the volume of bilateral lymph node dissection in men with cystoprostatectomy, in women with removal of the uterus and appendages. Patients in group 2 underwent TMT (maximum TUR of the bladder tumor followed by external beam radiotherapy (SOD 64–66 Gy) in 32 fractions and chemotherapy according to the following regimen: cisplatin 70 mg/m² intravenously on day 1 + gemcitabine 1000 mg/m² intravenously on days 1, 8, and 15). The number of drug therapy cycles ranged from 3 to 6.

All patients were divided into two age groups: <60 and ≥ 60 years. Patients ≥ 60 years predominated. In the older age group (≥ 60 years), TMT was more often performed (67.6% versus 46.0%), and in the younger (<60) RC (54.0% versus 32.4%) (Table 1).

Table 1.
Distribution of patients after TMT and RC depending on age

Age	TMT (n=74)	RC (n=100)	Totally	p, (df=1)
≥ 60 years old	50 (67,6%)	46 (46,0%)	96 (55,0%)	0,005
<60 years old	24 (32,4%)	54 (54,0%)	78 (45,0%)	

The majority of patients – 141 (81.0%) – had non-metastatic MIBC (T2-3N0M0). Of these, 95 (54.6%) had stage T2N0M0. The number of patients with regional lymph node involvement was 33 (19.0%) patients. At the same time, N+ was almost 2 times more common in the RCE group: 24.0% versus 12.2%, $p=0.05$ (Table 2).

When distributing according to the TNM classification, TMT and RC were more often performed for non-metastatic MC (T2-3N0M0), respectively, in 87.8% and 76.0% of patients.

Table 2.*Distribution of patients according to the TNM classification*

Diagnosis	TMT n=74	RC n=100	Totally, n=174	P, (df=9)
T2N0M0	42 (56,8%)	53 (53,0%)	95 (54,6%)	0,6
T2N+M0	2 (2,7%)	12 (12,0%)	14 (8,1%)	0,05
T3N0M0	23 (31,0%)	23 (23,0%)	46 (26,4%)	0,2
T3N+M0	7 (9,5%)	12 (12,0%)	19 (10,9%)	0,1

After RC, 56 (56.0%) patients underwent orthotopic cystoplasty with ileal segments using the Studer (2%), Houtman (10%), S-shaped cystoplasty (32%), and sigmoid colon (12%) methods for urinary diversion. The criterion for treatment effectiveness was OS – the interval between surgery and death or the last observation of the patient. Statistical processing of the obtained material was performed using STATISTICA 12 with Medical Bundle (StatSoft Inc., Tulsa, OK, USA) and MedCalc Statistical Software version 16.4.3 (MedCalc Software bvba, Ostend, Belgium). The relationship between the groups and 5-year OS was determined using Kaplan-Meier curves and the log-rank test. The Cox regression model was used for univariate multivariable analysis. Variables included in the univariate analysis: gender, age, tumor size, T stage, lymph node involvement.

Results

In the overall group (n=174), regardless of the MIBC stage and treatment method, the 5-year OS was 40.2%. It should be noted that this indicator was higher in women - 51.7% versus 38.6% in men (p=0.3), as well as in patients under 60 years old - 46.2% versus 35.4% (p=0.6) (Table 3). The average follow-up time for patients after TMT was 3.59 years, after RC - 4.07 years.

Table 3.*5-year OS in the overall group (n=174) depending on age and gender*

Characteristics of groups					
Groups	General (n=174)	<60 (n=78)	≥ 60 (n=96)	Male (n=145)	Female (n=29)
5-year-old	70 (40,2%)	36 (46,2%)	34 (35,4%)	55 (38,6%)	15 (51,7%)
P-value		0,6		0,3	

When assessing the impact of the treatment method, regardless of age, gender, T and N, it was found that 5-year OS was significantly higher in patients after TMT compared to RC: 46.0% versus 36.0%, p <0.01 (Table 4, Fig. 1).

Table 4.

5-year OS depending on the treatment method

Group	Totally	5-year OS	p
TMT	74	34 (46,0%)	0,01
RC	100	36 (36,0%)	
Total	174	70 (40,2%)	

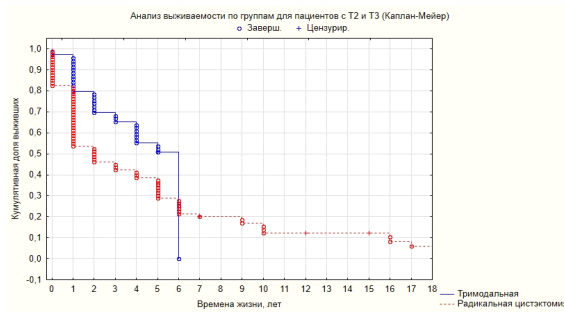


Figure 1. *5-year OS depending on the treatment method*

In patients under 60 years old, after RC, 5-year OS reached 44.44% and was comparable with TMT (55.9%), but 18.44% higher compared to the older group ($p=0.07$). After TMT, 5-year OS was slightly and insignificantly higher (by 11.8%) in the group under 60 years old and was comparable regardless of the treatment method in the groups over 60 years old.

When analyzing 5-year OS depending on the treatment method and the extent of tumor spread, significant differences after TMT and RC were obtained only in patients with non-metastatic MIBC (T2N0M0), which was higher in the TMT group: 25 (59.5%) versus 27 (51.9%) in the RC group, $p=0.04$. In MIBC (T3N0M0), the 5-year OS rates after TMT and RC did not differ significantly, but were significantly lower in these groups compared to patients with MIBC (T2N0M0) (Fig. 2).

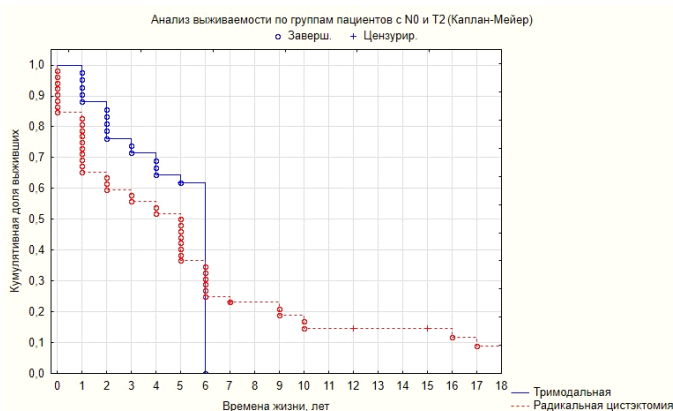


Figure 2. 5-year OS in T2N0M0 depending on the treatment method

Discussion

For many years, the main method of radical treatment of patients with MIBC has been RC. However, it is often accompanied by serious complications and a high mortality rate both in the early and late postoperative periods, significantly reducing the quality of life of patients.

Currently, TMT is considered as a reasonable alternative to RC in a certain category of patients with MIBC, which allows not only to preserve the bladder and an acceptable quality of life, but also to ensure the necessary level of oncological control over the course of the disease in the long term.

Our study showed that in real clinical practice, the 5-year OS rates after TMT are comparable with RC. Without taking into account age, gender, T and N, it was found that the 5-year OS was significantly higher in patients after TMT compared to RC: 46.0% versus 36.0%, $p < 0.01$. In the younger age group (< 60 years), RC had significant advantages in 5-year OS: 44.44% versus 26.00% ($p = 0.07$), but was comparable with TMT (55.9%). After TMT, 5-year OS was slightly and insignificantly higher by 11.8% in the group under 60 years old and comparable regardless of the treatment method in the groups over 60 years old. The presence of regional metastases significantly and reliably affects patient survival. In patients with non-metastatic MIBC (T2N0M0), 5-year OS was higher in the TMT group: 59.5% versus 51.9% in the RC group, $p = 0.04$.

Conclusions

In real-life clinical practice, patients after TMT had comparable 5-year OS with RC regardless of age and were higher in localized non-metastatic MIBC (T2N0M0). Thus, TMT may be an alternative treatment option in carefully selected patients who are not suitable for RC.

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冠心病患者和高残留血小板反应性患者死亡率的关键预测因素
**KEY PREDICTORS OF MORTALITY IN PATIENTS WITH
CORONARY HEART DISEASE AND HIGH RESIDUAL PLATELET
REACTIVITY**

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摘要。目的。在接受双重抗血小板治疗的冠心病（CHD）患者中，探讨13个预测因子与患者死亡率的相关性。

材料与方法。本研究进行了一项前瞻性临床研究。纳入了197例冠状动脉疾病患者，这些患者在2022年至2024年期间，经VerifyNow设备确诊为在接受双重抗血小板治疗（DAT）的背景下，存在血小板残留反应性。研究确定了13个危险因素及其与这些患者死亡率的相关性。

结果。51.8%的患者（n=102）检测到血小板残留反应性高。5.1%的患者（n=10）出现死亡。死亡率的关键预测因子是：年龄、C反应蛋白（CRP）、射血分数（EF）、血红蛋白和2型糖尿病（T2DM）。

结论：在DAT背景下，年龄、CRP、EF、血红蛋白和2型糖尿病是冠心病和HRPR患者死亡的关键预测因素，需要纠正这些危险因素以改善预后。

关键词：冠心病、HRPR、预测因素、死亡。

Summary. Purpose. Determination of the correlation between 13 predictors and the development of mortality in patients with high residual platelet reactivity (HRPR) and coronary heart disease (CHD) against the background of dual antiplatelet therapy.

Material and methods. A clinical prospective study was conducted. 197 patients with coronary artery disease were included, who were determined to have residual platelet reactivity against the background of dual antiplatelet therapy

(DAT) on the VerifyNow device in the conditions of the Research Institute of Cardiology and Internal Medicine from 2022 to 2024. 13 risk factors and their correlation with the development of mortality in these patients were identified.

Results. In 51.8% of patients ($n=102$), high residual platelet reactivity was detected. Mortality was observed in 5.1% ($n=10$). Key predictors of mortality development are: age, C-reactive protein (CRP), ejection fraction (EF), hemoglobin and type 2 diabetes mellitus (T2DM).

Conclusion. Thus, age, CRP, EF, hemoglobin and type 2 diabetes are key predictors of mortality in patients with coronary heart disease and HRPR against the background of DAT, which requires correction of these risk factors to improve the prognosis.

Keywords: coronary heart disease, HRPR, predictors, mortality.

Relevance

High residual platelet reactivity (HRPR) is a predictor of serious adverse cardiovascular events such as cardiovascular death, myocardial infarction, and stent thrombosis in patients with coronary artery disease (CAD), especially after percutaneous coronary intervention [1]. There are numerous cases of recurrent myocardial infarction and death after coronary stenting in patients with CAD and HRPR despite DAPT [2]. The above data indicate the need to identify type 2 diabetes in patients with CAD and HRPR on antiplatelet therapy as a predictor of mortality in order to assess the prognosis and prevent the development of mortality in these patients.

Materials and methods of research: A clinical prospective study was conducted. 197 patients with coronary artery disease were included, in whom residual platelet reactivity was determined against the background of dual antiplatelet therapy (DAT) using the VerifyNow device in the conditions of the NAO Research Institute of Cardiology and Internal Medicine from 2022 to 2024. 13 risk factors (age, glomerular filtration rate, body mass index, CRP, total cholesterol, triglycerides, fibrinogen, troponin I, D-dimer, ejection fraction, hemoglobin, type 2 diabetes, Covid-19) and their correlation with the development of mortality in these patients were determined using the logistic regression method, odds ratio.

Research results:

Table 1 shows that the average age of patients at the time of the study was 66.64 ± 9.32 year. The average SCF was 66.64 ± 9.32 ml/min/ 1.73 m^2 . The average BMI was 28.43 ± 5 kg/ m^2 . The average CRP level was 4.07 ± 1.93 mg/L. Total cholesterol, LDL and triglycerides were 4.86 ± 1.27 mmol/L, 2.87 ± 1.1 mmol/L and 1.42 ± 0.64 mmol/L, respectively. Overall, the average ejection fraction was $56.06 \pm 10.62\%$. The average hemoglobin level was 140.31 ± 18.67 g/L.

Table 1.
Clinical and anamnestic characteristics of patients (n=197)

parameter	men		women		Total	p
	N	$\bar{x} \pm SD$	N	$\bar{x} \pm SD$	$\bar{x} \pm SD$	
Age	112	65.9±9.26	85	67.61±9.35	66.64±9.32	0.203
Glomerular filtration rate (GFR, ml/min/1.73 m ²):	112	75.84±18.08	85	77.52±15.97	76.57±17.18	0.497
Body mass index, kg/m ²	112	28.7±5.21	85	28.08±4.71	28.43±5	0.389
C-reactive protein (CRP, mg/l):	112	3.86±1.89	84	4.35±1.96	4.07±1.93	0.075
Total cholesterol (TC, mmol/l):	112	5.01±1.32	85	4.67±1.18	4.86±1.27	0.068
Low-density lipoproteins (LDL, mmol/l)	112	2.92±1.09	85	2.8±1.12	2.87±1.1	0.438
Triglycerides (TG, mmol/l)	112	1.5±0.77	85	1.32±0.41	1.42±0.64	0.054
Fibrinogen (g/l)	112	3.44±0.94	85	3.49±1.54	3.46±1.23	0.743
Number of atherosclerotically affected vessels	112	3.76±3.1	85	4.2±3.42	3.95±3.24	0.345
D-dimer (ng/ml)	112	194.35±152.14	85	250.18±271.43	218.44±213.19	0.069
Troponin (ng/ml)	112	0.01±0.04	85	0.01±0.05	0.01±0.04	0.808
Ejection fraction (EF, %)	112	57.27±9.37	85	54.46±11.94	56.06±10.62	0.066
Hemoglobin (g/l)	112	141.15±15.77	85	139.2±21.96	140.31±18.67	0.470
\bar{x} -average value SD-standard deviation						

Figure 1 shows type 2 diabetes 26% (51), impaired glucose tolerance 2% (3), Covid-19 8% (16), COPD 2% (3), smoking 14% (27). Mortality was observed in 5.1% (10).

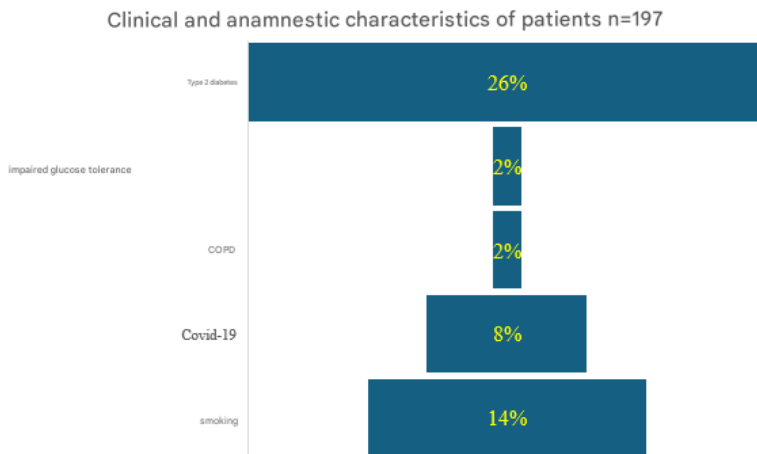


Figure 1.

Table 2.
Patient therapy (n=197).

Preparations	Number of patients taking drugs, n	Number of patients taking medications, %
β -blockers	162	82.2%
ACE inhibitors	100	50.8%
Sartans	73	37%
Calcium channel blockers	55	28%
Imidazoline receptor blockers	20	10.15%
Diuretics	59	30%
Statins	197	100%
Gastroprotective	197	100%
Antiplatelet therapy	197	100%
Hypoglycemic therapy	54	27.5%
Iron preparations	9	4.6%

Table 2 shows that almost all 197 patients (100%) received DAT (acetylsalicylic acid and clopidogrel). The remaining patients received: β -blockers - 162 patients (82.2%), ACE inhibitors - 100 patients (50.8%), sartans - 73 patients (37.1%), calcium channel blockers - 55 patients (27.9%), imidazoline receptor blockers - 20 patients (10.2%), diuretics - 59 patients (29.9%), antiarrhythmic therapy - 5 patients (2.5%).

Determination of platelet reactivity and the presence of resistance in antiplatelet therapy. Blood tests were performed on 197 patients with coronary heart disease (Table 6) In 51.8% of patients (102), high residual platelet reactivity (HRPR) was detected, the average PRU was 252.53. In 45.2% (89) of patients, the residual platelet reactivity was in the therapeutic window, the average PRU was 167. And only 3% (6) of patients had a high risk of bleeding, the average PRU was 38. As for the response to antiplatelet therapy, 87.8% (173) of patients taking ASA had a good antiplatelet effect and only 12.2% (24) of patients were resistant to ASA treatment. In 56.9% (112) of patients, a poor response to clopidogrel therapy was observed and resistance was observed, moreover, these patients had HRPR. 43.1% (85) of patients had a good antiplatelet effect and showed high inhibition of platelet aggregation by clopidogrel. In 190 healthy control patients, residual platelet reactivity was in the therapeutic window (Table 3).

Table 3.

Determination of residual platelet reactivity (RPR) and response to antiplatelet therapy.

Parameter		floor		total
		men	women	
ASA	good effect	97(86.6%)	76(89.4%)	173(87.8%)
	bad effect	15(13.4%)	9(10.6%)	24(12.2%)
Clopidogrel	good effect	45(40.2%)	40(47.1%)	85(43.1%)
	bad effect	67(59.8%)	45(52.9%)	112(56.9%)
RPR	bleeding	5(4.5%)	1(1.2%)	6(3.0%)
	therapeutic window	51(45.5%)	38(44.7%)	89(45.2%)
	WORTH	56(50.0%)	46(54.1%)	102(51.8%)

Table 4.

Logistic regression (significance of predictors and their relationship with the development of mortality)

Predictors	Significance	OR – odds ratio	95% confidence interval for odds ratio	
			lower	upper
age	0.023	2,978	1,159	7,651
GFR	0.360	1,438	0.661	3,132
BMI	0.980	0.990	0.474	2,070
CRP	0.038	2,353	1,050	5,269
TC	0.053	0.464	0.214	1,010
TG	0.260	0.527	0.173	1,607
Fibrinogen	0.956	1,020	0.495	2,105

D-dimer	0.281	1,511	0.714	3,197
Troponin I	0.241	1,878	0.655	5,385
EF	0,011	0.365	0.168	0.793
Hemoglobin	0,040	0.417	0.181	0.960
Type 2 diabetes	0.008	0.382	0.188	0.776
Covid-19	0.458	1,453	0.541	3,897

Table 4 shows that age (OR = 2.978, $p = 0.023$) significantly affects the probability of death. With increasing age, the probability of death increases by 2.98 times. Elevated CRP level (OR = 2.353, $p = 0.038$) is also associated with an increased probability of death (increases the risk by 2.35 times). EF (ejection fraction) (OR = 0.365, $p = 0.011$). An increase in EF is associated with a 2.7-fold decrease in the chances of death ($1/0.365$). Higher hemoglobin level (OR = 0.417, $p = 0.040$) reduces the risk of death (reduces the chances by 58.3%). Type 2 diabetes mellitus (OR = 0.382, $p = 0.008$), its correction and remission significantly reduce the risk of death by 2.6 times. Covid-19 (OR = 1.453, $p = 0.458$), Troponin I (OR = 1.878, $p = 0.241$), D-dimer (OR = 1.511, $p = 0.281$), fibrinogen (OR = 1.020, $p = 0.956$), TG (OR = 0.527, $p = 0.260$), BMI (OR = 0.990, $p = 0.980$), GFR (OR = 1.438, $p = 0.360$) did not have a statistically significant effect ($p > 0.05$). Key predictors of mortality are age, CRP, EF, hemoglobin and type 2 diabetes.

Discussion: To date, there are many cases of recurrent myocardial infarction and death in patients with coronary artery disease and HRPR after coronary angiography with stenting despite DAPT [3]. Due to the increase in the number of these adverse outcomes, the level of disability and mortality in patients with coronary artery disease and HRPR also increases [4]. A study conducted in the Korean population included 1220 patients (95.5%) with VORT against the background of antiplatelet therapy. During the study, 2.4% (30 patients) of cardiovascular events were observed, including 1.5% (18 patients) mortality from cardiovascular pathology, 1.3% (16 patients) non-fatal myocardial infarction, 1.6% (19 patients) episodes of stent thrombosis [5]. In patients receiving DAPT, older age is independently associated with reduced efficacy of ADP antagonists and a high risk of developing high residual platelet reactivity regardless of ASA and clopidogrel or ticagrelor therapy [6]. Recent data confirm the presence of a significant association and influence of older age on the development of HRPT despite DAPT therapy. This fact indicates that age is one of the predictors and risk factors for the development of HRPT and resistance to DAPT [7]. In patients with type 2 diabetes and impaired glucose tolerance with the presence of atherosclerosis, a high ankle-brachial index and high intima-media thickness were observed, indicating increased vascular stiffness. Moreover, a correlation was noted between high levels of glycated hemoglobin, hyperglycemia and an increase in the mean platelet volume [8].

Also, a prevalence of thrombocytosis is noted in patients with low hemoglobin levels and inflammatory bowel diseases and chronic kidney disease [9]. According to the RESCUE study, highly sensitive CRP and IL-6 are key risk factors for the development of atherothrombosis [10].

Conclusion: Thus, 51.8% of patients (n=102) showed high residual platelet reactivity. Mortality was observed in 5.1% (n=10). 5 risk factors: age, CRP, EF, hemoglobin and type 2 diabetes are key predictors of mortality in patients with coronary heart disease and HRRP against the background of DAT, which requires correction of these risk factors to improve the prognosis. Inflammation (CRP) increases the risk of death by 2.35 times. Increasing age increases the risk of death by 2.98 times. Achieving remission of type 2 diabetes reduces the risk of mortality by 2.6 times. Normalization of the ejection fraction reduces the risk of mortality by 2.7 times.

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未分化结缔组织发育不良与青少年胆道功能障碍的相互关系
**THE INTERRELATION BETWEEN UNDIFFERENTIATED
CONNECTIVE TISSUE DYSPLASIA AND FUNCTIONAL
DISORDERS OF THE BILIARY TRACT IN ADOLESCENTS**

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摘要. 对189名13–15岁青少年进行了检查。其中131例 (69.31%) 患者被发现存在此综合征。结果显示, 未分化结缔组织发育不良综合征与胆道功能异常相关。在受检青少年中, 未分化结缔组织发育不良与胆道功能障碍 (主要表现为各种运动障碍) 并存。

关键词: 青少年, 未分化结缔组织发育不良, 胆道功能障碍。

Summary. 189 teenagers aged 13-15 were examined. In 131 patients (69.31%), syndrome was detected. It was revealed that the undifferentiated connective tissue dysplasia syndrome is interrelated with the peculiarities of the functioning of the biliary tract. The presence of undifferentiated connective tissue dysplasia in the examined adolescents was combined with functional disorders of the biliary tract, primarily with various motor disorders.

Keywords: adolescents, undifferentiated connective tissue dysplasia, functional disorders of the biliary tract.

Currently, diseases of the digestive system in adolescents, including diseases of the biliary tract, are an important medical and social problem due to their widespread occurrence and high risk of early manifestation, and are an urgent issue in clinical pediatrics [1].

Functional disorders of the biliary tract are a combination of symptoms that cannot be explained by biochemical and structural changes. According to international criteria (Rome, III, 2006), functional disorders of the biliary tract include biliary type Oddi sphincter dysfunction, pancreatic type Oddi sphincter dysfunction, and functional disorders of the gallbladder.

Undifferentiated connective tissue dysplasia (UCTD) is a genetically determined developmental disorder in the pre- and postnatal periods, characterized by defects in fibrous structures and the intercellular matrix of connective tissue, leading to a violation of the formation of organs and systems, manifested by dysfunction of internal organs and the presence of phenotypic signs - markers.

The critical period of UCTD manifestations is adolescence, when the volume of connective tissue increases in proportion to the growth and development of the organism [2].

There is no doubt about the relevance of determining the relationship between UCTD and the development of functional biliary disorders in adolescents, since: the biliary tract is characterized by a significant degree of collagenisation, UCTD has a high prevalence in the population, there are a sufficient number of studies in the modern scientific literature that prove the aggravating role of UCTD in the development of various types of somatic pathology.

The purpose of the research: to study the phenotypic and clinical features of biliary tract pathology in adolescents with undifferentiated connective tissue dysplasia syndrome.

Materials and methods: 189 adolescents aged 13-15 years were examined. In 131 patients (69.31%), UCTD syndrome was detected. Functional disorders of the biliary tract were stated after the exclusion of organic gastrointestinal diseases.

UCTD was verified based on the presence of stigmas of dysembryogenesis and phenotypic features (soft auricles, blue sclera), changes in the structure of the musculoskeletal system, internal organs, skin (joint hypermobility, chest deformities, mitral valve prolapse, additional chords, excessive skin distensibility, etc.).

The diagnosis of UCTD was established if the patient had more than six phenotypic stigmas of embryogenesis.

The work was approved by the bioethical committee. Information consent of legal representatives of patients was obtained. Statistical processing of the obtained data was carried out using licensed Microsoft Office Excel and Statistika software.

Results and discussion. In adolescents with UCTD, an asthenic type of constitution prevails. Of the phenotypic markers of UCTD, gallbladder deformities (58.73%), mitral valve prolapse (60.84%), additional chords of the left ventricle of the heart (58.73%), kidney ptosis (62.96%) were detected.

Phenotypic manifestations of UCTD were revealed: hypermobility of joints, asymmetric arrangement of shoulder blades, high palate, kyphoscoliotic posture, flat feet, thin skin, arachnodactyly.

In patients with UCTD, motor disorders of the biliary tract are observed, among which sphincter spasm of Oddi (47.9%) and gallbladder dysfunction (49.74%) predominate. With a long course, motor disorders of the Oddi sphincter, as well as disorders of the gallbladder, become factors in the formation of organic pathology.

Hypomotor gallbladder dyskinesia was found to be significantly more common in adolescents with UCTD compared to those without UCTD. In severe manifestations of UCTD, hypomotor gallbladder dyskinesia is statistically significantly more common compared to adolescents without connective tissue dysplasia, and when compared with data from patients with moderate manifestations.

In adolescents with UCTD, a combination of hypotonic disorders of gallbladder motor function with an increase in Oddi sphincter tone was significantly more common.

Pain syndrome was rated by the examined patients from 1 to 3 on the Likert scale. Adolescents with UCTD are statistically significantly more likely to rate pain as more intense in both biliary and pancreatic types of Oddi sphincter dysfunction. The data obtained may indicate the existence of a relationship between the severity of the UCTD syndrome and the intensity of pain. The intensity of the pain syndrome increases as the severity of UCTD increases (with moderate severity almost 2 times, with severe - this indicator was more than 5 times higher).

In adolescents with UCTD syndrome, diarrhea syndrome was significantly more common in both biliary type of Oddi sphincter dysfunction and pancreatic. The study showed that the incidence of diarrhea syndrome increases with an increase in the number of diagnosed signs of UCTD. In the group of patients with moderate signs of UCTD with biliary type of sphincter dysfunction, diarrhea is more common than in patients without connective tissue dysplasia.

In the group with pronounced signs of UCTD, the likelihood of developing diarrhea increases 7 times compared with adolescents without connective tissue dysplasia and 3 times compared with patients with moderate signs of UCTD. Pancreatic type of sphincter dysfunction in Oddi revealed a statistically significant predominance of diarrhea compared to those of the group with severe manifestations of UCTD.

Since all patients included in the study underwent a comprehensive examination to exclude organic diseases of the gastrointestinal organs, including the hepatobiliary zone, it can be assumed that the development of diarrhea is not a consequence of organic pathology of the gastrointestinal organs, but a manifestation of functional disorders against the background of severe UCTD (irritable bowel syndrome).

Conclusions. In the presence of undifferentiated connective tissue dysplasia syndrome in adolescents, the most common is the hypomotor type of biliary motility disorders. A combination of hypomotor disorders of the gallbladder motility with dysfunction of the Oddi sphincter is revealed. Undifferentiated connective tissue dysplasia syndrome is interrelated with the peculiarities of the functioning of the biliary tract, predisposing to the development of functional disorders of the organs of the hepatobiliary zone.

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卫生陶瓷生产中泥釉均匀性的探讨

INVESTIGATION OF THE UNIFORMITY OF SLIPS IN THE PRODUCTION OF SANITARY CERAMICS

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摘要. 本文认为, 在卫生陶瓷生产中, 确保浇注料浆的均匀性是产品质量稳定的关键因素。分析了传统的均化方法, 并指出了其在批量生产条件下的局限性。为了提高浇注料浆的均匀性, 建议使用带有弹簧插件的静态混合器, 该混合器无需使用运动部件即可产生湍流, 从而确保各组分的有效混合。在 SolidWorks 软件环境中进行了流体动力学建模。结果表明, 当料浆以 2 m/s 的速度送入时, 颗粒加速至 3.8 m/s, 并形成密集的混合区, 这有助于稳定流动并提高混合均匀性。

关键词: 料浆、卫生陶瓷、静态混合器、均匀性、均化、陶瓷生产、混合。

Abstract. The article considers ensuring the uniformity of casting slips in the production of sanitary ceramics as a key factor in the stable quality of products. The traditional methods of averaging are analyzed and their limitations in the conditions of mass production are shown. To increase the uniformity of casting slips, it is proposed to use a static mixer with a spring insert, which ensures efficient mixing of components by creating turbulent flows without the use of moving parts. Hydrodynamic modeling was performed in the SolidWorks software environment. It was found that when the slip is fed at a speed of 2 m/s, particles accelerate to 3.8 m/s and intensive mixing zones are formed, which helps to stabilize the flow and increase the uniformity of the mixture.

Keywords: slip, sanitary ceramics, static mixer, uniformity, average, ceramic production, mixing.

The production of sanitary ceramics requires high precision in the formulation and technological parameters, especially when forming products from casting slips. Slips are liquid ceramic masses containing water, kaolin, clay, quartz sand, feldspar, as well as modifying additives (electrolytes, dispersants, etc.). Their main task is to ensure fluidity and uniform distribution of components during cast-

ing, as well as to ensure the necessary strength and heat-resistant characteristics of the finished product [1].

One of the key problems at the stage of preparing and feeding the slips into the casting mold is to ensure their uniformity. The heterogeneous composition leads to uneven shrinkage behavior during drying and firing, which leads to the formation of surface defects (cracks, cavities, spots), as well as to unevenness in the density and strength of the product [1].

In traditional technology, large-sized averagers are widely used, in which the mass of the slip accumulates, circulates and mixes for a long time, which stabilizes its composition, but their use has significant disadvantages, especially in mass production [2, 3]: significant energy consumption; large occupied areas; difficulties in operational adjustment of the composition.

With increasing demands on quality and production efficiency, there is an increasing need for new solutions capable of providing a higher level of stabilization with lower energy consumption and compact design. One of these solutions is the use of static mixers, which are devices without moving parts, built into the pipeline and performing mixing due to the special geometry of the internal inserts. Advantages of static mixers [2]: compactness and simplicity of design; minimal energy consumption (they work due to flow pressure); the possibility of placement at various points of the technological chain (at the entrance to the molding site, at the stage of transportation of the slip, before feeding into the mold, etc.); increasing uniformity without significant changes in the production process.

The principle of operation of a static mixer [4, 5]: the slip is fed into the chamber at a speed of 0.5 to 2 m / s, then it passes through obstacles in the form of various insert elements, resulting in complex turbulent flows, while changing the direction and flow rates, which helps to equalize the composition without moving elements. The installation of a static mixer at the final stage of the slide transportation significantly reduces deviations in composition and increases the repeatability of product characteristics, which is especially important for mass production, where parameter stability is critical to minimize defects and reduce costs. The uniformity coefficient of the mixture coming out of the static mixer depends on the geometry of the mixing chamber, as well as on the type and size of the mixing inserts and their design features. This makes static mixers an attractive choice for optimizing processes in ceramic production and improving the quality of final products.

To simulate the hydrodynamic mixing process, a SolidWorks software product was selected [6, 7], which includes CAD/CAE systems, which provides quick configuration of modeling when making changes to the digital CAD model to create a digital prototype in a single digital environment (Fig. 1).

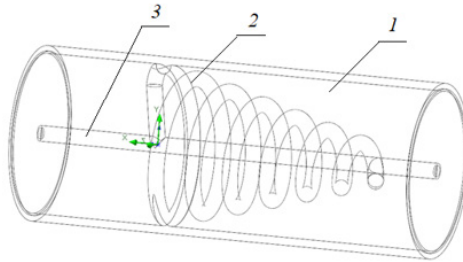


Figure 1. Design scheme of the proposed static mixer:
1 – mixing chamber; 2 – spring insert; 3 – shaft

Depending on the nature of the flow and the physicochemical properties of the slip, the design type of the mixing inserts is selected. To determine the trajectories and speeds of the mixture, it is necessary to create a digital model of a static mixer with an insert in the form of a spring (Fig. 1). It is important to check the model for gaps and intersections between the components to ensure the correctness of further actions. Next, you can start modeling the slip flows in a mixer with the set parameters and boundary conditions [8]:

- task type – internal – i.e. inside the working chamber;
- type of fluid – “non-Newtonian liquid”, viscosity 0.4 cPs, density 1.7 kg/ m³;
- conditions on the walls are set based on the roughness of the inner walls of the chamber 0.4 microns;
- temperature 20C;
- The “inlet speed” to the mixer is 2 m/s;
- “Ambient pressure” 1 Atm.

Based on the results of the simulation of the mixing process, the results were obtained in the form of trajectories of movement of the components of the mixture (Fig. 2). Analysis of the trajectory of movement of particles in the working area of the model showed that when they are fed at a speed of 2 m / s into the mixing chamber:

- the trajectory of the particles does not change over the entire cross-section until they enter the zone of interaction with the spring;
- before the second turn of the spring, the particles move in the inner part of the chamber, while their speed decreases from 2.2 m/s to 1 m/s;
- after the second revolution, some of the particles are carried away to the periphery and gain a speed from 1 m/s to 3.4 m/s;

– the movement of particles in the central part of the mixing chamber from the second to the fifth turn has a chaotic character of movement with particle acceleration from 2.2 m/s to 3.8 m/s;

– after the fifth turn, the flow stabilizes with a general increase in particle velocity, in the range of 2.2 – 3.8 m / s, which favorably affects the uniformity of the finished mixture, but several particles from the central region from an initial velocity of 2 m / s lose it to 1 m / s after a collision with the shaft, while having a maximum size particles.

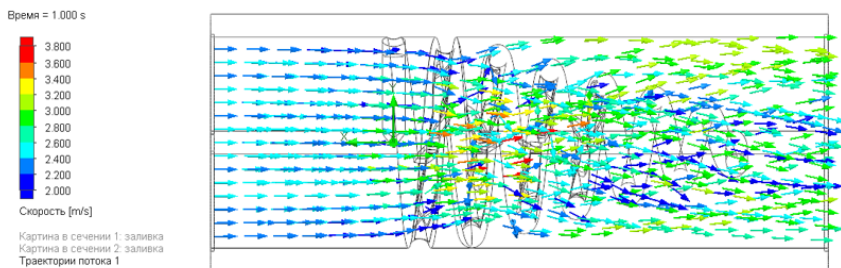


Figure 2. Results of hydrodynamic modeling of the mixing process in a static mixer with a spring insert: flow trajectories

An analysis of the graph of the dependence of the velocity of the slip particles on the length of their trajectory inside a static mixer with a spring insert shows a change in velocity for one of the 22 flow trajectories (Fig. 3). In the initial section (up to ~ 0.05 m), most trajectories demonstrate a stable velocity of about 2 m/s, which corresponds to the input flow parameters. As the particles move into the mixing chamber, there is a significant change in their velocities associated with the interaction with the mixer element, which gives randomness to the movement of streams and particles in them.

The speed increase is especially noticeable in the range from 0.05 to 0.2 m, where the speeds of some trajectories reach 3.5–3.8 m/s, which confirms the intense mixing caused by the interaction of the flow with the coils of the spring insert. Chaotic oscillations are also characteristic, which indicates turbulence and efficient mixing of particles.

After the mark of ~ 0.2 m, most trajectories stabilize at the level of 2.2–3.0 m/s, which indicates the alignment of flows and a more uniform distribution of the components of the mixture. In some cases, deviations are observed, for example, a decrease in speed to ~ 1 m/s, which may be due to the braking of larger particles in a collision with the central shaft.



Figure 3. Graph of the dependence of the flow velocity on the length of the trajectory

The analysis of the phase portrait (Fig. 4) shows the pattern of changes in the flow rates of the slip inside a static mixer with a spring insert, where the particle velocity increases from an initial 2.0 m/s to a maximum 3.8 m/s, which indicates the transition of the flow from laminar to intensely turbulent mode. The geometry of the spring insert creates multiple zones of vortices and local accelerations, especially noticeable after the second and third turns, where active vortices and shear zones form. This leads to a redistribution and accelerated mixing of components throughout the channel section. Due to the absence of stagnant zones and the high rate of particle redistribution, a uniform distribution of solid and liquid phases is achieved, which significantly increases the uniformity of the slip, improving its casting properties and reducing the likelihood of defects when molding products.

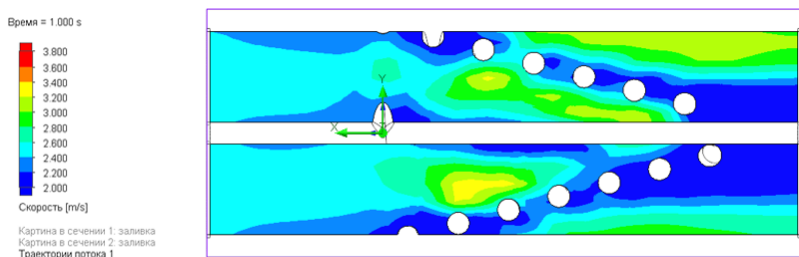


Figure 4. Results of hydrodynamic modeling of the mixing process in a static mixer with a spring insert: phase portrait of flow velocity changes

The presence of an insert in the form of a spring allows you to create a turbulent movement of particles and further distribute them throughout the chamber, thereby activating the mixing process without the presence of moving parts of the mixer elements. Moreover, there is an increase in the particle velocity from 2 m/s to 3.8 m/s (1.9 times), which also contributes to the active mixing of the components of the mixture. This corresponds to the theoretical prerequisites for the correct choice of the set parameters of the created model.

Conclusions.

1. It has been revealed that the use of large averagers to maintain the uniformity of the slip composition in the technological process is not always justified, especially in mass production.

2. The possibility of using a static mixer as an averager in the form of an insert into a pipeline at various points at different stages of the technological process or as an independent mixer is noted.

3. It was found that the value of the uniformity coefficient of the mixture is greatly influenced by the configuration of the inserts, the distance between them, and the feed rate of the mixture.

4. It is noted that a prerequisite for the mixer's operability is the accuracy of the fitting of the mixing elements, i.e. the absence of gaps between the pipe wall and the side faces of the spirals, and the working elements do not necessarily have to have an ordered structure.

5. Hydrodynamic modeling showed that after passing the fifth insertion turn, the flow stabilizes, and the particle velocity increases to 3.8 m/s, which creates a stable turbulent regime that promotes intensive mixing. The spring-shaped design forms zones of vortices and accelerations, especially pronounced in the second and third turns, ensuring an active redistribution of components throughout the flow section. By eliminating stagnant zones and evenly distributing particles, a high uniformity of the slip is achieved, which is critically important for product quality and minimizing manufacturing defects.

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确保矿棉生产的方法和设备

METHODS AND EQUIPMENT FOR ENSURING THE PRODUCTION OF MINERAL WOOL

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摘要. 本文简要介绍了矿棉（石棉）的种类、特性、生产方法，并介绍了设备的操作、滚筒式离心机的输入控制规则，以及为确保其不间断生产而配置设备元件的可能方法。

关键词: 矿棉; 纤维; 离心机; 滚筒; 振动弧堆焊。

Abstract. The article provides a brief description of the types of mineral (stone) wool, its properties, production methods with a description of the operation of the equipment, the rules for input control of the centrifuge with rolls, as well as possible methods for configuring equipment elements to ensure its uninterrupted production.

Keywords: mineral wool; fiber; centrifuge; roller; vibrating arc surfacing.

In recent years, due to the growth of housing construction, the production of thermal insulation materials has increased, in particular, mineral (stone) wool [1]. So, 2021 ended with an increase in its output by 9.8%; in 2023 - by 9.1%, and in 2024 manufacturers are forced to set quotas for supplies., the cost of products reached 182 billion rubles [2]. Thus, there is a constant increase in the market needs for mineral wool and continues its development until now. Mineral wool [3] is intended for the manufacture of thermal insulation and sound insulation products in construction; as thermal insulation of surfaces with temperatures up to +700 °C of industrial equipment, reservoirs and pipelines of heating networks, main oil and gas pipelines, technological pipelines of power plants, metallurgical, petrochemical, etc. industrial enterprises.

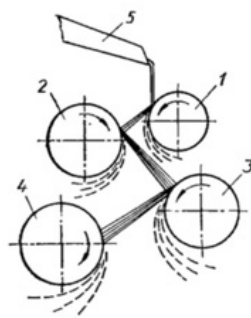
Depending on the raw materials, mineral wool differs in types [1, 3], such as: glass wool, stone wool, slag wool made from molten glass, igneous rocks, blast

furnace slag, respectively. The world's leading manufacturers use only rocks as raw materials, which makes it possible to obtain high-quality mineral wool with a long service life. It is recommended to use it for critical structures, in cases where their long-term reliable operation is required [3, 4]. Its production consists of the following stages: loading and melting in a melting unit; production and precipitation of stone wool fibers; formation of a carpet from cotton wool; polymerization by heat treatment; packing of stone wool.

Currently, the most promising method of fiber formation is a combined centrifugal roller [3, 4]. This method produces mineral fiber from a melt under the action of centrifugal forces generated by centrifuges. Depending on the number of rolls, centrifuges are divided into single-, two-, three-, four-roll, etc., and according to the number of melt transfers between the working bodies, they are divided into single- and multi-stage. Four-roll centrifuges are the most common (Fig. 1) [4]. The centrifuge consists of a P-shaped bed on which four working rolls are mounted in bearing units with individual drives. The rollers rotate towards each other in a vertical plane, and there is a fence on the sides.



a



b)

Figure 1. Photo of melt contact with wolves (a) and a diagram of fiber formation:

1 – a centrifuge roll with a thread; 2, 3, 4 – smooth centrifuge rolls; 5 – vertical furnace

The material with a temperature of about 1400°C enters a certain point of the upper fast-rotating roller 1, splitting the melt stream and transferring it to the next rolls. Roller 1 has a screw thread and rotates at a frequency of 3000 s^{-1} . The screw thread helps to accelerate the dissection of the jet. Roll 1 produces a small amount of mineral fiber, but the main part comes from rolls 2, 3 and 4. The rotational

speed of the rolls increases as the melt progresses (roll 2 — 4000 s⁻¹, roll 3 — 5000 s⁻¹, roll 4 — 6000 s⁻¹). It is mandatory to warm up the surface of the centrifuge rolls to a temperature of at least 400°C, since the fiber is formed only when the melt adheres to the surface of the rolls. The formed fibers are picked up by air and carried into the fiber deposition chamber, where they settle on the surface of the mesh conveyor. A fan with a capacity of 1400 m³/h is installed on the centrifuge to blow the resulting fibers. The frozen non-fibrous inclusions are removed by a scraper conveyor [4].

The main body influencing the duration of the centrifuge operation are rolls made of Ct 20, the operating time before replacement of which is 46-50 hours. Increasing the efficiency of rolls with the use of new wear-resistant materials [5] in the manufacture and restoration technology is an urgent task. For the high quality of the finished product, it is necessary to ensure input quality control, which is a check of raw materials, components and materials that were supplied to the enterprise from suppliers. The purpose of this event is to prevent the production of low-quality raw materials.

Each company independently develops documentation defining the procedure for control of raw materials and supplies. Various services of the company with lawyers are included in this process. At the same time, the entrance control regulations include:

1. Sorting the rolls by nominal outer diameter and marking with a marker the conditional roll number (No. 1 - No. 4) and the nominal diameter (Ø285, Ø320, Ø340, Ø350) on one of the rolls of the group sorted by standard size. If available, specify the factory roll number.
2. Checking the compliance of the actual number of rolls with the data provided by the customer in the accompanying documentation along with the rolls.
3. Determination by visual inspection of the type of landing surfaces (conical or cylindrical landing) and designation of conical landings with a marker letter "K".
4. Make measurements of the inner diameter of the roll ØB. The maximum deviation of ØB should not exceed +6 mm from the drawing size of the customer's CD. Take measurements at least at 3 points, in accordance with the scheme shown in (Fig. 2).

The main structural elements that are subject to wear are the rolls. To repair them, the following methods of their repair are used: vibro-arc surfacing; induction surfacing; electric spark surfacing; surfacing under a layer of flux.

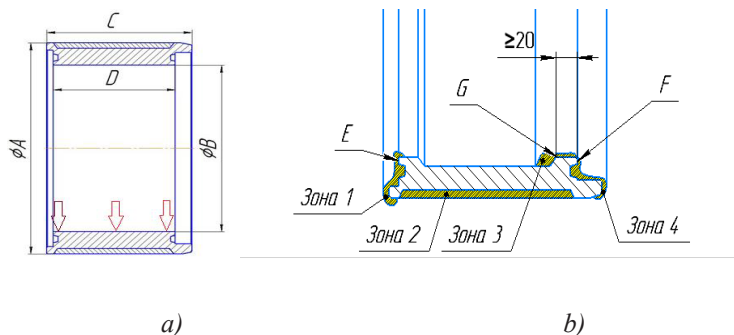


Figure 2. The main dimensions of the roll to be monitored (a); areas of control and subsequent surfacing

The most common method of restoring centrifuge rolls is vibro-arc surfacing [5-8]. This method is used in repair enterprises [5, 8] due to the ease of development and operation of surfacing installations, the possibility of applying layers 0.5...3 mm thick on the outer and inner surfaces of steel and cast iron parts; the possibility of restoring parts up to 1000 mm in length and up to 300 mm in diameter. The electrode wire is fed to the weld surface of the part through a mouthpiece vibrating with a frequency of up to 110 Hz and an amplitude of up to 4 mm. Due to vibrations, surfacing can be carried out at voltages of 12... 18 V. During welding with a vibrating electrode, alternating electrical discharges and short circuits are observed with the formation of contacts between the electrode and the part, and the forced transfer of electrode droplets into the welding bath. The advantages of this method are:

- slight heating of the parts (no more than 100 °C);
- high process productivity (up to 2.6) kg/h;
- the possibility of obtaining a metal layer with increased hardness;
- no subsequent heat treatment is required.

At the same time, the following factors affect the quality of the deposited metal and the part itself:

- non-melting of the applied layer with the part material;
- splashing of the electrode material and its increased consumption;
- splashing of the electrode material and its increased consumption;
- the appearance of shells, pores and microcracks in the deposited metal layer;
- reduced fatigue strength by 30...60 %;
- the presence of significant tensile residual stresses in the deposited layer.

Currently, the use of various thermal insulation materials based on mineral fibers is one of the most popular and promising directions for sound and thermal insulation of various surfaces of structures with temperatures up to +700 °C in

all industries of oil and gas pipelines, technological pipelines of power plants, metallurgical, petrochemical, etc. industrial enterprises, as well as construction, are capable of changing the market in the near future. Therefore, the development of new and modernization of old equipment, improving the operability of its elements will improve the quality of manufactured materials and ensure uninterrupted production sufficient to develop and meet the needs for them.

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采用摩擦化学包覆法提高针织设备摩擦部件的使用寿命
**INCREASING THE SERVICE LIFE OF PARTS OF FRICTION
UNITS OF KNITTING EQUIPMENT BY THE FRICTION-
CHEMICAL METHOD OF CLADDING**

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注释. 本文探讨了利用摩擦化学覆层技术延长针织设备摩擦单元使用寿命的问题。结果表明,最广泛使用的针织机是横机,其针织机构在运行过程中磨损严重。这是由于该设备部件的负荷和运行速度高以及润滑不足造成的。通过摩擦覆层方法对摩擦表面进行改性,可以改善摩擦表面的摩擦力学特性。本文研究了该方法的一种——在钢表面形成铜涂层的摩擦化学方法。研究了工艺环境的组成、工具的选择和验证,并确定了涂层的形成方式。与未经处理的基础样品相比,表面改性样品的磨损量和摩擦扭矩均有所降低。

关键词: 摩擦单元、横机、摩擦覆层、耐磨性、工艺环境、零件表面改性。

Annotation. *The paper considers the issues of increasing the service life of friction units of knitting equipment using friction-chemical cladding technology. It is shown that the most widely used knitting machines are flat knitting machines, which experience significant wear of their knitting mechanism during operation. This is due to high loads and operating speeds of the parts of this equipment, as well as insufficient lubrication. It is possible to improve the tribomechanical characteristics of rubbing surfaces by modifying them using friction cladding methods. In the article, the authors conducted a study of one of the varieties of this method - the friction-chemical method of forming a copper coating on a steel surface. The composition of the process environment, the tool was selected and substantiated, the modes of coating formation were determined. Tribomechanical tests of samples with a modified surface showed a decrease in wear and friction torque compared to the basic untreated samples.*

Keywords: *friction unit, flat knitting machines, friction cladding, wear resistance, technological environment, modification of the surface of parts.*

In the textile industry, the youngest branch is knitwear, especially when compared to weaving. It produces scarves, gloves, underwear, headwear, medical and industrial products. In the manufacture of these products, a wide range of threads from animal and plant materials, as well as chemical fibers, are used.

There are several dozen large enterprises in the Russian Federation that have modern knitwear equipment (mainly German and Japanese). A number of enterprises still continue to operate on outdated equipment [2].

The increase in the volume of knitwear production depends, among other things, on the performance of the main equipment, which includes hosiery machines, flat knitting machines, circular knitting machines, warp knitting machines and cotton knitting machines.

Flat knitting machines are mainly used [5]. This is due to the fact that their use allows for a reduction in production costs, the process itself is easy to mechanize, and the equipment is easy to maintain.

Flat knitting machines have a rather complex structure. Especially their knitting mechanism (needle beds, knitting needles and wedges). Moreover, during loop formation, two friction pairs can be distinguished - "knitting needle - needle bed" and "knitting needle - wedges". These parts wear out quite quickly, which leads to the occurrence of defective products. With severe wear, the knitting machine may break down.

The wedges of the flat knitting machine wear out very quickly. Because of this, they have to be changed up to four times a year. The needle beds wear out less. This is due to the fact that special requirements are imposed on their wear resistance.

Various studies have shown that approximately ninety percent of the wedge load is carried by one needle (with a total wedge load of about ten kilograms). And all this occurs at high speeds of movement of parts [4].

The service life of friction parts of knitted equipment can be increased by modifying their surface layer, for example, by friction plating methods [1,3]. These methods involve applying a coating to the base material using friction and pressure to form a strong connection between them.

According to the physical nature of this process, friction-mechanical, friction-chemical and friction-electromechanical cladding can be distinguished. In our opinion, the friction-chemical method of modifying the surface layer of rubbing parts of process equipment is the simplest and most universal.

The formation of coatings by the friction-chemical method in metal-plating technological environments occurs as a result of physical and chemical processes between the working environment and the workpiece during mechanical activation of the surface by a tool, and the activation of the surface can be carried out by a metal tool that does not contain a film-forming material, or a non-metal tool (for example, rubber, felt, etc.) [6].

A mixture containing 2% Aerosil 300, 2% copper (II) chloride and the rest being absolute isopropyl alcohol can be used as a process medium. The metal coating is formed by friction due to the reduction of the applied metal halide (copper (II) chloride) present in the medium. This process is activated by friction surface treatment, when the tool rubs against the surface in the presence of a process medium. Finely dispersed powdered silicon dioxide is added to the composition to increase viscosity and acidity. The basis of the mixture is anhydrous isopropanol, which effectively degreases surfaces. The quantitative ratio of the components is determined by the following factors.

At low copper salt concentration (less than 2%), the protective metal film takes a very long time to form due to the low activity of the chemical composition. Because of this, the thickness of the metal film is very small. Increasing the copper salt content above 2% is impractical, since such a large amount does not dissolve in isopropanol.

Aerosil 300 is used as a filler in the amount of 2%. It performs the function of an abrasive – quickly removes the oxide film from the metal surface. In addition, it increases the viscosity and acidity of the working environment.

Insufficient Aerosil 300 content (less than 2%) does not ensure activation of the metal deposition process due to insufficient acid formation. In addition, such abrasive concentration is insufficient in the friction zone. Exceeding the filler concentration above 2% increases the viscosity of the working medium, which disrupts the technological process of surface treatment.

Surface modification is carried out using a rubber roller at a speed of no more than 5 m/s.

With a specific tool load of about 1 MPa, it is possible to obtain workable coatings within ten seconds. Increasing the processing time does not make sense, since a coating thicker than 5 μm is not formed.

Tribological tests of the modified surface layer were carried out on a Reichert friction machine using the Timken method in accordance with the ASTM-D2782-02-2014 standard. 24 flat samples were made of IX15 steel. 24 ring-shaped samples were also made of IX15 steel. Half of the samples were then coated with a rubber roller using the above-described process medium at a specific load on the tool of 1 MPa, a processing speed of 2 m/s and a processing time of 10 s. Industrial oil of the I20A brand was used as a lubricant. The samples were lubricated by dipping the roller in oil. The morphology of the friction track surface was studied using a 4XB metallographic microscope.

During the tribological tests, the friction samples were loaded stepwise with forces of 60, 160, 260 and 360 N. The test time at each step was 10 minutes. Also, at each step, the consumed working current of the test setup motor was recorded, according to which the friction torque was determined using a calibration graph. The averaged experimental results are presented in Fig. 1.

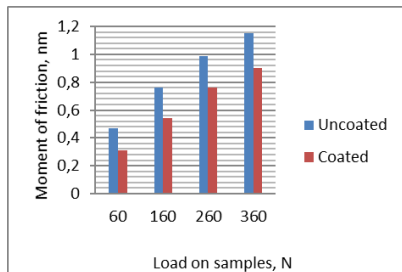


Figure 1. Dependence of the friction moment of samples made of steel grade IIX 15 with and without coating on different loads on the samples

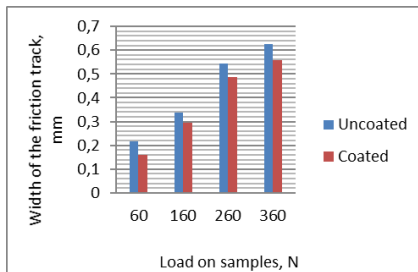


Figure 2. Dependence of the friction track width of samples made of IIX15 steel with and without coating on different loads on the samples

As can be seen from the obtained graphs, at each stage there is a decrease in the friction moment of the coated samples compared to the uncoated samples by approximately 1.4 times. This is probably due to the fact that the copper-containing coating works not only as a solid lubricant coating, but also improves the adhesion of the liquid lubricant to the surface of the sample.

The wear of the samples was estimated by the width of the resulting friction track on a flat sample. The measurements were taken using a 4XB metallographic microscope with a digital camera at a magnification of 300 times.

Fig. 2 shows the averaged results of the experiment to determine the dependence of the friction track width of samples made of steel grade IIX 15 with and without coating on different loads on the samples. As can be seen from the obtained graphs, the presence of a coating on the samples leads to a decrease in their wear by approximately 1.1 times. At first glance, it seems that this is not a very high indicator, but given that the tests were carried out at very high specific loads, much higher than real ones, the positive effect is obvious.

The conducted studies on the process of forming coatings by friction-chemical method in metal-plating technological environments have shown that this modification of the surface layer allows to increase the service life of rubbing parts of technological equipment. The technology for forming this coating is simple, inexpensive and environmentally friendly, which is why it can be successfully used to improve the tribomechanical characteristics of friction units of knitting equipment.

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使用模糊逻辑实时预测和确定电信网络设备状况的优势
**ADVANTAGES OF USING FUZZY LOGIC TO PREDICT AND
DETERMINE THE CONDITION OF TELECOMMUNICATION
NETWORK EQUIPMENT IN REAL TIME**

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摘要. 本文探讨了如何运用模糊逻辑分析和处理电信网络设备事件的实际统计数据。此外，本文还讨论了隶属函数，引入了与网络参数相关的模糊集概念，并运用模糊集进行计算。

关键词: 电信网络、统计学、模糊逻辑、模糊集、隶属函数、预测。

Abstract. *The article discusses the issues of analyzing and processing real statistics of events on telecommunication network equipment using fuzzy logic. The article also discusses membership functions, introduces the concept of a fuzzy set in relation to network parameters, and performs calculations with fuzzy sets.*

Keywords: *telecommunication network, statistics, fuzzy logic, fuzzy sets, membership function, forecasting.*

Introduction. Heterogeneous telecommunication networks are complex systems consisting of heterogeneous equipment operating under various conditions. Predicting the state of such equipment is an important task to ensure uninterrupted network operation and minimize losses [1].

Traditional forecasting methods often face difficulties due to incomplete data, noise, and uncertainty in the description of processes. Fuzzy logic provides an effective tool for solving problems associated with uncertainty and imprecision of information. It allows modeling complex systems using linguistic variables and fuzzy sets.

The use of fuzzy logic in predicting the state of heterogeneous network equipment has a number of advantages:

1) Accounting for fuzzy - fuzzy logic allows you to operate with fuzzy concepts such as “high load”, “low signal quality”, which is more consistent with the actual operating conditions of the network.

2) Flexibility - Fuzzy logic models easily adapt to changes in the network and new types of equipment.

3) Interpretability - fuzzy logic rules can be represented as linguistic expressions, making them easier to understand and customize.

The subject of modeling and forecasting in such telecommunication networks is a system that reproduces the object of study in such a way that on its basis the structure and distribution of phenomena, their changes over time, connections and dependencies can be studied [2].

To solve such problems related to data analysis in the presence of random effects, the apparatus of applied statistics is intended, an integral part of which are statistical forecasting methods. These methods allow us to identify patterns against the background of randomness, make reasonable forecasts and assess the probability of their fulfillment [3].

To assess the condition of equipment, it is necessary to perform forecasting and determination of the condition of equipment of heterogeneous telecommunication networks using fuzzy logic algorithms.

To carry out the research, the initial data on the equipment condition for the annual period of 2024 from the monitoring program were used.

The initial data are presented as an array consisting of 1568 rows (time slices of equipment states) and 5 columns (characteristics of events on telecommunications network equipment). A fragment of the initial data containing the following indicators: date and time of the event, territory, type of equipment, duration of damage, loss of services/number of subscribers, is presented in Table 1.

Table 1
Fragment of statistical data of equipment states on a heterogeneous telecommunication network

Item No.	Date and time of the event	Territory	Equipment type	Damage duration, min.	Loss of services Number of subscribers
1	29.01.2024 12:09:00	SC Tavricheskoe	ATS	2	3
2	01/14/2024 18:29:59	SC Maryanovka	Access switch	55	20
...
1568	28.12.2024 12:00:05	SC Omsk	Aggregation switch	15	161

To solve the problem, it is necessary to determine the state of a telecommunications network of three types [4]:

1. B1 - pre-failure state of the network,
2. B2 - pre-emergency state of the network,
3. B3 - emergency network condition.

The following rules for basic implicative fuzzy statements are introduced:

A1 - if the duration of damage is short and the loss of services is insignificant, then condition B1 should be selected.

A2 - if the duration of damage is average and the loss of services is average, then condition B2 should be selected.

A3 - if the duration of damage is long and the loss of services is significant, then condition B3 should be selected.

Next, we define the following fuzzy numbers:

C1 = small, C2 = medium, C3 = large.

D1 = minor, D2 = moderate, D3 = major.

Based on the data in Table 1, we determine the domain of the membership function for the duration of damage and loss of services (the number of affected subscribers in an emergency situation on the network).

The graphs of the membership function of the duration of damage and loss of services are presented in Fig. 1 and Fig. 2.

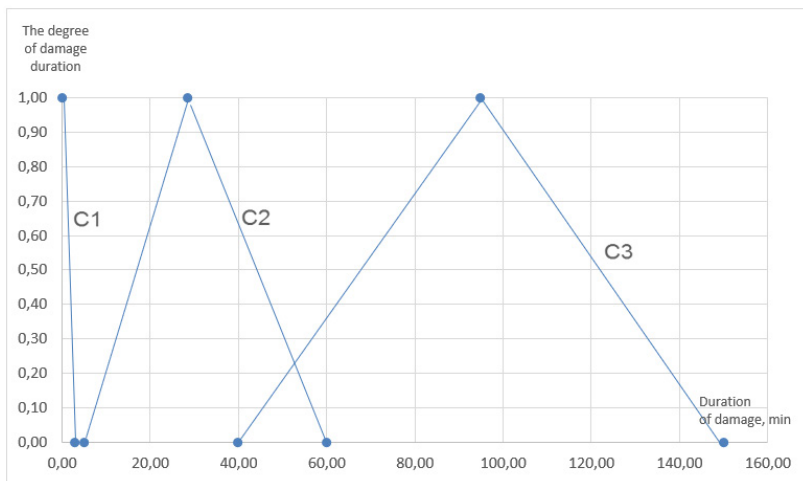


Figure 1. Graph of the membership function of damage duration

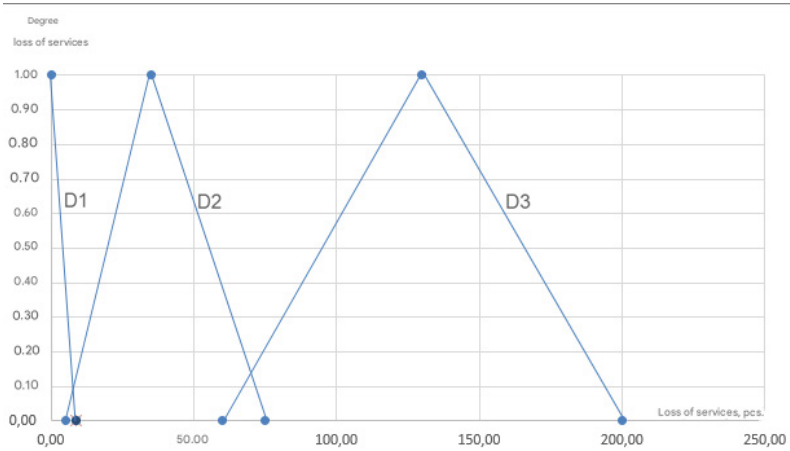


Figure 2. Graph of the membership function of service loss

These fuzzy numbers are included in fuzzy statements and have the following form (we set them a priori, determine them from the graphs):

$$C_1 = \left\{ \frac{0,6}{2}, \frac{0,2}{4} \right\}, C_2 = \left\{ \frac{0}{2}, \frac{0,9}{30}, \frac{0,2}{75} \right\}, C_3 = \left\{ \frac{0,2}{130}, \frac{0,7}{75} \right\}$$

$$D_1 = \left\{ \frac{0,8}{2}, \frac{0,1}{8} \right\}, D_2 = \left\{ \frac{0,3}{8}, \frac{0,8}{35}, \frac{1,0}{40}, \frac{0,8}{45}, \frac{0,3}{70} \right\}, D_3 = \left\{ \frac{0}{40}, \frac{0,9}{140}, \frac{0,2}{70} \right\}$$

According to the rules of modification of complex fuzzy statements A1, A2, A3 can be transformed into $\tilde{\alpha}_1 \equiv L_1$ there is U1, there is U2, there is U3. $\tilde{\alpha}_2 \equiv L_2$ $\tilde{\alpha}_3 \equiv L_3$

At the same time L_1, L_2, L_3 are fuzzy relations whose membership functions are constructed according to the modification rules:

$$M_{L1}(x, y) = (M_{C1}(x) \wedge M_{D1}(y)) \vee (M_{C1}(x) \wedge M_{D2}(y)). \quad [1]$$

$$M_{L2}(x, y) = (M_{C1}(x) \wedge M_{D3}(y)) \vee (M_{C2}(x) \wedge M_{D1}(y)). \quad [2]$$

$$M_{L3}(x, y) = (M_{C2}(x) \wedge M_{D2}(y)) \vee (M_{C3}(x) \wedge M_{D1}(y)). \quad [3]$$

Next, we introduce the following notations for clear statements:

U1= <It is recommended to select the equipment status of type B1>:

$$U_1 = \left\{ \frac{1,0}{B_1}, \frac{0}{B_2}, \frac{0}{B_3} \right\}. \quad [4]$$

U2= <It is recommended to select state B2>:

$$U_2 = \left\{ \frac{0}{B_1}, \frac{1,0}{B_2}, \frac{0}{B_3} \right\}. \quad [5]$$

U3= <It is recommended to select state B3>:

$$U_3 = \left\{ \frac{0}{B_1}, \frac{0}{B_2}, \frac{1,0}{B_3} \right\}. \quad [6]$$

Suppose the duration of the fault is 4 minutes and the loss of service is 6 subscribers. This means that in terms of fuzzy numbers we have a relationship with crisp singletons.

$$F = \left\{ \frac{1,0}{4} \right\}, G = \left\{ \frac{1,0}{6} \right\}$$

The ratio of precise numbers will be:

$$L = \left\{ \frac{1,0}{(4;6)} \right\}. \quad [7]$$

Next, we set the task of choosing one of the three states, taking into account the obtained relation [7].

To do this, we will evaluate the degree of truth of a given inference scheme by decomposing it into three inference schemes. Display:

$$A1: L1 \rightarrow U1A1i: L1 \rightarrow U1A2i: L2 \rightarrow U2A3i: L3 \rightarrow U3$$

$$A2: L2 \rightarrow U2 \frac{R}{Z_i} \frac{R}{Z_i} \frac{R}{Z_i}$$

$$A3: L3 \rightarrow U3$$

$$\frac{R}{Z_i}, i = 1, 2, 3$$

To carry out calculations, it is necessary to carry out preparatory constructions. Let $x=4$ and $y=6$ be given.

Substituting the values into formula [1], we obtain:

$$M_{L1}(4,6) = (M_{C1}(4) \wedge M_{D1}(6)) \vee (M_{C1}(4) \wedge M_{D2}(6)) = (0,2 \wedge 0,3) \vee (0,4 \wedge 0,1) = 0,2.$$

Substituting the values into formula [2], we obtain:

$$M_{L2}(4,6) = (M_{C1}(4) \wedge M_{D3}(6)) \vee (M_{C2}(4) \wedge M_{D1}(6)) = (0,2 \wedge 0) \vee (0,1 \wedge 0,3) = 0,1.$$

Substituting the values into formula [3], we obtain:

$$M_{L3}(4,6) = (M_{C2}(4) \wedge M_{D2}(6)) \vee (M_{C3}(4) \wedge M_{D1}(6)) = (0,1 \wedge 0,1) \vee (0 \wedge 0,3) = 0,1.$$

It follows from this:

$$L_1 = \left\{ \frac{0,2}{(4;6)} \right\}, L_2 = \left\{ \frac{0,1}{(4;6)} \right\}, L_3 = \left\{ \frac{0,1}{(4;6)} \right\}, L = \left\{ \frac{1,0}{(4;6)} \right\}$$

Let us introduce the indicator T - the degree of truth - the inverse ratio. From this it follows:

$$T\left(\frac{L}{L_1}\right) = \left\{ \frac{0,2}{1,0} \right\}, T\left(\frac{L}{L_2}\right) = \left\{ \frac{0,1}{1,0} \right\}, T\left(\frac{L}{L_3}\right) = \left\{ \frac{0,1}{1,0} \right\}$$

$$T\left(\frac{U_i}{U_j}\right) = \left\{ \frac{1,0}{1,0} \right\}, \text{ when } i \neq j. T\left(\frac{U_i}{U_i}\right) = \left\{ \frac{0}{1,0} \right\}$$

Let us determine the degree of truth for the output circuit A11 using the expression:

$$\widetilde{T}_{11} = \widetilde{T}_{11}(A_{11}; L, U_1). \quad [8]$$

To calculate the expression, we apply the formula:

$$M_{\widetilde{T}_{11}}(\tau) = 1 \wedge \left(1 - M_{T\left(\frac{L}{L_1}\right)}(\tau) + M_{T\left(\frac{L}{L_2}\right)}(\tau) \right), \tau \in [0; 1]$$

At $\tau=1.0$ we get:

$$M_{\widetilde{T}_{11}}(1,0) = 1 \wedge \left(1 - M_{\widetilde{T}(\frac{L}{L_1})}(1,0) + M_{\widetilde{T}(\frac{Z_1}{Z_1})}(1,0) \right) = 1 \wedge (1 - 0,2 + 1) = 1 \wedge 1,8 = 1,0.$$

Let's find the degree of truth for the output circuit A21:

$$\widetilde{T}_{21} = \widetilde{T}_{21}(A_{21}; L, U_1)$$

$$M_{\widetilde{T}_{21}}(\tau) = 1 \wedge \left(1 - M_{\widetilde{T}(\frac{L}{L_2})}(\tau) + M_{\widetilde{T}(\frac{Z_1}{Z_2})}(\tau) \right),$$

$$M_{\widetilde{T}_{21}}(1,0) = 1 \wedge \left(1 - M_{\widetilde{T}(\frac{L}{L_2})}(1,0) + M_{\widetilde{T}(\frac{Z_1}{Z_2})}(1,0) \right) = 1 \wedge (1 - 0,1 + 0) = 0,9.$$

We will also determine the degree of truth for the third output circuit A31:

$$\widetilde{T}_{31} = \widetilde{T}_{31}(A_{31}; L, U_1)$$

$$M_{\widetilde{T}_{31}}(\tau) = 1 \wedge \left(1 - M_{\widetilde{T}(\frac{L}{L_3})}(\tau) + M_{\widetilde{T}(\frac{Z_1}{Z_3})}(\tau) \right)$$

$$M_{\widetilde{T}_{31}}(1,0) = 1 \wedge \left(1 - M_{\widetilde{T}(\frac{L}{L_3})}(1,0) + M_{\widetilde{T}(\frac{Z_1}{Z_3})}(1,0) \right) = 1 \wedge (1 - 0,1 + 0) = 0,9.$$

Stage 6.

Let us determine the resulting degrees of truth of the inference rule for choosing each type of state.

For example, when choosing the first type of state B1, the degree of truth is determined as:

$$M_{\widetilde{T}_1}(\tau) = \min(M_{\widetilde{T}_{11}}, M_{\widetilde{T}_{21}}, M_{\widetilde{T}_{31}}) = \min(1,0; 0,9; 0,9) = 0,9.$$

When choosing the second type of state B2, the degree of truth is determined as:

$$M_{\widetilde{T}_2}(\tau) = \min(M_{\widetilde{T}_{12}}, M_{\widetilde{T}_{22}}, M_{\widetilde{T}_{32}}) = \min(0; 1,0; 0) = 0.$$

When choosing the third type of state B3, the degree of truth is determined as:

$$M_{\widetilde{T}_3}(\tau) = \min(M_{\widetilde{T}_{13}}, M_{\widetilde{T}_{23}}, M_{\widetilde{T}_{33}}) = \min(0; 0; 1,0) = 0$$

Next, we select the maximum of the three values, i.e., the choice of state B1, B2, B3 maximizes the degree of truth. $M_{\widetilde{T}_1}(\tau), M_{\widetilde{T}_2}(\tau), M_{\widetilde{T}_3}(\tau)$

It follows that with a damage duration of 4 minutes and loss of services for 6 subscribers, the most acceptable choice is network state B1.

The conducted study examined the issues of using fuzzy logic algorithms in relation to forecasting the state of telecommunications network equipment. The proposed model for forecasting the state of network elements provides an operational assessment of the state of network elements in real time in a complex situational environment..

It should also be noted that fuzzy logic is a promising tool for predicting the state of equipment in heterogeneous telecommunications networks. Its use can improve the reliability and efficiency of networks, reduce maintenance costs, and prevent equipment failures in telecommunications networks.

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神经网络集成：概述和应用
**INTEGRATION OF NEURAL NETWORKS:
OVERVIEW AND APPLICATIONS**

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摘要.近年来，神经网络凭借其处理海量数据并从中提取复杂模式的能力，已成为人工智能不可或缺的一部分。然而，在各个模型快速发展的背景下，将其集成到现有信息系统中至关重要。本文概述了神经网络集成方法，探讨了其主要优势和局限性，并重点介绍了实际应用的主要方向。此外，本文强调了在实施神经网络解决方案时需要综合考虑目标系统架构特性的必要性。文中还列举了神经网络在医学和金融领域的应用案例，并提出了人工智能系统集成领域未来研究的建议。

关键词：神经网络、集成、人工智能、机器学习、实际应用、系统架构。

Abstract. *In recent years, neural networks have become an integral part of artificial intelligence due to their ability to process large amounts of data and extract complex patterns from them. However, against the background of the rapid development of individual models, the task of their integration into existing information systems is of relevance. This paper presents an overview of neural network integration methods, considers their key advantages and limitations, and emphasizes the main directions of practical application. It emphasizes the need for a comprehensive approach to the implementation of neural network solutions, considering the peculiarities of the target systems architecture. Examples of using neural networks in medicine and finance are presented, and recommendations for further research in the field of AI system integration are given.*

Keywords: *neural networks, integration, artificial intelligence, machine learning, practical applications, system architecture.*

Modern neural networks have demonstrated high performance in classification, prediction, and data generation tasks [1]. Their success in a variety of application areas - from medical diagnostics to algorithmic trading - has led to an explosion of interest on the part of researchers and developers. However, along

with the expansion of their functionality comes the question of their integration into real information and technological systems.

Integration of neural network models requires overcoming several technical and methodological difficulties [3]: from ensuring compatibility with the existing architecture to guarantees of interpretability and reliability. This article aims to systematize current approaches to integration and analyze potential directions of development in this area.

The modular approach assumes that neural network components are implemented as independent services or libraries interacting with other parts of the system through well-defined interfaces. This provides flexibility in replacing, updating and scaling models. Containerization technologies (Docker, Kubernetes) are used to provide runtime isolation and portability of solutions [5].

Advantages:

- Easy debugging and updates;
- Possibility to work on different modules in parallel.

Disadvantages:

- Need to harmonize data formats;
- Increased response time for inter-module calls.

Many developers use ready-made AI models hosted in cloud environments. Such API interfaces allow you to quickly connect AI functionality (image recognition, text analysis, etc.) to business applications. At the same time, it is possible to deploy in both public and private clouds, which is especially important for organizations with security requirements.

Examples of platforms:

- Google Vertex AI
- Microsoft Azure ML
- Amazon SageMaker
- Hugging Face Inference Endpoints

Challenges:

- Limitations on call speed and volume;
- Risks of data leakage;
- Dependence on external infrastructure.

On-device integration is increasingly used in mobile, embedded and IoT devices. Models are optimized using compression (quantization, pruning) and conversion methods (TensorFlow Lite, ONNX, CoreML).

Applicable in cases of:

- Limited or unstable network;
- Low latency requirements (automobiles, medical devices);
- Increased data privacy.

In large distributed systems, neural networks are integrated through message brokers (Kafka, RabbitMQ, MQTT), allowing incoming data to be processed in real time. This approach provides high throughput and resilience to failures.

Neural networks can directly intervene in decision-making processes by being embedded in business logic rules, such as in credit decision or recommendation systems. This requires the joint use of AI and expert systems, leading to hybrid solutions (neuro-symbolic architectures).

Advantages

- Improving the accuracy of decisions based on big data;
- Ability to automate complex analytical tasks;
- Adaptability of models to changes in input data.

Challenges

- Compatibility: the need to customize the interaction of neural network models with existing IT infrastructure;
- Interpretability: the “black box” of neural networks makes monitoring and auditing difficult;
- Performance: computational requirements may exceed the resources of the target systems;
- Safety and ethics: the risks of unpredictable model behavior in critical systems [7].

In practice, neural networks find application in various industries where complex, voluminous or high-frequency data need to be analyzed. One of the most dynamically developing areas is healthcare [6]. Here, neural network models are used to diagnose diseases based on visual medical data, including X-rays, MRI and CT scans. Such technologies allow not only to increase the accuracy of pathology detection, but also to significantly reduce the analysis time. An important feature of medical applications is the need for strict interpretability of models, as well as compliance with industry standards for data storage and transmission (e.g., DICOM or FHIR). In addition, neural networks are used to predict individual patient response to treatment and monitor health status using data from wearable devices.

In the financial sector, neural network models are widely used for fraud detection, credit risk analysis and automated customer counseling. Here, a key requirement for integration is to comply with regulatory standards such as GDPR or the Basel Accords, as well as to ensure that AI solutions are explainable, as they are used to make critical decisions for customers and organizations. Neural networks are also finding applications in algorithmic trading and market news analysis, where high speed real-time information processing is required.

In industry and logistics, artificial neural networks are being actively implemented in systems for predictive maintenance of equipment, management of pro-

duction processes and optimization of logistics routes. Implementation of such solutions requires close integration with industrial automation systems using specialized communication protocols and control architectures. Especially relevant here are hybrid solutions that combine local processing on peripheral devices with centralized analysis in the cloud.

The education sector is also being influenced by machine learning technologies. Neural networks are used in adaptive learning systems that are customized for each student individually, as well as in automated assessment of text-based assignments. Integration of AI into educational platforms implies compliance with personal data protection requirements and support for compatibility with existing distance learning systems.

Thus, the practical implementation of neural networks covers a wide range of tasks and industries. In each case, integration requires an individual approach, in view of both the technical features of the target systems and regulatory and ethical constraints.

Successful integration of neural networks requires:

- Development of standards for interaction between AI models and information systems;
- Improving the interpretability of models;
- Creation of model lifecycle support platforms (MLOps);
- Strengthening cybersecurity measures for AI implementation.

Hybrid architectures, in which neural networks are supplemented with logical and symbolic components, are also becoming relevant, thus increasing the explainability of solutions.

Integration of neural networks [4] is a key stage on the way from research models to real-world applications in industry, healthcare and other areas. Despite the progress in building effective AI models, there are still many unsolved problems related to their implementation into existing systems. Solving these challenges requires an interdisciplinary approach and close cooperation between researchers, engineers, and information technology specialists.

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饲喂大白猪使用“酸尿素”饲料添加剂时肌肉组织的化学组成
**CHEMICAL COMPOSITION OF MUSCLE TISSUE OF
LARGE WHITE PIGS WHEN USING THE FEED ADDITIVE
“ACIDOMURINE” IN THEIR FEEDING**

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注释。作者介绍了饲料添加剂“Acidomurin”成分在幼猪生长发育期营养中对育肥屠宰后肌肉组织化学组成和成熟过程的延长作用的研究结果，这些研究结果无可争议地证明了成熟过程中肌肉化学组成和糖原分解过程的改善，以及背部最长肌肉的物理技术特性和肌纤维结构的改善（与对照组相比）。

关键词：猪，育肥，有机酸，化学组成，背纵肌，糖原分解，物理和技术特性。

Annotation. The authors present the results of studies reflecting the prolonging effect of the ingredients of the feed additive “Acidomurin” in the nutrition of young pigs during the growing period, on the chemical composition and maturation processes of muscle tissue of animals after fattening and slaughter, which indisputably prove the improvement of both the chemical composition and the processes of glycogenolysis during maturation, the physico-technological properties of the longest muscle of the back, as well as the structure of muscle fibers in experimental animals groups against the background of control.

Keywords: pigs, fattening, organic acids, chemical composition, longitudinal dorsi muscle, glycogenolysis, physical and technological properties.

In the context of alternatives to antibiotic growth promoters to improve growth performance and maintain animal health, there is a growing interest in researching organic acids and medium-chain fatty acids in pig diets [8, 12]. Although organic acid supplements were originally intended for weaned piglets, there is growing evidence that they may also have beneficial effects on finisher pigs [9, 11]. In addition, it has been shown that organic acids can be effectively combined with other feed additives [10]. Recent studies have shown that dietary supplementation with a combination of organic and medium-chain fatty acids can improve growth performance, nutrient digestibility, and meat quality in weaners or fattening pigs [5, 7]. It has been confirmed that medium-chain fatty acids, especially those saturated with 6–12 carbon chains, are the best feed additives for improving animal health, productivity, feed digestibility and meat quality [4].

Material and methods of research. The experience of feeding the feed additive “Acidomurine” to young pigs of the large white breed during the period of rearing and subsequent slaughter of experimental animals after fattening was carried out under the conditions of the peasant farm Kolesnikova I.A. (Rostov region). The tested feed additive “Acidomin” was included in the diet of animals of experimental groups in the amount of 0.8 and 1.0 kg/t of feed.

Results of the study. It is known that the nutritional value of meat and its physicochemical properties change for many reasons, including under the influence of biologically active additives. After slaughtering the experimental animals, we determined the composition of the longest muscle of the back of the experimental animals (Figure 1).

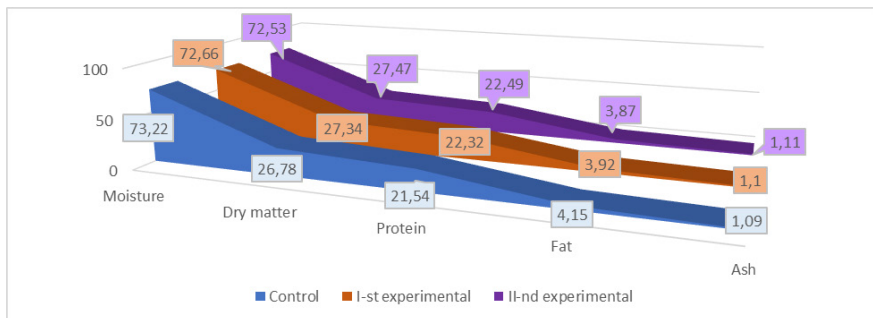


Figure 1. Chemical composition of the longest dorsi muscle, %

A decrease in moisture was found in the experimental samples, which significantly affected the presence of dry matter in the longest muscle of the back of young pigs, which significantly prevailed over the control by 0.56% ($P \leq 0.05$) and 69% ($P \leq 0.05$), respectively. The most significant changes in the composition of

dry matter underwent the parameters of protein content in relation to the control: in the first experimental group – by 0.78% ($P \leq 0, 01$), in the II experimental group – by 0.95% ($P \leq 0.01$). The biologically active components of the feed additive “Acidomurine” motivated a slight decrease in fat content by 0.23 and 0.28% with an insignificant difference, and the ash level, on the contrary, increased in the samples of the experimental groups against the background of control, but this increase did not have significant values.

Autolysis or maturation of raw meat after slaughter of animals is characterized by a number of interrelated processes occurring under the influence of tissue enzymes, during the period of aging and which motivate high organoleptic and physico-technological properties. During the breakdown of adenosine triphosphate acid, free phosphoric acid is formed and energy is released, which contributes to the muscle contraction. When glycogen is broken down, lactic acid is formed and energy is also released. It has been proved that postmortem rigor mortis occurs at the concentration of hydrogen ions (pH) in the range of 6.3-6.5, and the accumulation of lactic and phosphoric acids causes a decrease in this parameter to 5.6. At the same time, lactic acid contributes to the breakdown of the contractile muscle protein actomyosin into actin and myosin. After three to four days at a temperature of +3-50 C, the meat, as a result of changes in the structure of myofibrils that ensure the contraction of striated muscles, acquires tenderness and aroma [1, 2].

The parameters of glycogenolysis in the muscle tissue of pigs obtained in our experiment are demonstrated in Table 1.

Table 1
Glycogenolysis parameters during meat maturation (n=5)

Options	Test Groups		
	Control	Acidomurine	
		I Experimental (0.8 kg/t feed)	II Experimental (1.0 kg/t feed)
3 hours after slaughter			
pH	5,89±0,06	5,85±0,05	5,84±0,04
Glycogen, mg%	591,7±12,28	689,1±14,37***	703,4±15,06***
Lactic acid, mg%	278,6±3,85	294,3±4,12*	301,8±5,34**
24 hours after slaughter			
pH	5,60±0,05	5,74±0,07	5,72±0,06
Glycogen, mg%	269,4±16,21	381,6±14,84***	392,4±17,43***
Lactic acid, mg%	584,7±4,03	565,9±4,62*	553,6±5,89**

The concentration of hydrogen ions in the samples of the control group, three hours after the slaughter of animals, slightly exceeded this indicator in the experimental groups by 0.68 and 0.86%, and at the end of the day, the acidity index in

all experimental groups decreased, but at the same time in the experimental groups it exceeded the control: in the I group – by 2.5%, in the II group – by 2.14%, amounting to 5.74 and 5.72 units..

The level of glycogen in the longissimus dorsi muscle of the killed animals, after three hours, dominated the control by 97.4 (16.46%; $P \leq 0.001$) and 111.7 mg/% (18.88%; $P \leq 0.001$). Later, as a result of autolysis, lasting 24 hours, a decrease in this parameter was recorded: in the control groups – by 2.2 times, and in the experimental groups – by 1.81 and 1.79 times. As a result, the presence of glycogen in the experimental groups was 112.2 (41.65%; $P \leq 0.001$) and 123.0 mg/% (45.66%; $P \leq 0.001$) higher than in the control groups.

In the process of glycogenolysis, glycogen is broken down and lactic acid is formed, the content of which after a three-hour exposure in the experimental groups exceeded the control by 15.7 (5.64%; $P \leq 0.05$) and 23.2 mg/% (8.33%; $P \leq 0.01$), and a day later the concentration of lactic acid increased: in the control group by 2.10 times, in the experimental groups somewhat less, by 1.92 and 1.89 times. As a result, the presence of lactic acid in the experimental groups turned out to be lower than in the control groups by 18.8 (3.32%; $P \leq 0.001$) and 31.1 mg/% (5.62%; $P \leq 0.01$), which, in our opinion, can be interpreted as a higher level of hydrogen ion concentration (pH) compared to the control group, which is consistent with the results of A.V. Frolov's studies [3].

The ability of meat to retain moisture is commensurate with the number of hydrophilic centers of the myofibril protein, which are formed during the destruction of actomyosin.

The assessment of the physical and technological properties of muscle tissue confirmed the effect of the tested feed additive on the moisture-holding capacity of meat (Figure 2).

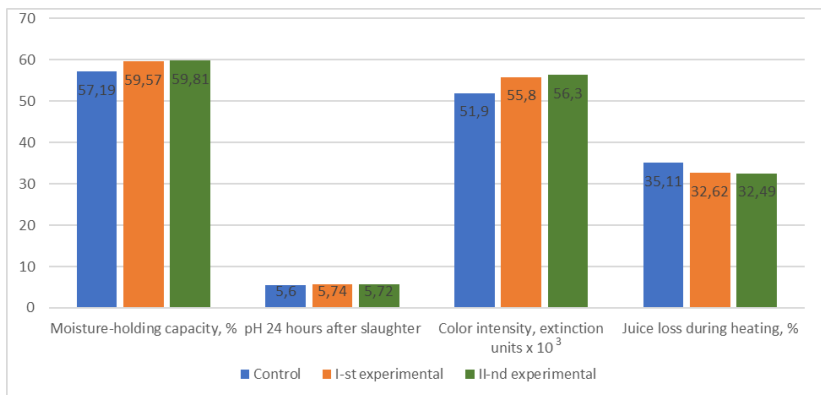


Figure 2. Physical and technological properties of muscle tissue of young pigs

The moisture-holding capacity of meat increased by 2.38% ($P \leq 0.05$) in the first experimental group, and by 2.62% ($P \leq 0.01$) in the second experimental group against the background of the control group. The loss of juice during heating, which decreased in the experimental samples compared to the control group by 2.49 ($P \leq 0.05$) and 2.58% ($P \leq 0.01$), once again confirms a higher ability to retain moisture in meat. Lee X. J. et al. [6] also prove that a mixture of organic and medium-chain acids in the diet of young pigs subsequently affects the loss of juice when the meat is heated.

The effect of the use of the feed additive Acidomurin was also manifested in an increase in the intensity of muscle fiber coloration, which significantly dominated by 7.51 ($P \leq 0.01$) and 8.48% ($P \leq 0.01$) in relation to the control.

The main structural and functional unit of muscles is muscle fibers. The growth of muscle mass is provided by two mechanisms: the thickening of existing fibers and the formation of new ones. The latter process occurs due to the splitting of large fibers, which creates conditions for hyperplasia of muscle tissue. Thus, the balance between small and large fibers reflects the physiological state of the muscles and helps to determine the leading mechanism of their enlargement.

Studies on the structure of muscle fibers conducted by us have demonstrated their qualitative changes under the influence of the ingredients of the experimental additive (Figure 3).

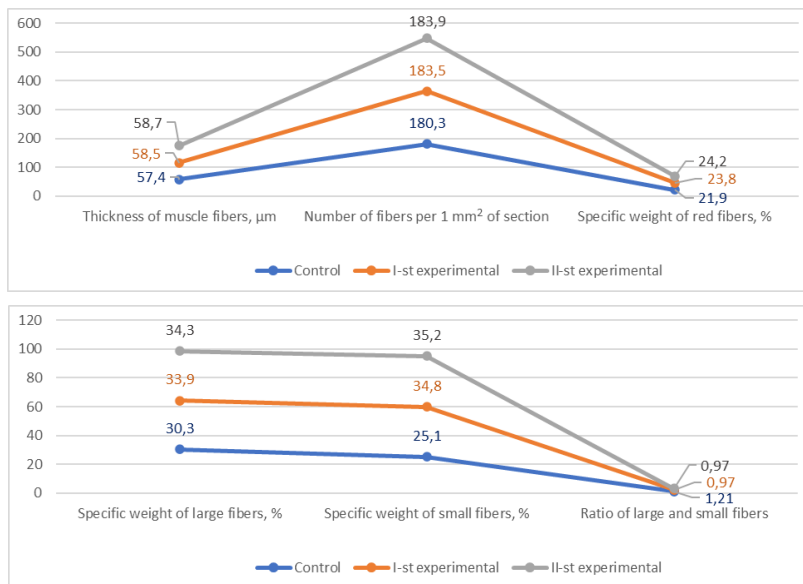


Figure 3. Structure of muscle fibers in experimental animals

The thickness of muscle fibers contrasted between the meat samples of the experimental groups and the control group at the first level of confidence: the excess in the first experimental group was 1.1 μm (1.92%; $P \leq 0.05$) and the II group was 1.3 μm (2.26%; $P \leq 0.05$). The proportion of small fibers in the experimental samples prevailed over the control group by 38.65 ($P \leq 0.001$) and 40.24% ($P \leq 0.001$), that is, the difference overcame the third level of confidence. Number of fibers per 1 mm^2 The slice also dominated the control by 1.78 ($P \leq 0.05$) and 2.00% ($P \leq 0.05$), and the proportion of red fibers by 1.90 ($P \leq 0.05$) and 2.30% ($P \leq 0.05$), respectively.

This is indisputable proof that the superior control gain in live weight obtained in the animals of the experimental groups by the end of fattening was possible due to the intensive formation of new fibers, and not through their thickening. Taking into account the fact that fine-fiber meat has better organoleptic properties, it can be stated that the tested additive has a positive effect on the nutritional value of meat.

Conclusion. The positive effect of a mixture of alpha-monolaurin and other organic acids included in the feed additive “Acidomurine” in the amount of 0.8 and 1.0 kg/t of feed on the chemical composition, physical and technological properties and autolysis of meat has been experimentally confirmed. At the same time, it should be emphasized that for practical use we recommend using a dosage of 1.0 kg of the additive per ton of feed, which showed the most significant results.

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不同灌溉制度下克拉斯诺达尔边疆区稻田土壤氮素动态
**DYNAMICS OF NITROGEN IN SOILS OF RICE FIELDS OF THE
KRASNODAR KRAI UNDER DIFFERENT IRRIGATION REGIMES**

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摘要.水稻是最独特的农作物之一。其独特之处在于它能够在湿润的土地上生长；能够在各种覆盖水层的土壤上生长；能够在淡水和咸水灌溉下生长；能够在热带、亚热带、沙漠和温带地区生长。然而，作物生长和形成的最佳条件仍然是涝渍土壤。同时，不同的灌溉方式会形成独特的水稻土壤成土过程，从而影响土壤的改良状态，包括土壤中矿物质和有机质的含量。氮是水稻营养最重要的元素，因此本研究旨在研究不同灌溉方式下氮的动态变化。通过研究不同灌溉方式对水稻生长季的影响，我们获得了一些建议，以提高水稻产量并在水稻种植期间保持土壤肥力。

关键词：水稻，灌溉方式，水稻土壤，氮，肥料，产量。

Abstract. *Rice is one of the most unique agricultural crops. Its specificity lies in the fact that it can grow on moist lands; on various soils covered with a layer of water; with irrigation with fresh and salt water; in tropical, subtropical, desert and temperate zones. However, the optimal condition for the development and formation of the crop is still waterlogged soil. At the same time, there are various irrigation regimes that form a unique soil-forming process on rice soils that affects the meliorative state of the soil, including the content of mineral and organic elements in it. The most important element of rice nutrition is nitrogen, so the goal of our research was to study the dynamics of nitrogen under various types of irrigation. As a result of the studies of the influence of various forms on rice crops during the growing season, recommendations were obtained that will increase rice productivity and maintain soil fertility during rice cultivation.*

Keywords: *rice, irrigation regime, rice soils, nitrogen, fertilizers, yield.*

Introduction. In world practice, there are a number of methods of rice cultivation [1,2]:

– dryland rice cultivation, water supply is provided exclusively by atmospheric precipitation;

- rice cultivation under irrigation conditions with controlled flooding during the growing season and in flooded depressions without regulation of the flooding level;

- floating rice culture in a zone with flooding by a water layer from 1 to 5 m or more.

In all rice-growing regions of Russia, rice is grown as a flooded crop. The presence of a water layer creates specific conditions for both vegetation and agricultural work.

In dryland farming, the yield is determined by the amount of water, and the struggle for the yield is primarily reduced to the struggle for moisture, for its accumulation [3-5]

The theoretical foundations of the system of application of mineral fertilizers are most widely and fully developed for the conditions of rice cultivation with a water regime - shortened flooding.

As for dryland rice or rice grown without flooding with a layer of water, there is practically no data on these issues [6.]

Main part. Currently, there is a need to differentiate water regimes in order to save water, increase the efficiency of nitrogen fertilizers, reduce the risk of environmental pollution and in the development of herbicide-free rice cultivation technology. Therefore, studies of the dynamics of nitrogen in the soil under various water regimes in order to regulate the nutritional regime of rice with this essential element are very relevant [7,8]

The studies were carried out on the vegetation site in the peasant farm “Golovin Grigory Nikolaevich” of the Kalininsky district in 2021-2024. Laboratory analyses were conducted at GEYA-NIL.

The following sections were laid on three types of rice fields:

- meadow-chernozem-like soil of the Kuban training farm of the Kuban State Agrarian University, department No. 4;

- alluvial-meadow solonchakous soil of the Golovin Grigory Nikolaevich peasant farm of the Kalininsky district;

- meadow-marsh soil of TEREZ LLC of the Belorechensky district.

The arable layer of these soils was removed and brought to the vegetation site. Soil (ballast) was poured onto the bottom of concrete baths with an area of 0.70 m². The ballast was then moistened, leveled and compacted, and then covered with a film to prevent vertical and lateral filtration. The soil brought from the field was crushed and sifted through a sieve, and then poured into the lysimeters in a 20 cm layer. After moistening and some compaction, the remaining 10 cm of soil, previously thoroughly mixed with mineral or organic fertilizers, were poured in. Mineral fertilizers were applied at the rate of $N_{120}P_{90}K_{60}$, which corresponds to 42 g (NH₄)₂SO₄, 16 g double superphosphate and 7 g potassium chloride per lysim-

eter. Organic fertilizer was applied at the rate of 10 tons per 1 ha, which corresponds to 700 g per lysimeter. Sowing was carried out according to a stencil with hatched seeds of the Rapan 2 rice variety, placing them according to a 7.5x5 cm pattern. Sowing was completed by covering the seeds with a thin layer of soil and moistening. Further work consisted of breaking through, creating different types of water regimes (constant flooding, shortened flooding and periodic irrigation up to 80-90% of the FPV) and periodic weed control.

During the growing season, soil samples were collected at a depth of 0-20 cm for determining the nitrogen content in the phases of rice plant growth and development (shoots, tillering, booting, panicleation - flowering and full ripeness). The soil was delivered to the laboratory, field moisture was determined, dried, crushed, ground and sifted through a sieve with 0.25 cm holes.

We determined alkaline-hydrolyzable nitrogen according to Kornfield in Conway cups. The method is based on the hydrolysis of organic compounds in the soil with a 1 N NaOH solution. The ammonia released in this case is taken into account by the microdiffusion method.

We determined water-soluble ammonium compounds by the colorimetric method with Nessler's reagent. The method is based on obtaining an orange complex by the interaction of Nessler's reagent (alkaline solution!) with ammonium salts.

Nitrates were determined by the colorimetric method according to Grandval-Lyazh with disulfophenolic acid. When the mixture is alkalinized, the solution acquires a yellow color, the intensity of which is used to judge the nitrate content in the soil.

Alkaline-hydrolyzable nitrogen. At the current level of agriculture, plants do not always have enough nitrogen present in the soil in mineral form and mobilized from organic matter. The deficiency is replenished with nitrogen fertilizers.

In this regard, there was a need to study and characterize soils by their ability to provide plants with nitrogen and predict the effect of nitrogen fertilizers.

Numerous methods of analysis provide an idea of the provision of plants with soil nitrogen in the early stages of development, but do not allow us to judge the amount of soil nitrogen available to plants during the growing season.

Therefore, methods for determining easily hydrolyzable soil nitrogen are used, which are based on the definition of not only mineral nitrogen currently in the soil, but also part of the organic nitrogen, which can be mineralized in the near future.

The results of the analyses (Table 1) indicate that the highest content of alkaline-hydrolyzable nitrogen in meadow-chnozem-like soil is observed in the germination phase and is 10.36-12.88 mg/100 g of soil. In the tillering phase, it drops sharply to 6.72-7.84 mg/100 g of soil and in subsequent phases it increases slightly and is evenly distributed until the end of the growing season.

Table 1.
Experimental design

Soil type	Water regime	Fertilizer
Meadow-chernozem-like	P.F.	NPK
	S.F.	NPK
	S.F.	Manure
	S.F.	Peat
	S.F.	Luzern
	P.I.	NPK
Alluvial-meadow solonchakous	P.F.	NPK
	S.F.	NPK
	P.I.	NPK
	P.F.	NPK
	S.F.	NPK
Meadow-marsh	S.F.	$\frac{1}{2}$ NPK + $\frac{1}{2}$ Luzern
	S.F.	$\frac{1}{2}$ NPK + $\frac{1}{2}$ Manure
	S.F.	$\frac{1}{2}$ NPK + $\frac{1}{2}$ Peat
	P.I.	NPK
	P.I.	Luzern

Note. P.F. – permanent flooding; S.F. – shortened flooding; P.I. – periodic irrigation.

The latter is apparently associated with intensive nitrogen consumption by rice plants in the tillering phase. The application of organic fertilizers slightly increases the content of easily hydrolyzable nitrogen in the soil. The absence of a significant difference between the variants with different types of water regime indicates that the nitrogen content in the soil depends little on the type of water regime.

The content of alkaline-hydrolyzable nitrogen in alluvial-meadow solonchakous soil is less than in meadow-chernozem-like and meadow-marsh soils. The dynamics of nitrogen in the phases of rice plant vegetation obeys the revealed pattern. There was especially little alkaline-hydrolyzable nitrogen at the end of the growing season. The content of alkaline-hydrolyzable nitrogen in meadow-bog soil is high in all phases (6.616-13.36 mg/100 g of soil), and its dynamics confirms the revealed pattern; its increase at the beginning of vegetation, decrease in the tillering phase, then some increase and uniform distribution in subsequent phases until the end of vegetation.

Ammonia nitrogen. Plants absorb two main nitrogen compounds from the soil - nitrate and ammonium salts. Nitrogen, the main nutrient, is available to rice mostly in ammonia form, especially at a young age. In non-irrigated chernozem

soils, nitrogen absorbed by plants is mainly in nitrate form, ammonium - appears in noticeable quantities only in late autumn and spring.

Soil flooding causes a redistribution of mobile forms of nitrogen in a short time (reduction of nitrate and appearance of ammonium nitrogen). 10-15 days after flooding, as the recovery processes intensify, nitrogen in the soil in the 0-10 cm horizon is mainly in the ammonium form.

During the growing season, for all types of water regime, the lowest NH_4 content in meadow-chernozem-like soil was observed at the beginning of booting (Table 2). The latter is apparently due to the intensive consumption of nitrogen by rice plants during this period.

Table 2.
*Dynamics of alkaline-hydrolyzable nitrogen in the soil (mg / 100 g of soil).
Vegetation experiment, 2021.*

Water regime	Fertilizer	Vegetation phases				
		Young crops	tillering	tubing	sweeping out, flowering	full ripeness
Meadow-chernozem soil						
P.F.	NPK	11,20	6,72	5,90	7,56	6,72
S.F.	NPK	10,36	7,84	7,98	6,72	7,00
S.F.	Manure	10,50	12,74	8,54	8,68	6,72
S.F.	Peat	12,98	7,42	9,10	9,24	7,00
S.F.	Luzern	12,60	7,42	8,68	9,24	6,72
P.F.	NPK	10,64	7,00	8,40	8,12	7,58
Alluvial meadow saline soil						
P.F.	NPK	5,00	3,22	4,48	5,60	2,24
S.F.	NPK	5,46	3,92	4,48	3,36	2,52
P.I.	NPK	5,88	5,32	4,84	3,92	4,20
Meadow-marsh soil						
S.F.	NPK	11,34	9,82	7,56	8,12	6,72
S.F.	NPK	12,18	8,12	8,34	8,40	6,44
S.F.	½NPK+ ½ Luzern	13,86	7,42	8,96	11,76	6,72
S.F.	½NPK+½ Manure	12,46	6,02	8,82	8,96	6,72
S.F.	½NPK+ ½ Peat	12,74	7,42	8,54	8,40	7,84
P.I.	NPK	12,88	10,22	9,38	9,52	7,56
S.F.	Luzern	12,02	7,14	8,82	8,96	6,16

Permanent flooding provides the best accumulation of nitrogen in the soil. The difference in nitrogen accumulation in the soil is insignificant between the perma-

nent and shortened types of water regime; the advantage of shortened flooding is probably in the comparative economy of irrigation rates.

On alluvial-meadow soil, the same pattern is preserved, both in accumulation and in the dynamics of nitrogen in the soil during the rice vegetation phases.

On meadow-marsh soil, in addition to the general pattern revealed in the dynamics of nitrogen during the vegetation phases, some accumulation of nitrogen was observed when organic fertilizer was applied.

Nitrate nitrogen. Unlike ammonia nitrogen, which can be present in the soil both in solution and in the absorbed state, nitrates are present in the soil only in a soluble state. Therefore, all the saltpeter can be easily extracted from the soil with water. If we determine both nitrates and ammonia, we will find out the presence of easily digestible nitrogenous substances in the soil, which serve as food for plants [1].

At a young age, rice plants feed mostly on the ammonia form, adult rice plants can also consume nitrates, thanks to the enzymes present in them, which are capable of reducing NO_3 to NH_4^+ . After 10-15 days after flooding, as the reduction processes intensify, nitrate forms decrease and by the end of the growing season they are practically absent. They reappear in the soil only after the discharge of water from the checks. Nitrate forms of nitrogen, as can be seen from the analysis data (Table 3), were observed at the beginning of the growing season of rice plants.

As is known [1], nitrates are in a soluble state, therefore, after flooding they decrease and by the end of the growing season they are practically absent. This pattern applies to all types, regardless of the types of fertilizers applied.

Table 3.
Dynamics of nitrate nitrogen in the soil (mg/100 g soil), vegetation experiment, 2021.

Water regime	Fertilizer	Vegetation phases			
		Young crops	tillering	sweeping out, flowering	full ripeness
Meadow-chernozem soil					
P.F.	NPK	1,60	0,37	Signs	Signs
S.F.	NPK	1,6	0,87	Signs	Signs
S.F.	Manure	1,6	0,32	Signs	Signs
S.F.	Peat	2,9	0,35	Signs	Signs
S.F.	Luzern	1,6	0,42	Signs	Signs
P.I.	NPK	5,00	0,65	Signs	Signs
Alluvite meadow saline soil					
P.F.	NPK	5,00	0,45	Signs	Signs

S.F.	NPK	2,8	0,35	Signs	Signs
P.I.	NPK	7,8	0,42	Signs	Signs
Meadow-marsh soil					
P.F.	NPK	1,6	0,60	Signs	Signs
S.F.	NPK	2,8	0,35	Signs	Signs
S.F.	½NPK+ ½ Luzern	2,8	0,80	Signs	Signs
S.F.	½NPK+ ½ Manure	1,6	0,92	Signs	Signs
S.F.	½NPK+ ½ peat	5,0	0,42	Signs	Signs
P.I.	Luzern	1,6	0,62	Signs	Signs
P.I.	NPK	5,0	0,87	Signs	Signs

Conclusions.

Irrigation regime does not have a significant effect on the content of alkaline-hydrolyzable nitrogen in the soil.

Meadow-chernozem-like and meadow-marsh soils are better supplied with alkaline-hydrolyzable nitrogen than alluvial-meadow solonchakous soil.

The highest content of alkaline-hydrolyzable nitrogen in all types of studied soils is observed in the seedling phase, it decreases sharply in the tillering phase, increases slightly by the booting phase, and then decreases until the end of the growing season.

Application of organic fertilizers slightly increases the content of alkaline-hydrolyzable nitrogen in all soils.

Constant flooding causes accumulation of ammonia nitrogen in the soil.

The lowest content of ammonia nitrogen in soils was observed at the beginning of booting, slightly increased in the panicle-formation phase and until the end of the growing season.

The irrigation regime directly affected the dynamics of nitrate nitrogen in the soil. With periodic flooding, the content of nitrate nitrogen in the studied soil varieties is higher than with constant flooding.

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图瓦共和国克孜勒市城市固体废物填埋场影响区土壤重金属和砷污染水平评估
**ASSESSMENT OF THE LEVEL OF SOIL CONTAMINATION WITH
HEAVY METALS AND ARSENIC IN THE ZONE OF INFLUENCE
OF THE MUNICIPAL SOLID WASTE LANDFILL IN KYZYL,
REPUBLIC OF TYVA**

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摘要. 本文探讨了当今最紧迫的问题之一——土壤重金属和砷污染。本研究给出了2019年克孜勒市城市固体废物填埋场影响区土壤污染浓度系数 (C_c) 和总污染指标 (C_c) 的计算值。所得数据有助于确定土壤化学元素污染的类别和程度, 这是评估该市环境状况的重要一步。

关键词: 土壤覆盖、重金属、城市固体废物填埋场、污染程度、污染类别。

Abstract. *This article discusses one of the most pressing issues of our time — soil pollution with heavy metals and arsenic. The study presents the calculated values of the concentration coefficient (C_c) and the total indicator (C_c) of soil pollution in the impact zone of the municipal solid waste (SW) landfill in Kyzyl for 2019. The data obtained made it possible to determine the category and level of soil pollution with chemical elements, which is an important step in assessing the environmental situation in this city.*

Keywords: *soil cover, heavy metals, MSW landfill, pollution level, pollution category.*

Introduction. *In the context of increasing urbanization and the accompanying pollution of landscapes with toxic substances, especially heavy metals (HM), the study of the components of the natural environment in cities is becoming extreme-*

ly relevant. Emissions of pollutants from vehicles and industrial enterprises, as well as runoff from landfills, form man-made flows that negatively affect various elements of the urban ecosystem. These processes lead to the emergence of geochemical anomalies and the formation of zones unfavorable for human habitation.

Today, the solid municipal waste (SMW) landfill in the city of Kyzyl is one of the main sources of man-made pollution of the environment. The city of Kyzyl is the capital of the Republic of Tyva, located in the eastern part of the Ulug-Khem basin, at the confluence of the Bii-Khem and Kaa-Khem rivers, which form the Ulug-Khem.

The landfill, created in 1983, is located 8 km south of the Sputnik microdistrict in the southern part of the city. According to the city administration, the area of the landfill is 30 hectares, and its capacity reaches 750 thousand m³. Every year, more than 35,869 tons of MSW are taken to the city's landfills, and solid waste also comes from the nearby village of Sukpak and the settlement of Kaa-Khem. The process of solid waste disposal at landfills is accompanied by biogas emission and leachate formation, which in turn leads to pollution of the atmosphere, soil and groundwater.

The study of the soil cover for the presence of pollutants is the most important part of the ecological and geochemical survey of the territory. In this regard, we set the goal of assessing the level of soil pollution with heavy metals and arsenic in the zone of influence of the solid waste landfill of the city of Kyzyl. The object of the study were areas directly adjacent to the landfill.

Materials and methods of research. Sampling was carried out in May 2019 according to the standard methodology. During the study, five soil samples were collected, including a background sample. The background sample was taken 40 km south of the city of Kyzyl. The sampling depth was 0-10 cm; the average sample was formed from 10-15 point samples, after which a 1500-gram sample was selected for analysis. All analyses were carried out in an accredited laboratory in the city of Kyzyl, based at the Federal State Institution of the State Agrochemical Service Station "Tuvinskaya", where chemical analyses of soil pollution with heavy metals and arsenic were performed using certified methods [1]. In the process of geochemical processing, two key coefficients were determined: the coefficient of technogenic concentration (K_c) and the total pollution index (ZC) [2]. The concentration coefficient (C_c) was calculated using the formula:

$$K_c = C_i / C_{\phi},$$

where C_i – the content of an element in a specific sample, mg/kg;

C_φ – background content of the element, mg/kg.

Since man-made anomalies most often have a polyelement composition, the total pollution index (ZC) was calculated for them using the formula:

$$Z_c = \sum_{i=1}^n K_c + \dots K_{c_n} - (n-1),$$

where n is the number of elements taken into account.

Research results. Analysis of chemical elements showed that the content of heavy metals and arsenic in the soil cover does not exceed the maximum permissible concentrations (MPC). Processing of analytical data consisted of calculating the coefficient (KS) of concentration and the total indicator (ZC) of soil cover pollution with heavy metals and arsenic.

Calculated data for the coefficient of concentration (Cc) and the total indicator (Zc) of soil cover pollution are presented in Table 1.

Table 1

Concentration coefficient (Cc) and total indicator (Zc) of contamination of soil cover with HM and arsenic in the zone of influence of the Kyzyl SW landfill (gross form)

Sample No.	Sampling location	Concentration coefficient (Cc)									Zc (total indicator)
		Cd	Ni	Zn	Cu	Pb	Mn	Co	Hg	As	
1	Kyzyl city 100 m west of the solid waste landfill	1,12	2,06	1,8	1,05	1,0	1,66	1,32	1,71	1,4	4,98
2	Kyzyl city 100 m east of the solid waste landfill	1,72	2,66	1,71	1,19	1,33	1,34	1,42	2,14	1,3	6,81
3	Kyzyl city 100 m north of the solid waste landfill	1,84	2,2	1,76	1,19	1,78	1,44	2,21	2,42	1,4	8,21
4	Kyzyl city 100 m south of the solid waste landfill	1,08	2,2	2,52	1,25	1,13	1,55	1,96	1,64	2,05	7,38

It was found that in the test areas located near the solid waste landfill, the values of the technogenic concentration coefficient (Cc) varied from 1.0 to 2.66 units. The highest values were recorded for such heavy metals as nickel, mercury and zinc, while copper, lead and manganese demonstrated the lowest concentration values (Fig. 1).

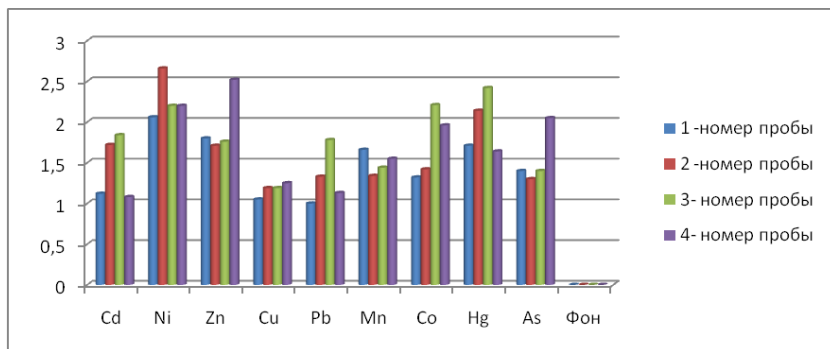


Figure 1. The coefficient (K_c) of concentration of heavy metals and arsenic in the soil cover of SW in Kyzyl for 2019 (gross forms).

The calculated total pollution index (Z_c) ranged from 4.98 to 8.21 units, which indicates minimal and weak pollution of the soil cover with heavy metals and arsenic (Table 1). A weak level of pollution was noted at a distance of 100 meters north of the MSW landfill, while at the other studied points the pollution level can be classified as minimal. The assessment of the danger of soil pollution with a complex of heavy metals according to the Z_c indicator was less than 16 units, which indicates an acceptable category of soil pollution.

According to the authors [3,4], the level of pollution of the soil cover of Kyzyl in 2008 for mobile forms was assessed as minimal, and for gross forms - as weak. In 2009, the results also showed a weak level of pollution for various forms.

Conclusions. Thus, the results of the conducted studies confirm that the content of heavy metals and arsenic in the soil cover in the zone of influence of the solid waste landfill of the city of Kyzyl does not exceed the maximum permissible concentrations (MPC). Despite the fact that the degree of pollution (K_s) exceeds one, the level of pollution of the soil cover is classified as minimal and weak, which corresponds to the permissible category of pollution. These data emphasize the need for further monitoring of the state of the environment in this area, as well as possible measures to minimize the impact of man-made factors on the ecosystem of the city.

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