



SCIENTIFIC RESEARCH OF THE SCO COUNTRIES: SYNERGY AND INTEGRATION

上合组织国家的科学研究：协同和一体化

Proceedings of the
International Conference

Date:
September 11

Beijing, China 2024

上合组织国家的科学研究：协同和一体化
国际会议

参与者的英文报告

International Conference
“Scientific research of the SCO
countries: synergy and integration”

Part 2

2024 年 9 月 11 日，中国北京
September 11, 2024. Beijing, PRC

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

(September 11, 2024. Beijing, PRC)

ISBN 978-5-905695-82-7

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。

作者对所引用的出版物，事实，数字，引用，统计数据，专有名称和其他信息的准确性负责

These Conference Proceedings combine materials of the conference – research papers and thesis reports of scientific workers. They examine technical, juridical and sociological aspects of research issues. Some articles deal with theoretical and methodological approaches and principles of research questions of personality professionalization.

Authors are responsible for the accuracy of cited publications, facts, figures, quotations, statistics, proper names and other information.

ISBN 978-5-905695-82-7

©Scientific publishing house Infinity, 2024

©Group of authors, 2024

CONTENTS

ECONOMIC SCIENCES

基于操作员方法的工业企业管理中使用仿真工具的可能性分析 Analysis of the possibility of using simulation tools in the management of an industrial enterprise based on the operator approach <i>Lapshina Marina Leonidovna, Zolotukhina Oksana Olegovna, Serebryakova Nadezhda Aleksandrovna</i>	9
环境和技术现代化的信息支持和方法支持的综合方法 Integrated approach to information support and methodological support for environmental and technological modernization <i>Mudrova Svetlana Vladimirovna, Ivanov Nikita Dmitrievich</i>	15
生态和技术主权框架内的可持续发展经济学 The economics of sustainable development within the framework of ecological and technological sovereignty <i>Rudenko Victoria Alekseevna, Sofronov Ivan Ilyich</i>	18
闭环经济发展趋势 Trends in the development of a closed-loop economy <i>Rudkovskaya Margarita Mikhailovna, Prokhorov Yuri Nikolaevitch, Gelfand Polina Arkadyevna</i>	23
构建企业文化是协调员工关系的一个因素 Formation of corporate culture as a factor in harmonizing staff relations <i>Evseenko Viktoriia Alexandrovna</i>	28
小型科技公司和中小企业是俄罗斯联邦国家企业支持的工具 Small technology companies and small and medium-sized businesses as instruments of state business support in the Russian Federation <i>Yuhno Nicolay Sergeevich</i>	34
从数字经济转型过程中国际法规范修正的角度形成国际贸易概念 Formation of concepts of international trade from the standpoint of correction of norms of international law during the transition to a digital economy <i>Vyatchenkov Andrey Vladimirovich, Kharlanov Alexey Sergeevitch</i>	40
俄罗斯是国际法古典解释的积累和应用的聚集者，也是传统家庭和宗教价值观的捍卫者 Russia as an aggregator of accumulation and application of international law in its classical interpretation and as a defender of traditional family and religious values <i>Vyatchenkov Ivan Vladimirovich, Kharlanov Alexey Sergeevitch</i>	48

JURIDICAL SCIENCES

- 关于国家调节的货物（工程、服务）供应合同领域立法系统化的问题
To the issue of systematization of legislation in the sphere of state-regulated contracts for the supply of goods (works, services)
Lavrik Tatyana Mixajlovna, Isajkina Anna Aleksandrovna 54

PEDAGOGICAL SCIENCES

- 加强博士教育：方法论准备在发展专业和教学活动中的作用
Enhancing doctoral education: the role of methodological readiness in developing professional and pedagogical activities
Pruksaseat Chanittra 59

PHILOLOGICAL SCIENCES

- 俄罗斯大学的俄语对外教学：方法与实践
Teaching Russian as a foreign language at the Russian university: methodology and practice
Barashyan Valentina Karapetovna, Kononenko Anna Pavlovna, Nedospasova Larisa Alekseevna 65

- 公立中学英语和国际考试结构中的前缀
Prefixes in the structure of state secondary school and international exams in English
Patlatenko Valeriya Aleksandrovna, Shilikov Sergei Ivanovich 75

PHILOSOPHICAL SCIENCES

- 尝试通过 F. Nietzsche、O. Spengler、P.A. Sorokin 和 I.A. Ilyin 对火的哲学解释的棱镜来理解现代文化的状态
An attempt to comprehend the state of modern culture through the prism of philosophical interpretations of fire by F. Nietzsche, O. Spengler, P.A. Sorokin and I.A. Ilyin
Moiseenko Tatyana Nikolaevna 82

CULTURAL STUDIES

- 上合组织文化政策体系：以科学发展战略作为维护国际关系体系国家中心范式的机制
The system of cultural policy in the SCO: a strategy of scientific development as a mechanism for protecting the state-centric paradigm in the system of international relations
Marzoeva Angelika Vladislavovna 89

ART HISTORY

- 当代中国学院音乐：论作曲家贾大群的创作原则
Contemporary Chinese academic music: on creative principles of composer Jia Daqun
Polosina Anastasia Igorevna 95

BIOLOGICAL SCIENCES

关于东西伯利亚新发现稀有鸟类物种的补充数据

Additional data on new finds of rare and scanty bird species in Eastern Siberia
Mel'nikov Yuriy Ivanovich 100

阿瓦恰湾（东堪察加半岛）石鸡冠花 *Alectrias alectrolophus* (Stichaeidae) 的饮食和形态特征

Some features of the stone cockscomb *Alectrias alectrolophus* (Stichaeidae) diet and morphology in Avacha Bay (Eastern Kamchatka)
Zheleznyak Maria Yurevna 111

MEDICAL SCIENCES

天然聚戊烯醇作为一种具有良好免疫潜力的物质

Natural polyprenols as a substance with promising immunological potential
Marakhouski Yury Kharitonovich, Rubens Juris Pavlovich, Roshchin Viktor Ivanovich, Bartkevics Vadim, Zajakina Anna 116

残疾人权益保护的社会政策

Social policy in relation to the protection of rights disabled people
Dymochka Mikhail Anatolyevich, Naumenko Lyudmila Leonidovna, Stasevich Natalia Yurievna, Grigorieva Irina Vladimirovna 130

远程医疗心电图监护技术在脑卒中患者高科技神经康复治疗心脏安全性监测过程中的应用

Telemedicine ECG monitoring technologies in the process of monitoring the cardiac safety of high-tech neurorehabilitation of patients after a cerebral stroke
Neprintseva Natalia Viktorovna, Schikota Alexey Mikhailovich, Kostenko Elena Vladimirovna, Pogonchenkova Irena Vladimirovna 135

康复潜力和康复预后定义的方法

Methodological approaches to the definition of rehabilitation potential and rehabilitation prognosis
Demuria Lyubov Edwardovna, Naumenko Lyudmila Leonidovna, Kirsanov Dmitry Alexandrovich, Denisov Konstantin Ivanovich, Morozov Ivan Nikolaevich 141

医疗改革的历史阶段

Stages of healthcare reform in the historical aspect
Gabrielyan Artur Rudolfovich, Demuria Lyubov Edwardovna, Kechaykin Alexey Nikolaevich, Serov Denis Vladimirovich 146

牙科实践中锥形束 CT 密度参数准确性的客观评估

Objective evaluation of density parameters' accuracy in cone-beam computed tomography in dental practice
Hossain Shazmim Jahan, Muraev Alexander Alexandrovich 155

与年龄相关的呼吸器官解剖特征

Age-related features of the anatomy of the respiratory organs

Ilyasov Abusupiyan Butashevich, Guseinova Sabina Tagirovna,

Kurbanova Patimat Arsenovna, Akaeva Diana Rizvanovna161

过早衰老患者健康状况评估

Assessment of the health status of patients with premature aging

Saprykina Alice Igorevna.....166

PHYSICAL AND MATHEMATICAL SCIENCES

非线性控制系统优化中控制轨迹集合的优势

Advantages of controlling ensembles of trajectories in nonlinear control system optimization

Zavadskiy Sergey Vyacheslavovich.....171

DOI 10.34660/INF.2024.90.74.027

基于算子法的工业企业管理中应用仿真工具的可行性分析
**ANALYSIS OF THE POSSIBILITY OF USING SIMULATION
TOOLS IN THE MANAGEMENT OF AN INDUSTRIAL
ENTERPRISE BASED ON THE OPERATOR APPROACH**

Lapshina Marina Leonidovna

*Doctor of Technical Sciences, Full Professor
Voronezh State University of Forestry and Technologies named
after G.F. Morozov*

Zolotukhina Oksana Olegovna

*Candidate of Economic Sciences, Associate Professor
Voronezh State University of Engineering Technologies*

Serebryakova Nadezhda Aleksandrovna

*Doctor of Economic Sciences, Full Professor
Voronezh State University of Engineering Technologies*

摘要。本文考虑了对企业可持续经济发展前景进行初步分析的程序，其中考虑了算子的几何密度特性，使用概率方法在多准则优化中选择最合适的估计值，以及基于形成的帕累托最优集考虑每个替代方案的加权系数和折衷指标值的多准则决策算法。

关键词：模型、利润、经济、结构、优化、算子。

Abstract. *The article considers the procedure of preliminary analysis of the prospects for sustainable economic development of an enterprise taking into account the use of the properties of the geometric density of the operator, the use of a probabilistic approach to selecting the most appropriate estimates in multi-criteria optimization, an algorithm for making a multi-criteria decision taking into account the weighting coefficients and values of compromise indicators of each alternative based on the formed Pareto optimal set.*

Keywords: *model, profit, economy, structure, optimality, operator.*

The relevance of the problem under consideration is due to a number of significant factors, the essence of which can be reduced to the following currently obvious postulate: it is inappropriate to consider the current economic situation at any enterprise or in the industry as a whole without using simulation or mathematical methods and models. The statements of many authoritative Russian and foreign

economists confirm this: any theoretical provisions are determined by the level of the mathematical apparatus used, as well as further adaptation to practice of the results obtained in the course of scientific research.

Carrying out the improvement and optimization of the structures of an organization seeking to increase its profitability, as well as the construction of optimal mathematical models and the greatest formalization of the tasks set, allow the full use of computer technology. Initially, let us ask ourselves the question: what can we say about the number of arguments of a numerical function, given the range of values that it takes on a sphere of unit radius? In the general case, the answer will be unambiguous: nothing can be said for sure. However, it seems possible to confirm that sometimes it will receive unexpected estimates of the number of arguments.

Initially, we will form the form by analyzing the quadratic form $f(x) = (Ax, x)$ with the normal operator A and marking, using parentheses, the scalar product belonging to the corresponding space C^n . It is obvious that the number of vertices of a given polygon does not answer the question of the number of eigenvalues, taking into account their multiplicity, since we do not know the number of vertices located inside this polygon. It is only known about the existence of a one-to-one correspondence between the vertices of the polygon and the eigenvalues [1].

Let us find the density of the set relative to the center, defined as the point of origin of the coordinate axes. First, we formulate the definition.

Definition. The quantity w , found by formula (1) corresponds to the density M relative to the center specified by the origin of the coordinate axes:

$$w = \frac{1}{2} \sup \left\{ \left(\sqrt{\frac{\rho_1}{\rho_2}} + \sqrt{\frac{\rho_2}{\rho_1}} \right) \frac{1}{\cos \frac{\varepsilon_{12}}{2}} \right\}, \forall \{1\}, \{2\} \in M, \{1\} \neq \{2\} \quad (1)$$

where ρ_i determines the distance between a point $\{i\} \in M$ and point O , ε_{ij} corresponds to the smallest of the angles between the vectors $\vec{\rho}_i$ and $\vec{\rho}_j$.

We will look for the density of the numerical domain of the operator A in the form:

$$w(A) = \frac{1}{2} \max_{\lambda_i \neq \lambda_j} \left\{ \left(\sqrt{\frac{|\lambda_i|}{|\lambda_j|}} + \sqrt{\frac{|\lambda_j|}{|\lambda_i|}} \right) \frac{1}{\cos \frac{\varepsilon_{ij}}{2}} \right\}$$

We represent the density value $w(A)$ as a constant value with respect to rotations and transformations of the plane, using the definition of the diagonal dominant:

$$|a_{ii}| \geq \sum_{i \neq j} |a_{ij}|, \quad i = \overline{1, n}.$$

Then we formulate a statement that will be used at the stage of graphical implementation of the enterprise management model, helping to analyze its various options with subsequent selection of the best of them [2].

Statement. The implementation of inequality (2) strictly corresponds to the condition of existence of a matrix with diagonal dominance in any orthonormal basis corresponding to operator A .

$$w(A) \leq \sqrt{\frac{n}{n-1}}, \quad n \neq 1 \quad (2)$$

Calculations refute the fact of the existence of diagonal dominance in the matrix defining the essence of the problem. As an example of this type of matrix, we can name the payoff matrix in the section of linear programming [4]. Let us consider the case in which the organizer of the game designates a certain area of winnings, based on the probabilistic approach. Then he needs to build such rules that will place the winnings in the area we need. The game should still remain meaningful, which entails the absence of a diagonal dominant in the payoff matrix. The formulated statement leads to the equivalence of the inequality of the form

$$w(A) > \sqrt{\frac{n}{n-1}}, \quad n \neq 1 \quad (3)$$

The necessity of geometric constructions in the study of density $w(A)$. is obvious. Formula (3) defines the conditions of the matrix dimension and, as a consequence, the number of arguments of the quadratic form (Ax, x) :

$$n > \frac{w^2(A)}{w^2(A)-1} \quad (4)$$

Let us assume that the operator A defines the payoff matrix of an arbitrary game. Using (4), we establish the number of restrictions on the game variants used:

$$N \geq 1 + \left[\frac{w^2(A)}{w^2(A)-1} \right].$$

After the organizer has obtained a number of game strategies that do not change its content, it will be possible to build strategies for each case [3].

Inequality (4) confirms that the geometric density of eigenvalues reaches one, which corresponds to the smallest possible value, and its increase to larger sizes leads to the absence of diagonal dominance.

It should be noted that the geometric analysis of the functional features of such a set is significantly influenced by various nuances determined by the geometric density. Let us formulate the following statement.

Statement. Let M be a point set on a plane. Then the geometric density of the set M is equal to the geometric density of the boundary of its convex hull. $w(M) = w\{\partial(\text{conv } M)\}$.

The conducted study of the economic component of the enterprise and the formalization of this study, taking into account the specification of the possibility of using IT technologies, the identification of the constituent components, the selection of preferences in the parameters that clarify this identification, confirmed the possibility of constructing and further operating a simulation model of management using an operator approach. Let us consider the possibility of using a multi-criteria approach to choosing the most adequate management decision. The value of an arbitrary i -th indicator of two or more alternatives $f_i(A_r)$ and $f_i(A_s)$ can be specified using their distribution function $p\{f_i(A_r) \geq b_r\} = \beta_r$, $p\{f_i(A_s) \geq b_s\} = \beta_s$ or the following two relations: $p\{f_i(A_r) \in [b_{ik}^i, b_{ik}^{i+1}]\} = \beta_{ik}^i$ and $p\{f_i(A_s) \in [b_{ik}^i, b_{ik}^{i+1}]\} = \beta_{ik}^i$, $i = 0, \dots, T$. [4]. Here b_{ik} and b_{ik}^i different values of the i -th efficiency parameter, $k = 1, \dots, K$, and β_i and β_{ik} , also $\beta_{ik}^i, \beta_{ik}^i$ respectively, the probabilities that its value in alternative probabilities will be less than or equal to the value β_i or lie in the corresponding interval of values. When comparing the values of the same efficiency indicator of two different alternatives, different deterministic quantities can be considered:

- mathematical expectations

$$\varphi_{ik}(A_k) = m_i\{f_i(A_i)\} = \sum_{i=1}^T \bar{b}_{ik}^i \beta_{ik}^i, \bar{b}_{ik}^i = \frac{1}{2}(b_{ik}^{i+1} + b_{ik}^i);$$

- standard deviations:

$$\sigma_{ik}(A_k) = \sigma_i^2\{f_i(A_i)\} = \frac{1}{T-1} \sum_{i=1}^T [m_i\{f_i(A_i)\} - b_{ik}^i]^2 \beta_{ik}^i;$$

- the probability that the value of the corresponding indicator will not exceed or will be equal to some specified values of this indicator:

$$\varphi_{ik}(A_k) = p\{f_i(A_i) \geq b_{ik}\} = \int_{-\infty}^{b_{ik}} f_i(x | A_r) dx; \quad \varphi_{ik}(A_k) = p\{f_i(A_i) \leq d_{ik}\} = \int_{b_{ik}}^{+\infty} f_i(x | A_r) dx.$$

The value of the indicator, the achievement of which is guaranteed with a probability not lower than that specified in advance:

$$\varphi_{ik}(A_k) = \{\bar{b}_{ik}^i | p[f_i(A_i) \geq \bar{b}_{ik}^i] \geq \beta_{ik}\} \quad \varphi_{ik}(A_k) = \{d_{ik} | p[f_i(A_i) \leq d_{ik}] \geq \gamma_{ik}\}.$$

In addition, moments of higher orders can be considered as indicators. In addition, moments of distribution of higher orders can act as such indicators

$$\varphi_{ki}(A_r) = S\{f_i(A_r)\} = \sum_{i=1}^T [m_i f_i(A_r) - b_{ik}^i]^3 \beta_{ik}^i; \quad \varphi_{ki}(A_r) = R\{f_i(A_r)\} = \sum_{i=1}^T [m_i f_i(A_r) - b_{ik}^i]^4 \beta_{ik}^i.$$

Let us assume $\bar{\geq}_{Re}$ or $\bar{\leq}_{Re}$ that the conditions or correspond to the conditions of priority preferences, one side over the other in the direction of minimizing or maximizing the corresponding values.

Statement. The distribution function of the i -th indicator of the effectiveness of the alternative A_r has an absolute preference relative to the distribution function of this indicator A_l $p\{f_i(A_r) \geq b_{ik}\} \bar{\leq}_{Re} p\{f_i(A_l) \geq b_{ik}\}$, in terms of $p\{f_i(A_r) \geq b_{ik}\} \bar{\geq}_{Re} p\{f_i(A_l) \geq b_{ik}\}$, if each of the following system of inequalities is satisfied:

$\varphi_{1i}(A_r) \geq \varphi_{1i}(A_i); \varphi_{3qi}(A_r) \geq \varphi_{3qi}(A_i); q = 1, \dots, Q_1; \varphi_{5qi}(A_r) \leq \varphi_{5qi}(A_i); q = 1, \dots, Q_2;$ (5)
 $\varphi_{2i}(A_r) \leq \varphi_{2i}(A_i); \varphi_{4qi}(A_r) \geq \varphi_{4qi}(A_i); g = 1, \dots, G_1; \varphi_{6qi}(A_r) \leq \varphi_{6qi}(A_i); g = 1, \dots, G_2;$ (6)
 or $p\{f_i(A_r) \geq b_{ik}\} \succ_{\text{Re}} p\{f_i(A_i) \geq b_{ik}\}$, in terms of $p\{f_i(A_r) \geq b_{ik}\} \bar{\succ}_{\text{Re}} p\{f_i(A_i) \geq b_{ik}\}$, if each of the following system of inequalities is satisfied:

$$\varphi_{1i}(A_r) \geq \varphi_{1i}(A_i); \varphi_{3qi}(A_r) \geq \varphi_{3qi}(A_i); q = 1, \dots, Q_1; \varphi_{5qi}(A_r) \geq \varphi_{5qi}(A_i); q = 1, \dots, Q_2; \quad (7)$$

$$\varphi_{2i}(A_r) \leq \varphi_{2i}(A_i); \varphi_{4qi}(A_r) \geq \varphi_{4qi}(A_i); g = 1, \dots, G_1; \varphi_{6qi}(A_r) \geq \varphi_{6qi}(A_i); g = 1, \dots, G_2; \quad (8)$$

If at least one of the conditions (5)-(6) is not met, then we speak of relative preference conditions. Let us write some additive complex indicator of the distribution function evaluation of the i -th criterion in the following form:

$$\phi_i^+(A_r) = \alpha_{1i}\bar{\varphi}_{1i}(A_r) + \sum_{q=1}^{Q_1} \alpha_{3i}\bar{\varphi}_{3i}(A_r) + \sum_{q=1}^{Q_2} \alpha_{5i}\bar{\varphi}_{5i}(A_r) - \alpha_{2i}\bar{\varphi}_{2i}(A_r) - \sum_{g=1}^{G_1} \alpha_{4i}\bar{\varphi}_{4i}(A_r) - \sum_{g=1}^{G_2} \alpha_{6i}\bar{\varphi}_{6i}(A_r); \quad (9)$$

$$\phi_i^-(A_r) = \sum_{g=1}^{G_1} \alpha_{4i}\bar{\varphi}_{4i}(A_r) + \sum_{g=1}^{G_2} \alpha_{6i}\bar{\varphi}_{6i}(A_r) - \alpha_{2i}\varphi_{2i}(A_r) - \alpha_{1i}\bar{\varphi}_{1i}(A_r) - \sum_{q=1}^{Q_1} \alpha_{3qi}\bar{\varphi}_{3qi}(A_r) - \sum_{q=1}^{Q_2} \alpha_{5i}\bar{\varphi}_{5qi}(A_r); \quad (10)$$

It should be noted that, depending on the specifics of a particular task, many of the deterministic values in additive complex indicators for assessing the distribution function may be absent. This can be achieved by setting the values of the weighting coefficients a_{ik} equal to 0. As complex criteria that most objectively assess the effectiveness of alternatives, we can use additive indicators presented in the following form:

$$F^+(A_r) = \sum_{i=1}^n w_i \phi_i^+(A_r); \quad F^-(A_r) = \sum_{i=1}^n w_i \phi_i^-(A_r); \quad (11)$$

where $0 \leq w_i \leq 1, \quad i = 1, \dots, n; \quad \sum_{i=1}^n w_i = 1$.

In practical decision-making cases, the most common situation is when:

- 1) $\alpha_{1i} = 1$, and all other values of the weighting coefficients are equal to 0, i.e. we take into account the mathematical expectation of the distribution function;
- 2) $\alpha_{1i} \neq 0, \alpha_{2i} \neq 0$, and all other values of the coefficients are equal to 0, here the mathematical expectation and dispersion of the distribution function are taken into account.

As complex criteria for assessing the effectiveness of alternatives, we can use compromise indicators of the following type:

$$F^*(A_r) = \sum_{i=1}^n w_i \phi_i^*(A_r); \quad F^-(A_r) = \sum_{i=1}^n w_i \phi_i^-(A_r), \quad \text{где } 0 \leq w_i \leq 1, \quad i = 1, \dots, n; \quad \sum_{i=1}^n w_i = 1 \quad (12)$$

Thus, after the introduction and calculation of various efficiency assessments of each particular indicator, as well as the first step of the exclusion algorithm, based on establishing the facts of absolute preference for a subset of alternatives that do not belong to the Pareto set, the algorithm of generalized efficiency indicators, both particular indicators based on expressions (5) - (6), and generalized indicators for each alternative, the subsequent steps of the algorithm coincide with the

decision-making algorithm in the single-criterion case. The proposed and substantiated, from the point of view of mathematical formalization, approach to making the most optimal decision on managing the behavior of an enterprise, based on preliminary monitoring of economic functioning, is of interest from the point of view of the following aspects:

- in the possibility of identifying the key elements that determine the system,
- in choosing the format that characterizes the state of the elements of interest;
- in developing a virtual model that reproduces the behavioral features of the simulated system.

References

1. Johnston J 1997 *Econometric Methods* (N.Y: The McGraw-Hill Companies, Inc.)
2. Lee D, Wu Y 1986 *Geometric complexity of some location problems, Algorithmica* 1 193
3. McKenzie L 1963 *The turnpike theorem of Morishima Review of Economic Studies* 30 (3) 169.
4. McCreight E 1988 *$O(n \log \log n)$ -time algorithm for triangulating a simple polygon* *SIAM J. Comput* 17 143.

DOI 10.34660/INF.2024.10.80.028

环境和技术现代化信息支持和方法支持的综合方法
**INTEGRATED APPROACH TO INFORMATION SUPPORT AND
METHODOLOGICAL SUPPORT FOR ENVIRONMENTAL AND
TECHNOLOGICAL MODERNIZATION**

Mudrova Svetlana Vladimirovna

*PhD in Economics, Associate Professor, Head of Department
Plekhanov Russian University of Economics*

Ivanov Nikita Dmitrievich

*Student
Plekhanov Russian University of Economics*

摘要。本文致力于解决生态和技术现代化这一紧迫问题，这是向可持续发展过渡的关键因素。作者提出了一种基于现代化过程的信息支持和方法支持之间关系的综合方法。本文分析了信息系统的关键要素，包括环境状况数据库、技术解决方案、法律规范和金融工具。作者强调了使用信息技术（包括 GIS、DBMS、物联网和人工智能）进行有效的环境数据管理和优化现代化过程的重要性。本文还描述了生态和技术现代化的方法基础，包括环境评估、可行性研究和环境标准的制定。作者建议创建一个集成信息资源和方法工具的单一平台，以确保有效和可持续的发展。

关键词：生态和技术现代化、信息支持、信息技术、人工智能、环境标准、可持续发展。

Abstract. The article is devoted to the urgent problem of ecological and technological modernization, which is a key factor in the transition to sustainable development. The authors propose an integrated approach based on the relationship between information support and methodological support of the modernization process. The article analyzes the key elements of the information system, including databases on the state of the environment, technological solutions, legal norms and financial instruments. The authors emphasize the importance of using information technologies, including GIS, DBMS, IoT and AI, for effective environmental data management and optimization of modernization processes. The article also describes the methodological foundations of ecological and technological modernization, including environmental assessment, feasibility study and development of environmental standards. The authors propose to create a single platform integrating information resources and methodological tools, which will ensure effective and sustainable development.

Keywords: *Ecological and technological modernization, information support, information technology, artificial intelligence, environmental standards, sustainable development.*

The global environmental crisis caused by anthropogenic impact on the environment requires urgent action. The transition to sustainable development based on the principles of environmental safety and conservation of natural resources is becoming a key task for all mankind. Ecological and technological modernization of the economic system aimed at the introduction of environmentally friendly technologies and improvement of environmental management is a prerequisite for achieving sustainable development. However, the effective implementation of environmental and technological modernization requires an integrated approach, which is based on the relationship between information support and methodological support.

Information support for environmental and technological modernization

For the successful implementation of environmental and technological modernization, it is necessary to have access to up-to-date and reliable information from various fields of knowledge. It is necessary to create a unified information system that will collect, process and analyze data on:

- The state of the environment: data on pollution levels, sources of emissions, the state of biodiversity, and climate change.
- Technological solutions: information about promising environmentally friendly technologies, their characteristics, applicability, and economic efficiency.
- Legal norms and standards: information on legislation, regulations, standards in the field of ecology and environmental modernization.
- Financial instruments: information on grant programs, subsidies, credit lines, and tax incentives designed to stimulate environmental modernization.

The role of information technology:

- Geographic information systems (GIS): GIS allows you to visualize data on the state of the environment and conduct spatial analysis, which helps to identify pollution zones and assess the impact of economic activity on the environment.
- Database management systems (DBMS): DBMS provide efficient storage, processing and analysis of large amounts of data, which is necessary for managing information about the state of the environment, technologies, legal norms and financial instruments.
- Internet of Things (IoT): IoT allows you to receive data on the quality of air, water, soil and other environmental parameters in real time, which increases the efficiency of monitoring and management of environmental processes.
- Artificial Intelligence (AI): AI can be used to analyze big data, predict environmental risks, and optimize environmental modernization processes.

Environmental assessment methods are necessary to assess the impact of economic activities on the environment and to develop measures to reduce environmental risks.

Feasibility study methods are necessary to evaluate the effectiveness of environmentally friendly technologies and determine the return on investment in environmental modernization.

The development of environmental standards is necessary to establish requirements for the environmental safety of production, products and services.

To ensure the effective implementation of environmental and technological modernization, it is necessary to integrate information resources and methodological tools into a single platform. This platform should provide access to data and tools in a single interface, which will simplify the process of finding and using information.

An integrated approach to information support and methodological support for environmental and technological modernization is a key factor for the successful implementation of the sustainable development strategy. The created information system and methodological tools contribute to improving the effectiveness of environmental measures, accelerate the process of introducing environmentally friendly technologies, and ensure transparency and accountability in the field of environmental modernization.

References

1. Mudrova, S. V. *The impact of digital technologies on economic development* / S. V. Mudrova // *Problems and prospects of industrial development in Russia: Collection of materials of the VIII International Scientific and Practical Conference "Industrial Economics under constraints", Moscow, November 24, 2020* / Edited by A.V. Bystrov. – Moscow: Limited Liability Company "KnoRus Publishing House", 2021. – pp. 260-265. – EDN JUEZAO.

2. Mudrova, S. V. *Development of the conceptual apparatus of spatial economics and spatial analysis* / S. V. Mudrova // *Financial management*. – 2021. – No. 3. – pp. 42-48. – EDN QZXTDZ.

3. Mudrova, S. V. *The main methodological approaches to the study of the impact of the information space on economic development* / S. V. Mudrova, M. M. Rudkovskaya // *Scientific research of the SCO countries: synergy and integration: Proceedings of the International Conference, Beijing, April 26, 2024*. – Beijing: Infiniti, 2024. – P. 41-44. – DOI 10.34660/INF.2024.33.71.172. – EDN SXAJSS.

生态和技术主权框架内的可持续发展经济学

**THE ECONOMICS OF SUSTAINABLE DEVELOPMENT WITHIN
THE FRAMEWORK OF ECOLOGICAL AND TECHNOLOGICAL
SOVEREIGNTY**

Rudenko Victoria Alekseevna

PhD in Economics, Associate Professor

*Central Economic and Mathematical Institute of the Russian Academy
of Sciences*

Sofronov Ivan Ilyich

Student

Plekhanov Russian University of Economics

摘要: 可持续发展正成为全球经济政策的关键目标,旨在平衡经济增长与环境保护和社会福祉。生态主权和技术主权作为相互交织的概念,对于实现这些目标至关重要。本文探讨了可持续发展的经济如何在生态主权和技术主权的框架内发展,强调各国在推进技术创新的同时,需要可持续地管理其自然资源。这两个因素之间的相互作用决定了全球经济可持续性的未来走向。

关键词: 可持续发展、生态主权、技术主权、绿色经济、环境政策、创新、循环经济。

Abstract. Sustainable development is becoming the key objective of global economic policies, aiming to balance economic growth with environmental protection and societal well-being. Ecological and technological sovereignty, as intertwined concepts, are fundamental to achieving these goals. This article explores how the economy of sustainable development can evolve within the framework of ecological and technological sovereignty, emphasizing the need for countries to manage their natural resources sustainably while advancing technological innovation. The interplay between these two factors determines the future course of economic sustainability on a global scale.

Keywords: sustainable development, ecological sovereignty, technological sovereignty, green economy, environmental policy, innovation, circular economy.

The concept of sustainable development has taken center stage in global economic and political discourse over the past few decades. As climate change, resource depletion, and social inequalities become more urgent issues, countries

worldwide are shifting their focus toward achieving long-term sustainability goals. At the heart of these efforts is the balance between economic growth, environmental preservation, and social equity.

In this context, ecological sovereignty refers to a nation's ability to manage its natural resources in a way that aligns with environmental goals, without excessive dependence on external influences. Technological sovereignty, on the other hand, pertains to a country's capacity to develop and implement technological solutions independently, ensuring both economic competitiveness and environmental responsibility. When combined, these two forms of sovereignty are essential for advancing a sustainable development economy.

This article examines the emerging trends and challenges in the economy of sustainable development within the framework of ecological and technological sovereignty, highlighting how these concepts can shape the future of economic growth and environmental stewardship.

Ecological sovereignty is increasingly seen as a fundamental pillar of sustainable development. Countries that rely on imported resources or unsustainable practices are vulnerable to environmental degradation and economic instability. Achieving ecological sovereignty involves the careful management of a nation's natural resources, ensuring that they are preserved for future generations while also supporting economic growth.

One of the most important aspects of ecological sovereignty is resource autonomy. Nations that can sustainably manage their resources—such as water, minerals, forests, and energy—can reduce their dependency on global supply chains and mitigate the risks associated with resource depletion. For example, countries with vast renewable energy potential, such as solar and wind, are investing heavily in green technologies to secure energy independence.

The protection and regeneration of natural ecosystems are vital components of ecological sovereignty. This includes efforts to reduce deforestation, conserve biodiversity, and rehabilitate degraded land. Countries that prioritize ecological sovereignty often implement policies to conserve their natural capital, thereby enhancing their resilience to environmental changes.

For instance, Costa Rica has become a global leader in ecological sovereignty by investing in reforestation and renewable energy. The country has committed to becoming carbon-neutral by 2050, demonstrating how natural capital can be preserved while fostering sustainable economic growth.

Technological sovereignty is the ability of a country to develop, control, and innovate its technological infrastructure without relying excessively on foreign technologies. In the context of sustainable development, technological sovereignty is crucial for advancing green technologies that enable nations to achieve their environmental goals.

Technological innovation plays a pivotal role in addressing global environmental challenges. Countries that have strong research and development (R&D) capacities are better positioned to develop renewable energy technologies, energy-efficient infrastructure, and advanced recycling systems. By fostering domestic innovation, nations can not only reduce their environmental footprints but also create competitive advantages in the global market for sustainable technologies.

Countries such as Germany and Japan are at the forefront of technological sovereignty in the realm of sustainability. Their investments in clean energy technologies, smart grids, and energy-efficient industrial practices have allowed them to lead the global transition toward a more sustainable economy.

A key element of technological sovereignty is the ability to implement circular economy principles on a local level. The circular economy emphasizes the continual use of resources by minimizing waste and maximizing the reuse, recycling, and refurbishment of materials. Technological innovation is essential for developing circular systems that can operate independently of global supply chains.

For example, localized waste-to-energy technologies, advanced recycling techniques, and smart city initiatives are becoming integral to the circular economy. Countries that achieve technological sovereignty can implement these solutions more effectively, reducing their reliance on resource imports and enhancing their ecological sustainability.

Ecological and technological sovereignty are closely linked, and their integration is essential for achieving sustainable development. A nation that can manage its natural resources sustainably while also advancing independent technological innovation is better positioned to promote long-term economic growth that does not compromise environmental integrity.

For instance, a country that harnesses its renewable energy resources and develops domestic technologies for energy storage and grid management can reduce its carbon emissions while securing energy independence. This integration of ecological and technological sovereignty not only strengthens the nation's environmental resilience but also bolsters its economic security.

Achieving ecological and technological sovereignty requires robust policy frameworks and governance structures. Governments must implement policies that incentivize sustainable practices in both the public and private sectors, while also investing in technological R&D that aligns with sustainability goals.

One of the challenges in this regard is balancing economic competitiveness with environmental responsibility. Countries that heavily rely on extractive industries or fossil fuels must undergo significant structural transformations to align with the principles of sustainable development. This often requires both financial investment and political will to overcome resistance from industries that benefit from the status quo.

Countries like Sweden and Denmark have demonstrated how policy alignment between ecological and technological sovereignty can drive sustainable development. By implementing carbon taxes, promoting green technologies, and supporting eco-innovation, these nations have managed to balance economic growth with environmental protection.

Renewable energy is at the core of both ecological and technological sovereignty. Countries that invest in renewable energy sources—such as wind, solar, and hydropower—are less dependent on imported fossil fuels, thus enhancing their ecological sovereignty. At the same time, domestic innovation in renewable energy technologies contributes to technological sovereignty.

The global shift toward renewable energy is a key trend in sustainable development. China, for instance, has become a world leader in solar panel production and is investing heavily in electric vehicle technology. This allows China to reduce its reliance on foreign oil while positioning itself as a major player in the global green economy.

Digital technologies are transforming the way ecological and technological sovereignty is pursued. The integration of AI, big data, and IoT into sustainability initiatives enables more efficient resource management and environmental monitoring. These technologies provide real-time data on energy use, emissions, and waste generation, allowing governments and businesses to make informed decisions about resource allocation.

The smart grid is an example of how digital transformation can enhance technological sovereignty. Countries that develop their own smart grid technologies can manage their energy resources more effectively, reducing waste and improving efficiency.

While ecological and technological sovereignty emphasize self-reliance, international collaboration remains essential for addressing global environmental challenges. Many environmental problems, such as climate change and biodiversity loss, are transboundary in nature and require collective action.

International organizations, such as the United Nations and the European Union, play a critical role in fostering cooperation between countries on sustainability issues. Through initiatives such as the Paris Agreement, countries commit to reducing their carbon footprints and transitioning to more sustainable economic models.

Technological sovereignty does not necessarily imply isolationism. Countries that excel in developing green technologies often engage in knowledge sharing and technology transfer to support global sustainability efforts. By exporting green technologies and expertise, nations can contribute to the global transition toward a sustainable economy while also enhancing their own economic standing.

For example, Germany has become a leading exporter of renewable energy technologies, helping other nations achieve their sustainability goals while boosting its own technological and economic sovereignty.

Ecological and technological sovereignty are critical components of the sustainable development economy. As countries strive to balance economic growth with environmental protection, these two forms of sovereignty will play increasingly important roles in shaping global economic and environmental policies.

By achieving ecological sovereignty, nations can sustainably manage their natural resources, reducing dependency on external supplies and enhancing environmental resilience. Simultaneously, technological sovereignty enables countries to develop the innovative solutions needed to address global sustainability challenges while maintaining economic competitiveness.

The integration of ecological and technological sovereignty will be key to ensuring that future economic growth is both sustainable and equitable. Through a combination of national self-reliance and international collaboration, countries can pave the way for a more sustainable and prosperous global economy.

References

1. Mudrova, S. V. *The influence of digital technologies on economic development* / S. V. Mudrova // *Problems and prospects of industrial development in Russia: Proceedings of the VIII International Scientific and Practical Conference "Industrial Economics under constraints", Moscow, November 24, 2020* / Edited by A.V. Bystrov. – Moscow: Limited Liability Company "KnoRus Publishing House", 2021. – pp. 260-265. – EDN JUEZAO.

2. Mudrova, S. V. *Development of the conceptual apparatus of spatial economics and spatial analysis* / S. V. Mudrova // *Financial management*. – 2021. – No. 3. – pp. 42-48. – EDN QZXTDZ.

3. Mudrova, S. V. *The main methodological approaches to the study of the impact of the information space on economic development* / S. V. Mudrova, M. M. Rudkovskaya // *Scientific research of the SCO countries: synergy and integration: Proceedings of the International Conference, Beijing, 26 апреля 2024 года*. – Beijing: Инфинити, 2024. – P. 41-44. – DOI 10.34660/INF.2024.33.71.172. – EDN SXAJSS.

DOI 10.34660/INF.2024.44.19.030

闭环经济发展趋势

TRENDS IN THE DEVELOPMENT OF A CLOSED-LOOP ECONOMY

Rudkovskaya Margarita Mikhailovna

PhD in History, Associate Professor

Plekhanov Russian University of Economics

Prokhorov Yury Nikolaevitch

PhD in Economics, Associate Professor

Moscow Metropolitan Governance Yury Luzhkov University

Gelfand Polina Arkadyevna

Student

Plekhanov Russian University of Economics

摘要。循环经济（CE）是一种当代经济发展模式，旨在通过回收、再利用和延长产品生命周期来最大限度地减少浪费并最大限度地提高资源利用率。本文探讨了全球和俄罗斯在循环经济发展方面的主要趋势，重点关注创新、数字技术的采用、商业模式的转变以及支持可持续发展的政府举措。本文还分析了在各个经济部门实施这一模式的挑战和机遇。本文深入探讨了循环经济如何重塑全球产业和经济结构。

关键词：循环经济、可持续发展、废物管理、商业模式、数字化转型、环境可持续性。

Abstract. *The circular economy (CE) is a contemporary model of economic development aimed at minimizing waste and maximizing resource utilization through recycling, reuse, and extending the lifecycle of products. In this article, the key global and Russian trends in the development of CE are examined, with a focus on innovation, the adoption of digital technologies, shifts in business models, and government initiatives to support sustainable development. Challenges and opportunities for implementing this model in various economic sectors are also analyzed. The article offers insights into how CE is reshaping industries and economic structures worldwide.*

Keywords: *circular economy, sustainable development, waste management, business models, digital transformation, environmental sustainability.*

The circular economy (CE) has emerged as a significant paradigm shift from the traditional linear model of “take, make, dispose.” In contrast, CE seeks to

create a regenerative system where products, materials, and resources are kept in circulation for as long as possible through reuse, repair, refurbishment, and recycling. This model is seen as a solution to many of the most pressing global challenges, such as resource depletion, environmental degradation, and climate change.

The transition to a circular economy is critical for ensuring long-term sustainability and reducing humanity's environmental footprint. This article explores the trends shaping the development of the CE, highlights the role of digital technologies and innovation, and discusses the challenges and opportunities presented by this shift in both the global and Russian contexts.

A key trend driving the circular economy is the increasing focus on improving recycling systems and enhancing resource efficiency. Governments and industries worldwide are adopting policies and practices to reduce waste, recycle materials, and close the loop on resource use. Companies are redesigning products to make them easier to disassemble and recycle, while also investing in technologies that allow for the extraction of valuable materials from waste.

In Europe, for example, the European Union's Circular Economy Action Plan is a landmark initiative that sets ambitious recycling targets and encourages the reuse of materials in key sectors such as electronics, textiles, and plastics. This has led to the rise of new industries focused on resource recovery, which aim to create more sustainable supply chains and reduce reliance on virgin materials.

The adoption of circular business models is transforming traditional production and consumption patterns. These models shift the focus from ownership to access, promoting shared use, leasing, and renting instead of the traditional ownership model. This helps extend the lifespan of products, reduce the need for new production, and decrease the overall consumption of resources.

For instance, some companies like Philips and H&M are embracing circular models by offering services such as product leasing and recycling programs. Philips, for example, has pioneered "light as a service" models where they retain ownership of lighting systems, maintaining and upgrading them as needed, while customers pay for the usage rather than the products themselves. H&M, a leading fashion retailer, is experimenting with clothing rental services and is also investing heavily in textile recycling technology.

The integration of digital technologies is crucial to the advancement of the circular economy. The Internet of Things (IoT), artificial intelligence (AI), and blockchain technologies are all being leveraged to enhance traceability, optimize resource use, and improve waste management systems.

IoT-enabled devices can monitor the condition and location of products, facilitating predictive maintenance and preventing premature disposal. This not only extends the product lifecycle but also helps to prevent unnecessary waste. AI is

being used to analyze consumption patterns, optimize supply chains, and improve product design for longevity and recyclability. Blockchain technology, with its ability to provide a transparent and immutable record of transactions, ensures the traceability of products throughout their lifecycle, which is critical for achieving circularity in supply chains.

A growing trend within the circular economy is the rise of product-as-a-service (PaaS) models, where consumers no longer purchase goods outright but instead pay for the service those products provide. This shifts the responsibility for product maintenance, repair, and end-of-life recycling back to the manufacturer, incentivizing companies to design longer-lasting, more durable products.

Examples include companies like Dell, which offers IT equipment on a leasing basis, ensuring that equipment is returned for refurbishment or recycling at the end of its useful life. Similarly, Michelin provides “tire-as-a-service,” where customers pay based on usage, and tires are taken back for retreading or recycling. This reduces the environmental impact by extending product lifecycles and minimizing waste.

The circular economy has a significant role to play in reducing environmental degradation and mitigating climate change. By reusing materials and reducing waste, CE lessens the need for virgin resource extraction, which is often a major driver of environmental harm, including deforestation, habitat destruction, and water pollution.

Additionally, the recycling of materials such as aluminum, plastics, and glass requires significantly less energy compared to the production of these materials from raw resources, leading to a reduction in greenhouse gas emissions. According to a study by the Ellen MacArthur Foundation, shifting to a circular economy in Europe could cut carbon emissions by up to 48% by 2030.

The circular economy not only benefits the environment but also offers significant socio-economic advantages. By creating new markets for recycled materials, remanufacturing, and repair services, CE has the potential to generate millions of new jobs across the globe. According to the World Economic Forum, a transition to a circular economy could create over 4.5 million new jobs in Europe alone by 2030.

In addition to job creation, CE can also improve economic resilience by reducing reliance on volatile global supply chains. By keeping materials in circulation within local economies, countries can reduce their exposure to fluctuations in global commodity prices and the risks associated with resource scarcity.

While the concept of a circular economy is gaining momentum, there are still significant technological challenges that must be addressed to realize its full potential. The recycling of certain materials, such as mixed plastics or composite materials, remains difficult and expensive. Developing new technologies that can

efficiently break down complex materials and recover valuable resources is a critical challenge for the CE.

Furthermore, there is a lack of infrastructure to support large-scale recycling and reuse systems in many regions. For example, electronic waste recycling remains a challenge due to the complex mix of materials used in modern devices and the lack of standardized processes for their recovery.

The successful implementation of a circular economy requires supportive regulatory frameworks and financial incentives. Governments play a crucial role in setting standards for product design, waste management, and recycling, as well as in providing subsidies or tax incentives to encourage businesses to adopt circular practices.

In many countries, however, existing policies are still tailored to the linear economy, which makes it difficult for circular businesses to compete on equal terms. Additionally, the initial costs of transitioning to circular business models can be prohibitive for small and medium-sized enterprises (SMEs), which may require financial support to make the shift.

One of the most significant barriers to the widespread adoption of the circular economy is consumer behavior. Many people are accustomed to the convenience of disposable products and may be resistant to changes that require them to rent or share products, or to pay for services instead of owning goods outright.

Changing consumer attitudes and behaviors will be essential for the success of the circular economy. This will require education and awareness campaigns to highlight the environmental and economic benefits of CE, as well as innovative business models that make circular products and services more accessible and attractive to consumers.

In Russia, the circular economy is still in its infancy, and significant challenges remain. The country lacks the necessary infrastructure for widespread waste separation and recycling, and there is little government support in terms of regulatory frameworks or incentives for businesses to adopt circular practices. Moreover, public awareness of the need for recycling and resource efficiency remains low.

Russia's heavy reliance on its extractive industries also presents a challenge, as there is little incentive for companies in these sectors to reduce their consumption of raw materials or invest in recycling technologies. However, the country's vast industrial base and natural resources could offer significant opportunities for circular economy practices, particularly in industries such as metallurgy and energy.

Despite these challenges, there is significant potential for the circular economy to grow in Russia. The Russian government has begun to recognize the importance of environmental sustainability, and there are early signs of progress. Initiatives such as the National Project on Ecology aim to increase recycling rates and reduce the environmental impact of waste.

In the private sector, some companies are starting to embrace circular principles. For example, Russian energy giant Gazprom is investing in technologies to reduce waste and improve energy efficiency, while manufacturers like Severstal are exploring ways to recycle scrap metal more efficiently.

Russia also has the opportunity to leverage its scientific and technological expertise to develop new solutions for circular economy challenges. With the right investments in research and development, the country could become a leader in innovative recycling technologies and sustainable manufacturing practices.

The circular economy offers a transformative vision for the future of global and local economies, providing a path toward greater sustainability, resilience, and economic growth. While there are significant challenges to overcome, including technological, regulatory, and behavioral barriers, the trends in CE development show a clear shift toward more sustainable practices across industries.

The integration of digital technologies, the rise of circular business models, and increasing government support all point to a future where circular principles will play a central role in economic development. As countries like Russia begin to adopt circular practices, the potential for reducing environmental impact and creating new economic opportunities becomes ever more apparent.

With continued innovation, investment, and collaboration between governments, businesses, and consumers, the transition to a circular economy will accelerate, paving the way for a more sustainable and prosperous future.

References

1. Mudrova, S. V. *The impact of digital technologies on economic development* / S. V. Mudrova // *Problems and prospects of industrial development in Russia: Collection of materials of the VIII International Scientific and Practical Conference "Industrial Economics under constraints"*, Moscow, November 24, 2020 / Edited by A.V. Bystrov. – Moscow: Limited Liability Company "KnoRus Publishing House", 2021. – pp. 260-265. – EDN JUEZAO.

2. Mudrova, S. V. *Development of the conceptual apparatus of spatial economics and spatial analysis* / S. V. Mudrova // *Financial management*. – 2021. – No. 3. – pp. 42-48. – EDN QZXTDZ.

3. Mudrova, S. V. *The main methodological approaches to the study of the impact of the information space on economic development* / S. V. Mudrova, M. M. Rudkovskaya // *Scientific research of the SCO countries: synergy and integration: Proceedings of the International Conference, Beijing, 26 апреля 2024 года*. – Beijing: Инфинити, 2024. – P. 41-44. – DOI 10.34660/INF.2024.33.71.172. – EDN SXAJSS.

打造企业文化, 促进员工关系和谐
**FORMATION OF CORPORATE CULTURE AS A FACTOR IN
HARMONIZING STAFF RELATIONS**

Evseenko Viktoriia Alexandrovna

*Candidate of Economic Sciences, Associate Professor
Donetsk Academy of Management and Public Administration,
Donetsk, Russia*

摘要。在人事关系协调中, 一个重要的因素是企业文化, 它连接着组织所有人际过程, 并体现在组织的主要职能中, 因此它被实现为一种管理人事行为的社会机制。本文提出在人事行为管理中引入一种通过人的价值取向影响的文化成分, 这是基于对企业人事行为方面的深层本质以及管理的组织和方法机制的揭示。

关键词: 人事行为管理、企业文化、关系协调、激励杠杆、职业成长。

Abstract. *In the harmonization of personnel relations, an important factor is the corporate culture, which connects all interpersonal processes of the organization and is reflected in its main functions, due to which it is realized as a social mechanism for managing personnel behavior. The article proposes to introduce a cultural component of influence through the value orientation of people into the management of personnel behavior, which is based on the disclosure of the deep essence of the behavioral aspects of the enterprise personnel and the organizational and methodological mechanism of management.*

Keywords: *personnel behavior management, corporate culture, harmonization of relations, motivational levers, career growth.*

In the harmonization of personnel relations, an important factor is the culture that connects all interpersonal processes. To achieve high efficiency and organizational discipline, it is necessary to form its own corporate culture in the organization, using all the tools of its action, since its effective implementation will affect not only the harmonization of personnel relations, but also behavior in general.

The corporate culture of an organization exists and develops regardless of whether it is implemented or not, that is, if you do not work purposefully on its formation or adaptation, it will be spontaneous. In such conditions, its influence will have adverse consequences. Regardless of whether a corporate culture is created in an organization or not, there will always be so-called inert values, principles and traditions within the organization.

The holistic formation, or adaptation of corporate culture, is two-sided - the integration and communication of the cultural attributes of the organization to the external environment, and the influence on the internal environment of public opinion, traditions, modes of behavior. Therefore, considering corporate culture as a comprehensive set of manifestations, the factors of which will influence the harmonization of relations between the organization's personnel, we will analyze its main functions, goals and types.

The essence of corporate culture is reflected in its main functions, due to which culture is realized as a social mechanism for managing personnel behavior. For further implementation, formation or diagnostics of the mechanisms of culture of a particular organization, it is necessary to determine their list, therefore it is important to summarize and characterize the main classifications of its functions. A review of the works of domestic and foreign scientists showed that there is no general or generalized classification of the functions of corporate culture - most authors distinguish functions that differ in content, the total number of which is different.

Based on the analysis of studies on this topic, six main functions of corporate culture in an organization related to personnel behavior were identified, they are called goals arising from the context of harmonizing personnel relations (Table 1).

Table 1
Functions of corporate culture in the activities of an organization

Function name	Characteristics of the function
Fundamental	Formation and creation of basic image attributes (stereotypes) of the organization. Formation of a unique holistic perception in the external competitive environment
Familiar	Formation of a sense of responsibility for common goals and objectives in the personnel. Creation of an atmosphere of unity of spirit
Accumulative	Accumulation of joint efforts of the personnel of the organization by involving them in solving problems. Granting authority in decision-making to each employee
Balancing	Formation of a socially stable environment by ensuring the socio-cultural and material needs of the personnel
Controlling	Control over compliance with the norms of behavior of the personnel of the organization in the conditions of change
Strategic-planning	Creation and adaptation of new levers of influence on the behavior of the personnel and harmonization of their relationships by analyzing previous experience

Source: compiled by the author based on [1-3]

The generalization and definition of the main goals of culture in an organization gives grounds for the conclusion that, first of all, culture shapes organizational

behavior, critically influencing the behavior of the organization’s personnel, the harmonization of their relationships, the external environment and the effectiveness of organizational management. Consequently, the main prerequisite for the formation of the corporate culture of an organization is the definition of initial priorities that stimulate effective behavior of personnel. Based on the basic principles and functions of culture in the activities of the organization, management can build a clear plan for the formation of a unique and appropriate corporate culture in its case in order to harmonize personnel relationships and enhance competitiveness in the market. This is due to the fact that the formation of one’s own corporate culture is the achievement of its main goal in an agreed set of values and norms that closely unite the members of the organization and facilitate their involvement in the process of achieving organizational goals.

When forming a corporate culture, an important factor in its further development and modeling is the choice of its type. In the presented brief description of the types of corporate culture (Table 2), the main attention is focused on the scope of application of each type of culture, motivational levers and prerequisites for career growth, since from this position it is better to consider them when forming or adapting a corporate culture, taking into account the harmonization of personnel relations.

Table 2
Characteristic features of types of corporate cultures

Types of corporate cultures, their complex features			
1	2	3	4
Baseball team	Club culture	Academic culture	Culture of the fortress
Scope of application			
IT sphere, marketing and advertising, law firms, investment banking	Commercial banks, airlines, government organizations	Transnational corporations, pharmaceutical and industrial companies	Services, light industry, retail
Remuneration Policy			
Policy of material rewards for specific work performed with the involvement of freelance workers	Traditional wage policy	Traditional remuneration policy with a high proportion of non-material rewards	Traditional remuneration policy, without non-material incentives and bonuses
Motivational Levers			
High motivation of employees in the short term. In conditions of constant staff turnover, the mercantile factor plays a significant role	High motivation for career advancement. In cultures of this type, dedication to the common	The main motivational lever of this type of culture is the opportunity to learn throughout one’s career.	Lack of any motivational levers. The main motivation is stable wages for short-term employment

	values of the organization, loyalty		
Prerequisites for career growth			
There are virtually no prerequisites for sustainable career growth, since in this type of corporate culture there are virtually no non-material rewards, and all the emphasis is on the quick and effective performance of duties.	In cultures of this type, rapid career growth is not typical. Preference is given to young workers, who are given all the prerequisites for gradual advancement through the club hierarchy.	In this type of culture, preference is given to attracted young personnel with subsequent narrowly qualified development. There are prerequisites for rapid career growth	There are virtually no prerequisites for career growth, since organizations with this type of culture usually resort to a policy of constant staff rotation, as well as reorganizations

Source: compiled by the author based on [4, 5]

In practice, each organization chooses a successful symbiosis for itself from the given types of cultures. It is possible to implement one specific type of culture with a subsequent transition to another in the process of formation and development of the organization.

Based on the works of J. Sonnenfeld and R. Gelrigel, as well as on the classification of types of corporate culture by T. Deal and A. Kennedy, who distinguish types of cultures by the coordinates of two key market characteristics of the organization, namely the degree of risk and the speed of personnel feedback, the academic-elastic and adaptation-oriented types of culture are identified as the most effective in the conditions of not just the formation or adaptation of the corporate culture of the organization, but taking into account the general strategy of its development (Fig. 1).

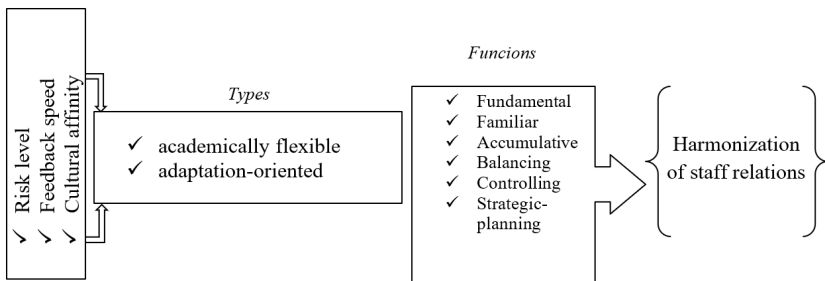


Figure 1. The influence of corporate culture functions on the harmonization of personnel relations

Taking into account the above, it can be argued that the process of domestic organizations entering foreign markets is accelerating, while large international corporations are simultaneously penetrating the domestic market, a large multinational group of personnel is being created with its own characteristics, needs and motivational attitudes, and there is a need for research into cross-cultural personnel management. The formation of an interethnic corporate culture presupposes a closer acquaintance with local contexts and practices, which is due to the powerful influence of cultures and institutions on various issues of human resource management. The influence of the country of location on the formation of corporate culture at the level of subsidiaries of transnational corporations is especially noticeable in the countries of the former socialist camp, since the domestic cultural and institutional environment is fundamentally different from other market economies. Open borders, free access to information and a vast geography of qualified personnel actively contribute to the development of the phenomenon of comprehensive internationalization. Traditionally, within the framework of a universal corporate culture, cross-cultural communication in organizations is viewed through the prism of relationships and connections at the top management level, but with the growth of the average employee of the organization, special attention is paid to cross-cultural management. Given this, the concept of cross-cultural capital of the company, that is, investments in the future of their personnel in the field of cross-cultural communications, is of great importance. Effective cross-cultural management is becoming an instrument of such a policy.

The growth of globalization leads to an increase in the opportunities for maneuvering resources for multinational companies and their subsidiaries, which accumulate resources from different parts of the world and provide training of highly qualified personnel at lower costs for operations and production. This is not a new phenomenon today, since borders are largely erased when it comes to technology, information, free movement of goods and capital.

Cross-cultural research is very important for organizations seeking to disseminate their management and management methods in practice - they are primarily interested in overcoming cultural barriers and increasing labor productivity. Understanding cultural differences in modern business is undoubtedly the key to effective cross-border cooperation, but the consideration of the issue in this context has reached its qualitative peak, and the current and future object of research on the subject of cross-cultural communication is personnel as a component of not only an international company, but also an ordinary enterprise that is a participant in the global market.

Thus, most transnational companies use a universal corporate culture in all their divisions and subsidiaries, which significantly strengthens the ties between employees, that is, an effective process of cross-cultural communication occurs. In

turn, an important role in this process is played by top managers who, despite their social status, cultural stereotypes or different national affiliations, must adhere to a certain model of behavior in managing cross-cultural communications.

The main theories of management and personnel management highlight human behavior as an important manifestation of his potential, since it has a significant impact on the effectiveness of the organization and its competitiveness. The intellectualization of society increases attention to the management of human behavior, who is the bearer of knowledge, the owner of intellectual capital and at the same time the implementer of ideas. Taking this into account, the formation and adaptation of corporate culture are considered the basis for harmonizing relations in the team and the effective operation of the organization.

References

1. San S. *Values of corporate culture: place and functions in the system of labor relations of the organization // Society: sociology, psychology, pedagogy. 2023. No. 6 (110). P. 75-78.*
2. Safonova L.A., Kasatkina E.A. *Attributes and role of corporate culture in ensuring effective enterprise management // Financial Economics. 2023. No. 7. P. 192-195.*
3. Dzhabrailova L.Kh., Elbieva L.R., Magomedova H.N. *The influence of the corporate culture of the organization on the efficiency of personnel // Innovative Economics: information, analytics, forecasts. 2023. No. 1. P. 103-108.*
4. Fokina N.Yu. *Differences and similarities of corporate culture in different countries: main types and connection with the socio-cultural factor // Bulletin of the Altai Academy of Economics and Law. 2022. No. 10-2. P. 330-337.*
5. Palevskaya S.A., Bobrova M.V. *Classifications of types of corporate culture of an organization (historical aspects) // Bulletin of the National Research Institute of Public Health named after N.A. Semashko. 2019. No. 3-4. P. 65-76.*

小型科技公司和中小企业是俄罗斯联邦国家企业支持的工具

SMALL TECHNOLOGY COMPANIES AND SMALL AND MEDIUM-SIZED BUSINESSES AS INSTRUMENTS OF STATE BUSINESS SUPPORT IN THE RUSSIAN FEDERATION

Yuhno Nikolay Sergeevich

Postgraduate student

Plekhanov Russian University of Economics

注释。如果不加强和扩大企业规模，国家经济体系的发展就不可能实现，而与此相关的是，国家对创业的支持手段在现代经济中发挥着重要作用。在俄罗斯联邦，企业发展手段非常发达。因此，作为支持措施，企业根据活动类型获得税收和信贷优惠。应特别关注小型科技公司和中小型企业，因为这些国家计划旨在支持不同类型的企业开展活动。

关键词：国家对企业的支持手段、小型科技公司、中小型企业、税收优惠、简化税收制度。

Annotation. *The development of the country's economic system is impossible without strengthening and scaling up business, in connection with which, state support instruments for entrepreneurship play a major role in the modern economy. In the Russian Federation, the business development instruments are well developed. Thus, as support measures, enterprises receive tax and credit benefits, depending on the types of activities. Special attention should be paid to small technology companies and small and medium-sized businesses, since these state programs are aimed at supporting different types of enterprises in carrying out their activities.*

Keywords: *Instruments of state support for business, small technology companies, small and medium-sized businesses, tax incentives, simplified taxation system.*

The Government of the Russian Federation is developing various programs that allow entrepreneurs throughout the country to successfully develop their businesses, thereby positively influencing the country's economic growth. The use of these programs is possible depending on the form of doing business.

Small businesses are the most popular in Russia, and therefore a large number of government support instruments are aimed at developing small and medium-sized businesses in the Russian Federation (hereinafter referred to as SMEs).

Small businesses include enterprises whose number of employees does not exceed 100 people, and whose total income for the calendar year does not exceed 800 million rubles.

Medium-sized businesses include businesses whose revenue for the reporting year does not exceed 2 billion rubles, and whose number of employees does not exceed 250 people.

It is worth considering that the main goal of SMEs is to make a profit from the production and sale of goods and services. The organizational and legal form of SMEs is shown in Figure 1.

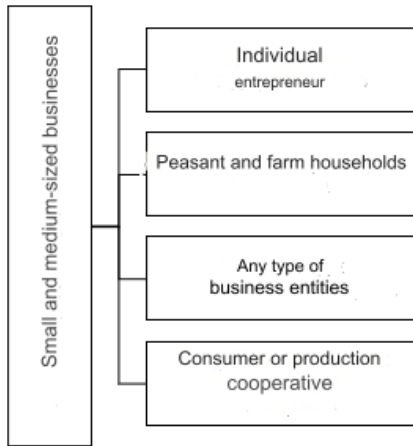


Figure 1. Organizational form of small and medium-sized businesses

It is also worth noting that, regardless of the organizational and legal form of SMEs, the participation of the state or non-profit organizations in the authorized capital of a small and medium-sized business cannot be more than 25%, the share of participation of legal entities and other organizations that are not SMEs is no more than 49% [4].

Using the SME status allows enterprises to receive property and financial support from the state, tax benefits, use a simplified taxation system and accounting and management reporting, and so on.

Small and medium-sized businesses include organizations that carry out work in 1,589 types of activities, according to the All-Russian Classifier of Types of Economic Activity (OKVED-2), of which 1,412 types of activities can be subject to a simplified taxation system, in particular a single agricultural tax, in accordance with subparagraph 5 of paragraph 1 of Article 427 of the Tax Code of the Russian Federation [2].

The simplified taxation system implies a tax regime that implies a special procedure for paying taxes. Thus, the taxpayer can choose two taxation options: income or income reduced by the amount of expenses incurred, where the rates are 6% and 15% of the taxable base, respectively [7].

The single agricultural tax is available only to agricultural producers whose activity class is 01, 02 and 03 in accordance with OKVED-2.

In addition, within the framework of the activities of SMEs, tax and credit incentives are also in effect, allowing for a reduction in the tax and debt burden on enterprises in order to increase production capacity.

Thus, the acquisition of the status of small and medium-sized business by an organization or entrepreneur allows the use of state instruments for supporting and developing business in the Russian Federation, which, in a situation of deteriorating macroeconomic conditions both in the country and in the world, provides additional competitive advantages in the market, which in turn contributes to the growth of the economic system of the Russian Federation.

At the same time, Federal Law No. 478-FZ of 04.08.2023 “On the Development of Technology Companies in the Russian Federation” established the status of a small technology company.

A small technology company should be understood as a commercial organization that is engaged in the development and (or) production of products, provision of services, and performance of work using innovative technologies [1].

Innovative technologies are a set of measures and tools aimed at increasing production efficiency or developing and selling unique modified goods and services.

The presence of an enterprise in the MTC register gives the company simplified access to government business support measures. In addition, small technology companies can be divided into 4 groups, presented in Figure 2.

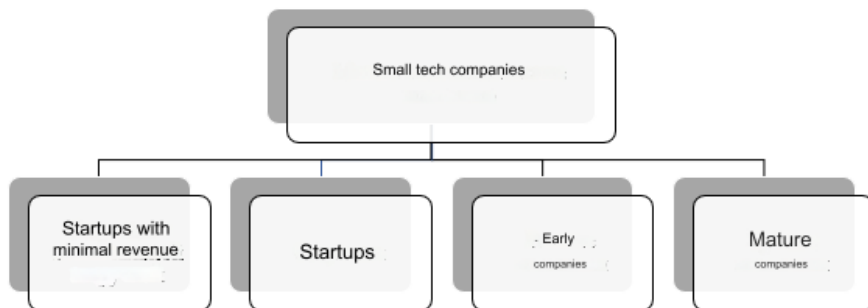


Figure 2. Types of small technology companies

Startups with minimum revenue include enterprises with an annual income of no more than 1 million rubles. Small technology companies with an income from 1 million rubles to 300 million rubles are considered startups.

If the annual income of a small technology company is from 300 million rubles to 2 billion rubles, such an organization is classified as an early company. A mature company has an annual income of 2 billion rubles to 4 billion rubles.

Small technology companies include enterprises operating in 1,849 types of activities, according to the All-Russian Classifier of Types of Economic Activity (OKVED-2), in accordance with Government Resolution No. 1847 of 02.11.2023 “On classifying technology companies as small technology companies and terminating the status of small technology companies, forming and maintaining a register of small technology companies and on information interaction.”

Small technology companies have tax and credit incentives, and there is also a simplified tax system, which allows companies to reduce expenses on interest and tax payments [3].

Thus, inclusion of an enterprise in the register of small technology companies allows the enterprise to use additional benefits from the state when running its business.

Let’s conduct a comparative analysis of the advantages and disadvantages of small and medium-sized businesses in comparison with small technology companies, in the context of government measures to support business in the Russian Federation.

As stated earlier, small and medium-sized businesses are subject to income tax at a rate of 6% and 15%. The income tax for small technology companies is 0%, and from January 1, 2025, the tax rate will be 5% [2].

SMEs operate in 1,589 types of activities, while small technology companies have access to 1,849 types of activities, and simplified taxation programs are available, including a single agricultural tax.

Moreover, since February 1, 2024, the preferential lending program is also available for small technology companies. In addition, the maximum loan amount for MTC is 1 billion rubles, while for SMEs, a loan for a maximum amount of 500 million rubles is available [6].

Another advantage of small technology companies is the provision of preferential terms for social contributions, preferential mortgages for employees, and so on.

However, it is worth noting that SMEs can be individual entrepreneurs, while only legal entities are recognized as small technology enterprises.

At the same time, the simplified taxation system is more accessible to small and medium-sized businesses. Also, small technology companies do not carry out their own activities in the field of construction.

At the same time, the process of registration and obtaining the status of a small technology company is greatly simplified in comparison with obtaining the status of a small and medium-sized business entity, that is, the bureaucratic procedure is reduced as much as possible.

Thus, it can be concluded that the acquisition and further use of the status of a small technology company is the most attractive instrument of state support for business.

However, it is worth considering the specifics of obtaining this status, since this requires the development, implementation, use and sale of innovative technologies [5].

At the same time, the status of a small and medium-sized business entity may be available to both legal entities and individual entrepreneurs, which, together with the simplified income tax system, is also an effective measure for business development in the Russian Federation.

The use of these methods of state support for business should be carried out on the basis of a full and comprehensive analysis of the scope of activity of the organization or entrepreneur.

However, a wide variety of different business development tools allows not only to ensure the development of the Russian economy, but also to positively influence the economic stability in the country, which is in the context of sanctions restrictions and an unstable geopolitical situation in the world.

The article was prepared as part of the research work «Improving measures of state financial regulation of innovative development of the Russian Federation in the context of the policy of import substitution», financed by an internal grant from the Federal State Budgetary Educational Institution of Higher Education «Russian University of Economics named after G.V. Plekhanov», order No. 1527 of July 29, 2024.

References

1. *Federal Law of 04.08.2023 No. 478-FZ "On the Development of Technology Companies in the Russian Federation"*
2. *Tax Code of the Russian Federation*
3. *Government Resolution of 02.11.2023 No. 1847 "On classifying technology companies as small technology companies and on terminating the status of small technology companies, forming and maintaining a register of small technology companies and on information interaction"*
4. *Confident development of small and medium business. Electronic resource. URL: <https://www.kommersant.ru/doc/6559877?ysclid=m0sv393s8t596142317>*

5. *Measures to support small technology companies. Electronic resource. URL: https://www.economy.gov.ru/material/departments/d01/razvitie_tehnologicheskogo_predprinimatelstva/mery_podderzhki_malyh_tehnologicheskikh_kompaniy/?ysclid=m0suyk8mb4828178448*

6. *State programs to support small businesses – 2024. Electronic resource. URL: <https://kontur.ru/articles/4710?ysclid=m0supaup1s396479031>*

7. *Simplified taxation system. Electronic resource. URL: <https://www.nalog.gov.ru/rn77/taxation/TAXES/usn/?ysclid=m0sqghmax9206658270>*

从数字经济转型时期国际法规范修正的角度形成国际贸易概念
**FORMATION OF CONCEPTS OF INTERNATIONAL TRADE
FROM THE STANDPOINT OF CORRECTION OF NORMS OF
INTERNATIONAL LAW DURING THE TRANSITION TO A
DIGITAL ECONOMY**

Vyatchenkov Andrey Vladimirovich

Postgraduate Student

*Diplomatic Academy of the Ministry of Foreign Affairs of Russia,
Moscow, Russia*

Scientific Advisor - Kharlanov Alexey Sergeevitch

*Doctor of Economic Sciences, Candidate of Technical Sciences,
Professor*

*Diplomatic Academy of the Ministry of Foreign Affairs of Russia,
Moscow, Russia*

注释。作者给出了广告和营销举措的例子，并分析了正在进行的“数字风暴”，在业务流程演变过程中，生产力出现了爆炸式增长，业务流程决定了商业模式本身的内容，并在制造商将现有商品出售给潜在消费者的时间和材料成本之间寻找最优方案，在创意产业的世界中，他们准备好解决自己参与创造性地将最终产品的新属性提升到个人偏好水平的过程的问题，并准备好在人工智能和大数据系统调整后，在一系列越来越先进的复制品/替代品中对原件的创意进行完美升级，从纠正国际法和后疫情时代的碎片化和全球本地化的角度。

关键词：联合国可持续发展目标、人工智能、大数据、生成式人工智能、商业模式、营销、创意产业、行为经济、中国第二次跳跃、俄罗斯、中国、亚太经合组织、“亚洲四小虎”、“亚洲小虎”、电子商务、元宇宙、数字替身、生态系统、化身、VR 和 AR、解耦、NBICS、工业 4.0、ESG 标准。

Annotation. *The authors give examples of advertising and marketing moves and analyze the ongoing “digital storm” with an explosive growth in productivity in the process of evolution of business processes that determine the content of the business models themselves and the search for an optimum between the time and material costs of manufacturers for the sale of existing goods to potential consumers, ready in the world of creative industries to solve the problems of their own involvement in the processes of creatively bringing new properties of the resulting products to the level of their personal preferences and ready for*

perfectionist upgrades of the very ideas of the originals in a set of increasingly advanced replicas/substitutes when they are tuned by AI and Big Data systems, from the standpoint of correcting international law and post-covid fragmentation and glocalization.

Keywords: *UN SDG, AI, Big Data, generative AI, business models, marketing, creative industries, behavior economy, Second Chinese jump, Russia, China, APEC, “Asian tigers”, “Small Asian tigers”, E-commerce, metauniverses, digital doubles, ecosystem, avatars, VR and AR, decoupling, NBICS, Industry 4.0, ESG standards.*

The ongoing involvement of AI systems in the business processes of the behavioral economy of the post-industrial “knowledge society”, which overlapped and polarized the trends of globalization, then the Covid stagnation and post-pandemic recession and the global crisis of ideas in politics and business, led to the beginning not only of the emergence of “explosive growth” in the early 2000s of qualitatively different digital solutions in the set of digitalizing processes of international economic relations and international relations, to the development of the necessary skills of their own adaptability, but also gave the emerging and possessing new qualities labor force of Industry 4.0 its own niche for creating competitive advantages capable of finding its potential consumer even more targetedly and effectively [1]. At the same time, both the “green agenda” and the UN SDGs are becoming, in such a digital deformation of globalized sectors of the world economy, indicators of one’s own national technological and economic sovereignty, a basis for “red lines” in the field of scientific and technological advances, especially from the standpoint of increasing sanctions pressure or the squeezing out of their former colonies by developed countries from market niches, growing confrontation for new segments of world trade in the most viable segments of glocal territories, increasing fragmentation of global chains and the growth of participants in ever-shortening sequences of like-minded people in the field of materials science, technology and logistics exchange[2]. The behavioral economy of creative industries itself, following the precepts of Daniel Kahneman and Richard Thaler, finds its own class of consumers, celebrities and groups of creators of a new class of goods and services involved in mutual creativity, preventing each individual from facelessly and unclaimedly dissolving in the increasingly perfect enclaves of digital ecosystems and services, metaverses of hand-drawn avatars and in the gaming industries of augmented and virtual realities. This constant “vigil” in geophysical environments provides a solution to the “single day”, destroying “loneliness on the network” and strengthening the craving for enduring values and supporting the growing level of total consumption, where everything personal is replaced by the search for new tools and retention mechanisms, dissolving due to the introduction

of innovative solutions and unique, professionally developed competencies capable of dividing the world of the “alpha” generation into real and cyber-realizable possibilities of humanoids and machines [3].

The first to achieve this were the Asia-Pacific countries, which intercepted the fading Anglo-Saxon leadership of the time of the ideas of the “global factory” of Richard Nixon and Henry Kissinger, creating several waves of “Chinese leaps”. In particular, the First of them, in the early 2000s, together with the emerging “digital storm”, demonstrated the resilience and competitiveness of both the early “Asian tigers” of the 1980s and the Celestial Empire, which was itself accelerating in its qualitative transformation, as a driver of global production and a trend-setter in copying and refining existing technologies and content of unpretentious consumers of the baby boomer and “X” generations, who were completing their taste preferences in the unpretentious and already classical, from the standpoint of traditional marketing, 20th century, as a prologue to the ideas of Peter Drucker, Philip Kotler and Igor Ansoff, to the expected neoclassical changes in trading platforms and emerging digital ecosystems of marketplaces and generative AI [4].

These changes themselves have led to the fact that by 2024, global big tech spends up to 44 billion US dollars on AI systems to transform their business processes (Sherwood Foundation) [5], and the Second Chinese Leap, which began at the end of winter of this year, is fundamentally different from the history of the first precedent in international trends of trade itself in that it is not based on the quantitative copying of a certain number of originals in their thoughtless mechanical prototyping at the level of replicas, but has reached a new innovative groundwork, which is now calculated by generative AI systems, uses Big Data and is capable, due to developed ecosystems and a wide range of marketing and targeted advertising tools, of revealing leading global brands of various “high-tech” companies, imitating original goods with sets of lines of substitutes with modified or improved properties, falling under the press of foresight and an advertising set of ideas from the standpoint of increasing dependence on ESG standards that meet the categories “green” or “energy-saving”, “smart” and qualitatively different from the original ideas of solutions. The originals themselves, when they appear on global commodity platforms, become the basis for the analysis and refinement of the original prototypes, the declared matrices of the technological minimum, subject to tuning and upgrading of various creative industries, as an indestructible alternative to the new construction of the world economy with the help of deep machine learning and generative AI. Moreover, this concerns not only fashion or antique business, but it also becomes a projection of “big tech”, trying to improve their original creations to the level of “luxury”, but often unable to compete with Asian replicas, bringing the set of properties to the absolute for each buyer focus group, living by their own preferences and expecting from creative companies not

only the transfer of copyright to them (due to emerging multiplier effects, such as the scale effect, the Internet of things and targeted refinement of the facets of each such original in the applied NBICS transformation), but also with the obvious mass recognition of the primacy of the “new Chinese wave” in its “high-tech” aesthetic/taste perfection, as the mainstream of the behavioral economy of the future. In other words, no matter what appears on the market, from the point of view of innovative improvements, as well as rebranding of possible development options, goods acquire a “second life”, becoming masterpieces for global markets from the standpoint of reducing the cost, while maintaining the declared quality, and with the addition of new functions, properties and services that help to improve the ideas themselves in their qualitatively improved and creatively changed semantic embodiment based on the inclusion of AI tools for a digital copy of each significant buyer, as the main creator of the business process of the brands in question [6]. And the tragedy of such manufacturers, in their competition with the “Chinese wizards” and in their interaction with the growing Asian tiger cubs, is manifested in the fact that their capabilities are extremely limited, and the latter, engaged in a kind of tuning and refinement of small details in the original, replace mass production with targeted production, and solve the issues of intercepting the initiative for further production of an improved product at the price of substitutes, but with the resulting set of better parameters than the product initially entering the market.

This became possible on the basis of a symbiosis of technologies, innovations, previously used generative AI systems and Big Data to simplify everything that is part of the Chinese high-tech ecosystem, as a multiplying environment of knowledge and new meanings capable of conquering almost any commodity markets from the standpoint of the evolution of NBICS technologies and imposing their own vision of everything new on each buyer in their personal motivation and in the tireless desire to receive a spectrum of the possible based on the newly proposed. And better than the Celestial Masters, who have grasped both fashion, and knowledge, and the psychology of the client today in the world, no one can offer this so massively, aggressively and categorically yet competitively or at least somehow resist, which means that this Second Chinese Leap will sweep away with its “digital storm”, in a series of waves of mergers and acquisitions, all potentially interesting developers falling under the criteria of “old money”, whose global leader remains, as before, Bernard Arnault. And these classic goods and services will be latently swept away both in the “golden billion” and outside the regions of traditional production of high-quality food and alcohol based on nanocluster solutions and through ongoing fragmentation through the construction of chains of preferences in the resources used and in the customer expectations themselves: from 24/7 e-commerce to “convenience stores” [7].

From such trends that are becoming the mainstream of technology development in Industry 4.0, solving issues of higher-quality achievement of product and production efficiency based on the growing digitalization of business processes, the introduction of generative AI and the formation of niches of expected preferences, the optimum will be built to reduce the contribution of the resources used in the ongoing cycles of building original clusters of product lines and zones of their unlimited evolutionary improvement. And the methods of classical marketing are becoming a requiem for the emerging rebranding to create network structures of a new and self-organizing set matrix that takes into account not only the practice of redistribution of goods and services themselves based on e-commerce, but also allows for a more targeted calculation of horizontal industry cooperation, identifying the tasks and capabilities of each participant capable of making their individual contribution to both the creative industry itself and the creative repeatability of the basic product, with a constantly changing set of properties to order for each potential consumer. At the same time, the growing expectation of an ever more perfect miracle will motivate the manufacturer to more fully serve the increasingly demanding orders for each focus group, take into account the similarity or difference in emerging product preferences, track the dynamics of participants in export-import operations from the standpoint of their age, gender, culture and other personal and human characteristics. And in these processes, cloud computing, Big Data, and quantum calculations of atomized average consumers, and the possible development in a virtual environment of dynamic models of changing volatility of regional and global markets based on online monitoring of changing parameters, which will always take into account the solvent demand of the buyer and the seller's ability to mimic, created by him, his product offerings and innovative preferences of either the "army of snobs" or the "creative plankton" of their own hedonic dreams, actively help [8].

Such obvious advantages will be able to help to more quantitatively provide the opportunity to satisfy the needs in the environment of newly industrialized countries, whose market is growing and becoming a hedging option for the "golden billion" market, which lowers the level of innovation of the goods sold for them [9], and transferring original solutions of product lines to less rich, but more mobile markets, switching to substitutes and using the advantages of marketplaces and payment systems within the framework of digital ecosystems developed by local TNCs and TNBs and putting forward their own rules in the formation of existing meeting places for buyers and producers (metaverses, virtual and augmented reality, the use of avatars and digital twins, gaming technologies and the Internet of things) [10].

At the same time, the leaders of this process remain the Asia-Pacific countries, which previously reached the level of inaccessibility of their priority areas

in global ICT development. Their experience of maintaining their own zones of preferential technological development affects the digital storm itself of the ongoing digitalization of the world economy, and is also actively manifested in the American-Chinese dicapping, which has determined the sanctions and autarky opposition in the struggle for the basic foundations of the new military-technological order of states and regions of the world. It is this vision that AUKUS constructs, with its potential new members such as South Korea and Japan, as well as Canada and New Zealand preparing to join it, allowing the principles of Anglo-Saxon dominance to be built ever closer to China, as an increasingly likely enemy and aggressor of Taiwan, the place of the expected confrontation in the Asia-Pacific region, which can at any moment become a theater of military operations [11].

At the same time, the SDGs and the desire to comply with them at the B2G and B2B level provide more and more opportunities to develop the infrastructure of the Asia-Pacific region and APEC itself for more successful trade and building priorities for digital partnership within developing territories. Forecasts about what and when these tasks for the growth of the welfare of states will turn out to be will depend on the speed of development of the alternative integration agenda of BRICS, the coordination of routes of the countries of the North and South [12], as new drivers of economic growth in the 21st century, as well as the ability to build a multipolar and polycentric world within the framework of common tasks of sustainable development and a response to the risks of technological leaps, which can be hedged by systemic and collective efforts within the boundaries of new strategic alliances and formations. It is necessary to already draw “contour maps” of “road atlases” of more successful waves of mergers and acquisitions, gaining momentum in the post-covid development of countries with a single goal-setting, free from neo-hegemony [13], and not ready to go the way of led vassals and live again according to the standards of “catch-up development” or “closed cycles” of an increasingly urbanized future [14]. And the role of ICT as indicators of national technological sovereignty will only grow, as stated in the Decree “On the national development goals of the Russian Federation for the period 2030 and for the future up to 2036” signed on the day of the inauguration of the President of Russia V.V. Putin on May 7, 2024 [15], which means that the marketing of future digital transformations of business models will also include the policy of successful competition both within states and at the macro- and meso-levels.

The criteria for the correction of international law themselves are based on a change in attitudes towards the concepts of the “digital economy” and the “new green technological order”, which requires clear calculations not only of carbon-free units, but also a set of international treaties as a framework for stability and successful development of the UN SDGs for each state in its further competitive state and in its unique existence and further, among the threats and challenges of the 21st century.

References

1. Aleksandrov A.G., Glagolev V.M., Shingarev A.B. *Interstate confrontation in the context of globalization: problems and prospects*. Moscow: Research Center «Encyclopedia», 2020.
2. Kharlanov A.S., Bely R.V. *New realities of warfare: “cyberterrorism” and information wars // Legal science*. - 2021. - No. 6. - P. 106-110.
3. Kharlanov A. S. *Neocolonial aspects of global governance and maintaining Russia’s imperial aspirations in the new world order//SCIENCE AND INNOVATIONS - MODERN CONCEPTS - Moscow: Infinity Publishing House, 2022.-116 p.*
4. ISEM SB RAS - 2023: *ways of forming an interstate energy association in North-East Asia have been studied / Federal State Budgetary Scientific Institution L.A. Melentyev Energy Systems Institute of the Siberian Branch of the Russian Academy of Sciences / 12/25/2023.*
5. *Foundation Sherwood*. www.foundationsherwood.org, *AI report of global digital investments, April, 2024.*
6. Kharlanov AS, Likhonosov AG, Boboshko AA, Evans JN, *Fundamentals of military power as the hegemony of the state in the architecture of the world order: features and recommendations. Proceedings of the International University Scientific Forum “Practice Oriented Science: UAE – RUSSIA – INDIA.” - UAE, 2022.: Infiniti Publishing.*
7. *Modern trends in international relations and their impact on the national security of the Russian Federation in the 21st century*. Moscow, 2024. VAGSh, RSUH, *Collective of authors*. P.235-238.
8. *Berlin announced plans to “forever” abandon energy resources and Russia / RBC/ 05/10/2023 // URL:https://www.rbc.ru/politics/10/05/2022/627a6a579a79473d01044804*
9. Kharlanov A.S., Tolmachev P.I., Evans Y.N. *Trends redistribution of assets against the backdrop of the decoupling of the economies of China and USA // Issues of Innovative Economics. – 2023. – Vol. 13. – No. 4.– doi:10.18334/vinec.13.4.120327.*
10. Kotler Philip. *Marketing 5.0. Next Generation Technologies / Philip Kotler, Setiawan Ivan, Kartajaya Hermawan; - Moscow: Eksmo, 2023.-272 p.- (Marketing Atlanteans).*
11. *China as a Strategic Partner and Valuable Neighbor. Civilizational Choice and Modern Trends of Cooperation: monograph\A.S. Kharlanov, I.A. Maksimisev, A.A. Boboshko, M.M. Novikov; ed. S.V. Loktionov. - Moscow: 2022. - 190 p.*
12. *Russian Space: Choice of the Future and Main Trends of Dominance: monograph / A.S. Kharlanov, M.M. Kharlamov, R.V. Bely, A.A. Boboshko, M.M. Novikov; scientific editor V.I. Kryuchkov. - Moscow: 2022 / -206 p.*

13. A.S. Kharlanov. *Asian syndrome: the battle of superpowers for new world domination. Interuniversity international congress. Higher school: scientific research. Moscow. November 24, 2022. Infinity Publishing House. Pp. 39-44.*

14. *Expert #35 (1264). Evgeny Ogorodnikov. We win on their field and by their rules.*

15. *Decree of the President of Russia V.V. Putin of May 7, 2024 "On the national development goals of the Russian Federation for the period 2030 and for the perspective up to 2036". www.kremlin.ru*

俄罗斯是国际法古典解释的积累和应用的聚集者，也是传统家庭和宗教价值观的捍卫者

RUSSIA AS AN AGGREGATOR OF ACCUMULATION AND APPLICATION OF INTERNATIONAL LAW IN ITS CLASSICAL INTERPRETATION AND AS A DEFENDER OF TRADITIONAL FAMILY AND RELIGIOUS VALUES

Vyatchenkov Ivan Vladimirovich

Postgraduate Student

*Diplomatic Academy of the Ministry of Foreign Affairs of Russia,
Moscow, Russia*

Scientific Advisor - Kharlanov Alexey Sergeevitch

*Doctor of Economic Sciences, Candidate of Technical Sciences,
Professor*

*Diplomatic Academy of the Ministry of Foreign Affairs of Russia,
Moscow, Russia*

注释。作者们提出了关于国际法原则和规范不可侵犯性的相关性的论点，在国际竞争日益激烈的过程中，不同的地缘政治行为者可以对这些原则和规范做出不同的解释，并在新的殖民主义游戏中将其降低到“强者态度”的水平，这为盎格鲁-撒克逊人实现了他们的帝国野心提供了优势，但并不能保证他们在建设多中心和多极世界中取得胜利，而多中心和多极世界应该在蒙昧主义和无神论时代在维护传统宗教的家庭和精神道德价值观的过程中产生。

关键词：俄罗斯、越南、阿联酋、沙特阿拉伯、阿塞拜疆、蒙古、ICT、AI、大数据、市场、数字化转型、美国、中国、俄罗斯、高科技、工业 4.0。

Annotation. *The authors present their arguments about the relevance of the inviolability of the principles and norms of international law, which can be interpreted differently by various geopolitical actors in the process of increasing international competition and reduced in new neocolonial games to the level of “the strong’s attitudes”, giving advantages to the Anglo-Saxons in realizing their imperial ambitions, but not guaranteeing them victory in the construction of a polycentric and multipolar world, which should arise in the process of preserving the family and spiritual-moral values of traditional religions in times of obscurantism and atheism.*

Keywords: *Russia, Vietnam, UAE, Saudi Arabia, Azerbaijan, Mongolia, ICT, AI, Big Data, marketplaces, digital transformation, USA, China, Russia, high-tech, Industry 4.0.*

The current September continues the series of active actions of the President of Russia V.V. Putin after the trip to China, and then to the DPRK, and to the SRV, which created the impression for the whole world of a certain adjustment and balancing of forces to polarize processes in the Asia-Pacific region from the position of the return of Russia as a key player, and showed the revival of once powerful, but then lost almost completely ties. It is the revived agenda of assistance and partnership in the strategic deployment of a community of interests with these countries not only as former colleagues in the socialist camp, but also as states maintaining their sovereign priorities within the framework of the national ideology of justice and social institutions of progressive development, emerging from under the corporatocracy dictate, that give the world hope for fair relations between states and peoples and the expected peace of the era of the collapse of the neocons and the ideas of unbridled consumption of the “golden billion” at the expense of everyone else. All these states have the imprint of pro-communist ideology and utopianly expected attitudes of equality and brotherhood, which really contributed to the division of the world into 2 camps and after the end of the “cold war” gave a second chance to evaluate their own interests from the position of the elites and the expression of the will of the people, they continue to wait by inertia for initiatives from Russia. At the same time, communism in Asia has always had a communal and community tint, flaring up either with the unbridled tyranny of the Khmer Rouge, or expanding into variants of matrix or network cooperation of economic chains of pro-Chinese orientation, implemented in the routes of historical supplies, and reviving today from the positions of fragmentation and further glocalization in ensuring their own technological and food security of countries and their sovereignty-gaining industries.

The result of such geopolitical zoning to date has become a deeply debugged mechanism for the accumulation and clustering of competitive advantages and technological competencies, without which, according to EU statistics, up to 40% of the Old World’s GDP still cannot do, and China, which is buying up the infrastructure of European countries, has advanced in these expansionist tendencies more deeply, pulling out the basic foundations in technology and logistics, in energy and in the “brain drain” like Hermann Simon’s “hidden champions” at the end of the Marshall Plan, by no means a pro-American choice [1]. At the same time, the ongoing dicing in the ICT has already shown the futility of Anglo-Saxon retorts and reprisals in the sanctions field, the inability to resolve issues of material and component support without the old Asian tigers and the growing “Asian

tiger cubs of the second wave”, who are waiting for their “meat” from the body of the decrepit and tired of their own hegemony and greatness states of the “golden billion”.

The invented game of colony and metropolis is still trying to turn neocolonialism into the basic priorities of the modern world, and therefore Mongolia and Azerbaijan, the basic countries in Asia and Transcaucasia, must receive their share of the reward for the correct choice of their place in the rapidly changing world [2].

Therefore, Azerbaijan wants to build an oil tanker fleet with Russia and promote new routes through its territory to replace the “Nord Streams” blown up by the collective West, especially when the Ukrainian Nazis begin the autumn blackmail of the energy sector of Europe, which has signed up for expensive and long-term LNG, which is not yet capable of being delivered in full volume, either by transport or infrastructure, to end consumers in the Old World from the New [1;5].

The Kursk adventure showed that the fight for the PAO Gazprom hub in Sudzha is the main task of mastering the energy lever during the period of maximum demand for gas in Europe, which is already afraid of nuclear provocations in Kurchatov and Zaporozhye at Russian nuclear power plants, which are constantly subjected to cyberattacks and drone attacks by the Ukrainian Armed Forces under the control of NATO instructors and Western PMCs [3; 4]. The task of the Americans to create “dead lands” of potential contamination in new Russian territories through “dirty bombs” or leaks from nuclear power plants, and also to knock Russia out of the game of civilized energy security and self-sufficiency of Europe forever is becoming real, since without hopes and without really declared and existing opportunities for Azerbaijan to help itself and Russia saturate European hubs with hydrocarbons, there will no longer be a stable and innovative economy of the EU [2; 5].

Understanding all the advantages of such multi-vector and the ability to be a real diplomat gives Ilham Aliyev the opportunity to apply to BRICS, which, together with the Turkish request to accept alternative Anglo-Saxon ideas and opportunities into this business club, makes this story strategically in demand, and the logistics and energy of opportunities are simply off the charts: and this is not only the North-South corridor, but the ability to combine one’s interests with Russia and strengthen the understanding of what kind of configuration is needed for the integration platform, allowing each participant to build their IEO preferences and loop their priorities in the NBICS technologies of Industry 4.0. [6;19]

The tasks for Mongolian comrades are to maintain not only the first places in the world in food security and raw materials, especially in terms of polymetallic ores and rare earths, but also not to dissolve in the “embrace of the Celestial Empire”, which believes that everything that is good for it is, of course, good for

the rest of the world. Therefore, the border with such a loving neighbor gives the MPR only one chance to survive in an alliance with the Russian Federation [7], as evidenced by the military parades on May 9, and joint exercises, and the desire to conduct accelerated reindustrialization with the help of Russian technologies and innovations capable of competing with the PRC for many industries within the still sovereign and peacefully reviving Mongolia. Therefore, realizing this and Khurelsukh stated that the Mongolian side will develop trade and economic cooperation with the Russian Federation and will bring significant prosperity and well-being to the peoples of the two countries, and will become a labor and energy bridge in Eurasia to protect food reserves from the standpoint of agriculture and crop production, cattle and breeding cattle [2;17].

At the same time, V.V. Putin stated that relations with Mongolia are one of the priorities of the Russian Federation's foreign policy in Asia, and therefore the completion of work on a temporary trade agreement between the Eurasian Economic Union (EAEU) and Mongolia [2;8], which should simplify the supply of Mongolian export goods to the Russian market, is becoming a conscious matter and a support for all those who are close to the ideas of developing Asia without the traditional English and the structures of the “European runners”, who are carrying away their remnants of former greatness from the African continent and believe in the continuation of Rudyard Kipling's “Great Game” in the world of corporations and the established capitalism of netocratic images and bankster extreme [10].

And so the tasks of such movements cannot but give Russia the opportunity not to react to the ICC, for this now at the request of South Africa, there is the state of Israel and its genocide against the Palestinians in the Gaza Strip, and to strengthen in us the determination to bring the world to a state of imperial sobriety [11], when several powers, having divided the world, will try to assess the strength and reliability of the institutions of multipolarity and polycentricity, and in the event of the inability of the parties to negotiate, to delegate to partners a part of a dignified, calm and confident in their future life [12], which will be a guarantee of true freedoms and conquests of man from the world of absurdity, betrayal and the absence of classical ideals of the family and sovereign freedoms of the individual without the primacy of international law, the same for everyone, making us all unhappy and very quickly ending within the territories allocated to us, becoming digital reservations and lands of “disappearing Indians” [13]. Of course, the West is already preparing new “smallpox blankets” for us next year, as it was earlier for the indigenous people of the American continent in the form of waves of COVID, the WHO is actively reporting on this, but it is the ability to analyze and hedge risks that distinguishes those [14] who live collectively from the ideas and fears generated by unconscious and irresponsible institutions of global gov-

ernance (neocons) [15], which are dragging the world towards disaster, but which is increasingly less led by provocations and is building its own medical redoubts and bins for its ethnic groups in the process of cooling the bubbles of overheated national economies and in the protracted post-COVID recession [16;17].

The arrival of one of the leaders of Vietnam to meet with our President speaks of the reconfiguration of production and markets between the countries for a single cooperative development, giving each other the cheapest raw materials in partnership and receiving semi-finished products and technologies in their best innovative execution. At the same time, the meeting of the speaker of the Federation Council of the Russian Federation V.I. Matviyenko with the head of the muftis of Saudi Arabia and the discussion of traditional Islamic values supports the work of Prime Minister M.V. Mishustin with the President of Uzbekistan Shavkat Mirziyoyev, which speaks of the destruction of the Anglo-Saxon formula “C5 + 1”, which does not cover the true interests of the national Eurasian elites, who are again being prepared for the role of local vassals and servants of the branch networks of global TNCs and TNBs.

The world is tired of living without rules in man-made chaos, waiting for a return to traditions and the primacy of international law, which is always for justice and for God’s Will between people in their relationships and development.

References

1. *V. Putin in Baku. RBC, 19.08.2024;*
2. *V. Putin and the Mongolian strategy. Vesti-24. September 3, 2024;*
3. *Digital Economy from Theory to Practice: How Russian Business Uses AI / Research by RAEC/HSE University with the Support of MICROSOFT [Electronic resource] Access mode: <https://www.sostav.ru/>(date accessed: 09/08/2024)*
4. *What matters most? Eight priorities for CEO’s in 2024[Electronic resource] Access mode: <https://informedi.org/> (accessed: 08/20/2024)*
5. *Speech by Huawei Chairman of the Board of Directors Guo Ping 03.03.2022 [Electronic resource] / / Access mode:<https://carrier.huawei.com/en/events/mwc2022/videos/keynote-guoping>(date accessed: 25.01.2024)*
6. *Kharlanov A. S. Neocolonial aspects of global governance and maintaining Russia’s imperial aspirations in the new world order//SCIENCE AND INNOVATIONS - MODERN CONCEPTS - Moscow: Infinity Publishing House, 2022.-116 p.*
7. *Tibetan ‘unicorns’: how the Chinese startup market was reshaped. 12/23/2023. Economist. Venture industry and startups.*
8. *Hungry “tigers”: how China and the US are dragging Asian economies to the bottom. Economist. 12/16/2022. Economic trends.*

9. *Hermann Simon. "Hidden Champions". Publisher. 2009. P. 30-38.*
10. *European solar panel manufacturer threatens to move to the US. Prime. (13.06.2023). ZDF. Deindustrialisierung Programm.*
11. *Kharlanov A.S., Khairutdinov A.K., Boboshko A.A. Creation of a new civilizational order of planet Earth: transition to a "green economy". Features and risks. Innovations and investments. 2021. No. 10. P. 18-23.*
12. *Expert No. 35 (1264). Evgeny Ogorodnikov We Win on Their Field and by Their Rules – URL: <https://www.expert.ru> (date accessed: 28.08.2024)*
13. *Kotler, Philip. Marketing 5.0. Next Generation Technologies / Philip Kotler, Setiawan Ivan, Kartajaya Hermawan; - Moscow: Eksmo, 2023.-244-246 p.- (Marketing Atlanteans).*
14. *China as a Strategic Partner and Valuable Neighbor. Civilizational Choice and Modern Trends of Cooperation: monograph\ A.S. Kharlanov, I.A. Maksimtsev, A.A. Boboshko, M.M. Novikov; ed. S.V. Loktionov. - Moscow: 2022. - 176 p.*
15. *Russian Space: Choice of the Future and Main Trends of Dominance: monograph / A.S. Kharlanov, M.M. Kharlamov, R.V. Bely, A.A. Boboshko, M.M. Novikov; scientific editor V.I. Kryuchkov. - Moscow: 2022 / -208-212 p.*
16. *Mark Greeven, George Yip, Wei Wei. Innovators of the Celestial Empire or Chinese Business Conquers the World. Moscow, 2022. Lanit. P.45-48.*
17. *Kai-Fu Lee. AI Superpowers: China, Silicon Valley, and the New World Order. Boston: New York: Houghton Mifflin Harcourt, 2018.*
18. *Kharlanov A.S. Propaganda and "soft power" of "digital nomads" in the era of the SVO. Higher school: scientific research. M.2023. P.98-103.*
19. *Kharlanov A.S., Tolmachev P.I., Evans Y.N. Asset redistribution trends against the backdrop of decoupling of the economies of China and the United States // Issues of Innovative Economics. - 2023. - Vol. 13. - No. 4. - doi:10.18334/vinec.13.4.120327.*

关于国家调节的货物（工程、服务）供应合同领域立法系统化的问题
**TO THE ISSUE OF SYSTEMATIZATION OF LEGISLATION IN
THE SPHERE OF STATE-REGULATED CONTRACTS FOR THE
SUPPLY OF GOODS (WORKS, SERVICES)**

Lavrik Tatyana Mixajlovna

Candidate of Juridical Sciences, Associate Professor,

Head of Department

Tambov State Technical University

Isajkina Anna Aleksandrovna

Master's degree student

Tambov State Technical University

摘要。本文致力于研究国家调节的货物（工程、服务）供应合同领域的立法系统化问题。作者提出了完善俄罗斯国家调节的货物（工程、服务）供应合同领域立法的建议。

关键词：国家调节的货物（工程、服务）供应合同体系、政府采购、政府合同。

Abstract. *The article is devoted to the study of issues of systematization of legislation in the sphere of state-regulated contracts for the supply of goods (works, services). The author gives proposals for improving Russian legislation in the sphere of state-regulated contracts for the supply of goods (works, services).*

Keywords: *system of state-regulated contracts for the supply of goods (works, services), government procurement, government contract.*

The legislation of our country, which regulates the system of state-regulated contracts for the supply of goods (works, services), is based on the provisions of the Constitution of the Russian Federation, the Civil Code, the Budget Code of the Russian Federation and consists of a number of other federal laws and regulatory legal acts.

First of all, these include, by right, the Federal Law of April 5, 2013 No. 44-FZ “On the contract system in the sphere of procurement of goods, works, services to meet state and municipal needs”¹, which, in order to improve efficiency, ef-

¹ On the contract system in the sphere of procurement of goods, works, services to meet state and municipal needs: Federal Law of 05.04.2013 No. 44-FZ (as amended on 14.02.2024) // Collection of Legislation of the Russian Federation. – 2013. – No. 14. – Art. 1652.

fectiveness, ensure openness and transparency of procurement, prevent corruption and other abuses, regulates relations aimed at meeting state and municipal needs, when:

- procurement planning;
- determining suppliers (contractors, performers);
- concluding and executing state (municipal) contracts;
- monitoring (audit, control) in the sphere of procurement.

Federal Law of July 18, 2011 No. 223-FZ “On the procurement of goods, works, services by certain types of legal entities”² is a framework law, since it establishes only general principles and basic requirements for procurement for:

state corporations and public-law companies, natural monopoly entities, organizations operating in the field of electricity supply, gas supply, heat supply, water supply, sanitation, wastewater treatment, municipal solid waste management, autonomous institutions, business entities in whose authorized capital the share of the Russian Federation, a constituent entity of the Russian Federation, or a municipality is more than 50 percent;

- budgetary institutions;
- state and municipal unitary enterprises.

The objectives of regulation of the said law are to ensure the unity of the economic space, create conditions for satisfying the needs of the specified legal entities, with the necessary indicators of price, quality and reliability, efficient use of funds, expanding the opportunities for participation of legal entities and individuals in procurement for the needs of customers and stimulating such participation, developing fair competition, ensuring openness and transparency of procurement, preventing corruption and other abuses.

Federal Law of December 29, No. 275-FZ “On the State Defense Order”³ establishes the specifics of the formation, placement, execution of the state defense order and state control (supervision) in the sphere of the state defense order.

Federal Law of December 13, 1994 No. 60-FZ “On the supply of products for federal state needs”⁴ establishes the general principles and procedure for the formation and execution on a contractual basis of purchase orders for federal state needs by organizations regardless of their form of ownership, for the purposes of:

- creating and maintaining state material reserves, the required level of defense capability and security of the country;

² On the procurement of goods, works, services by certain types of legal entities: Federal Law of 18.07.2011 No. 223-FZ (as amended on 04.08.2023) // Collection of Legislation of the Russian Federation. – 2011 – No. 30. – Art. 4571.

³ On the state defense order: Federal Law of 29.12.2012 No. 275-FZ (as amended on 22.07.2024) // Collected Legislation of the Russian Federation. – 2012. – No. 53. – Art. 7600.

⁴ On the supply of products for federal state needs: Federal Law of 13.12.1994 No. 60-FZ (as amended on 28.06.2022) // Collected Legislation of the Russian Federation. - 1994. - No. 34, Art. 3540.

- ensuring export deliveries of products to fulfill international economic, including foreign exchange and credit, obligations of the Russian Federation;
- implementing federal target programs.

Relations that arise in connection with the purchase and supply of agricultural products and food for federal state needs are regulated by Federal Law No. 53-FZ of December 2, 1994 “On the Purchase and Supply of Agricultural Products, Raw Materials and Food for State Needs”⁵.

At the same time, today the main problems are the lack of a clear and harmoniously structured system of legal norms that is easy to understand for any entity that intends to participate in public procurement and the lack of uniformity in judicial and administrative practice. At the same time, the mass needs of customers are the same, and the market is not divided according to the applicable legislation. Existing laws are difficult for unprepared persons to understand. This is confirmed by the large number of changes made to the listed acts.

Since 1993, more than one thousand by-laws aimed at regulating relations in the field of procurement have been adopted in the country.

Over the past 10 years alone, the Federal Law “On the Contract System in the Sphere of Procurement of Goods, Works, Services to Meet State and Municipal Needs” has been amended more than 100 times - this is one of the most amended laws in the country.

The rules for procurement by certain types of legal entities within the framework of the Federal Law “On the Procurement of Goods, Works, Services by Certain Types of Legal Entities” have changed and, to some extent, become more stringent. Purchases in the sphere of state defense procurement are increasingly becoming a separate sphere of purchases with their own rules and conditions.

This allows us to talk about the popularity of the topic of procurement legislation, which has recently reached incredible proportions, not to mention the lack of unity in judicial practice.

One gets the impression that the main goal of the legislation is not to ensure effective public procurement, but to establish many bureaucratic procedures that sometimes greatly slow down the procurement process itself and scare off potential suppliers (contractors, performers).

For example, there are different approaches of the Federal Law “On the contract system in the sphere of purchases of goods, works, services to meet state and municipal needs” and the Federal Law “On the purchase of goods, works, services by certain types of legal entities” to the requirements for procurement participants

⁵ Federal Law of 02.12.1994 No. 53-FZ “On the Purchase and Supply of Agricultural Products, Raw Materials and Food for State Needs” (as amended on 19.06.2011) // Collection of Legislation of the Russian Federation. - 1994. - No. 32. - Art. 3303

and support for small businesses, as well as the parallel existence of two independent registries of unscrupulous suppliers, despite the fact that they are maintained by the same body (FAS Russia) and the grounds for inclusion in the registries are very similar.

Russian procurement legislation is characterized by its procedural nature. In order to bring the procurement system to uniformity, the current laws must be systematized and unified.

Currently, proposals to codify procurement legislation (create a unified procurement code) are increasingly being discussed among scientists and practicing specialists in the field of procurement. Its necessity is explained by a fairly significant number of existing regulatory legal acts governing relations in this area⁶.

And if we talk about a single code as a mechanism for unifying approaches and requirements in procurement for both state and municipal needs, and in procurement by certain types of legal entities, then such a goal is achievable, the unification itself is really capable of simplifying participation in procurement for market participants.

When codifying procurement laws, the interests of all bidders must be taken into account. This involves a synthesis of federal laws “On the contract system in the sphere of procurement of goods, works, services to meet state and municipal needs”, “On the procurement of goods, works, services by certain types of legal entities”, “On the state defense order”, “On the supply of products for federal state needs”, “On the purchase and supply of agricultural products, raw materials and food for state needs”, federal, regional by-laws and industry legislation (construction, medicine, etc.). The procurement system must undergo radical changes, become uniform for everyone, flexible and simplified. It seems that the codification of laws should eliminate existing difficulties of a terminological nature, which often complicate understanding and slow down the interaction processes between the state and entrepreneurs. It is necessary to provide customers with the opportunity to use all the advantages of civil legislation. The issues of regulation of individual contracts should be properly worked out. In addition, it is necessary to unify the rules for monitoring, auditing and control in the field of procurement by regulatory authorities.

The creation of a single code will have a positive effect on all procurement participants.

For the state:

- full control over the movement of funds;
- saving resources and minimizing corruption risks due to better control and transparency;

⁶ Shichanin Mikhail. Will a Procurement Code Be Adopted in Russia - Expert Opinion // [Electronic Resource]: IPP “GARANT.RU”: information and legal portal. [Official website]. URL: <https://www.garant.ru/news/1719681/?ysclid=m0ewj4rky572749145> (accessed: 27.08.2024).

- automation of control over customers and suppliers through digitalization of processes;
- creating a positive image of public procurement against the background of a decrease in the number of corruption scandals.

For suppliers (performers, contractors):

- reduction in the number of selection procedures due to the unification of the rules of procurement procedures;
- reduction in costs for securing a contract, working on electronic trading platforms, preparing applications;
- reduction in dumping in tenders.

References

1. *On the contract system in the sphere of procurement of goods, works, services to meet state and municipal needs: Federal Law of 05.04.2013 No. 44-FZ (as amended on 14.02.2024) // Collection of Legislation of the Russian Federation. – 2013. – No. 14. – Art. 1652.*

2. *On the procurement of goods, works, services by certain types of legal entities: Federal Law of 18.07.2011 No. 223-FZ (as amended on 04.08.2023) // Collection of Legislation of the Russian Federation. – 2011 – No. 30. – Art. 4571.*

3. *On the state defense order: Federal Law of 29.12.2012 No. 275-FZ (as amended on 22.07.2024) // Collected Legislation of the Russian Federation. – 2012. – No. 53. – Art. 7600.*

4. *On the supply of products for federal state needs: Federal Law of 13.12.1994 No. 60-FZ (as amended on 28.06.2022) // Collected Legislation of the Russian Federation. - 1994. - No. 34, Art. 3540.*

5. *Federal Law of 02.12.1994 No. 53-FZ “On the Purchase and Supply of Agricultural Products, Raw Materials and Food for State Needs” (as amended on 19.06.2011) // Collection of Legislation of the Russian Federation. - 1994. - No. 32. - Art. 3303*

6. *Shichanin Mikhail. Will a Procurement Code Be Adopted in Russia - Expert Opinion // [Electronic Resource]: IPP “GARANT.RU”: information and legal portal. [Official website]. URL: <https://www.garant.ru/news/1719681/?ysclid=m0ewj4rkhy572749145> (accessed: 27.08.2024).*

DOI 10.34660/INF.2024.42.50.036

加强博士教育：方法论准备在发展专业和教学活动中的作用
**ENHANCING DOCTORAL EDUCATION: THE ROLE OF
METHODOLOGICAL READINESS IN DEVELOPING
PROFESSIONAL AND PEDAGOGICAL ACTIVITIES**

Pruksaseat Chanittra

Postgraduate student

Ural Federal University, Yekaterinburg, Russia

摘要。方法论准备对于博士生在高等教育中从事专业和教学活动至关重要。它被认为是一个重要的国家、教育和经济问题，可以提高博士教育的质量，使其与国家和国际标准保持一致。本文研究了方法论准备的三个主要组成部分：动机、认知和操作，通过强调科学导师在促进博士教育发展中的作用，为博士生的专业和教学标准建模。方法论准备的关键组成部分：专业、方法论和研究能力、系统思维技能和电子学习准备，这些对于 21 世纪的博士生提高他们的专业和教学活动是必不可少的。通过独特地实施方法论准备，电子学习准备可以通过提升博士生进行教学和科学研究所需的 IT 技能来提高高等教育机构博士生专业和教学活动的效率和有效性。

关键词：方法论准备、专业和教学活动、博士生、电子学习准备。

Abstract. *Methodological readiness is essential in preparing doctoral students for professional and pedagogical activities in Higher Education. It is considered a critical national, educational, and economic concern that could improve the quality of doctoral education to align with national and international standards. This paper examines the three major components of methodological readiness: motivational, cognitive, and operational conjoin to model professional and pedagogical standards of doctoral students by emphasizing the role of scientific supervisors in fostering the development of doctoral education. Key components of methodological readiness: professional, methodological, and research competencies, systematic thinking skills, and e-learning readiness were reported as indispensable to equip 21st-century doctoral students to enhance their professional and pedagogical activities. Implementing methodological readiness distinctively, e-learning readiness can refine the efficiency and effectiveness of professional and pedagogical activities of doctoral students in higher educational institutions by upgrading their IT skills necessary to conduct pedagogical and scientific research.*

Keywords: *methodological readiness, professional and pedagogical activities, doctoral students, e-learning readiness.*

The current trend in higher education requires postgraduate students to comply with their academic, scientific, and professional abilities in the economy, the state, and academia. National and international guidelines have generated specific requirements for doctoral education and emphasized the necessity of creating scientific and pedagogical conditions for economic, socio-political, technical, and socio-cultural perspectives. Each country has distinct guidelines to enhance doctoral students' pedagogical and professional activities by gratifying educational and economic provisions to develop the country professionally, pedagogically, and economically. Doctoral students who will become future teachers should get acquainted with pertinent methodological and professional support from higher educational institutions, specifically the mentorship of their scientific supervisors. Scientific supervisors ought to collaborate with academia and the state to promote awareness of appropriate methodological and pedagogical training and implement methodological readiness to enhance the effectiveness of students' pedagogical and professional activities.

Currently, doctoral students are assigned two main tasks—scientific and educational.

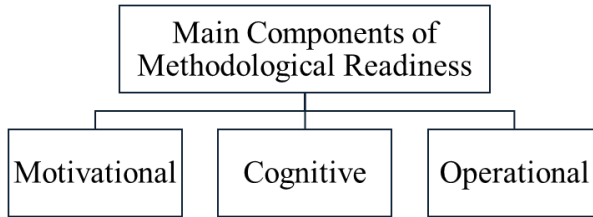
1. *Scientific:* the scientific activities—thesis preparation, composing research, and academic publications for professional skills.
2. *Educational:* completing academic modules and scientific works as required by the academic curriculum.

However, these students are lacking motivation in their doctoral studies. They are bewildered by the new educational environment and scientific requirements in passing their academic modules and composing their theses. By raising awareness of doctoral students to implement methodological readiness in preparation for pedagogical and professional activities, they will become self-regulated learners and possess key competencies to meet the demands of the state, employment market, and higher education. This paper will assess key components and types of methodological readiness of doctoral students that will cater to their professional and pedagogical abilities in 21st-century doctoral education.

Methodological readiness is the key aspect for effective and efficient preparations of doctoral students for scientific and pedagogical activities in Higher Education [12]. It is vital to clarify the doctoral students' professional and pedagogical abilities as required by the Higher Education and global employment markets. There are several definitions of 'readiness' and 'methodological readiness' in the educational context. As stated by [11], '*readiness*' is "an agreement to do something; a state of having everything done". Further, the context of '*methodolog-*

ical readiness’ is perceived as “a person-oriented activity aimed at performing a certain action” [6]. Other definitions of methodological readiness include “the integration of methodological knowledge, skills, and personal qualities for future teachers to carry out all types of methodological activities in a specific area of the educational system [9]. It combines the methodological training of specialists and the developmental trends of modern education into a new set of scientific and pedagogical skills of scientific and technical specialists [12].

Methodological readiness can be classified into three major components: motivational, cognitive, and operational [9].



1. *Motivational*—the communicational styles and emotionality of the specialists that emphasize the orientation of professional behaviors of doctoral students, the orientation of performed scientific and pedagogical activities and ideological attitudes, and the personal characteristics of an ideal teacher in higher educational settings.
2. *Cognitive*—levels of knowledge of university teachers in applying special scientific, professional-pedagogical, and methodological organization of teacher training. Doctoral students ought to possess IT knowledge and professional and pedagogical bases of learning in organizational activities and to develop their systematic thinking and analytical thinking skills [5]. Systematic thinking skills are the personal qualities of a teacher who wants to become a well-trained academic professional and assist their doctoral students in higher education. It embodies problem-solving skills in searching for appropriate solutions to scientific problems to form the teacher’s readiness.
3. *Operational*—the ability to possess scientific and pedagogical skills to develop teachers’ methodical activities in higher educational settings: evaluation, research, teaching activities, and project training.

Thus, there are two types of operational components of methodological readiness:

1. *Theoretical*—conducting professional, pedagogical, and methodological works. To elaborate, doctoral students who possess theoretical readiness will have a professional ability to carry out methodological and method-

ical thinking skills. These skills enhance the student's ability to perform methodological work and conduct professional and pedagogical activities. Specific examples of operational type of methodological readiness are the creation of pedagogical design, pedagogical model, and pedagogical conditions to improve the quality of teaching and learning assessment of future specialists, in this context, the doctoral students. Pedagogical design is regarded as one of the four major categories of professional-pedagogical activities mandatory to conduct every teacher's teaching activity [13]. It reflects the overall educational processes that conglomerate students' independent tasks and teachers' professional experiences in higher education [7]. Incidentally, the '*content of education*', the main subset of pedagogical design, allows university teachers and doctoral students to acquire essential and sound pedagogical theories, forms, and concepts to enhance professional pedagogical skills for future employment skills. These skills will reinforce doctoral students' integrative professional self-determination to align with the labor market.

2. *Practical*—the level of professional and pedagogical skill formation of doctoral students to independently carry out professional and pedagogical activities in Higher Education. It comprises research skills and e-learning readiness. As contended by [8], research skills are necessary for doctoral students to carry out their professional and pedagogical activities. This type of readiness combines quantitative research skills, interpretative skills, report writing skills, and analytical skills. By acquiring the abovementioned research skills, doctoral students will possess relevant methodological competencies to plan and conduct research and attain analytical skills for statistical competencies in conjunction with presentation skills in academic conferences.

Chiefly, e-learning readiness construes the assessment of the readiness level the institution is available to implement and adopt e-learning tools [2]. It plays a prominent role in shaping the productive learning experiences of a teacher in their students' professional experiences [1]. Hence, e-learning readiness is compulsory to improve the digital educational technologies of modern-day doctoral students globally. By acquiring sufficient knowledge of e-learning readiness, students will become self-regulated learners and utilize online tools for their research activities [10]. In [4]'s study, technological access is the key influential factor in determining Thai doctoral students' level of e-learning readiness. Therefore, the implementation of e-learning readiness relies on several elements: self-control, internet self-efficacy, a collaboration between the higher educational institutions and the state, and the specialized training of university teachers for doctoral students to perform professional and pedagogical activities efficaciously [3].

In sum, the methodological readiness of doctoral students to perform professional and pedagogical activities conglomerates various components and types

under different research fields. By acquiring relevant methodological readiness, postgraduate students will possess the ability to conduct professional scientific and pedagogical research, develop their analytical and critical thinking skills, synthesize research methods and newly acquired methodological knowledge for teaching practice in Higher Education, and implement their e-learning readiness (operational skills) to develop up-to-date pedagogical technologies and become self-regulated learners in various educational environments. Last, e-learning readiness is critical to reinforce the 21st-century competencies of doctoral students who will transform into future teachers [3].

Therefore, practical and theoretical types of methodological readiness allow future teachers to discern the theoretical and practical skills for research and pedagogical works from different perspectives. These future teachers can employ professional, research, and methodological competencies to cater to future employment, the state, and professional education. Hence, the utilization of methodological readiness, most importantly, e-learning readiness in doctoral education can enhance relevant pedagogical and professional activities in higher education. Consequently, if university teachers and research supervisors can regulate the implementation and raise awareness of methodological readiness in their doctoral students, then it is viable to initiate appropriate pedagogical conditions for an ideal educational environment and select versatile pedagogical approaches that gratify the students' personal, pedagogical, and academic needs in various higher educational contexts across borders.

References

1. Borotis, S., Poulymenakou, A. *E-Learning Readiness Components: Key Issues to Consider Before Adopting e-Learning Interventions // E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education. 2004 Vol. 1: 1622–1629 URL: <https://www.semanticscholar.org/paper/E-Learning-Readiness-Components%3A-Key-Issues-to-Borotis-Poulymenakou/da93fafa907c1677dcaf4a6393af9d8d7e6ff49d>(date of access: 05/08/2024)*
2. Bowles, M. *What is Electronic Learning? In M. Bowles (Ed.), Relearning to E-learn: Strategies for Electronic Learning and Knowledge. Monograph. Melbourne University Publishing. 2004. Vol. 1, No. 1. pp. 3-19.*
3. Elçiçek, M. & Erdemci, H. *Investigation of 21st-century competencies and e-learning readiness of higher education students on the verge of digital transformation // Journal of Computer and Education Research. 2021. No. 9 (17), 80-101. DOI: 10.18009/jcer.835877 (date of access: 05/08/2024)*
4. Hashim, H., Tasir, Z. *E-Learning Readiness: A Literature Review // LATICE'14. Proceedings of the International Conference on Teaching and*

Learning in Computing and Engineering. 2014 pp. 267-271. Available at: DOI: 10.1109/LaTiCE.2014.58. (date of access: 02/08/2024)

5. Komarova E.P., Sapozhkova N.A., Aristova I. V., Yartseva I.K. *Teacher's Readiness Formation for Development of Systems Thinking on the Basis of Conceptual Pedagogical Model // Language and culture*. 2020. No. 51 pp. 119–128. <https://doi.org/10.17223/19996195/51/6> (date of access: 18/07/2024)

6. Kondakov I. M. *Psikhologiya [Psychology]. Illustrated dictionary: More than 600 ill. And 1700 art. / St. Petersburg.; Moscow: Prime-EUROZNAK, 2003 (Moscow: PF Krasny proletariy)*. p. 508.

7. Ivanovna M.E., Molotkova N. *Pedagogical practice of PhD students of the technical university: traditions and innovations// Higher Education in Russia*. 2018. Vol. 27. No. 4. pp. 101-114. URL: <https://cyberleninka.ru/article/n/pedagogicheskaya-praktika-aspirantov-tehnicheskogo-universiteta-traditsii-innovatsii?ysclid=m0qh1yg7ru561846166>(date of access: 18/07/2024)

8. Meerah, T. S. M. *Readiness of preparing postgraduate students in pursuit of their doctoral programme // Procedia - Social and Behavioral Sciences*. 2010. Vol. 9. pp. 184–188. DOI: <https://doi.org/10.1016/j.sbspro.2010.12.133>(date of access: 18/07/2024)

9. Nasyrova E. F., Drozdova A. A. *Methodical readiness as a component of professional competence of bachelors of professional and pedagogical education // Modern Research of Social Problems (electronic scientific journal), Modern Research of Social Problems*. 2015. №6(50). pp. 279-289. URL: <https://cyberleninka.ru/article/n/metodicheskaya-gotovnost-kak-sostavlyayuschaya-professionalnoy-kompetentnosti-bakalavrov-professionalno-pedagogicheskogo?ysclid=m0qhi6nyfb15448831>(date of access: 18/07/2024)

10. Oliver, M. *Online learning helps prepare pupils for university // Education Journal*. 2014 No. 218 pp. 12–15. URL: https://www.researchgate.net/publication/329223239_Online_Learning_Leading_e-Learning_at_Higher_Education(date of access: 18/07/2024)

11. Ozhegov S. I., Shvedova N. Yu. *Explanatory Dictionary of the Russian language*, AZ Publishing House. 1992.

12. Rezer T.M., Pyrkova T.A., Pruksaseat Ch., Ketrish E.V. *Methodological Readiness of Graduate Students of the University For Professional And Pedagogical Activity: The Current State of the Problem // Modern problems of science and education*. 2024, No 3. DOI: 10.17513/spno.333657. (date of access: 12/08/2024)

13. Senko Yu. V. *Modernization of education is not a competency-based approach // Modernization of professional and pedagogical education: trend, strategy, foreign experience. Proceedings of the international scientific conference / under the scientific editorship of M. P. Tyrina, L. G. Kulikova. Barnaul: Russia. pp. 23-27 URL: https://www.elibrary.ru/item.asp?id=32433316 (date of access: 22/08/2024)*

DOI 10.34660/INF.2024.71.61.037

俄罗斯大学的俄语对外教学：方法与实践

**TEACHING RUSSIAN AS A FOREIGN LANGUAGE AT THE
RUSSIAN UNIVERSITY: METHODOLOGY AND PRACTICE**

Barashyan Valentina Karapetovna

*Candidate of Philological Sciences, Associate Professor
Rostov State Transport University*

Kononenko Anna Pavlovna

*Candidate of Philological Sciences, Associate Professor
Rostov State Transport University*

Nedospasova Larisa Alekseevna

*Senior lecturer
Rostov State Transport University*

摘要。由于经济和政治互动，俄罗斯与中国大学的国际合作正在迅速发展。两国之间的这种合作加速了教育领域的发展。所提出的俄语作为外语教学方法的相关性在于其有效性和教育过程组织的改进，这是新的国际教育标准所要求的。俄语作为外语教学问题是基于国内外科学家的资料来考虑的。本文分析了在“系统编程和人工智能技术”领域为中国学生教授俄语作为外语的方法。分析了现有的教育和方法材料，考虑到学生的民族倾向。研究的目的是概括大学教育过程中俄语作为外语教学的方法和实践。本文强调了基于学生民族语言特征的教育过程组织、教育培训和语言学习形成的要求。本文提出了一种教育过程，分为四个学习阶段，逐渐融入社会和文化环境。每个阶段都辅以一个考虑到交际方法的主题重点。本文介绍了罗斯托夫国立交通大学多年来在俄语作为外语教学方面的实践经验，这些经验包括教育、培训和社会导向。分析了学习俄语作为外语存在的问题。本文对没有与中国学生合作经验的俄语作为外语教师可能具有实际意义，并且可以在学习过程中使用所提出的方法。

关键词：教学方法、俄语作为外语、中国学生、语言学校、教学阶段、教育目标、社会导向教育、国际合作、语言教学。

Abstract. *International cooperation with Chinese universities is developing rapidly in Russia due to economic and political interaction. Such cooperation between the two countries has accelerated the development in the field of education. The relevance of the presented methodology of teaching Russian as a foreign language lies in its effectiveness and improvement of the educational process organization, which is dictated by new international educational standards.*

The problem of teaching Russian as a foreign language is considered on the materials of foreign and domestic scientists. The article analyzes the methods of teaching Russian as a foreign language for Chinese students in the field of “System programming and artificial intelligence technologies”. The existing educational and methodological materials are analyzed taking into account the ethnic orientation of the students. The purpose of the research is to generalize the methodology and practice of teaching Russian as a foreign language in the educational process of the university. The article highlights the requirements for the educational process organization, educational training and the language learning formation, based on the students’ national language specifics. The article proposes an educational process that is divided into four stages of learning with gradual immersion into the social and cultural environment. Each stage is supplemented by a subject focus taking into account the communicative approach. The article describes the practical experience of teaching Russian as a foreign language with elements of educational, training and socially oriented focus, obtained over several years at the Rostov State Transport University. The existing problems of learning Russian as a foreign language are analyzed. The article may be of practical importance for teachers of Russian as a foreign language who do not have experience working with Chinese students and can use the proposed methodology in the learning process.

Keywords: *teaching methodology, Russian as a foreign language, Chinese students, language school, teaching stages, educational goal, socially oriented education, international cooperation, language teaching.*

Introduction

International cooperation all over the world is based on the study of a foreign language, which is a priority in choosing a country for further education. In the modern era of a rapidly changing world, both in economics and politics, people are offered new opportunities not only to expand their professional ties, but also for personal development, education and the acquisition of new skills. They can also bring elements and experience from other countries into their national professional sphere. It is not surprising that among the most popular foreign languages Russian occupies a special place. Naturally, there is an increasing demand for specialists in the field of linguistics who can teach Russian as a foreign language. It should be noted that foreign students study at almost every Russian university today that is why the need to create specialized language courses and methods of teaching Russian, taking into account the characteristics of students, is becoming more and more urgent. Various aspects of studying Russian as a foreign language (RFL) are actively discussed in scientific journals. The Rostov State Transport University is no exception. The interested management of the University began to develop

international cooperation and accept students from China in priority areas. This article provides an overview of foreign and domestic RFL teaching techniques. We will also reveal our own experience of teaching RFL based on the materials of the textbook “The Road to Russia”, a grammar commentary and dictionary to the textbook for Chinese speakers, the textbook “Listening and understanding everyday conversations and announcements”, the textbook “Pure Grammar” and the textbook on specialty “Issue 12. Computer Science”. In addition to the listed teaching aids, our own unique methodological manuals were used at the practicals since the entire course of study lasted 2 years and consisted of 1,040 hours of full-time format and 480 hours of online format. While developing the methodology for teaching RFL the authors were guided by the modern experience of teaching RFL at Russian and Chinese universities, as well as the practice of using an online platform.

Review of Russian and foreign literature

The discipline “Russian as a foreign language” was developed several centuries ago. Based on the work of Vlasov S.V. and Moskovkin L.V. [11], which is devoted to educational and methodological manuals for foreigners, RFL teaching covers the period of the late XVII – early XVIII century. The authors highlight the process of developing the methodology of teaching Russian through the study and memorization of words, dialogues and phrases. While studying RFL, the authors identified several areas: linguistic, professionally oriented and scientific.

The linguistic direction of RFL includes the following sections: lexicology, grammar, phonetics, stylistics, etc., within the framework of which philology students acquire fundamental knowledge, as well as pedagogical skills and abilities in the field of teaching RFL. As for the professionally oriented direction, it is worth noting the interdisciplinary approach, which significantly affects the learning process. The scientific direction combines the two previous ones, as is based on a high level of language knowledge and professional competencies. The problems that scientists are dealing with cover the most discussed topics and areas in science. Thus, E.V. Potemkina [9] considers the concept of a secondary linguistic personality associated with the teaching of foreign languages, including RFL. Another author, S.G. Vorkachev [12], proposes the concept of a linguistic personality based on the interdisciplinary meaning of philosophy, sociology and psychology, that is, on spiritual and physical properties. Khabarova O.V. [3] emphasizes the main role of the text based on the national Russian culture. At the same time not only the text, but also specially organized forms of visual communication, in particular, the inclusion of elements of cultural and historical study of the Russian language, contribute to the highest quality knowledge of the Russian language. Thus, Cherepanova T. B. [1] suggests studying Russian using excursions that promote the development of cognitive and communicative competence.

As for foreign authors, Guo Yuhua [2] relies on the language component of foreign students when learning RFL. Krasner, Irene and Thomas Jesús Garza [6] consider the development of digital humanitarian technologies for functioning as means for students' to get access to Russian-language learning through online platforms, libraries and foreign language departments. Robin Richard [10] describes the forming of the Russian language level for the correct understanding of news, specialized and social texts. The authors [9] pointed out the problems that arise in the social environment of students with a low level of language proficiency. Kononenko A.P., Nedoseka L.A. [4] described the issues of language development in the legal aspect. The work emphasizes the interdisciplinary component based on the language of the specialty. The above works are based on the process of language competence forming in students studying RFL.

The authors of the article noted that the following issues are described in the works: socio-cultural context of studying RFL, methodological aspects of problems, methodological manuals and linguistic difficulties that students encounter in the process of learning RFL.

Consequently, the analysis of domestic and foreign scientific periodicals, as well as educational and methodological materials, indicate the need to develop the methodology for teaching Russian as a foreign language at the university, dividing it into stages of training in accordance with the set goals and objectives of the educational curriculum of the university.

Methodological basis of the study

This paper analyzes the existing problems of studying and teaching Russian as a foreign language at the Rostov State Transport University. Based on the carried out analysis, the methodology of teaching RSL through immersion in the language environment and the introduction of the language school for Chinese students was developed. The socio-cultural environment has positively influenced the process of adaptation and understanding of the Russian language as a foreign language, the culture of the region and the country as a whole.

The methodology for teaching RSL was based on four stages. The first stage became the initial block of the methodology, since it was directly the informative and the introductory part of learning RFL. To do this, teachers have developed an online course related to the phonetic and lexical base. The classes were held online to study the alphabet and the minimum lexical units of the Russian language. Students perceived such training as a game, as they practiced such skills as reading and pronunciation of letters, syllables and phrases. After getting acquainted with the Russian language reading rules, the study of grammar began: explaining parts of speech, building up questions and finding answers in simple sentences. Quite a large amount of time was spent on this stage, since the students attended classes irregularly and not seriously, which led to some difficulties in understanding

Russian speech. The second stage became the most difficult for both teachers and students. At the second stage, the language summer school was offered with full-time attendance at classes in the country of the language being studied. A comprehensive program for studying RFL was developed (Table 1).

Summer language school program (Russian as a foreign language)

Sections by weeks	Excursions and events in Rostov region
Section 1. The Russian alphabet. The rules of reading. Interrogative constructions. Affirmative and interrogative speech constructions. Mini texts. Dialogues. Speech topics: «Acquaintance,» «Family Album,» «My Family.» Affirmative and interrogative speech constructions. Mini texts. Dialogues. Monologue.	A visit to the bank, a cell phone office, grocery store, park, zoo, orientation at the university. Explanation of norms and rules of behaviour in a public place and in a hostel. Safety instructions. Sightseeing tour of Rostov-on-Don.
Section 2. Speech topics: «City, transport,» «City, orientation in the city.» Affirmative and interrogative speech constructions. Mini texts. Dialogues. Monologue.	Attending an event in the city park, paying in a store, infrastructure around the university. Visiting polyclinics. Travel by public transport. A trip to malls Rio and MegaMag.
Section 3. Speech topics: “Food”, “Leisure”, “Hobbies”. Affirmative and interrogative speech constructions. Mini texts. Dialogues. Affirmative and interrogative speech constructions. Mini texts. Dialogues. A monologue.	A visit to the cinema. Acquaintance with the Don culinary traditions. An excursion to the city of Azov.
Section 4. Speech topics: “Shopping”, “Conversations in a store, in a library, in a canteen”. Affirmative and interrogative speech constructions. Mini texts. Dialogues. A monologue.	Dialogues in the city streets with passers-by. Working with understanding Russian speech in the street. Visiting a sports complex. Reading street signs and identification marks. An excursion to Loga Park.
Section 5. Speech topics: “Work and free time”, “Seasons”, “Weather”. Affirmative and interrogative speech constructions. Mini texts. Dialogues. A monologue.	Solving everyday problems: washing, cleaning and cooking. Consultation with a therapist. Studying the menu in a cafe and dialogues with the waiter. A trip to the city of Taganrog.
Section 6. Speech topics: “Health”, “Traditions and customs”. Affirmative and interrogative speech constructions. Mini texts. Dialogues. A monologue.	Meeting university students. Participation in quests, board games and musical performances. Cruise to Starocherkassk for the folk festival of Cossack songs.

In the second stage, the teachers were involved in working with Chinese students for 6-9 hours. Taking into account the summer weather conditions, classes were held in cool classrooms during the day, and in the morning and evening the

received knowledge was practiced outside or on the territory of the university campus. The constant supervision of Chinese students has shown the positive dynamics in the achieving those goals and objectives that were set in daily classes. The work turned out to be very difficult both for teachers and students, since the process of mastering lexical material required much time and effort. The students did not have time to master such a diverse flow of information. Only by the third week, the students adapted to completely new conditions and were able to use actively the Russian language in public places. Communication within the group remained in Chinese, which had a negative effect on the vocabulary acquisition. The excursions have become such a pleasant entertainment addition and positively influenced understanding of the Russian culture. The textbook “The Road to Russia level 1” and the grammar commentary for Chinese speakers formed the basis of this stage. Moreover, the rules of writing were practiced every lesson, contributing to memorizing the spelling of words and even sentences. This textbook was developed specifically for Chinese students, and the grammatical commentary helped explain and supplement the necessary information. It should be noted that the teachers did not speak Chinese, so it was difficult for them to explain the rules of grammar without the language knowledge.

The third stage provided the opportunity for a smooth transition from creative education with entertaining elements to more traditional one for further full-time study at the university. Classes were included in the university’s schedule, that is, the use of Russian as a foreign language in academic classes was practiced daily. This particular stage turned out to be the most difficult, since the language load increased both on students and teachers. Basically, RFL classes were held after the main schedule in order to analyze the difficulties the students faced and to try to correct the understanding and learning the material. The teaching aids were based on: the textbook “Listening and understanding everyday conversations and announcements”, the textbook “Pure Grammar” and the textbook “The Road to Russia level 2”. The classes were conducted by teachers, who divided them into the following aspects: 1) phonetic classes (practicing and understanding the pronunciation of words, phrases, sentences, mini texts, dialogues in audio format); 2) reading (reading and understanding mini stories with retelling elements); 3) grammar and written exercises (practicing grammatical rules in written exercises).

At the fourth stage, the amount of learning hours increased due to the introduction and development of concepts in professionally oriented texts. To achieve the goal of understanding and using professional vocabulary, teachers used the additional textbook on the specialty “Issue 12. Computer Science”.

According to textbooks and teaching aids selected according to certain parameters and learning objectives, all four stages of teaching RFL demonstrated positive dynamics of the methodology. The given example of the language school at

the university influenced positively the further study of RSL. The teachers demonstrated an innovative approach to teaching students, applying their professionalism and learning experience.

The developed methodology is not limited only to this educational and methodological material, additional sources are used that include short films, news and entertainment programs. Foreign students are most interested in news that is not related to politics or economics. Paying attention to the educational literature, the teachers have noted that the subject and content of textbooks do not greatly vary from each other, but they all have a common feature which is they focus on a foreign origin of a student. As it turned out, this approach in the educational literature is very correct and accurate, capable of building a teaching methodology based on additional sources for this particular language group of students.

The results of study

It is customary to distinguish 6 levels in the content of studying RFL and such a classification is very similar to the European one: Level I - elementary - the foundation for all subsequent ones (literally “in 2 words” the student should be able to introduce himself, tell about himself, understand the co-speaker when speaking slowly, repeat what was said); Level II - basic - sufficient for applying for citizenship of the Russian Federation (proficiency in a fairly fast pace of speech, the ability to conduct dialogues and argue one’s point of view, etc.); Level III - I certification level - sufficient for admission to Russian universities (developed oral and written speech); Level IV - II certification level - the level of a university graduate, sufficient for working in Russia (fluent communication, including on highly specialized topics); Levels V and VI - III and IV certification levels respectively – the levels of an educated native speaker.

In order for students from China to be able to start full-time classes at the Rostov State Transport University (RSTU) on September, 1 in groups with native speakers, where all subjects taught were specialized and professionally oriented, the teachers of RFL faced the task to “bring” Chinese students from the elementary level to the third one in the shortest possible time. After online classes, Chinese students began full-time classes at the RSTU summer language camp (July 2023) with a small vocabulary that allowed them to communicate tolerably in the street, in shopping malls, in a dormitory, etc. and with an almost complete lack of grammar. Such a level of Russian language proficiency would not allow them fully receive an education at a Russian university. Moreover, as a result, in the first months of study, Chinese students experienced such learning difficulties as discomfort, psychological depression, and demotivation in their studies.

The application of the author’s methodology of teaching RFL in practice has led to positive results in the Russian language learning by Chinese students in the shortest possible time, to the formation of certain skills and abilities, namely:

- the ability to write down words, phrases, sentences;
- understanding the culture of the Russian language and adaptation in society;
- proficiency and use of the Russian language in speech activity in various situations;
- the ability to perceive information from general and professionally oriented texts;

Having analyzed the literature of teaching RFL, the authors concluded that the existing components such as content, language and style characteristics were developed in accordance with the objectives of teaching RFL. Such tasks can be divided into categories: 1) main characteristics, determining a single system of interaction between a teacher and a student; 2) secondary characteristics based on the perception of the linguistic environment through dialogues and texts about the country, culture and characteristics of the people.

With the help of the textbook “The Road to Russia,” a developed grammar commentary and a dictionary for Chinese speakers, teachers were able to build intercultural communication at the initial stage of training. The explanation of grammar material and the introduction of vocabulary in Russian was accompanied by a correctly developed commentary in which information was duplicated in Chinese. Such an addition improved the perception of the structure of the Russian language as a foreign language, its grammatical foundations and contributed to the learning of the lexical minimum for communication at the everyday level. However, the textbook and commentaries proved to be insufficient resources due to the difficulties of students’ perception and reproduction of the language in everyday life. Speech structures, lexical units, illustrations and grammatical constructions presented in the textbook contain a minimal format of communicative activity. In order to improve communication tasks, it was decided to interact with foreign and Russian students in RFL classes with the aim of intercultural communication and overcoming the difficulties of the language barrier. Such a methodology of teaching RFL has led to a positive result based on the principle of relevance and adequacy of perceived information and the specifics of the language environment. The communicative approach was applied at all four stages of training:

The analysis of the developed methodology for teaching RFL showed the effectiveness and prospects of the learning process, proposing a communicative approach as a basis.

Conclusion

The stages of the RFL teaching methodology developed by university teachers represent a unique systematic approach with a communicative focus. The methodology was based on educational and socially oriented goals. Differences in cultural aspects between countries and people gradually decreased in the process of adaptation through a communicative approach. In the process of training, teachers

constantly encouraged Chinese students to use the Russian language in various situations in everyday life and in the educational process. Thus, the methodology of teaching RFL helped cope with cultural and educational difficulties and form a positive perception of social adaptation.

Having studied the existing teaching methods of teaching RFL and having proposed their own teaching methodology, the authors have come to the conclusion that in the future new methods will be developed for foreign students, taking into account the directions and priorities of international forms of education.

Bibliography

1. Cherepanova, T. B. *On the effectiveness of cultural and historical study of the Russian language by foreign undergraduates through excursion forms // Visual communication in socio-cultural dynamics: collection of articles of the II International Scientific Conference (24-25.11.2016) / edited by N.F. Fedotova. Kazan: Kazan Publishing House. – 2016. – 516 p.*

2. Guo Yuhua. *Russian as a foreign language: systematization and experience (analysis of Russian scientific periodicals) // Ped.Rev. – 2017. – No.3 (17). – pp. 185-191.*

3. Khabarova, O. V. *The role and place of the socio-cultural component in the practice of teaching Russian as a foreign language // Baltic accent. – 2013. – No. 3. – pp. 33-38.*

4. Kononenko, A.P., , L.A. *Linguistic research of the law language development in the light of globalization of modern society / Kononenko A.P., Nedoseka L.A. // Modern pedagogical education. – 2020. – No. 6. – pp. 164-167.*

5. Kormos, Judit. *The role of attention in monitoring second language speech production. Language Learning 50. –2000. – pp. 343–84.*

6. Krasner Irene, Garza Thomas Jesús. *“Digital Humanities, Access, and the Teaching of Russian Language and Culture” . Russian Language Journal. – Vol. 71. – No. 1. – 2021. – pp. 5–26.*

7. Lobatyuk, V., Nam, T. *Everyday Problems of International Students in the Russian Language Environment // Technology and Language. – 2022. – No № 3(3). –P. 38-57.*

8. Long M.H., Gor K., Jackson, S. *(Linguistic Correlates of Second Language Proficiency: Proof of Concept with “ILR 2-3” in Russian. Studies in Second Language Acquisition. – 2012. – No 34(1). – pp. 99-126.*

9. Potemkina, E.V. *On the question of methods of forming a secondary linguistic personality // Bulletin of the LSU named after A.S. Pushkin. – 2013. – No.2. – pp. 215-223.*

10. Robin Richard. *“Reading Russian for the Disciplines: Google Translate.” Russian Language Journal – Vol. 71. – No. 1. – 2021. – pp. 73–114.*

11. Vlasov, S. V., Moskovkin, L. V. *Textbooks of the Russian language for foreigners of the late XVII – early XVIII century: addressee and linguistic methodological foundations // Problems of modern education.* – 2014. – No. 6. – pp. 119-127.

12. Vorkachev, S. G. *Linguoculturology, linguistic personality, concept: the formation of an anthropocentric paradigm in linguistics // Philological sciences.* – 2001. – No. 1. – pp. 64-72.

DOI 10.34660/INF.2024.43.19.038

公立中学结构中的前缀和国际英语考试

PREFIXES IN THE STRUCTURE OF STATE SECONDARY SCHOOL AND INTERNATIONAL EXAMS IN ENGLISH

Patlatenko Valeriya Aleksandrovna

Student

In. Yaz., Foreign Languages, Interpretation and Translation Centre, Tyumen, Russia

Shilikov Sergei Ivanovich

Candidate of Pedagogical Sciences, Associate Professor

In. Yaz., Foreign Languages, Interpretation and Translation Centre, Tyumen, Russia

摘要。本文致力于研究俄罗斯联邦教育机构“外语（英语）”课程中的前缀问题。作者考虑了英语单词构成中使用的主要前缀。分析有助于识别和描述公立中学和国际英语考试结构中的英语前缀。研究结果之一表明，前缀不仅存在于名词、形容词、副词和动词的词干中，如现代科学论文中所述，还存在于数字和动名词的词干中。

关键词：教育活动、英语、形态学、前缀、学生、教师、词形构成。

Abstract. *This article is devoted to the study of the problem of prefixes in classes of “Foreign Language (English)” in educational institutions of the Russian Federation. The authors consider the main prefixes used in the formation of English words. The analysis helps to identify and describe English prefixes in the structure of state secondary school and international exams in English. One of the findings of the research demonstrates prefixes not only in the stems of nouns, adjectives, adverbs and verbs, as presented in modern scientific papers, but also in the stems of numerals and gerunds.*

Keywords: *educational activity, English, morphology, prefixes, student, teacher, word formation.*

Modern languages of the world can be roughly divided into those that use prefixes and those that do not use them [7, p. 264]. The English language belongs to the former ones. English has two ways of forming words: word production, i.e. the formation of one word from another, and word formation [2, p. 456], i.e. making one word by combining two or more words. In turn, word production is represent-

ed in four ways: by changing the place of stress in the word; alternating sounds; preserving the pronunciation and spelling of the word while changing part of the speech; affixation [7, p. 458]. The topic of affixation was excellently revealed in due time by the Russian scientist A. A. Reformatzky, who argued that “the method of affixation consists in joining affixes to stems of” [7, p. 264]. This method is applicable to the topic of our research; however, we do not consider suffixation here, limiting ourselves to a detailed study of prefixation.

It should be noted that different authors consider the problem of prefixation differently, e.g., K. N. Kachalova, E. E. Izrailevich include this topic both in Morphology and Syntax of the practical grammar of the English language [2, p. 717]. V. L. Kaushanskaya, R. L. Kovner, O. N. Kozhevnikova, E. V. Prokofieva, Z. M. Raines, S. E. Skvirskaya, F. Ya. Tsyrlina refer prefixes to the morphological characteristics of parts of speech (nouns, adjectives, verbs and adverbs) [8, pp. 15, 50, 75, 204]. We stand on the position that prefixes are morphemes with grammatical meaning; they do not exist in isolation or separately from the stems of words. Therefore, they belong only to the sphere of Morphology. Prefixes are intended to form and modify words. It is traditionally believed that in English such parts of speech as the article, pronoun, prepositions, interjections, numerals and gerunds do not contain prefixes.

K. N. Kachalova, E. E. Izrailevich consider prefixing to be a way of forming words [2, p. 456], and Luke Prodromou believes that prefixes mainly serve to change the meaning of a word from the positive to negative (e.g., *like - dislike*, *lock - unlock*), from one meaning to the opposite (e.g. *clockwise - anti-clockwise*, *legal - illegal*, *regular - irregular*) and they rarely change a part of speech into another part of speech [12, p. 38], which, in turn, is a characteristic of suffixes. Luke Prodromou even expresses a vivid contradiction: “We use prefixes to change meaning. They rarely change the part of speech” [12, p. 38] and “They never change the part of speech” [12, p. 92]. We can totally agree that, basically, prefixes serve to give words the opposite or negative meaning [9, p. 369].

Richard Side and Guy Wellman point out that prefixes are used before a certain part of speech (nouns, adjectives, adverbs or verbs); meanwhile, in some cases a prefix can be a part of a stem that cannot exist without a prefix [13, p. 90], i.e.: “*disparage*”, “*immune*”, “*impeccable*”, “*impede*”, “*incessant*”, “*inflect*”, “*intact*”, “*repeal*”, “*unkempt*”, “*unscathed*”. These authors mention the most common prefix meanings, which are “the oppositive”, “the negative”, “the reverse”.

Russian students, who learn English, are faced with prefixes while preparing for the state secondary school and some international exams (e.g., FCE, GMAT, IELTS, TOEFL, etc). Let us consider how prefixes are presented in the “codifiers” of the state secondary school exams [4, p. 20 and 3, p. 22]. In general, the “codifiers” contain 14 prefixes, namely: *dis-*, *il-*, *im-*, *in-*, *inter-*, *ir-*, *mis-*, *non-*, *over-*, *post-*, *pre-*, *re-*, *un-*, *under-*.

Textbooks on international exams, i.e., FCE, GMAT, IELTS, TOEFL, etc., mention the following 29 prefixes: *anti-, co-, de-, dis-, ex-, il-, im-, in-, inter-, ir-, macro-, micro-, mis-, mono-, multi-, non-, out-, over-, post-, pre-, pro-, re-, semi-, sub-, super-, trans-, un-, under-*. It is quite obvious that the list in foreign textbooks is more than twice as complete (29 versus 14). In contrast to the “codifiers” of the state secondary school exams, they have such prefixes as *anti-, co-, de-, ex-, macro-, micro-, mini, mono, multi-, out-, over-, post-, pro-, semi-, sub-, super-, trans-*, the number of which comes to 15.

These data quite convincingly indicate that the prefixes in the “codifiers” of the state secondary school exams are pretty limited. One gets the impression that the prefixes *anti-, co-, de-, ex-, macro-, micro-, mini, mono, multi-, out-, pro-, semi-, sub-, super-, trans-* are of no interest to the compilers of the “codifiers”. Nevertheless, these prefixes are easily found in practical materials, e.g., in academic texts on specialised Internet sites [21], [22], [23] or in textbooks [6] in which one can find such words as “*ecosystems*” and “*biodiversity*”, which contain the prefixes *eco-* and *bio -*, that are somehow ignored in the “codifiers” [3, 4].

In current textbooks on international exams, prefixes are arranged in alphabetical order, and Russian students can find, albeit briefly, the material explaining the meaning of each definite prefix, e.g., *anti-* has the meaning of “opposite” (“*anti-clock-wise*”, “*anti-climax*”); *co-* has the meaning of “together” (“*co-worker*”, “*co-habit*”); *de-* has the meaning of “opposite” (“*decentralize*”); *dis-* has the meaning of “negative” (“*dislike*”); *ex-* has the meaning of “previous” (“*ex-husband*”); *il-* has the meaning of “opposite” (“*disembark*”); *im-* has the meaning of “opposite” (“*impossible*”); *in-* has the meaning of “opposite” (“*indirect*”); *inter-* has the meaning of “between” (“*intercontinental*”); *ir-* has the meaning of “opposite” (“*irrelevant*”); *macro-* has the meaning of “large” (“*macroeconomics*”); *micro-* has the meaning of “very small” (“*microelectronics*”); *mis-* has the meaning of “wrongly/badly” (“*mistake*”); *mono-* has the meaning of “one” (“*monolingual*”); *multi-* has the meaning of “many” (“*multipurpose*”); *non-* has the meaning of “opposite” (“*non-commercial*”); *out-* has the meaning of “more” (“*outnumber*”); *over-* has the meaning of “too much” (“*overdo*”); *post-* has the meaning of “after” (“*postgraduate*”); *pre-* has the meaning of “before” (“*pre-arrangement*”); *pro-* has the meaning of “in favor of” (“*pro-Unions*”); *re-* has the meaning of “again” (“*retell*”); *semi-* has the meaning of “half” (“*semicircle*”); *sub-* has the meaning of “under” (“*subterranean*”); *super-* has the meaning of “greater than” (“*superhuman*”); *trans-* has the meaning of “across” (“*transcontinental*”); *un-* has the meaning of “negative” (“*unlock*”); *under-* has the meaning of “not enough” (“*undercook*”).

Let us make a remark about the morpheme *mini-*. Luke Prodromou [12, p. 92] attributes it to prefixes, although he recognizes the separate spelling of *mini-* with

the stems of words (e.g., “*mini hi fi*”, “*mini bus*”). However, modern dictionaries [16-20] define this lexical unit as simultaneously several independent parts of speech, namely, a noun, an adjective and an abbreviation. We are of the opinion that this morpheme can be considered a prefix only in the case of a combined or hyphenated spelling with the stem of the word (e.g., “*minicomputer*”, “*miniserries*”). In order to make sure whether the morpheme *mini-* is a prefix or not, you need to refer to a reliable English-English dictionary. For example, in Macmillan English Dictionary [17] you can find the following words with this prefix: “*minibar*”, “*minibreak*”, “*minibus*”, “*minicab*”, “*minicomputer*”, “*minimart*”, “*mini-roundabout*”, “*miniseries*”, “*miniskirt*”, “*minivan*”.

It can be noted that various textbooks offer a few common rules regulating usage of a number of prefixes, e.g., the prefix *il-* is used in stems beginning with the English letter “Ll” (“*illegal*”, “*illiterate*”, “*illogical*”); the prefix *im-* is used in stems starting with the English letter “Mm” or “Pp” (“*immature*”, “*immoral*”, “*immortal*”, “*impatient*”, “*impolite*”, “*impossible*”); the prefix *ir-* is used in stems beginning with the English letter “Rr” (“*irregular*”, “*irrelevant*”, “*irresistible*”); prefixes ending in a vowel letter can be written either in one word or hyphenatedly with the stem of the word (“*anti-clockwise*”, “*anti-climax*”, “*anti-theft device*”, “*anti-European*”, “*antisocial*”, “*co-worker*”, “*coexist*”, “*cohabit*”, “*mini-session*”, “*minibreak*”, “*multi-million*”, “*multicolored*”, “*multifaceted*”, “*pre-arrest*”, “*predate*”, “*pro-comfort*”, “*prolong*”, “*re-take*”, “*reunite*”, “*semi-moronic*”, “*semidetached house*”); the prefix *ex-* is written hyphenatedly with the stem of the word (“*ex-husband*”); the prefix *non-* can be written either in one word or hyphenatedly with the stem of the word (“*non-commercial*” or “*nonfunctional*”); prefixes are written hyphenatedly with the stem of the word if the latter is represented by a toponym beginning with a capital letter (“*anti-European*”, “*pre-Gold Rush population*”, “*pro-Unions*”, “*pre-University*”, “*pro-European*”).

However, some of these rules should be treated with a great deal of caution, since they are often simply contradictory, e.g., the word “*regulate*” will contradict the rule about “the prefix *ir-*”, since it will attract the prefix *de-*, not *re-*: “*de-regulate*”; the word “*exchange*” will contradict the rule about “the prefix *ex-*”: “*exchange*”.

One of the advantages of textbooks on international exams in English is the fact that they explain which part of speech a particular prefix can be used with, e.g.: the prefix *anti-* can be combined with an adjective and a noun; *co-* - with a noun and verb; *de-* - with a verb and noun; *dis-* - with a verb; *ex-* - with a noun; *il-* - with an adjective; *im-* - with an adjective; *in-* - with an adjective; *inter-* - with an adjective; *ir-* - with an adjective; *macro-* - with a noun; *micro-* - with a noun; *mini-* - with a noun; *mis-* - with a verb; *mono-* - with a noun and an adjective; *multi-* - with a noun and an adjective; *non-* - with an adjective; *out-* - with a verb;

over- - with a verb; *post-* - with a noun and verb; *pre-* - with a noun and verb; *pro-* - with a noun and an adjective; *re-* - with a verb; *semi-* - with a noun and an adjective; *sub-* - with a noun and an adjective; *super-* - with a noun and an adjective; *trans-* - with a noun, verb and an adjective; *un-* - with a verb and an adjective; *under-* - with a verb. In our opinion, this meaningful information contributes to the fact that students will more firmly remember English prefixes in words (including the words themselves).

A number of foreign authors of textbooks on international exams indicate common mistakes of students when they use prefixes in the stems of words. For example, there is such a reminder: “Some common mistakes are:

You must unconnect the cable first.

They expelled him for disbehaving” [9, сtp. 38].

Here, the correct options should be considered as follows:

“*You must disconnect the cable first*”.

“They expelled him for misbehaving”.

In the course of our work, we identified English prefixes, compiled them listed in alphabetical order and gave a comparative analysis of prefixes in the structure of the state secondary school and some international exams (FCE, GMAT, IELTS, TOEFL, etc.).

We identify 50 English prefixes: *ab-*, *anti-*, *arch-*, *be-*, *bi-*, *co-*, *counter-*, *cyber-*, *de-*, *dis-*, *dys-*, *eco-*, *en-*, *ex-*, *extra-*, *giga-*, *hyper-*, *il-*, *im-*, *in-*, *infra-*, *inter-*, *ir-*, *macro-*, *mal-*, *medi-*, *mega-*, *micro-*, *mid-*, *mini-*, *mis-*, *mono-*, *multi-*, *neo-*, *non-*, *out-*, *over-*, *post-*, *pre-*, *pro-*, *proto-*, *pseudo-*, *re-*, *semi-*, *sub-*, *super-*, *trans-*, *un-*, *under-*, *up-*.

It is permissible to assert that the hypothesis of the research work stating that there are prefixes in English that are combined not only with nouns, adjectives, adverbs, verbs, as presented in modern scientific works, but also with gerunds (“*misbehaving*”) and numerals (“*in the mid-1960s*”), is confirmed. It seems possible to present a definition of a prefix: “*PREFIX is a part of a word that is a verb, noun, adjective, adverb, gerund or numeral, which is the integral part to this word being placed before its stem, having one or more meanings, performing an inflectional function of the opposite, negative or other meanings, or it is an integral part to the stem which does not exist without the prefix*”.

To summarize, the solution to the problem of prefixes in English is still, for the most part, in its infancy. No rule can guarantee the unambiguous usage of a particular prefix, which is why the best way to choose the correct prefix for a particular lexical unit is to look them up in traditional dictionaries. The identified and systemically described 50 prefixes can, to some extent, simplify the process of students’ learning English in the field of Morphology in educational institutions of the Russian Federation.

We assume that the presented 50 English prefixes are not exhaustive due to the inability to cover the entire range of English vocabulary because of its constant development. For this reason, we invite all interested parties to join us in a further, more thorough study of this issue.

References

1. Arnol'd I.V. *Leksikologija sovremennogo anglijskogo jazyka. Posobie dlja studentov anglijskikh otdelenij pedagogicheskikh vuzov.* – M.: Izd-vo «Prosveshhenie», 1966. – 342 s.
2. Kachalova K. N., Izrailevich E. E. *Prakticheskaja grammatika anglijskogo jazyka.* — M.: Junvest List, 2000. — 717 s.
3. «Kodifikator proverjaemykh trebovanij k rezul'tatam osvoenija osnovnoj obrazovatel'noj programmy srednego obshhego obrazovaniya i ehlementov sodержaniya dlja provedeniya edinogo gosudarstvennogo ehkzamina po anglijskomu jazyku». 10.11.2023 <https://fipi.ru/ege/demoversii-specifikacii-kodifikatory#!/tab/151883967-11>.
4. «Kodifikator proverjaemykh trebovanij k rezul'tatam osvoenija osnovnoj obrazovatel'noj programmy osnovnogo obshhego obrazovaniya i ehlementov sodержaniya dlja provedeniya osnovnogo gosudarstvennogo ehkzamina po anglijskomu jazyku». 10.11.2023 <https://fipi.ru/oge/demoversii-specifikacii-kodifikatory#!/tab/173801626-11>.
5. *Manshtejn” S.A. Iljustrirovannyj kurs anglijskogo jazyka. Petrograd”.* Tipografija Trenke i Fjusno, Maksimilianovskij per., № 13. 1916. – 157 s.
6. *Proekt s uchastiem razrabotchikov KIM EGEh. Tipovye ehkzamenacionnye varianty. Pod redakciej M. V. Verbickojj. - Nacional'noe obrazovanie. M.: 2000.* 367 s.
7. *Reformatskij A.A. Vvedenie v jazykovedenie/Pod red. V. A. Vinogradova. - M.: Aspekt Press, 2000. - 536 s.*
8. *Kaushanskaja V. L. i dr. Grammatika anglijskogo jazyka (Na anglijskom jazyke).* — 4-e izd., L.: «Prosveshhenie». Leningradskoe otделение. 1973. — 319 s. *Eastwood John. Oxford Practice Grammar. Oxford University Press. 2011. – 439 p.*
9. *Margaret Matthews, Katy Salisbury. IELTS Plus 3 Practice Tests. Pearson. 2011. – 192 p.*
10. *Michael Clutterbuck, Phillip Gould, 2005, 2011. Focusing on IELTS: General Training Practice Tests. 2nd ed. McMillan. – 176 p.*
11. *Prodromou Luke Grammar and Vocabulary for First Certificate. Pearson Education Limited. 1999. – 319 p.*
12. *Side Richard and Wellman Guy. Grammar and Vocabulary for Cambridge Advanced and Proficiency. Pearson education Limited. 2002. – 288 p.*

13. *TOEFL iBT Prep Plus 2020-2021. 4 Practice Tests.* Kaplan. 2019. – 294 p.
14. *Vanessa Jakeman, Clare McDowell. IELTS Plus Practice Tests.* Pearson Longman. 2001. – 176 p.
15. *Abby Lingvo.* <https://www.lingvolive.com/en-us>.
16. *Macmillan English Dictionary,* 2006. – 1693 p.
17. *Multiran.* <https://www.multitran.ru/c/m.exe?l1=1&l2=2&s=effectual>.
18. *Muller V.K. English-Russian dictionary, 70,000 words and expressions.* St. Petersburg, “Akademicheski proekt”, 1996.
19. *Prompt online.* <https://www.translate.ru/>.
20. <https://en-oge.sdamgia.ru/>.
21. <https://en-ege.sdamgia.ru/>.
22. <https://fipi.ru/>.

尝试通过 F. Nietzsche、O. Spengler、P.A. Sorokin 和 I.A. Ilyin 对火的哲学解释的棱镜来理解现代文化的状态

**AN ATTEMPT TO COMPREHEND THE STATE OF MODERN
CULTURE THROUGH THE PRISM OF PHILOSOPHICAL
INTERPRETATIONS OF FIRE BY F. NIETZSCHE, O. SPENGLER,
P.A. SOROKIN AND I.A. ILYIN**

Moiseenko Tatyana Nikolaevna

Postgraduate student

Chelyabinsk State Institute of Culture,

Chelyabinsk, Russia

摘要: 文化范式变迁的每一个历史阶段, 都在思想家和哲学家的心灵深处引起深刻的共鸣。他们试图找出衰落的原因, 并对文化的发展作出一定的预测, 他们不止一次地将火作为最具争议的现象。基于其属性特征, 文化哲学概念的作者能够识别出最紧迫的问题, 并确定文化能够摆脱危机状态的分叉点。向更新的另一个发展水平迈进。通过对F.尼采、O.斯宾格勒、P.A.索罗金和I.A.伊林的作品分析, 以及对他们相关文化状态的理解, 表明将火作为表征21世纪文化状态具有完全启发性的价值。

关键词: 文化, 文化危机, 火, 哲学。

Abstract. *Each historical stage of the change of cultural paradigms found a deep response in the souls of thinkers and philosophers. Trying to identify the causes of decadence and give a certain forecast for the development of culture, they more than once turned to fire as the most controversial phenomenon. Based on its attributive characteristics, the authors of cultural-philosophical concepts were able to identify the most pressing problems and determine the bifurcation points through which culture can emerge from the state of crisis. Move to another level of development updated. Analysis of the works of F. Nietzsche, O. Spengler, P.A. Sorokin and I.A. Ilyin, concerning the understanding of the state of culture relevant to them, showed that turning to fire has a completely heuristic value for characterizing the state of culture in the 21st century.*

Keywords: *culture, crisis of culture, fire, philosophy.*

Analysis of the conceptualization of fire in the history of culture and philosophical thought [1,2,3,4,5,7,8,9] showed that theoretical understanding of the

phenomenon of fire allowed to form such a construct (image, symbol, notion and concept), by means of which all processes and phenomena occurring not only in the natural world, but also in culture (this “second nature”), as the objective world of man, were explained. In general, fire is one of the most powerful symbols in the history of culture, which has always been associated with strength, vital energy and destruction. And the extent of its presence in culture (in all senses) indicated the active functioning of its “living” (“fiery”) principle [7], the forms in which it manifests itself, marking the current existence of culture and allowing to predict the directions of its development. From this point of view, fire can be spoken of as a kind of cultural constant, around which the space of culture (its being, content, modes of functioning, etc.) was formed with necessity and according to specific laws. In the context of philosophical interpretations of fire, the constancy of the latter is emphasized by its role as an “image-paradigm” (in the terminology of A.D. Okhotsimsky) [2] around which the space of culture is formed in the thinking of this or that philosopher and through the prism of which one can give a characteristic of the actual being of culture.

Despite the fact that there is no direct understanding of the being of culture in the context of its “living” (fiery”) beginning in the history of philosophy, one can distinguish a number of such concepts in which the philosopher turns to fire to characterize the essence of culture, its specific content, functioning and predicting the direction of its further development. As an example, the most “fiery” (in the opinion of the author of the article) cultural-philosophical concepts of F. Nietzsche, O. Spengler, P.A. Sorokin and I.A. Ilyina.

It should be noted that each of the philosophers mentioned approached the interpretation of fire from a purely personal understanding of culture, living conditions, and within the framework of the current worldview. But it was fire, or rather the ways of interpreting it and the options for representing it, from the perspective of cultural issues, that became the unifying point that determined the author’s thesis (developed within the framework of the dissertation research by the author of the article) - culture is alive with fire.

F. Nietzsche, one of the most influential philosophers of the 19th century, uses the metaphor of fire to reflect the concept of spiritual and cultural transformation. Noting the crisis of contemporary culture, Nietzsche called for liberation from traditional values and the creation of new ones, like fire that burns away the old to make room for the new. He constantly speaks of the “purifying spirit of Fire” (FOOTNOTE), in which it is necessary “to burn the old tablets in order to write new ones” [10]. Developing his own ideas within the framework of the distinction between the Apollonian and Dionysian principles in culture, he sees the cause of decadence as the predominance of the Apollonian principle in the form of “saturation” with reason. From his point of view, culture is at the “lowest point of viabil-

ity”. This is a fire that burns, but loses fuel. It needs a new “igniting” impulse, the role of which in F. Nietzsche is played by the optimistic breakthrough of creative individuals beyond the inertia of Apollonian norms and rules [10].

The state of culture in the 21st century in the context of Nietzsche’s ideas clearly reveals the successes of man in realizing individual creative impulses, the “will to power”. And especially the “will to power”, but in the literal sense. On the face of it - a dangerous game with Dionysian fire: corruption, extremism, totalitarianism, terrorism. The dance of mad Vita in all its glory. Whether humanity has managed to “cure the disease” of culture, which the philosopher once wrote about, is a big question.

But if Nietzsche advocated the creative power of fire, then O. Spengler saw in fire a symbol of a dying culture. In his concept, the symbol of fire, on the one hand, carries creative energy (something must start the process of birth), on the other hand, it symbolizes the end of the life cycle of culture and its transition to the phase of decay. Having reached its apogee – civilization, culture has squandered its “spiritual forces”: against the backdrop of scientific and technological achievements, the ideals of beauty, goodness, and the sacred have disappeared... “The soul of culture is dying out,” writes Oswald Spengler in his work “The Decline of the West” (1918-1922) [11]. The onset of the era of decline for Western culture, based on the philosopher’s reflections, can be compared to a dying fire that cannot be revived. Thus, for O. Spengler, the life of any culture (in its specific content) is a one-way ticket. And the dying fire is the harbinger of a new culture. But P.A. Sorokin absolutely disagreed with this, proposing to consider the existence of culture as a kind of cycle of cultural events (“supersystems” or phases). In this cycle, culture practically shares the fate of the flame, “flaring up in measures and dying out in measures,” changing with dramatic speed. The philosopher sees the reason for this in the constant transformation of the world of meanings and values. This process, at a certain point, flares up to the limits of a “world fire” [12]. It reaches the scale of a catastrophe (in the sense of P.A. Sorokin), changing the content of culture. And the future of culture directly depends on how humanity will manage to survive the “fire of catastrophe”, what cultural mechanisms for maintaining a living value principle in culture will be used. Its stability in one or another phase of development, its viability as a whole. Such a model of cultural existence is a flame passing from one state to another. And at each stage, each time, adaptation to new realities is necessary, which means there will be a new contradiction between traditions and innovations, between the material and the spiritual, between the rational and the ideal, between values and anti-values. And these contradictions are not only in the external world, in the culture itself, they constantly flare up in the spiritual sphere - the inner world of the individual. I.A. wrote about this in his time. Ilyin, focusing on the “secret fires of life” that were given to each person “in-

dividually”, and which “... bring us purification and call us to new forms of being” [13]. Mastering this fire is the essence of the realization of one’s own “optimistic” breakthrough, creative potential, a priori designated in man by his nature. In such a context, the concept of “inner fire” acquires ontological and at the same time existential meaning, “capturing” in its content that beginning that defines man in his essence as a creator of culture.

The general characteristics and tendencies of the culture of the 19th and 20th centuries easily fit into the “Procrustean bed” of such a concept as chaos: a global crisis of art, a crisis of art, a crisis of ideological, ethics and law, and as a consequence, a “revolt of the masses”. Two world wars, revolutions and a number of various local conflicts, all this left a significant mark and made the culture “blaze”. And this flame found a response in the minds and souls of philosophers and thinkers, expressed in the context of the figurative and symbolic interpretation of fire. The “native” archetypal image allowed not only to draw a “live” and understandable picture of the crisis of culture, but also to indicate the most burning problems that he had to face and that must be overcome to take a step into a better future.

History shows that each time a new cultural practice or skill appeared, it meant that another spark had flared up, was noticed and put to use. However, it was also the other way around, when outwardly clearly visible phenomena, events, etc. did not lead to elevation, did not warm. The first (genuine sparks) include the flourishing of art during the Renaissance, the literature of the Silver Age, the exploration of outer space, Soviet culture, etc. The modern course towards the revival/revitalization of the national-traditional is also a vivid example of that living spark that for centuries has provided people with cultural identity, and culture has demonstrated its ability to exist sustainably, to spread in various forms and phenomena, expanding the human world. Indeed, the models, concepts and structures of ancient wisdom, melted down in the crucible of scientific and cultural creativity, are today turning into new original ideas. In the space of modern culture, the most “energy-saturated” (“fiery”) phenomenon is informatization, which has affected almost all spheres of human activity: both material and spiritual, thereby radically changing not only the human world, but also the cultural world.

The second, which we will designate as “false fires”, can include various outbursts of “barbarism”, both in our usual understanding of this word, and in the senses that N.V. Motroshilova speaks about [14].

To summarize, we can say that the existence of culture in the past two centuries was formed in the context of such “fiery” metaphors as “disease”, “extinction”, “world fire”, etc., while the trends of culture in the 21st century are increasingly finding expression in the category of “speed”. It is increasingly difficult to find a “quiet place” and “slow time”. An incessant flow of innovations, rapidly changing trends, changing worldviews, the destruction of established cultural norms

and attitudes. Man is increasingly captured by new objectifications, he drowns in the diversity and multiplicity of phenomena of modern culture (especially mass culture). The huge, overgrown world becomes alien to man, unmasterable, subordinating him to his own logic. We increasingly miss new lights that can ensure the viability of culture, flying like mayflies to the bright flame of “false fires”. Because it is easy, because you do not need to think, you do not need to make any impulses. Because it is bright and does not burn. Today, it is quite acceptable to talk about Christian values, while justifying terrorism (the actions of the Vatican in the context of the Ukrainian military conflict). To look favorably on inhuman cynicism; the crisis of the institution of the family. What is today’s popularization of LGBT ideology worth, which is actively promoted by Western culture. All this is a vivid example of a culture whose flame is losing fuel. And in an attempt to save it, society is ready to throw anything into the furnace, as long as it differs from the established values. If only it would burn, and the flame would attract more and more moths. Today, human abilities to adequately perceive, evaluate, preserve and create basic universal spiritual and cultural values are subject to ever greater atrophy. And all this against the backdrop of ever greater technological breakthroughs aimed at improving human living conditions, multiculturalism (in its positive sense), freedom of creative self-realization and other phenomena that so vividly burst into the world of man, the world of culture. But if we add to this the aggravated geopolitical and interethnic conflicts, the global crisis of society, the depletion of irreplaceable resources (including human ones), then everything is conducive to the entire objective world of man cracking at the seams, and the culture of the 21st century is once again and inevitably heading towards death. To the extinction of the fire of culture.

So, was O. Spengler right and civilization really “kills the soul” of culture? And the freedom of the Dionysian spirit, which Nietzsche spoke about, is no longer a blessing and in this “fiery dance of Vita” culture dissolves... At each stage of its historical development, culture has been on the brink more than once. At the moment of each ideological revolution, culture felt a decline in morals, values, the disintegration of society. But each time, having passed through the “fire of the experienced catastrophe” (in the sense of P. Sorokin), culture stepped over this threshold and moved on renewed. But what this “further” will be directly depends on what the culture’s “today” is. But both poles of the existence of culture, as a factor of its viability, depend on man - this is what we need to remember. Not God, not any other Demiurge, Absolute or One will not give us our future if we ourselves do not imbue ourselves with it with all our hearts. We will not respond with that “inner fire” that I.A. Ilyin. The main thing is, while carefully looking at modern culture, not to miss what exactly the genuine lights that ensure the viability of culture are lit in. But not just to notice, but also to pick up, use these lights,

change the world of man, expanding and improving the cultural world, providing man with even more opportunities to reveal his creative individuality for the common good and for the sake of life.

References

1. Moiseenko T.N. *Understanding the phenomenon of fire: relevance of new knowledge (philosophical reflection)* / T.N. Moiseenko // *Materials of the International Conference “Scientific research of SCO countries: synergy and integration” – Repost in English? April 26, 2018/ Beijing, PRC – Minzu University of China, 2018; Scientific publishing house Infinity, 2018; Group of authors, 2018/ - P.43-47*

2. Moiseenko T.N. *Interpretation of the phenomenon of fire in the history of culture and philosophy: from figurative representations to conceptual constructions* / T. N. Moiseenko // *Bulletin of the Chelyabinsk State University. – 2019. - No. 12 (434). Man. Society. Culture. Issue. 54. – Pp. 95-102*

3. Moiseenko T. N. *Philosophical reflection on the foundations of culture as a search for a way out of the crisis of modern culture* / T. N. Moiseenko // *Culture-art-education: materials of the XI scientific and practical. conf. scientific and pedagogical workers of the institute / compiled by Yu. V. Gushul (scientific ed.), S. B. Sinetsky (responsible compiler); Chelyabinsk state institute of culture and arts. - Chelyabinsk: ChGIK, 2019. – Pp. 198-203*

4. Moiseenko T. N. *Understanding the Foundations of Culture in the Context of Philosophical Metaphors of Fire* / T.N. Moiseenko // *Bulletin of the Buryat State University. Publishing House of the Buryat State University Republic of Buryatia, Ulan-Ude Highway, Issue 3, 2020. - Pp. 69-76*

5. Moiseenko T.N. *On the Crisis of Culture in the 21st Century (philosophical reflection)* / T.N. Moiseenko // *Scientific schools. Youth in Science and Culture of the 21st Century: Proceedings of the International Scientific and Creative Forum (Scientific Conference), November 12-13, 2020 / compiled by: S.B. Sinetsky (responsible compiler), A.V. Lushnikova (scientific editor). – Chelyabinsk: ChGIK, 2020. – Pp. 18-20*

6. Moiseenko T.N. *The idea of fire as a “universal key” to understanding the existence of the world and man: mythopoetic and rational-logical methods of interpretation in philosophy* / T.N. Moiseenko // *Bulletin of the Voronezh State University. Series: Philosophy. 2021. No. 3 (41). July-September. – P. 113-121*

7. Moiseenko T.N. *“The fiery principle” as a fundamental basis for philosophical understanding of the existence of culture* / T.N. Moiseenko // *Scientific schools. Youth in science and culture of the 21st century: materials of the international. scientific and creative forum (scientific conference), November 18-19, 2021 /*

compiled by: S.B. Sinetsky (responsible compiler), A.V. Lushnikova (scientific ed.). – Chelyabinsk: ChGIK, 2021. – P.36-39

8. Moiseenko T.N. *Philosophical understanding of the problem of the viability of culture in the context of the energy approach* / T.N. Moiseenko // *Scientific schools. Youth in science and culture of the 21st century: materials of the international. scientific and creative forum (scientific conference), November 24-25, 2022* / compiled, scientific editor Yu.V. Gushul; Chelyabinsk state in-t of culture. – Chelyabinsk: ChGIK, 2022. – P.14-17

9. Moiseenko T.N. *Heuristic Potential of the Diversity of Interpretations of Fire as a Basis for Understanding the Existence of Culture* / T.N. Moiseenko // *Higher School: Scientific Research. Proceedings of the Interuniversity International Congress (Moscow, August 18, 2022)*. - Moscow: Infinity Publishing House, 2022. – P. 32-36

10. Nietzsche F. *Thus Spoke Zarathustra* / F. Nietzsche. *Works in 13 volumes, v. 4.*, Cultural Revolution Publishing House. Moscow, 2007. – 432 p.).

11. Spengler O. *The Decline of Europe: Essays on the Morphology of World History* / trans. N.F. Garelin. Vol. 1. *Image and Reality*. Minsk: Popurri, 1998. – P. 688

12. Sorokin P.A. *Crisis...Catharsis...Charisma...Resurrection...* / P.A. Sorokin. [Electronic resource] Trans. V.V. Sapova // *Bulletin of the Russian Academy of Sciences*, 1999. Vol. 69, No. 3. URL: <http://www.ras.ru/> date of access 05/23/2020

13. Ilyin I.A. *The Path to Obviousness. Essay M.: ZAO Izdatelstvo Eksmo-Press*, 1988. (Series Anthology of Thought), 912 p. - P. 611

14. Motroshilova N.V. *Civilization and Barbarism in the Modern Era [Text]* / N.V. Motroshilova; Russian Academy of Sciences, Institute of Philosophy. – M.: IF RAS, 2007. – 268 p.

DOI 10.34660/INF.2024.47.11.040

UDC: 130.2

上海合作组织文化政策体系：以科学发展战略维护国家中心主义国际关系体系的机制

THE SYSTEM OF CULTURAL POLICY IN THE SCO: A STRATEGY OF SCIENTIFIC DEVELOPMENT AS A MECHANISM FOR PROTECTING THE STATE-CENTRIC PARADIGM IN THE SYSTEM OF INTERNATIONAL RELATIONS

Marzoeva Angelika Vladislavovna

Postgraduate

Russian State Social University,

Moscow, Russia

摘要。本文讨论了上海合作组织（SCO）制定统一文化政策的必要性。建议设立一个专门机构负责目标制定、管理和协调。分析了上合组织文化合作的主要方向，以及该组织在文化互动过程中可能面临的潜在挑战，包括身份问题和克服政治冲突。强调文化政策是全球化背景下加强参与国之间联系的重要工具，全球化被视为全球治理框架内的战略规划构想，旨在取代国际关系中的“国家中心”范式。

作者得出结论，上合组织的文化政策可以成为对抗全球化的关键机制，其中文化研究充当了纽带，为制定有效的文化战略和举措提供了科学依据和方法论支持。因此，上合组织不仅有潜力抵制全球化，而且有潜力成为文化多样性的引擎，为加强各国人民之间的联系和创造一个更加公正和可持续的世界做出贡献。本文将引起国际关系领域研究人员的兴趣，他们试图在多边组织框架内制定有效的文化战略和举措。

关键词：上海合作组织（SCO）、文化政策、文化、全球化、文化主权、文化认同。

Abstract. *This article discusses the need to develop a unified cultural policy for the Shanghai Cooperation Organization (SCO). It is proposed to establish a specialized body responsible for goal setting, management and coordination. The main directions of cultural cooperation within the SCO are analyzed, as well as potential challenges that the organization may face in the process of cultural interaction, including issues of identity and overcoming political conflicts. It is emphasized that cultural policy is an important tool for strengthening ties between participating states in the context of globalization, which is considered as a construct of strategic planning within the framework of global governance, aiming to displace the “state-centered” paradigm from international relations.*

The author concludes that the SCO cultural policy can become a key mechanism for countering globalization, in which cultural studies acts as a link

providing scientific justification and methodological support for the development of effective strategies and initiatives at the cultural level. Thus, the SCO has the potential not only to resist globalization, but also to become an engine of cultural diversity, contributing to strengthening ties between peoples and creating a more just and sustainable world. The article will be of interest to researchers in the field of international relations seeking to create effective cultural strategies and initiatives within the framework of multilateral organizations.

Keywords: *Shanghai Cooperation Organization (SCO), cultural policy, culture, globalization, cultural sovereignty, cultural identity.*

Introduction. In the context of globalization, the world is characterized by an active exchange of information, as well as cultural and economic resources between different countries. In this regard, organizational structures such as the Shanghai Cooperation Organization (SCO) face a number of challenges, since globalization, as a project, poses an existential threat to local cultures, which are at risk of losing their national identity and cultural sovereignty. It is necessary to understand that globalization is a construct of strategic planning of the Anglo-Saxon civilization, which aims to displace the “state-centric” paradigm from the system of international relations. This project is aimed at transforming the Westphalian structure of the world order into new, more complex forms [1], in favor of the formation of a transnational structure, “the key components of which form the transnational capitalist class and the transnational state” [2]. Against this background, there is a need to develop strategies that will be aimed at protecting and preserving the cultural identity of each of the parties. The cultural policy within the SCO should take into account the identities of the member countries – China, India, Russia, Kazakhstan and other countries of Central and East Asia. At the same time, the SCO participants are states with diverse cultural traditions and historical contexts, which necessitates the development of a joint cultural policy that promotes cooperation and mutual understanding. In other words, we propose introducing a new concept of “SCO cultural policy”, which should be adaptive to the tasks of the strategic management system aimed at counteracting the “erosion” of the borders of sovereign states in the context of globalization. This requires an analysis of the cultural contexts and social realities of each country, as well as the development of mechanisms for the practical application of cultural strategies and initiatives. The SCO has a unique opportunity to create a single platform for the exchange of cultural values and ideas, which can contribute not only to strengthening interstate ties, but also to increasing the level of trust between peoples. The need for joint efforts is due to many factors, such as historical conflicts, cultural differences, economic interests, which can lead to misunderstanding or tension. In addition, it is important to fill the gap in the scientific content of the key instrument

of cultural policy. We are talking about cultural studies - a science that has been divided into fundamental and applied. For example, the phenomenon of culture in Western Europe and America (English-speaking countries) is understood mainly in the socio-ethnographic sense. Cultural studies as a separate science is not distinguished here. Cultural anthropology is considered the main science. Research methodologies in cultural studies and cultural anthropology differ significantly. Cultural studies usually use interpretive approaches that allow analyzing cultural phenomena through the prism of theoretical concepts. Cultural anthropology, on the contrary, relies on empirical research based on real observations. Anthropologists strive for a deep understanding of cultural practices, including customs, beliefs and rituals, which allows them to more accurately explain the behavior and interaction of people in a certain cultural environment. Depending on the goals and subject areas, the level of knowledge and generalization, fundamental and applied cultural studies are distinguished. We conclude that cultural anthropology includes fundamental cultural studies, turning the subject of research into a tool for project management.

In addition, the development of cultural science in English-speaking countries is associated with an innovative approach to the object of study – society, within which culture began to be considered as a means of forming a worldview, with the aim of introducing a new form of identity and political self-identification in specific social contexts. It is for this reason that globalization has a powerful potential that affects all spheres of activity. To achieve the set goals, a number of ideas and concepts have been developed and implemented within the framework of the global governance system called “globalization”. Among them: cosmopolitanism, transnationalism, Westernization, the Commonwealth of Nations, cultural and ideological hegemony, modernization, the UN, the European Union, multiculturalism, cultural globalization, global citizenship, soft power, unification of cultures, cultural diplomacy, international community, mass culture, sexual revolution, world-systems analysis, the LGBT movement, the theory of complex interdependence, comprehensive security, consumer society, as well as international terrorism, the clash of civilizations, the end of “history and the last man”, etc. All of the listed concepts are projects of the cultural policy of the Anglo-Saxon civilization, which is carried out both on the domestic and foreign policy contours. Moreover, these projects are associated with such transnational crimes as: “aggression of some states against others, apartheid, genocide, ecocide, use of weapons of mass destruction, espionage, racism, neo-Nazism, chauvinism, separatism, and terrorism” [3]. The implementation is carried out in the context of “a historically passed stage of human development under the slogan of value against sovereignty” [4], which reflects the goal-setting of the global project to reconstruct the Westphalian system of world order. And here we agree with the statement that

“it was globalization that led to the maximum decline in the role of the state, both in the economy and in international relations” [5]. As the Russian historian A. I. Fursov asserts: “... the national state with all its attributes is simply inadequate to the world of neoliberal globalization” [6]. We consider cultural policy within the framework of the Shanghai Cooperation Organization as an important aspect of the interaction of the participating countries in the context of globalization. The complexities associated with cultural diversity, conflicts of interest and political constraints require a balanced approach to the formation of a common strategy. Cultural studies in the context of the SCO should become an important tool for the formation of a positive image of the member countries in the international arena, as well as for solving internal social and cultural problems. The evolution of approaches to cultural policy within this organization can serve as an example for other regional associations seeking to harmonize relations between cultural traditions and modern challenges. We conclude that the SCO has a unique potential for developing a strategy capable of countering the negative consequences of globalization, since the member countries of this organizational structure are one of the few forces capable of developing alternative approaches to global challenges in the context of increasing globalization, when the cultural and political norms of Western civilization dominate. Against the backdrop of growing political and economic instability in the world, the SCO countries can use their cultural resources as a means of strengthening their positions in the international arena. In the context of global challenges such as cultural homogenization and the loss of traditional values, the SCO can act as a platform for exchanging experience in the field of cultural policy. Interaction between member states should be based on the principles of mutual respect and equality, which will allow for the diversity of cultural contexts and traditions to be taken into account. This creates the pre-conditions for the introduction of innovative approaches to the development of cultural strategies, as well as the integration of new cultural forms that promote social unity.

The SCO member states may have different priorities in cultural policy. Some states may focus on preserving traditional culture, while others may strive for more modern approaches. This may complicate the process of developing coordinated initiatives. Countries with different levels of economic development may experience difficulties in implementing initiatives. More developed states, as a rule, have more powerful financial and higher-quality educational resources for the implementation of cultural programs, while less developed countries may not have such opportunities. Issues of political censorship and control over cultural expression may influence the cultural policy of the Shanghai Cooperation Organization. The diversity of approaches to freedom of speech and culture in the member states may become a serious obstacle to effective interaction. In addition, it is

necessary to take into account the influence of global trends, such as digitalization and migration, which are changing the cultural landscape. In a rapidly changing world, cultural standards and forms of expression are also changing. This may lead to the need to adapt the SCO cultural policy to new realities, which in turn requires flexibility and willingness to compromise from the member states. This means that one of the key tasks of the Shanghai Cooperation Organization is to create a mechanism for cultural exchange that can strengthen mutual understanding and cooperation between the member states. In particular, it is advisable to create a single governing body responsible for goal-setting, management and coordination. Conclusion. We should not underestimate the potential for cooperation in countering globalization, which is considered as a global governance project in which the Anglo-Saxon civilization plays a key role. The SCO has every chance of becoming a platform for exchanging cultural practices, ideas and organizing joint events aimed at developing effective strategies not only in the field of economic and military interaction. Initiatives within the SCO can contribute to the creation of a common cultural space based on mutual respect and understanding. International dialogue aimed at eliminating stereotypes and possible tensions in mutual understanding is a key aspect of an effective SCO cultural policy. Cultural studies, as an interdisciplinary science, plays the role of a connecting link here, providing scientific substantiation and methodological support for effective interaction at the cultural level. Thus, the SCO, through the development of a systemic cultural policy and the active use of cultural studies, has the potential not only to resist globalization, but also to become an engine of cultural diversity, helping to strengthen ties between peoples and create a more just and sustainable world.

References

1. Marzoeva, A. V. *Improving Russia's cultural policy in the context of globalization. Part 1.* – DOI 10.34685 / HI.2024.78.53.013. – Text: electronic // *Cultural Studies Journal.* – 2024. – No. 2. – P. 10-16. – URL: http://crjournal.ru/rus/journals/649.html&j_id=60.
2. Komar Yu. I. *Globalization – global capitalism? (Abstract review) – Text of the scientific article on the specialty “Economics and business” // Globalization and the Afro-Asian world. Methodology and theory.* – 2008. – P. 63-107.
3. Shalagin A.E. *Transnational crime: concept, features, countermeasures / A.E. Shalagin // Bulletin of Economics, Law and Sociology.* – 2016. – No. 3. – P. 138
4. Guzikova, M. O. *Values versus sovereignty: the state in the “world community” / M. O. Guzikova // Scientific dialogue.* - 2013. - No. 1 (13): *History. Sociology. Economy.* - P. 93-109.

5. Kharybin A.N. *The impact of globalization on the sovereignty of the state // Politics and Society*. 2021. No. 4. P. 38-43. DOI: 10.7256/2454-0684.2021.4.33439 URL: https://nbpublish.com/library_read_article.php?id=33439

6. Fursov A.I. *Man-made crisis*. URL: <https://libking.ru/books/sci-/sci-culture/104053-andrey-fursov-rukotvornyy-krizis.html>

DOI 10.34660/INF.2024.78.58.041

当代中国学院音乐：论作曲家贾达群的创作原则
CONTEMPORARY CHINESE ACADEMIC MUSIC: ON CREATIVE
PRINCIPLES OF COMPOSER JIA DAQUN

Polosina Anastasia Igorevna

Peter the Great St. Petersburg Polytechnic University,

Applicant

The N. A. Rimsky-Korsakov Saint Petersburg State Conservatory

摘要：本文旨在对中国当代学院音乐文化现状及音乐家贾达群的艺术进行回顾，介绍贾达群的活动领域，并概括其在中国当代学院音乐发展中所扮演的角色。贾达群是当代中国作曲家中具有独特艺术特色的代表人物，他不仅是一位作曲家，更是一位艺术家、音乐学家、教育家和哲学家。贾达群的音乐作品中蕴含着中国民族元素，包括中国乐器、民间音乐主题、五声音阶和中国文化意象等。

关键词：中国音乐、音乐汉学、中国当代作曲家、中国作曲家流派、新中国音乐、贾达群。

Abstract. *The article is devoted to a review of the current state of academic Chinese musical culture and the art of musician Jia Daqun (贾达群). The author introduces Jia Daqun's areas of activities and characterizes the role of the composer in the development of Chinese contemporary academic music. Jia Daqun represents contemporary generation of Chinese composers with own features of art, he showed himself not only as a composer, but also as artist, musicologist, teacher and philosopher. Musical compositions of Jia Daqun contain national Chinese elements, which are represented by Chinese musical instruments, folk musical themes, pentatonic scale and images of Chinese culture.*

Keywords: *Chinese music, musical sinology, contemporary Chinese composer, Chinese composers' school, new Chinese music, Jia Daqun.*

Nowadays interest in China grows up all over the world due to the active development of country in all spheres including culture. Since the 20th century, Chinese artists actively started to investigate Western culture and synthesize foreign traditions with Chinese national elements. In the first decades of the 20th century, European and Russian musicians immigrated to China and taught Chinese people music with strong influence of European education system. Thus, the first Chinese conservatory based on the Western educational system was founded in Shanghai

in 1927. By now, there are already above 10 conservatories in China, it shows that professional music education in country rises. Also, within one century many orchestras based on Western tradition, music schools and courses, music faculties of universities appeared in China.

The period from the 1910^s in China is characterized by the beginning of the «New Culture Movement» («新潮»). At that time, in China was published a magazine with the same title, which featured articles about Western music. The «New Culture Movement» gained its most active development after the end of the Cultural Revolution, since 1976. Musician-researcher, the author of the first Russian-language monograph about Asian music U Gen-Ir calls the period from 1911 to the present day in China «Music of the Newest Time» [5, p. 23]. Russian researcher Anna Danilova in her article «The Chinese School of Composers: Traditions and Modernity» notes that the music of Chinese composers created since the mid-20th century is called «New Chinese Music». Period from 1976 (after the end of the Cultural Revolution) to the present is called the «period of openness», as it is associated with political reforms and the openness of China [1, pp. 20-22]. Chinese Composers actively started to study Western music and modern techniques of musical composition. After the Cultural Revolution in China, the «iron curtain» was opened, many Chinese musicians went to study in European countries, the United States and Russia. Some of them returned to China to continue their careers and teach new generations of musicians. Among Chinese musicians who created music during the «period of openness» and continue compose nowadays special role belongs to Jia Daqun.

The art of Jia Daqun is widely known in countries of Europe, Asia and the USA. Jia Daqun was born in 1955 in the city of Chongqing in southwest China. Firstly, he started to be in contact with art through traditional Chinese painting and calligraphy. Jia Daqun studied at the Sichuan Fine Arts Institute for eight years. Chinese national fine art influenced him as musician, from painting he borrowed the principle of lines and forms to his musical compositions, he carefully presents graphics of scores. During childhood in Chongqing, Jia Daqun was interested in Chinese music, traditional local genres of the Sichuan province. He was greatly impressed by Sichuan Opera Chuanju (川剧), Beijing Jingxi opera (京戏) performed by the famous Lijiaban troupe (厉家班), which was organized in Shanghai but moved to Chongqing after the Sino-Japanese War. Many of Jia Daqun's compositions reflect impressions from theatrical performances and memories of his homeland: this is manifested in the titles of his compositions, the borrowing of some authentic folk musical themes, the use of traditional musical instruments participating in opera performances, as well as the strengthening of the role of percussion instruments, which is characteristic of Chinese operas.

Jia Daqun's interest in music was particularly strong in the 1970^s. After the Cultural Revolution, the study of Western music in China was again permitted.

It allowed Jia Daqun to study European musical repertoire, Western music theory and the basics of composition. He graduated from the Sichuan Conservatory of Music where he studied composition with musicians Huang Wanpin (黄万品, bachelor degree) and Gao Weijie (高为杰, master degree). Jia Daqun's dissertation «Structural Counterpoint» was highly praised by the government commission and subsequently expanded upon in his theoretical monographs. Jia Daqun came to the creation of an original concept for analyzing music, it is reflected in his theoretical works: «Composition and Analysis. Musical Structure: Morphology, Configuration, Counterpoint and Duality» (《作曲与分析. 音乐结构: 形态、构态、对位以及二元性》) [2] and «Poetics of musical structure — selected musical configuration issues» (《结构诗学—关于音乐结构若干问题的讨论》) [3]. Jia Daqun proposes a theory of structural analysis; he considers musical compositions as a set of structures that are in a multitude of interrelations. The multi-level nature of musical structures determines the integrity of a composition. Jia Daqun uses such concepts as structural states, structural functions, structural alignment, structural layers, and natural structural state. It is associated with the idea of the deep layer of the initial primary structure of a musical composition called «Ursatz» by Heinrich Schenker, whose theory largely inspired Jia Daqun to create his concept and structural hierarchy. Both monographs of Jia Daqun are used in the educational process in China. Jia Daqun sought to combine the theory of composition and practice. He saw necessity for each musician to be able to find a certain analytical approach to compositions of other authors, while expanding their own opportunities during creation of music. According to the researcher, the main goal of analysis is to understand the creative process of composers. Publication of two significant Jia Daqun's monographs was preceded by many years of experience in teaching and performing at master classes, studying existing books on the analysis of musical works of Chinese and foreign authors. Famous contemporary Chinese-born American composer and a peer of Jia Daqun Tan Dun (谭盾) called monograph «Composition and Analysis. Musical Structure: Morphology, Configuration, Counterpoint and Duality» a great achievement of the beginning of the XXI century.

After graduating from the Sichuan Conservatory of Music Jia Daqun started to be a teacher of composition and orchestration in alma mater, was invited to the United States as an honorary professor to give lectures at universities and participate in conferences in European countries. In 1995, Jia Daqun was invited to Shanghai Conservatory of Music as a teacher. Currently he is a professor of composition and music theory at the Shanghai Conservatory of Music, a supervisor of graduate and doctoral students, a member of the Chinese Musicians Association and the Shanghai Contemporary Music Society. Artistic life of Jia Daqun connected with Shanghai, it is a multinational city, in the 20th century it was called «East-

ern Paris», «modern Babylon», and Chinese «window to Europe». The founder of Chinese music education, one of the founders of the Shanghai Conservatory Xiao Yumei invited to the Conservatory leading musicians who previously studied abroad. In the first years of the Conservatory's work, there was a shortage of specialists in the field of European music. It was precisely during this period that there were many foreign musicians and artists in Shanghai, including musicians from Russia. Nowadays Shanghai Conservatory of Music is one of main and leading universities in China. Jia Daqun teaches new generation of contemporary composers with fresh ideas, including new sound possibilities and contemporary techniques.

Jia Daqun is the author of more than 40 mostly instrumental compositions. His multifaceted way of thinking and desire for experimentation are reflected in various compositional solutions, diverse performing line-ups, attention to details of the composer's writing, the graphics of the musical text and paratextual elements, which include the titles of compositions and different author's remarks. Another distinctive feature of the graphics of his scores is the special role of empty space. The concept of emptiness is inextricably connected with the philosophy of Zen Buddhism; emptiness can often be found in many paintings of Chinese artists. Jia Daqun's scores also contain unfilled bars and whole lines, against which the melodic lines or musical structures stand out visually. Another characteristic feature of composer's art is important role of percussion, both traditional Chinese and foreign. The composer also uses «percussion» techniques of sound extraction on other melodic instruments, such as *col legno* on strings, a strike on the valves of brass instruments, clusters on the piano, a strike on the soundboard.

Jia Daqun's art represents a synthesis of traditional Chinese culture with modern composition techniques: seriality, serialism, pointillism, minimalism, micropolyphonic technique, aleatoricism, spatial music. In many of compositions Jia Daqun combines traditional Chinese instruments with European ones, uses national instruments of other countries: Irish flute, tambourine and accordion, cowbells, African drums, Japanese flute shakuhachi, kamancha, tar, duduk, Persian flute nai, Iranian santur, kanun, predecessor of the European lute which called ud, guitar and others. Jia Daqun's main areas of creativity are symphonic and chamber-instrumental music for various ensembles. The composer experiments with the stage position of performers and instruments, their arrangement on stage to create a certain sound in space. His art shows a bright fusion of some techniques, which creates a unique sound. It is noteworthy that Jia Daqun continues to live and work in China throughout his life, contributing to the development of musical culture and science in China.

«...Music is my academic life and spiritual mission. I will continue to pursue and practice in my whole life unswervingly...» [4, p. 2]

Bibliography

1. Danilova A. V. *The Chinese School of Composers: Traditions and Modernity : conference proceedings // Science, education, society: development trends and prospects: materials of the XIII International scientific and practical conference (Cheboksary, February 8, 2019) / editorial board: O. N. Shirokov [et al.] – Cheboksary : Center for Scientific Cooperation «Interactive Plus», 2019. – pp. 20-22. (in Russian)*
2. Jia Daqun. *Composition and Analysis. Musical Structure: Morphology, Configuration, Counterpoint and Duality – Shanghai : Shanghai Conservatory of Music Press, 2016. – 395 p. (in Chinese)*
3. Jia Daqun. *Poetics of musical structure — selected musical configuration issues – Shanghai : Shanghai Conservatory of Music Press, 2009. – 173 p. (in Chinese)*
4. *Traditional Culture & Contemporary Intellect. Concert of Jia Daqun's Chamber Music : [booklet] / Shanghai : Shanghai Music Publishing House, 2018.*
5. U Gen-Ir. *History of Music of East Asia (China, Korea, Japan) : study guide / U Gen-Ir. – Saint-Petersburg : Planet of Music; Lan, 2011. – 544 p. (in Russian)*

关于东西伯利亚新发现稀有鸟类物种的补充数据
**ADDITIONAL DATA ON NEW FINDS OF RARE AND SCANTY
BIRD SPECIES IN EASTERN SIBERIA**

Mel'nikov Yuriy Ivanovich

*Candidate of Biological Sciences, Head of Postgraduate Baikal Museum
Siberian Branch of Russian Academy Science,
Listvyanka setl., Russia*

注释。基于长期研究(1965–2024)，介绍了有关东西伯利亚新发现、非常稀有和小型鸟类的材料。它们基于需要进一步确认的鸟类发现信息。现代材料仍然包含物种登记的参考资料，以及对发现的详细和准确的描述，这些在该地区科学文献中是找不到的。在这种情况下，通常不清楚这些信息来自哪里。很明显，它们应该被排除在该地区的鸟类群之外。然而，过了一段时间，在其他观察时期，人们证实了它们的发现——通常比文献中所述的时间要晚得多。因此，它们以前生活在这个地区的可能性非常高。在许多情况下，可以根据对旧文献的详细分析来确定真相。然而，目前往往无法获得。因此，对此类发现的新确认对于形成研究区域鸟类的完整清单至关重要。本出版物包含的信息有助于编制 20 世纪下半叶至 21 世纪初气候严重变暖时期东西伯利亚鸟类完整清单。

关键词：东西伯利亚、气候动态、鸟类驱逐、新物种及其现状。

Annotation. *Based on long-term research (1965-2024), materials on the findings of new, very rare and small bird species of Eastern Siberia are presented. They are based on information on bird finds that required additional confirmation. Modern materials still contain references to species registrations, rather detailed and accurate descriptions of finds, which are not available in the scientific literature on this region. In such cases, it is usually unclear where this information came from. It is quite obvious that they should be excluded from the bird fauna of the region. However, after a while, there are confirmations of their findings made during other periods of observation – usually much later than those stated in the literature. Therefore, there is a very high probability that they previously lived in this area. In many cases, the truth can be established based on a detailed analysis of old literature. However, it is currently often unavailable. Therefore, new confirmations of such finds are of great importance for the formation of a complete list of birds of the studied region. This publication contains information, the use of which makes it possible to complete the preparation of a complete list of*

birds of Eastern Siberia during the period of severe climate warming in the second half of the XX – early XXI centuries.

Keywords: *Eastern Siberia, climate dynamics, bird eviction, new species and their status.*

Introduction. Currently, the formation of a complete list of birds in Eastern Siberia is complicated by the current climate dynamics – a sharp warming [4, 17-21, 24-25, 27-30, 34, 36, 44, 50-52]. This warming caused a massive outflow of birds from South and Central Asia to the northern borders of their habitats. As a result, the northern regions of Inner Asia were flooded, in the full sense of the word, with new species that had never been observed in this territory before [31, 34]. Another reason for their registration is the very low abundance of many tundra and forest-tundra species on the borders of their ranges. Therefore, their finds during the spring and summer-autumn migrations have the appearance of accidental flights. And only long-term and detailed studies allow us to accurately determine the status of such species.

The formation of a new list of birds of Eastern Siberia is an urgent task of our time. This is especially important because the climate warming here was much stronger ($1.9^{\circ}\text{C}/100$ years) and passed earlier than, in general, in the northern hemisphere of the Earth ($0.7^{\circ}\text{C}/100$ years) [4, 21, 24-25, 30, 32, 44, 51-52]. After 2005, the level of climate warming in the Baikal region decreased sharply and a warming of $0.3\text{-}0.4^{\circ}\text{C}$ is expected for the next 10 years [18]. An abnormally warm summer was observed in 2015 and was accompanied by the development of very strong fires throughout the Baikal region for several years [18, 34]. In this regard, in order to complete the preparation of a complete list of birds of Eastern Siberia during the period of sharp climate warming, an additional analysis of the usefulness of the collected information is necessary. This publication contains information, the use of which makes it possible to complete the preparation of a complete list of birds of this huge region for the specified period - the second half of the XX – beginning of the XXI centuries.

Material and methodology. The general characteristics of Eastern Siberia are described in sufficient detail in several publications and in this case we do not specifically consider [24-25, 27-30, 34]. Detailed studies cover the entire studied region and this allows us to confidently characterize the entire fauna of its birds. However, very rare and scanty species require special approaches for their search and detection. The main survey of the territory was carried out on hiking and boating routes, covering the entire region fairly evenly. Special population counts were carried out at the largest “cold wintering” of shorebirds and waterfowl in the source and upper reaches of the Angara River. In addition, we have collected our own information and survey data on such wintering throughout Eastern Siberia.

The species composition, sex ratio and number of birds were determined both during the periods of spring and autumn migrations, and during their flight to molt (shorebirds and waterfowl). The peculiarities of the distribution of these groups of birds in the water area and coastal zone of Lake Baikal, as well as their numbers, were studied using a specially developed technique on a modernized Yaroslavets type boat [32]. Every year, during the periods of the rise of the main part of the birds “on the wing”, the main part of this lake was surveyed, and since 2023, the entire Baikal was covered by records. The processing of the material was carried out on the basis of methodological approaches justified by leading ornithologists of Russia [42].

The determination of the species composition of birds, the direction of their evictions, and the identification of features of the dynamics of the boundaries of the ranges were carried out using both domestic and foreign special Field-Guides and Reference Books [6, 12, 16, 22, 38, 43, 49, 53]. The obtained materials significantly supplement our knowledge about the avifauna of this region.

Results. Based on the work done, it was possible to establish the dates and places of the first reliable registrations of several species of birds in Eastern Siberia. The following data reveal the features of their registrations and the reasons for the lack of information about them in the modern literature on the fauna of this region.

The Night Heron *Nycticorax nycticorax*. It was registered in Nizhneangarsk on June 04, 1991 (Northern Baikal) by U. Olsson, but the registration is considered erroneous due to the lack of more detailed information, as well as additional indications of a meeting of the species by other researchers [35]. Our work, which was carried out at that time on the lake Baikal, indicate the appearance of some herons bird species atypical for the region during this period of registration. In particular, the Night Heron was discovered by us in a colony of Grey Herons in the delta of the Selenga River back in August 1980. However, it was not possible to shoot it, and the possibilities of photographing were limited, and it was not included in the list of new bird species in this region. The above meeting makes it possible to include this species in the list of birds of Lake Baikal. It occurs on the territory of Mongolia, but nesting has not been proven [53].

The Red-crested Pochard *Netta rufina*. A pair of birds of this species was recorded near the village of Bolshaya Rechka on June 02, 1987 [35]. Most likely, an extremely rare stray species is the nearest place of its registration in the lake Hubsugul [48]. It breeds in Western Mongolia (Orkhon-Selenga district) [9, 53].

The Ferruginous Duck *Aythya nyroca*. Two individuals have been recorded among waterfowl on the lake Bely by village Orongoy on May 20, 2020 [5]. This is the first meeting of the species in Eastern Siberia, but it is a rare spending the summer and flying bird of Western Mongolia [53].

The Baer's Pochard *Aythya baeri*. A very rare stray species of Eastern Siberia. It was recorded once in the floodplain of the Tulunzhi River (five km from Ulan-Ude) on May 07-08, 1974. Seven birds, together with the Garganey *Anas querquedula* (32 birds), fed in dense thickets of Southern Reed *Phragmites australis*. In the same area, one bird (a male in mating attire) was selected from a guard dog [45]. It is found in small numbers on the outskirts of Eastern Mongolia [53], and the main breeding range is located in the Amur River basin and the northeastern outskirts of China [6, 22].

The Himalayan vulture or Kumai *Gyps himalayensis*. This species is easily confused with another species, the Eurasian Vulture *Gyps fulvus*. In this regard, very often encountered birds were redefined several times. Thus, the bird photographed on July 02, 1996 on the Munku-Sardyk ridge (Eastern Sayan) was identified as a Kumai, but then redefined to a Eurasian Vulture [11, 41]. Another finds from the Tazheran steppe of the Olkhon district of the Irkutsk region dated May 21.05. and July 10, 2019 was identified by Irkutsk ornithologists as a Eurasian Vulture [1]. Later, according to the same photographs, the ornithological commission identified this bird as an adult Kumai [39]. Another meeting dated on September 10, 2020 is known from the upper reaches of the Bolshoy Zanginsan river. Here, a very light bird feeding on a fallen horse among 10 Black Vulture *Aegypius monachus*, was confidently identified as a Kumai by a hunter according to Field Guide "Bird of Siberia" [10, 43]. Assessing the encounters of these species in Eastern Siberia, it must still be recognized, as other authors also point out [10, 39], that in Eastern Siberia, the Kumai rather than the Eurasian Vulture is more likely to occur. Kumai is quite widespread in Mongolia and even breeds narrowly locally, and the Eurasian Vulture is almost not found here [11, 39, 53].

The Bearded Vulture *Gypaetus barbatus*. A very rare species of birds of prey in Eastern Siberia. Flights are known to the Bodaibinsky district of the Irkutsk region, to the interfluvium of the Lower Tunguska and Lena rivers (1902), to the valley of the Chara River at the mouth of the river Zhuya (the vicinity of the village of Ust-Zhuya) in 1942 [7, 13-15]. In Eastern Siberia, it is found in Tofalaria (Eastern Sayan). Here he was registered at the top of the Uda river on its right tributary of the Chelo-Mongo river on August 29, 1961. It occurs according to pp. Nyandarma, Karas and at the source of the Kazyr [15]. The extraction of the Bearded Vulture in the upper reaches of the Uda River in the 90s of the last century is known. Later, on March 24, 2012, it was noted at the Sandy Pass in the left-bank bend of the river Uda [23]. At the end of June 2016, it was registered on the border of the Irkutsk Region and the Republic of Buryatia in the upper reaches of the Ehe-Gol River (a tributary of the Kitoy River) [41]. According to B. Nimbayar, a young Bearded Vulture tagged with a transmitter in the summer of 2018 explored the entire high-mountainous part of the Barguzinsky ridge, including the Chivy-

rkuisoye plateau, and then flew into the Bodaibo district of the Irkutsk region to the Altan-Yan ridge, south of the city of Bodaibo [2, 41]. It breeds in Southern and Central Mongolia [53], from where it obviously flies to Eastern Siberia.

The Chukar *Alectoris chukar*. This species is given in V.V. Podarevsky's monograph [37] for the vicinity of Munku-Sardyk (the border region between Russia and Mongolia in the upper reaches of the Irkut River). However, this fact is disputed by almost all researchers. Indeed, at present, the range of the species does not reach this section of the Eastern Sayan far [12, 49, 53], being located noticeably to the south. At the beginning of the last century, the number of Galliformes birds was significantly higher, which does not exclude its habitat on the northernmost border of its range. The Chukar is not listed in the list of birds of Eastern Siberia [14], however, in the adjacent territory of Mongolia in the southern mountain systems it is included in the fauna and has a fairly large range [12, 49, 53], although its distribution does not reach the border with Russia. Currently, this event seems unlikely. Nevertheless, taking into account the materials of V.V. Podarevsky [37] and the very original coloring that facilitates its definition, as well as the survey data we received from hunters in the second half of the XX century, it is quite possible for its long-range flights to this territory.

The Ring-necked Pheasant *Phasianus colchicus*. In the list of birds of Eastern Siberia prepared by T.N. Gagina [14], this Pheasant is listed as an extinct species based on fossil remains found in the region. For the first time, well-preserved Pheasant remains were discovered in the Tunka Valley in 2009 [46]. Later, the species was recorded in the Cheremkhovsky district of the Irkutsk region [47]. On June 2, 2023, A.V. Nizhegorodtseva, an employee of the Baikal Museum of the Siberian Branch of the Russian Academy of Sciences, took a picture of this species in the vicinity of Bolshaya Rechka village. A Ring-necked Pheasant without a tail is clearly visible in the photo. Obviously, he suffered from a dog attack, as he stayed close to the village. It is more likely that this is an escaped bird from the aviary, since attempts have been made in recent decades to keep this species in captivity. However, the discovery of a Pheasant in the upper reaches of the Oka River undoubtedly belongs to the wild population. Currently, it is indicated for the territory of Buryatia (Eastern Sayan) as a possibly stray species [11]. It is a rare breeding species in the adjacent territory of Mongolia [48]. This undoubtedly dramatically increases the possibilities of its registration in the border areas of Russia and penetration into more remote northern regions. This conclusion is also emphasized by the discovery of the species in the Cheremkhovsky district at a sufficient distance from populated areas [47].

The Purple Sandpiper *Calidris maritima*. Despite the presence waders in the lists many authors have of Lake Baikal [8-9, 40], but there is still no real information about the finds of this species. This species is also missing from the list of

birds of Eastern Siberia prepared by T.N. Gagina [14]. This species is not included in the list of birds of the Lake Baikal Hollow and in a special review of the waders of this Hollow devoted to the dynamics of their ranges in connection with climate changes [28, 34]. It is still unclear on the basis of what data this species is included in the list of birds of the Hollow lake Baikal and Eastern Siberia.

When working in the Yarkies, a ridge of sand dunes overgrown with Cedar Elfin *Pinus pumila*, separating the swampy estuaries of the pp. Upper Angara and Kicher from the lake Baikal on August 22, 2018, 3 Purple Sandpipers were found in a small flock of Temminck's Stint *Calidris temminckii* on an extensive sand spit. Birds are examined in detail with 12-fold binoculars from a distance of about 15.0 m. They are quite large for sandpipers, with a characteristic stocky figure and short legs. The color is very dark due to the numerous mottling on the abdomen and the general dark background of the back color. The legs are yellowish and the beak has a yellow base. The rather loud call signs "keut" and "kevit", characteristic of the species, stand out well, while short trills "three-three" are typical for the Temminck's Stint when disturbed (the movements of the observer are similar to the pursuit of birds). This is the first reliable confirmation of the discovery of this species on the coast of Lake Baikal.

The Great Knot *Calidris tenuirostris* has no real indications of the finds of this species in the literature, but it is included in the list of birds of the Eastern Siberia [40]. Based on this, it is also included in the list of species of waders found on the fly in Eastern Siberia [26]. However, further research confirmed his meetings in the Hollow of lake Baikal. On August 23, 2018, we observed a pair of birds of this species on a long sand spit along the Yarkies estuary of the Upper Angara River. The large size, approximately comparable to the Greenshank *Tringa nebularia*, a wide dark stripe on the chest formed by rather large semilunar spots and well-defined individual reddish mottling in the scapular area, forming a noticeable spot on the back, make it possible to uniquely identify this species. During short dashes (during observations, disturbed birds moved), a characteristic quiet call "woot" or "woot-woot" is issued. It is an extremely rare flying species of Eastern Siberia. It has also been recorded in the north-east of Mongolia (Lake Buin-Nur) by German ornithologists [53].

The Great Skua *Stercorarius skua*. The Hollow of lake Baikal, as the largest freshwater reservoir in Eastern Siberia, is very characterized by the registration of northern species of plover-like birds Charadriiformes, which are completely atypical for the region. To date, 15 such species have been registered here [30]. Until recently, three species of pomeranians have been observed in the waters of Lake Baikal: Pomarine Skua *Stercorarius pomarinus*, Parasitic Skua *Stercorarius parasiticus* and Long-tailed Skua *Stercorarius longicaudus* [34]. In the autumn of 2022, flights of the Great Skua *Stercorarius skua* were recorded here for the first

time. This species was recorded at the entrance to Aya Bay on September 13, 2022 at a distance of about 30.0 m in a small flock of Kittiwake *Rissa tridactyla* (22 birds). A repeat encounter was recorded in a large mixed flock of migratory Gull species on September 23, 2022 (two birds) on the eastern side of the island Olkhon in the bay opposite the small village of Uzura [33]. The appearance of this species was undoubtedly facilitated by the extensive northwestern front of inclement and very cold weather with snowfall on the second line of ridges surrounding the lake Baikal [33].

The Lesser Citrine Wagtail *Motacilla (citreola) werae*, Buturlin, 1908. It was first recorded on the territory of the Irkutsk region. A group of four birds that kept in a flock of White Wagtail *Motacilla alba* (about 20 birds) was noted in the Balagan district of the Irkutsk region in the vicinity of the village of Birit on August 15, 2015. The species was determined from photographs by Ya.A. Redkin [3].

Thus, as a result of our own research and analysis of the literature, it was possible to confirm the occurrence of 12 bird species in Eastern Siberia, previously little known or completely unknown to the region.

The work was carried out within the framework of topic No. 121032900077-4 "Ecological diagnostics of changes in some elements of biogeocenoses in the territory of Eastern Siberia." The equipment of the Center for Collective Use "Scientific Expedition Center "Baikal"" (<https://ckprf.ru/catalogue/ckp/3213559/>) was used in this article.

References

1. Alekseenko M.N. The first meeting of the Eurasian Vulture *Gyps fulvus* (Hablizi. 1783) in the Irkutsk region // *Baikal. zool. journal.*, 2019. - № 2(25). – P. 109.
2. Ananin A.A. The results of the inventory of the avifauna of the Trans-Baikal National Park in 2008-2018. // *The role of research work in the management and development of protected areas. Irkutsk: Institute Geography SB RAS Publ.*, 2019. – pp. 11-16.
3. Belyaev A.I. Meeting of the Lesser Citrine Wagtail *Motacilla (citreola) werae*, Buturlin, 1908 in the Irkutsk region // *Baikal. zool. journal.*, 2016. - № 1(18). – P. 126.
4. Berezhnykh T.V., Marchenko O.Yu., Abasov N.V., Mordvinov V.I. Changes in the summer circulation of the atmosphere over East Asia and the formation of long low-water periods in the Selenga River basin // *Geography and Natural Resources*, 2012. - No. 3. - pp. 61-68.
5. Bogdanovich V.A. Interesting bird encounters in winter and early spring 2020 in the Republic of Buryatia // *Baikal. zool. journal.*, 2020. - № 1(27). – P. 129.

6. Brazil M. *Birds of East Asia: Eastern China, Taiwan, Korea, Japan and Eastern Russia*. - London: Christopher Helm Press, 2009. – 528 p.
7. Dementiev G.P. Detachment of birds of prey // *Birds of the Soviet Union*. – M.: “Soviet Science” Publ., 1961. – Vol. 1. – pp. 70-341.
8. Dorzhiev Ts.Z., Badmaeva E.N. *Non-Passeriformes birds of the Republic of Buryatia: an annotated list // Nature of Inner Asia*, 2016. - No. 1. – pp. 7-60.
9. Dorzhiev Ts.Z., Badmaeva E.N., Tseveenmyadag N. *Ecological and systematic characteristics of wetland birds of the Lake Baikal basin // Nature of Inner Asia*, 2018. - № 3(8). – Pp. 51-83.
10. Dorzhiev Ts.Z., Bazarov L.D., Sushkeev E.M. *Meeting of the flying Kumai Gyps himalayensis on Khamar-Daban (Southern Baikal region) // Baikal. zool. journal.*, 2020. - № 2(28). – Pp. 111-112.
11. Dorzhiev Ts.Z., Durnev Yu.A., Sonina M.V., Elaev E.N. *Birds of the Eastern Sayan*. – Ulan-Ude: Buryat State University Publ., 2019. – 400 p.
12. Fomin V.E., Bold A. *Catalog of birds of the Mongolian People’s Republic*. – M.: Nauka Publ., 1991. – 125 p.
13. Gagina T.N. *On the fauna of birds of the Vitimo-Olekminsky mountainous country // Bull. Irkutsk Agricultural Institute*, 1960. – Issue 18. – pp. 211-240.
14. Gagina T.N. *Birds of Eastern Siberia (List and distribution) // Trudy State Nature Reserve “Barguzinsky”*, 1961. – Vol. 3. – pp. 99-123.
15. Gagina T.N. *Notes and additions to the list of birds of Eastern Siberia // Trudy State Nature Reserve “Barguzinsky”*, 1962. – Issue 4. – pp. 203-207.
16. Koblik E.A., Redkin Ya.A., Arkhipov V.Yu. *List of birds of the Russian Federation*. – M.: Comrade scientific KMK Publ., 2006. – 256 p.
17. Koshelenko I.V. *Droughts and the fight against them. Review*. – Obninsk: VNIIGMI-MCD Publ., 1983. – Issue 4. – 56 p.
18. Kovadlo P.G., Shikhovtsev A.Yu., Yazev S.A. *On the influence of modern warming on the humidification of the Baikal region // Development of life in the process of abiotic changes on Earth: materials IY All-Russian Scientific and Practical Conference – Irkutsk: Irkutsk State University Publ.*, 2023. – pp. 164-167.
19. Krivenko V.G. *Waterfowl and their protection*. – M.: VO Rosagroprom Publ., 1991. 271 p.
20. Latysheva I.V., Loshchenko K.A., Shakhaeva E.V., Smetanin G.S. *Circulatory features of abnormal weather phenomena on the territory of Russia in the summer of 2013 // Bull. Irkutsk State University. Ser. Earth Sciences*, 2013. - Vol. 6, No. 2. - pp. 125-137.
21. Levi K.G., Yazev S.A., Zadonina N.V. *Global natural and climatic changes in the history of the Earth - historical monitoring of natural anomalies in Siberia and the possibility of their prediction // Modern geodynamics and dangerous natural processes in Central Asia. Irkutsk: Institute Earth’s Crust Publ.*, 2004. - pp. 23-46.

22. MacKinnon J., Phillips K., Fen-qi H. *A field guide to the birds of China*. – Oxford: Oxford University Press, 2000. – 586 p.

23. Medvedev D.G. *The meeting of the Bearded Vulture Gypaetus barbatus (L., 1758) in Tofalaria (Irkutsk region) // Baikal. zool. journal., 2012. - № 1(9). – P. 120.*

24. Mel'nikov Yu.I. *Modern climate changes and pulsation of the boundaries of coastal bird ranges in Eastern Siberia // Environmental cooperation of the Chita Region (Russian Federation) and the Inner Mongolia Autonomous Region (PRC) in transboundary ecological regions. Chita: Zabaikalsky State Pedagogical University Publ., 2007. - pp. 231-236.*

25. Mel'nikov Yu.I. *Cyclical climate changes and dynamics of bird ranges in the south of Eastern Siberia // Ornithogeography of the Palearctic: modern problems and prospects. – Makhachkala: Dagestan State Pedagogical University Publ., 2009. – pp. 47-69.*

26. Mel'nikov Yu.I. *Fauna of the waders of Eastern Siberia: general trends of change during the XX century // Waders of Northern Eurasia: ecology, migration and protection. - Rostov-on-Don: Southern Science Center RAS Publ., 2011. - pp. 37-57.*

27. Melnikov Yu.I. *Modern bird fauna of Lake Baikal Hollow and features of its formation // Bull. Irkutsk. State University. Ser. Biology. Ecology, 2016. – Vol. 16. – pp. 62-83.*

28. Mel'nikov Yu.I. *Dynamics of the fauna of the waders of the Lake Baikal basin and its connection with modern climate changes (late XVIII – early XXI centuries) // Nature of Inner Asia, 2019. - № 1(10). – Pp. 28-53.*

29. Mel'nikov Yu.I. *Modern climatic changes, dynamics of habitats and diversity of birds of arid territories of Inner Asia // Steppes of Northern Eurasia: materials of the IX International Symposium. - Orenburg: Orenburg State University Publ., 2021. - pp. 548-554.*

30. Mel'nikov Yu.I. *Ecology of Laridae under conditions of unstable hydrological regime: colony sizes and synchronization of reproduction // Biosystems Diversity, 2021. – Vol. 29, № 4. – P. 399-406.*

31. Mel'nikov Yu.I. *Birds of Eastern Siberia - modern climate warming and its consequences // Proceedings of the International University Scientific Forum “Practice Oriented Science: UAE – RUSSIA – INDIA” (May 12, 2022, UAE). – Dubai: Infinity Publ., 2022. - Part 2. – P. 182-192.*

32. Mel'nikov Yu.I. *General approaches to the organization of bird counts in the late summer and migration periods in the water area of lake Baikal using motor boats and launches // Proceed. of the Internat. Un-ty Scientific Forum “Practice Oriented Science: UAE – RUSSIA – INDIA” (October 12, 2022, UAE). – UAE: Infinity Publ., 2022. – P. 84-94.*

33. Mel'nikov Yu.I. *The Grate Skua Stercorarius skua (Brünnich, 1764) (Aves, Stercorariidae) is a new stray species of Lake Baikal Hollow // Baikal. zool. journal., 2023. - № 1(35). - Pp. 43-45.*
34. Mel'nikov Yu.I., Gagina-Skalon T.N. *Birds of Lake Baikal (from the end of the XIX to the beginning of the XXI century): species composition, distribution and nature of stay // Bull. of MSNT. Dep. Biol., 2016. - Vol. 121. - Issue 2. - pp. 13-32.*
35. Mlikovsky Jiry. *Waterbirds of lake Baikal, eastern Siberia, Russia // Forktail, 2009. - Vol. 25. - P. 13-70.*
36. Obyazov V.A. *Regional response of surface air temperature to global changes (on the example of Transbaikalia) // DAN, 2015. - Vol. 461, No. 4. - pp. 459-462.*
37. Podarevsky V. V. *Problems of hunting and economic acclimatization in Eastern Siberia. - Irkutsk: East.- Siberian Regional Publ., 1936. - 119 p.*
38. Popov V.V. *Birds (Aves) // Annotated list of fauna of Lake Baikal and its drainage basin. - Vol.1, book 2. - Lake Baikal. - Novosibirsk: Nauka, 2004. - pp. 1062-1198.*
39. Popov V.V., Alekseenko M.N. *Erroneous definition of the Himalayan Vulture Gyps himalayensis in the Irkutsk region // Baikal. zool. journal., 2019. - № 3(26). - P. 140.*
40. Popov V.V., Matveev A.N. *Vertebrate animals of the Baikal region: species composition and legal status. - Irkutsk: Irkutsk State University Publ., 2005. - 86 p.*
41. Popov V.V., Medvedev D.G. *Bearded Vulture Gypaetus barbatus (Linnaeus, 1758) // Red Book of the Irkutsk region. - Ulan-Ude: "Republic type" Publ., 2020. - pp. 430-431.*
42. Ravkin E.S., Chelintsev N.G. *Methodological recommendations for the integrated march accounting of birds. Reprint. - M.: State Committee of Natural Resources of the USSR Publ., 1990. - 33 p.*
43. Ryabitsev V.K. *Birds of Siberia: a reference guide in two volumes. - Moscow-Yekaterinburg: "Cabinet scientist" Publ., 2014. - Vol. 2. - 452 p.*
44. Shimaraev M.N., Starygina L.N. *Zonal atmospheric circulation, climate and hydrological processes on Lake Baikal (1968-2007) // Geography and Natural Resources, 2010, No. 3. - pp. 62-68.*
45. Shkatulova A.P. *Materials on the ornithofauna of the Buryat ASSR // Ornithology. - M.: Moscow State University Publ., 1979. - Vol. 14. - pp. 97-107.*
46. Sonina M.V., Durnev Yu.A., Medvedev D.G. *New and little-studied birds of the Tunka National Park and the problem of criteria in modern faunal studies // Protected areas and conservation of biodiversity of the Baikal region. - Irkutsk: Irkutsk State University Publ., 2001. - pp. 82-88.*
47. Stepanenko V.N. *About the meeting of the Ring-necked Pheasant Phasianus colchicus Linnaeus, 1758 in Cheremkhov district (Irkutsk region) // Baikal. zool. journal., 2015. - № 2 (17). - P. 127.*

48. Sumyaa, D., Scriabin N.G. *Birds of Prikhubsugulya*, MNR. – Irkutsk: Irkutsk State University Publ., 1989. – 189 p.

49. Sundev G. and Leahy Ch. *Birds of Mongolia*. - Helm: Bloomsbury Publishing Plc., 2019. – 1314 p.

50. Voronin V.I., Khantemirov R.M., Naurzbaev M.M. *Ultra-long Siberian tree-ring chronologies - reliable archives for paleoclimatic reconstructions // Development of life in the process of abiotic changes on Earth: materials III scientific.-practical conference*. - Novosibirsk: Institute Geography SB RAS named after V.B. Sochava Publ, 2014. - pp. 409-415.

51. Zherebtsov G.A., Kovalenko V.A., Molodykh S.I., Rubtsova O.A. *Patterns of climatic changes in the XX century and the main physical processes responsible for these changes // Bull. Irkutsk State University. Ser. Earth Sciences*. - 2011. - Vol. 4, No. 1. - pp. 87-108.

52. Zherebtsov G.A., Kovalenko V.A., Molodykh S.I., Kirichenko K.E. *The influence of solar activity on the temperature of the troposphere and the ocean surface // Bull. Irkutsk State University. Ser. Earth Sciences*. - 2013. - Vol. 6, No. 1. - pp. 61-79.

53. Zvonov B.M., Bukreev S.A., Boldbaatar Sh. *Birds of Mongolia. Part 1. Nevorobinye (Non-Passeriformes)*. – M.: Agricultural technologies Publ., 2016. – 396 p.

DOI 10.34660/INF.2024.92.97.043

阿瓦恰湾（东堪察加半岛）石鸡冠花（石鸡冠花科）的食性和形态特征
SOME FEATURES OF THE STONE COCKSCOMB *ALECTRIAS ALECTROLOPHUS* (STICHAEIDAE) DIET AND MORPHOLOGY IN AVACHA BAY (EASTERN KAMCHATKA)

Zheleznyak Maria Yurevna

Senior Lecturer

Vitus Bering Kamchatka State University

摘要。棕色鲂鱼是阿瓦查湾常见的沿海鱼类。分析了鲂鱼的大小和性别组成以及它们的食物。结果表明，在研究区域，雄性更常见，且比雌性大。在食物中发现了以前在鲂鱼胃中未知的寄居蟹。

关键词：棕色鲂鱼，大小和性别结构，两栖动物，寄居蟹，沿海，阿瓦查湾。

Abstract. *The stone cockscomb is a common species of littoral fish in Avacha Bay. The size and sex composition of cockscombs, as well as their diet, were analyzed. The results showed that males are more common in the study area and are larger than females. Hermit crabs, previously unknown in the stomachs of cockscombs, were found among the food items.*

Keywords: *stone cockscomb, size and sex structure, amphipods, hermit crabs, littoral, Avacha Bay.*

The stone cockscomb *Alectrias alectrolophus* (Pallas, [1814]) is a representative of the *Stichaeidae* family, widespread in the northwestern Pacific Ocean, found from De-Kastri Bay in the Sea of Japan to the west coast of Alaska [1 et al.]. This typically littoral species inhabits the intertidal zone during the open water period, remaining here in shelters under rocks and in puddles during low tide. In the pebble-boulder biotopes of Avacha Bay, the stone cockscomb is considered a mass species [2, 6], which, due to a more than 2-fold reduction in the species composition of the ichthyofauna of the intertidal zone since the late 1980s, forms the basis of its littoral ichthyocene [3]. Despite this, to date, information on the biology of the stone cockscomb in Avacha Bay is limited to a general description of its biology. Its mass distribution and habitation in the intertidal zone make *A. alectrolophus* a convenient object for study and allow us to consider it as a possible biological indicator of the ecological state of the littoral of Avacha Bay; information on its biology in this reservoir is of interest. The material for this report

was collected in May 2024 in the north-eastern part of Avacha Bay in the littoral area of the village of Seroglazka, near the pier (Fig. 1). The stone cockscomb was caught by hand under stones and in mussel thickets during the low tide and fixed in 6% formalin, further processing was carried out in the laboratory; the stomach contents were examined according to standard methods [4].

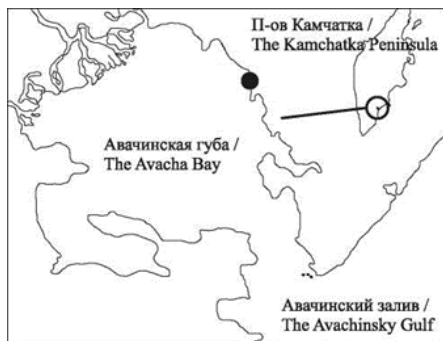


Figure 1. Littoral areas of Avacha Bay near the Seroglazka microdistrict, where stone cockscomb fish were caught

As the results of the studies showed, stone cockscomb fish are found in the surveyed area of the intertidal zone of the northeastern part of Avacha Bay only near technical structures (Fig. 2). The greatest number of its individuals (up to 5-7 fish) are noted in the middle horizon of the littoral at a distance of 30-80 cm from the water's edge, in mussel thickets and under them. Apparently, mussel shells serve as a good shelter for both stone cockscomb fish and their main food items - amphipods [5].



Figure 2. Technical structures covered with mussels - habitat of the stone cockscomb

The stone cockscomb is a small representative of the family *Stichaeidae*, the maximum size of which, according to literary data, does not exceed 15 cm [9]. In May, in the surveyed area of the littoral of Avacha Bay, this species was represented by individuals 53–118 (on average 89) mm in size with a body weight of 0.2–6.9 (on average 3.6) g. But most often, fish 81–90 and 91–100 mm in length were encountered (23.3 and 27.9%, respectively) with a body weight of 3.1–4.0 and 6.1–7.0 g (34.9 and 16.3%, respectively).

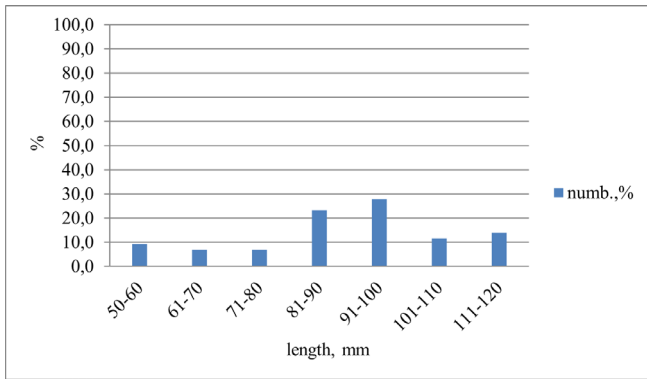


Figure 3. Size composition of the stone cockscomb

In the surveyed littoral area, females of *A. alectrolophus* are slightly smaller than males (maximum sizes of the former are 100 mm and 4.5 g, of the latter – 118 mm and 6.1 g). The relative number of females is less than males (18.6 and 65.1%, respectively), juveniles are slightly less than females – 16.3%. The gonads of males and females were at stage II maturity.

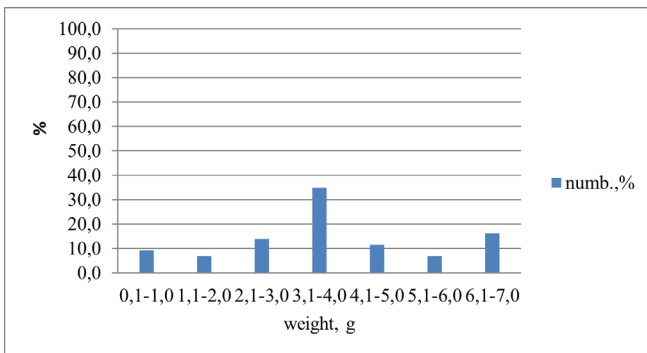


Figure 4. Weight composition of the stone cockscomb

According to the literature, the stone cockscomb is a benthophage by type of food, consuming various small bottom invertebrates, primarily crustaceans, mollusks and worms [1, 7, 8]. According to K. A. Vinogradov (1946), the main food organisms for this species in Avacha Bay in the 1930s were polychaete worms (mainly *Eteone longa*) and gastropods of the genus *Littorina* [2].

The results of our studies indicate that in May the main food of the stone cockscomb is the amphipods Amphipoda (44% by weight), while the significance of representatives of all other groups of invertebrates is relatively small. An additional source of food was the bivalves *Bivalvia* and green algae *Chlorophyta*. Also, quite a large amount of sand and small stones were often found in the stomachs. The peculiarity of the diet of the cockscombs in the surveyed area of the littoral of Avacha Bay is their consumption of hermit crabs of the genus *Pagurus*, which had not previously been noted for this area.

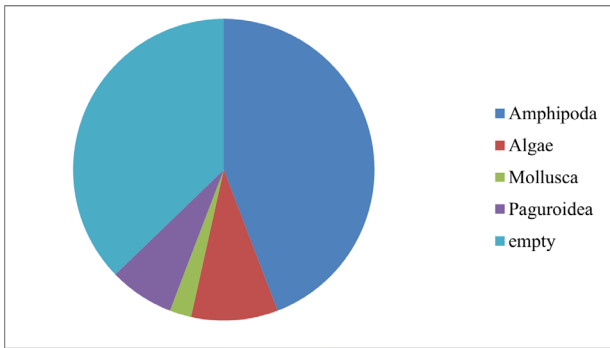


Figure 5. The proportion of food items in the stomachs of the stone cockscomb

Further examination of this area of the intertidal zone will make it possible to clarify the information obtained and more reliably estimate the total abundance, morphology and feeding habits of the stone cockscomb in Avacha Bay.

References

1. Andryashev A. P. 1954. *Fishes of the northern seas of the USSR*. Moscow; Leningrad: Publishing House of the USSR Academy of Sciences. 566 p.
2. Vinogradov K. A. 1946. *Fauna of the Kamchatka waters of the Pacific Ocean: thes. of Doc. Biol. Sci. Leningrad: ZIN AN SSSR*. 783 p.
3. Lindberg G. U., Krasnyukova Z. V. 1975. *Fishes of the Sea of Japan and adjacent parts of the Okhotsk and Yellow Seas. Part 4. Teleostomi. XXIX. Perciformes. Blennioidei. Gobioidi. L.: Nauka*. 463 p.

4. *Guide to the Study of Fish Nutrition*. 1986. Vladivostok: TINRO, 31 p.
5. Tokranov AM, Zheleznyak MY *Nutrition and Intraspecific Feeding Relationships of the Stone cockscomb *Alectrias alectrolophus* (Stichaeidae) in the Intertidal Zone of Avacha Bay (Southeastern Kamchatka)*. *Bulletin of Kamchatka State Technical University*. 2023. No. 64. P. 76-89.
6. Fedorov VV, Chereshev IA, Nazarkin MV, Shestakov AV, Volobuev VV 2003. *Catalog of Marine and Freshwater Fishes of the Northern Part of the Sea of Okhotsk*. Vladivostok: Dalnauka. 204 p.
7. Tsurpalo A. P. 1993. *Trophic characteristics of littoral fishes *Alectrias alectrolophus alectrolophus* and *Stichaeopsis nana* (Stichaeidae) of Shikotan Island (Kuril Islands) // Vopr. ichthyol. Vol. 33. Vyp. 2. Pp. 309–312.*
8. Chegodaeva E. A. 2005. *New data on the morphology and biology of the betta fish *Alectrias alectrolophus* (Stichaeidae) of the Tauy Bay of the Sea of Okhotsk // Conservation of biodiversity of Kamchatka and adjacent seas: Proc. VI scientific conference (Petropavlovsk-Kamchatsky, November 29–30, 2005)*. Petropavlovsk-Kamchatsky: Kamchatpress. Pp. 164–168.
9. Chereshev I.A., Volobuev V.V., Khovansky I.E., Shestakov A.V. 2001. *Coastal fishes of the northern part of the Sea of Okhotsk*. Vladivostok: Dalnauka, 197 p.

天然聚戊烯醇作为一种具有良好免疫潜力的物质
**NATURAL POLYPRENOLS AS A SUBSTANCE WITH PROMISING
IMMUNOLOGICAL POTENTIAL**

Marakhouski Yury Kharitonovich

*Doctor of Medical Sciences, Professor
Belarusian State Medical University,
Minsk, Republic of Belarus*

Rubens Juris Pavlovich

*Doctor of Medical Sciences
Research and Experimental Development on Biotechnology,
BF-ESSE LLC,
Riga, Latvia*

Roshchin Viktor Ivanovich

*Doctor of Chemical Sciences
Saint-Petersburg State Forest Technical University,
Saint-Petersburg, Russian Federation*

Bartkevics Vadim

*Doctor of Chemical Sciences
Institute of Food Safety, Animal Health and Environment,
Riga, Latvia*

Zajakina Anna

*Doctor of Biological Sciences
Research and Experimental Development on Biotechnology,
BF-ESSE LLC,
Riga, Latvia*

摘要。天然聚戊烯醇已被研究多年，并发表了大量文章。然而，这些出版物中有相当一部分没有被官方出版物数据库收录，即它们被归类为灰色出版物。因此，在过去5年中，只有16%的关于天然聚戊烯醇的文章发表在同行评审期刊上。

此外，聚戊烯醇本身具有复杂的分类特征，无法明确定义。还应注意，聚戊烯醇是一种特殊的脂质，不溶于水，天然形式的吸收阈值较低。为了克服这一障碍，人们使用了各种聚戊烯醇的化学改性，但生理上最完整的形式是基于水中脂肪颗粒的形式，接近天然胶束，而天然胶束是人体脂质吸收生理学中的主要形式。

一系列关于天然聚戊烯醇对免疫力影响的研究的特点是对免疫调节类型、免疫激活的评估相当笼统，而对免疫活性细胞本身及其参与聚戊烯醇作用的程度的评估相当模糊。这主要适用于巨噬细胞，因为巨噬细胞是免疫反应的关键调节细胞之一。

所提出的研究结果表明，聚戊烯醇纳米乳剂的发展前景十分光明，并且可能用于 M2 巨噬细胞的极化，即具有抗炎表型。

关键词：天然聚戊烯醇、特性、生物利用度、免疫力、巨噬细胞。

Abstract. *Natural polyprenols have been studied for many years and a large number of articles have been published. However, a significant number of these publications are not indexed in official publication databases, i.e. they are classified as gray publications. Thus, over the past 5 years, only 16% of all articles on natural polyprenols have been published in peer-reviewed journals.*

Moreover, polyprenols themselves have complex classification characteristics that do not allow for a clear definition. It should also be noted that polyprenols are special lipids that are insoluble in water and have a low absorption threshold in their native form. To overcome this barrier, various chemical modifications of polyprenols are used, but the most physiologically complete form is the form based on fat particles in water that are close to natural micelles, which are the main ones in the physiology of lipid absorption in humans.

A series of studies on the effect of natural polyprenols on immunity are characterized by fairly generalized assessments of the type of immunomodulation, immune activation with fairly vague assessments of the immune competent cells themselves and the degree of their participation in the effects of polyprenols. This primarily applies to macrophages as one of the key regulatory cells of immune reactions.

The presented own research results show very promising developments in the nanoemulsion of polyprenols and their possible use for polarization of M2 macrophages, i.e. with an anti-inflammatory phenotype.

Keywords: *natural polyprenols, characteristics, bioavailability, immunity, macrophages.*

Introduction.

Plant polyprenols are a class of natural compounds with numerous descriptions of biological activity, such as anticancer, hepatoprotective and antiviral. Polyprenols anti-infective properties are particular practical importance, since their action is associated with modulation of the immune system. However, further detailing of polyprenols such effect is required, along with a systematization of existing studies of the polyprenols effects on the immune system.

Methodology.

The search for polyprenols publications was carried out using the main databases: PubMed, Medline, Google Scholar, ScienceDirect, Academia.edu, Web of

Science, Elsevier, Researchgate.net and the main international patent databases WIPO PATENTSCOPE, ESPACENET.COM. Additional databases using: Chinese Knowledge On Frastructure (CNKI), Wan Fang, Chinese Scientific and Technological Periodical Database (VIP) and Chinese Biomedical Database (CBM), Research Council for Complementary Medicine (RCCM), British Library's Medical Information Centre (Alternative and Allied Medicine Database), Cochrane Library Cochrane Complementary Medicine Field, Committee on Herbal Medicinal Products (HMPC) of European Medicine Agency (EMA), Food and Drug Administration (FDA), World Health Organization (WHO) Global partners commit to advance evidence-based traditional, complementary and integrative medicine.

The following keywords and their combinations (AND, OR, NOT) were used, with an emphasis on immunological effect: polyprenols, history, chemistry, analysis, classification, adverse effects, administration and dosage, agonists, inhibitors, metabolism, pharmacokinetics, pharmacology, poisoning, immunology, therapeutic use, toxicity.

We selected the most important, high-quality and authoritative publications that are closely related to the problem, used the principle WordStat excels to analyze the publications text. Development option Yandex WordStat Vercion-1.9.1 (SEMANTICA). WordStat excels in text mining, providing researchers with a robust platform to delve into vast amounts of textual data. This capability enhances the depth of qualitative analysis, setting it apart in the landscape of tools for qualitative research.

Results.

A total of 2,750 publications were found, of which 1,724 were found in the last 10 years. A significantly smaller number of publications are found in the main search databases, such as PubMed. Medical Subject Headings (MeSH) is the NLM controlled vocabulary thesaurus used for indexing articles for PubMed the term polyprenols was introduced only in 2020 (Polyprenols. Long chain isoprene compounds that include a hydroxyl group at the terminal carbon atom. Year introduced: 2020). The term immunomodulation introduced in 2010. PubMed search builder options subheadings: "Polyprenols/immunology"[Mesh] - No results were found, "Polyprenols/metabolism"[Mesh] - 8 results, "Polyprenols/pharmacology"[Mesh] - 1. Therefore, the search for publications was limited to a 10-year period (2014-2024(6 months).

Moreover, a significant number of polyprenols publications are not peer-reviewed journal articles. As an example, we present the search results in the database Academia.edu: from 2047 only 23% and for 5 yeas - 16%

Search results show the presence of polyprenols publications are questionable in terms of the degree of evidence. Such publications are called gray. Many types of grey literature are not indexed in some of the more common research tools like

PubMed, CINAHL, Scopus, Unlike Peer-Reviewed literature. Grey Literature is not reviewed by experts before being published, which means readers must do all the work of evaluating the literature themselves. Other results confirming this position can be demonstrated by searching the Cochrane database. Database: Cochrane Central Register of Controlled Trials (CENTRAL), found - 12 trials matching polyprenols in Title/Abstract/Keyword.

The above dictates the need to pay attention to the term polyprenols, otherwise, let's start from the very beginning.

Polyprenols General Characteristics.

The main sources of obtaining polyprenols are extracts from different plants and they are characterized by vary in chain lengths of their homologs and molecular configurations, as well as different numbers of isoprene components [2]. Conifer biomass such as *Abies sibirica* L., *Picea abies* L., *Pinus sibirica* L., *Pinus sylvestris* L are popular plant sources for polyprenol extraction on a commercial scale. [3,4,5]. The highest content of polyprenols is observed in the needles of various spruce species (1.5 and 1.4% for the species *Picea obovata* Ledeb. and *Picea abies* L.. In the *Abies sibirica* L. extract the main polyprenols part (98%) is represented by C70H114O+C75H122O+C80H130O+C85H138O [6]. Poly-prenols, which are active ingredients identified in *G. biloba*, comprised of long chains of 14–24 isopentenyl units and have a similar structure as S-polyterpene alcohol (dolichols), which can be found in mammals, including people [7,8]

Briefly on Biological Properties.

Polyprenol is used to treat Alzheimer's disease, improves cell membrane characteristics, and has hepatoprotective, antiviral, and anti-tumoreffects. Therefore, polyprenol usage in functional foods and the development of new drugs has become an international research hotspot [9]. Plant polyisoprenoids (PreOH and polyprenyl phosphates) are able to diminish the levels of blood cholesterol affecting its biosynthetic pathway. They also prevent toxic injuries of the liver and restore disturbed hepatic functions. At the same time polyprenyl phosphates express anti-inflammatory activity suppressing lipoxygenase activity and lowering the levels of proinflammatory cytokines [10,11,12,13,14].

The possibility of polyprenyl phosphates to reveal at the same time anti-inflammatory action suppressing lipoxygenase activity and lowering the levels of proinflammatory cytokines was be illustrated in several publications [15,16,17].

Considerable differences were found between the uptake of polyprenols of differing chain lengths. Less than 1% of the polyprenols taken up was converted into more polar product, mainly polyprenyl phosphates and polyprenyl phosphate sugars. The short-chain polyprenols, from C35 to C65, were metabolized more rapidly than the long-chain polyprenols, as judged from the amount of polar products and fatty acid esters of polyprenols. [12]. These results indicate that various

polyisoprenes are taken up, to a small extent, from the diet by tissues under normal conditions and in liver these dietary lipids undergo terminal modifications. [18].

Worthy of mention are studies with tritium-labeled polyprenols. A search with the keywords: polyprenols and tritium and medicine revealed only 16 such studies, among them one carefully performed one should be mentioned. Asa Jakobsson, et al [18.19] showed the following. Short and long dolichols and polyprenols in free form or esterified with fatty acids were incorporated into liposomes and administered to rats through a gastric tube. The free alcohols were taken up by the liver to different extents. While uptake in other organs was less, it also involved the fatty acid esters. The use of systems other than liposomes did not increase the efficiency of uptake. Exogenous dolichols and polyprenols were both partly esterified in the liver and, to some extent, also phosphorylated; a portion of the polyprenols was also alpha-saturated. These results indicate that various polyisoprenes are taken up, to a small extent, from non-liposomes forms and in liver these lipids undergo terminal modifications. JACK W. RIP et al. published a high-quality systematic review of polyprenols [20], in which the following is noted in the section "B. Experiments on whole animals--intravenous injection". As the radioactivity in plasma declined following injection of [1-3H]dolichol, other tissues, particularly the liver and spleen, but also the intestine and contents, acquired significant amounts of tritium. About 80% of radioactivity from [1-4C]dolichol remaining in rats 24 hr post-injection was in the liver. In liver, esterification of dolichol to fatty acids has been observed less than 1,6%, and some phosphorylation of injected [1-14C] dolichol occurs. Nevertheless, more than 95% of the 4C-radioactivity in rat liver 1, 4 or 21 days after giving [1-4C]dolichol was still associated with either dolichol or its fatty acyl esters. Radiolabeled polyisoprenoid alcohols given orally to animals are poorly absorbed from the gut. The diet, therefore, does not contribute significantly to the pool of polyisoprenoid alcohols present in animals. Virus-infected cells acquired lesser amounts of [1-3H]dolichol than similar, uninfected cells. Human liver dolichol - 465 µg / g - 486 µg / g dolichol phosphate - 10.8 µg / g - 11.9 µg / g [21].

Polyprenols strong hydrophobic result its low bioavailability (insoluble in water). Meanwhile, the latest design and development of nanoemulsions, liposomes and injections based on plant polyprenols and their derivatives were reviewed, which provide a reference for further research into the development of pharmaceutical drugs of polyprenols and their derivatives.

There are several significant problems with polyprenols. First of all, their high lipophilicity, they are not soluble in water. In addition, it should be noted that there are no pharmacokinetic studies of polyprenols, which is very difficult to conduct in the case of a substances with molecules mixture. In addition, studies with tritium-labeled polyprenols have shown significant differences in the polyprenols

absorption and distribution in organs with different numbers of isoprene units and saturation degrees.

Effects of Polyphenols on the Immune System.

The search results for the effects of polyphenols on the immune system. Search results for the keywords “polyphenols” AND “immunity” OR “immune system” (results 125 number) . The main part of publications refers to the last 5 years - 84 (67%). In total, there are 47 publications for the analysis of the details of the polyphenols immunological effects. Below are the most important publications describing the details of immune reactions when using polyphenols.

Pronin AV and co-authors [22] argue that phosphates of polyphenols may act as effective antiviral agents with a wide spectrum of activity. One of such antiviral agents received from *Pinus sativum* polyphenols was named phosphenyl. The drug was found to inhibit an early phase of IL-1 and Con A interaction in spleen cells as well as lipoxygenase activity and expression of IL-2 receptors. Basing on all these data we proposed that polyphenols could be considered as a “label” which grants a possibility to the innate immune system.

Some other authors express a similar point of view. For example, Safatov AS et al [23] demonstrates the possibility of achieving a prophylactic effect by intramuscular injection of *Abies sibirica* polyphenols for the control of influenza virus infection in mice, and concluded that emulsions of polyphenols that have relatively low hydrophilic-lipophilic balance, inhibit influenza virus infection in mice through a modulation of the host immune response. Antiviral action has been found for polyphenols obtained from other natural sources: ginkgo leaves [24], standardized extract of *C. asiatica* containing the triterpenoid [25.] and *Avicennia alba* leaves [26]. The results of these studies show the presence of antiviral activity in natural polyphenols regardless of the polyphenols source.

Researchers from the USA presented a randomized placebo-controlled study of the antiviral efficacy and safety of polyphenols in cats viral infection (Feline viral rhinotracheitis-FVR) [27]. Authors hypothesized that polyphenyl immunostimulant (PI), an immunomodulatory veterinary biologic, would be useful in treating feline rhinotracheitis by reducing the severity of respiratory or/and ocular disease. Authors concluded following: “Polyphenyl immunostimulant reduces clinical severity of the disease probably through immunity upregulation but has no effect on viral or antibody titers”.

Another article in this study provides more detailed results [28]. The authors have proven that comparison of mean and SD values for the survival times of cats with dry FIP showed that the survival time of cats in our study was significantly longer for the group treated with Polyphenyl Immunostimulant. Adverse events were minimal, being confined to 3 animals reacting to the taste of the product and one animal having diarrhea. U.S. Veterinary License # 637. Distributed by:

VetImmune, LLC, P.O. Box 205, Kingston, TN 37763. Thus, today there is already a medicinal product in veteran medicine based on polyprenols with antiviral and immunological activity. However, for the development of this progressive direction, additional details of the polyprenols mechanism action on the immune system are needed.

The human microbial defense system can be simplistically viewed as consisting of 3 levels [29]: (1) anatomic and physiologic barriers; (2) innate immunity; and (3) adaptive immunity. Failure in any of these systems will greatly increase susceptibility to infection. Hematopoietic cells involved in innate immune responses include macrophages, dendritic cells, mast cells, neutrophils, eosinophils, natural killer (NK) cells, and NK T cells.

Morita, et al. [30] showed that short, C5-C20 prenyl pyrophosphates may serve as antigens, the recognition of which is conserved in vertebrate evolution of $\gamma\delta$ T cells. They offered a potential model of prenyl antigen interaction with T-cell receptors. Subset of T cells, $\gamma\delta$ T cells, exhibit specialized antigen (Ag) recognition properties and functions. $\gamma\delta$ T cells appear to function as a bridge between the innate and adaptive immune systems and play important roles in the control of infections and autoimmune responses. It has been shown that, T cells use their TCRs to recognize self and foreign prenyl pyrophosphate intermediates (prenyl-PP) in isoprenoid synthesis Results confirm and extend recent studies and demonstrate that BTN3A1 (butyrophillin - 3BTN3) is required for the recognition of prenyl-PP but does not appear to bind the intermediates directly [31]. To produce effector and competent T cells, initially naive CD8⁺ T cells are activated through antigen presentation by macrophages, dendritic cells (more often), and CD4⁺ cells and/or directly by virus-infected cells. [32,33]. To produce neutralizing antibodies, initially naive B cells are activated directly by free virus or indirectly through antigen presentation by macrophages and dendritic cells (more often), additional CD4⁺ cells. Naive B cells then proliferate and differentiate into plasma cells, synthesizing and secreting neutralizing antibodies, which are gradually destroyed in the serum [34]. Unlike the rapid production of effective T cells, antibody production is described by slow kinetics and is a specific characteristic of the adaptive variant of immunity. The indicated patterns of immune response to viruses have been successfully modeled in mathematical models [35]

Among the immunocompetent cells of the innate part of immunity particular importance antigen-presenting cells, which include dendritic cells and macrophages first and foremost. Moreover, dendritic cells are highly specialized in antigen presentation, while macrophages can be characterized as immune chameleons with proinflammatory (M1) or anti-inflammatory (M2) phenotypes. [36]. Macrophages are a heterogeneous population of terminally differentiated cells found in all tissues, including the bone marrow. They perform essential homeo-

static functions, including tissue remodeling, clearance of dead cells, and production of angiogenic factors [37].

Macrophages, an important component of the innate immune response, are a key regulator of intestinal microenvironment homeostasis. These cells essentially contribute to chronic inflammatory diseases due to their strong plasticity. A growing body of evidence suggests that the macrophage is a promising drug target for modulating the intestinal immune systems and regulating the inflammatory microenvironment, thus alleviating the inflammatory responses in ulcerative colitis. The macrophage-based therapy strategies for UC are still at an emerging stage [38].

Our own results.

We would like to point out the following. Two authors of this article, Victor Roshchin and Juris Rubens, has been involved in research on polyprenols for a long time and has priority in assessing the effect of polyprenols on the immune system, which is supported by two patents [39,40], with an emphasis on this option. Common symptoms for invention: “4. Stimulation of phagocytosis and digesting ability of macrophages”.

In our experiments, presented below, natural poliprenols was isolated from coniferous greenery, pine (*Pinus Sylvestris*) and spruce (*Picea Abies*) and carried out special purification at least 92% of the main plant-origin polyprenols homologues sum mass. The authors clearly understand the significant problem of polyprenols bioactivity and have carried out work in this direction with the consciousness of polyprenols nanoemulsion. We conducted a series of studies to create a polyprenols nanoemulsion. We managed to obtain encouraging results and obtain a stable polyprenols nanoemulsion: the droplet diameter of the dispersed phase of the polyprenols is 50-200 nm and remain stable for over 24 months at room temperature and can withstand sterilization. Patent application pending.

Experiment 1.

Bone marrow-derived macrophages and their polarization.

Macrophages were isolated from mouse bone marrow and cultured as previously described (41). Polyprenols dissolved in ethanol at 40°C to achieve a polyprenols concentration 1 and 5 mg/ml. Then, this solution was diluted 1:100 with Triton-x100/BSA-containing solution: 0.1 % Triton-X100, 2 % BSA in H₂O, with the final concentration of polyprenols – 10 and 50 µg/mL. The respective 0.1 % Triton-X100, 2 % BSA, and ethanol solution without polyprenol diluted 1:100 was used as a buffer control (solvent). The effect of polyprenols and the solvent on macrophage cell viability was tested using Live-or-Dye™ Fixable Viability Staining assay following flow cytometry analysis. Polyprenols optimal dose was selected with this indicator - macrophage cell viability, to rate of at least 82% viability, and final doses was 0.1 µg/mL - 0.5 µg/mL.

Preparation of bone marrow-derived macrophages (BMDM) from mouse femur and tibia. The bone marrow can be accessed from the bone ends by poking the ends with a 23G needle, slowly injecting approximately 2–3 mL PBS per bone. The cell pellet is achieved by centrifugation of the bone marrow suspension at $200 \times g$, 5 min at 4°C . Then the cells are resuspended in a complete medium and plated for polarization assays.

The programming of macrophages in the presence/absence of polyprenols (0.1 $\mu\text{g}/\text{mL}$ and 0.5 $\mu\text{g}/\text{mL}$) was performed with mIFN γ (50 ng/ml) and LPS (100 ng/ml) to achieve M1 phenotype or IL-4 (20 ng/ml) to achieve M2 phenotype, as previously described [42,43]. The macrophages were seeded into 6-well plate and the M1 or M2 polarization factors were added together with polyprenol (0.1 $\mu\text{g}/\text{mL}$ and 0.5 $\mu\text{g}/\text{mL}$ final concentration). Macrophages cultured with the same amount of the solvent without polyprenols and untreated cells (M0) were used as controls.

The polarization of macrophages into M1 and M2 phenotypes elicits the expression of respective pro-inflammatory and anti-inflammatory markers. M1 macrophages are expected to produce nitric oxide (NO) through metabolic switch and upregulation of inducible NO-synthase (iNOs). The second important M1 polarization marker is the elevated expression of MHCII molecule involved in enhanced antigen presentation by M1 macrophages. On the other hand, the M2 polarization is related to CD206 upregulation, representing the main M2 polarization marker. The cell surface markers and cytokines of programmed macrophages exhibiting pro-inflammatory (M1) and anti-inflammatory (M2) phenotypes. The M1 phenotype is induced by treatment of undifferentiated macrophages (M0) with IFN γ and LPS, or TLR1/2. The M2 phenotype is induced by treatment of M0 with IL-4, IL-13, and TGF.

In our study macrophages were cultured with IFN γ /LPS to achieve M1 phenotype in presence of 0.1 $\mu\text{g}/\text{mL}$ of polyprenols. The solvent without polyprenols was used as a control or blanc. After incubation (48h), the cell medium was collected and subjected to analysis of nitric oxide, whereas the cells were stained with cell viability assay and respective antibodies followed by flow cytometry.

We assessed the following indicators in expression of M1-related polarization markers in the presence of polyprenols: (A) cell viability; (B) anti-MHCII-APC antibodies; (C) anti-CD11b-FITC antibodies – myeloid cell marker; (D) Nitric oxide concentration in cell culture medium. variables. As follows from the results polyprenols do not have a polarizing effect on macrophages M0 and M1.

Experiment 2.

Macrophages were cultured with IL-4 to achieve M2 phenotype in presence of 0.5 $\mu\text{g}/\text{mL}$ of polyprenol. The solvent without polyprenol was used as a control. After incubation (48h), the cells were stained with cell viability assay and respective antibodies followed by flow cytometry. Results presented in Fig 1.

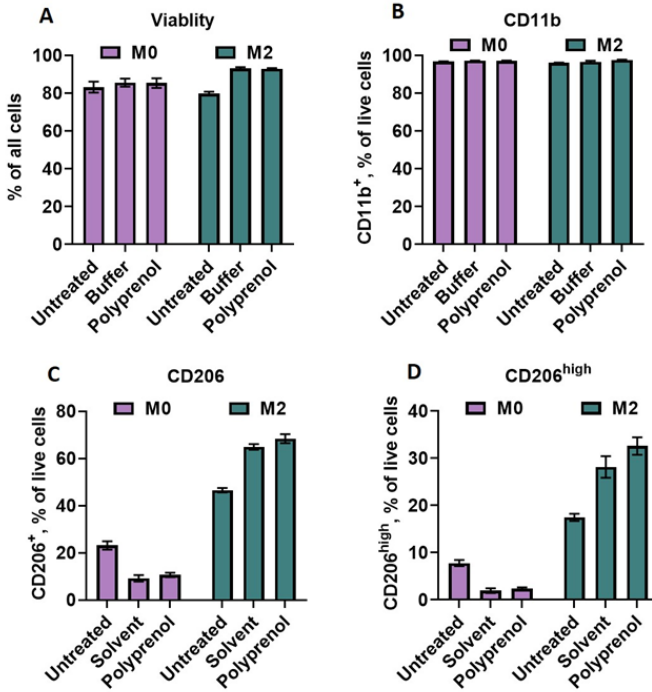


Figure 1. Expression of M2-related polarization markers in the presence of polyprenols.

Notr: (A) cell viability; (B) anti-CD11b-FITC antibodies – myeloid cell marker; (C) anti-CD206-PE antibodies; (D) anti-CD206-PE antibodies, highly stained population.

From the results, presented in the form of 2D histograms, is clear that polyprenols have a polarizing effect on M2 macrophages. Polyprenols at a concentration of 0.5 $\mu\text{g}/\text{mL}$ exhibited stimulatory effect on M2 polarization according to anti-CD206 staining.

The presented results of our experimental studies allow us to postulate that using polyprenols it is possible to provide immunity fine-tuning. However, further, larger-scale studies are required.

References

1. Tomáš Řezanka, Jaroslav Votruba, *Chromatography of long chain alcohols (polyprenols) from animal and plant sources*, *Journal of Chromatography A*, Volume 936, Issues 1–2, 2001, Pages 95–110, ISSN 0021-9673J.
2. Rezanka, T.; Votruba, J. *Chromatography of long chain alcohols (polyprenols) from animal and plant sources.* *J. Chromatogr. A* 2001, 936, 95–110.J.
3. Tao, R.; Wang, C.; Ye, J.; Zhou, H.; Chen, H.; Tao, R.; Wang, C.; Ye, J.; Zhou, H.; Chen, H. *Polyprenols of Ginkgo biloba Enhance Antibacterial Activity of Five Classes of Antibiotics.* *Biomed. Res. Int.* 2016, 2016, 1–8:
4. Van Beek, T.A.; Montoro, P. *Chemical analysis and quality control of Ginkgo biloba leaves, extracts, and phytopharmaceuticals.* *J. Chromatogr. A* 2009, 1216, 2002–2032.J and *Ginkgo biloba L.*;
5. Wang, C.Z.; Li, W.J.; Tao, R.; Ye, J.Z.; Zhang, H.Y. *Antiviral activity of a nanoemulsion of polyprenols from ginkgo leaves against influenza A H3N2 and hepatitis B virus in vitro.* *Molecules* 2015, 20, 5137–5151J.
6. Ilona Vanaga, Jerzy Gubernator, Ilva Nakurte, Ugis Kletnieks, Ruta Muceniece. *Identification of Abies sibirica L and Baiba Jansone. Polyprenols and Characterisation of Polyprenol-Containing Liposomes* *Molecules* 2020, 25, 1801J.
7. R. Tao, C. Wang, J. Ye, H. Zhou, and H. Chen, “Polyprenols of ginkgo biloba enhance antibacterial activity of five classes of antibiotics,” *BioMed Research International*, vol. 2016, p. 4191938, 2016J.
8. Meredith D. Hartley, Barbara Imperiali, *At the membrane frontier: A prospectus on the remarkable evolutionary conservation of polyprenols and polyprenyl-phosphates*, *Archives of Biochemistry and Biophysics*, Volume 517, Issue 2, 2012, Pages 83–97, ISSN 0003-9861J.
9. Isaac Duah Boateng, *Polyprenols in Ginkgo biloba; a review of their chemistry (synthesis of polyprenols and their derivatives), extraction, purification, and bioactivities*, *Food Chemistry*, Volume 418, 2023, 136006, ISSN 0308-8146J.
10. Pronin AV, Danilov LL, Narovlyansky AN, Sanin AV. *Plant polyisoprenoids and control of cholesterol level.* *Arch Immunol Ther Exp (Warsz)*. 2014 Feb;62(1):31-9. doi: 10.1007/s00005-013-0253-y. Epub 2013 Aug 31. PMID: 23995915; PMCID: PMC3898360J.
11. Illian DN, Hasibuan PAZ, Sumardi S, Nuryawan A, Wati R, Basyuni M. *Anticancer Activity of Polyisoprenoids from Avicennia alba Blume.* in *WiDr Cells. Iran J Pharm Res.* 2019 Summer;18(3):1477-1487J
12. Swiezewska E, Danikiewicz W. *Polyisoprenoids: structure, biosynthesis and function.* *Prog Lipid Res.* 2005 Jul;44(4):235-58. doi: 10.1016/j.plipres.2005.05.002. PMID: 16019076.

13. Surmacz L, Swiezewska E. Polyisoprenoids - Secondary metabolites or physiologically important superlipids? *Biochem Biophys Res Commun.* 2011 Apr 22;407(4):627-32. doi: 10.1016/j.bbrc.2011.03.059. Epub 2011 Mar 16. PMID: 21419101

14. Skorupinska-Tudek K, Wojcik J, Swiezewska E. Polyisoprenoid alcohols—recent results of structural studies. *Chem Rec.* 2008;8(1):33-45.

15. Qiong Zhang, Lixin Huang, Caihong Zhang, Pujun Xie, Yaolei Zhang, Shasha Ding, Feng Xu, *Synthesis and biological activity of polyprenols, Fitoterapia, Volume 106, 2015, Pages 184-193, ISSN 0367-326X.*

16. Sanin AV, Ganshina IV, Sud'ina GF, et al. Phosphorylated polyprenols—a novel class of compounds with anti-inflammatory and broncholytic activity (in Russian) *Infektsiya Immunitet.* 2011;1:355–360.

17. Pronin AV, Danilov LL, Narovlyansky AN, Sanin AV. Plant polyisoprenoids and control of cholesterol level. *Arch Immunol Ther Exp (Warsz).* 2014 Feb;62(1):31-9. doi: 10.1007/s00005-013-0253-y. Epub 2013 Aug 31. PMID: 23995915; PMCID: PMC3898360.

18. Jakobsson A, Swiezewska E, Chojnacki T, Dallner G. Uptake and modification of dietary polyprenols and dolichols in rat liver. *FEBS Lett.* 1989 Sep 11;255(1):32-6. doi: 10.1016/0014-5793(89)81055-5. PMID: 2507352.

19. Dalziel JE, Fraser K, Young W, McKenzie CM, Bassett SA, Roy NC. Gastroparesis and lipid metabolism-associated dysbiosis in Wistar-Kyoto rats. *Am J Physiol Gastrointest Liver Physiol.* 2017 Jul 1;313(1):G62-G72.

20. JACK W. RIP, C. ANTHONY RUPAR, KOTHAPALLIRAVI and KENNETH K. CARROLL, DISTRIBUTION, METABOLISM AND FUNCTION OF DOLICHOL AND POLYPRENOLS. *Prog. Lipid Res.* 1985, Vol. 24, pp. 269-309.

21. Meredith D. Hartley, Barbara Imperiali, *At the membrane frontier: A prospectus on the remarkable evolutionary conservation of polyprenols and polyprenyl phosphates, Archives of Biochemistry and Biophysics, Volume 517, Issue 2, 2012, Pages 83-97.*

22. Pronin AV, Grigorieva EA, Sanin AV, Narovlyansky AN, Ozherelkov SV, Deyeva AV, Danilov LL, Maltsev SD, Najid A. Polyprenols as possible factors that determine an instructive role of the innate immunity in the acquired immune response. *Russ J Immunol.* 2002 Jul;7(2):135-42.

23. Safatov AS, Sergeev AN, Shishkina LN, Pyankov OV, Poryvaev VD, Bulychev LE, Petrishchenko VA, Pyankova OG, Zhukov VA, Ryzhikov AB, Boldyrev AN, Buryak GA, Raldugin VA, Kukina TP, Tolstikov GA. Effect of intramuscularly injected polyprenols on influenza virus infection in mice. *Antivir Chem Chemother.* 2000 May;11(3):239-47.

24. Wang CZ, Li WJ, Tao R, Ye JZ, Zhang HY. Antiviral activity of a nanoemulsion of polyprenols from ginkgo leaves against influenza A H3N2 and hepatitis B virus *in vitro.* *Molecules.* 2015 Mar 19;20(3):5137-51.

25. Tawinwung S, Junsang D, Utthiya S, Khemawoot P. Immunomodulatory effect of standardized *C. asiatica* extract on a promotion of regulatory T cells in rats. *BMC Complement Med Ther.* 2021 Sep 3;21(1):220.

26. Qurrohman T, Hasibuan PAZ, Nuryawan A et al. Effects of polyisoprenoids from *Avicennia lanata* and *Avicennia alba* leaves on the gene expression of PI3K, Akt1, mTOR, P53, and EGFR in human colorectal adenocarcinoma WiDr cells [version 2; peer review: 1 approved with reservations, 1 not approved]. *F1000 Research* 2020, 9:182 (<https://doi.org/10.12688/f1000research.22021.2>).

27. Legendre AM, Kuritz T, Heidel RE and Baylor VM (2017) Polyphenyl Immunostimulant in Feline Rhinotracheitis: Randomized Placebo-Controlled Experimental and Field Safety Studies. *Front. Vet. Sci.* 4:24.

28. Legendre Alfred M. , Kuritz Tanya , Galyon Gina , Baylor Vivian M. , Heidel Robert Eric. Polyphenyl Immunostimulant Treatment of Cats with Presumptive Non-Effusive Feline Infectious Peritonitis In a Field Study. *Frontiers in Veterinary Science, VOL-4, 2017.*

29. Stuart E. Turvey, David H. Broide, Innate immunity, *Journal of Allergy and Clinical Immunology, Volume 125, Issue 2, Supplement 2, 2010, Pages S24-S32.*

30. Craig T. Morita, Hoi K. Lee, Hong Wang, Hongmin Li, Roy A. Mariuzza, Yoshimasa Tanaka; Structural Features of Nonpeptide Prenyl Pyrophosphates That Determine Their Antigenicity for Human $\gamma\delta$ T Cells. *J Immunol* 1 July 2001; 167 (1): 36–41.

31. Craig Morita, Olivier Henry, Mark Distefano, Jukka Mönkkönen, Yoshimasa Tanaka, Hong Wang; Butyrophilin 3A1 plays an essential role in prenyl pyrophosphate recognition by human $V\gamma 2V\delta 2$ T cells (P5051). *J Immunol* 1 May 2013; 190 (1_Supplement): 111.8.

32. Azkur AK et al.. 2020 Immune response to SARS-CoV-2 and mechanisms of immunopathological changes in COVID-19. *Allergy.* 75, 1564-1581. (doi:10.1111/all.14364).

33. Chen Z, John Wherry E. 2020 T Cell responses in patients with COVID-19. *Nat. Rev. Immunol.* 20, 529-536.

34. Seow J et al.. 2020 Longitudinal observation and decline of neutralizing antibody responses in the three months following SARS-CoV-2 infection in humans. *Nat Microbiol* 5, 1598-1607.

35. Zhang Luhao, Li Rong, Song Gang, Scholes Gregory D. and She Zhen-Su 2021 Impairment of T cells' antiviral and anti-inflammation immunities may be critical to death from COVID-19. *Soc. Open Sci.* 8211606.

36. Jablonski KA, Amici SA, Webb LM, Ruiz-Rosado JdD, Popovich PG, Partida-Sanchez S, et al. (2015) Novel Markers to Delineate Murine M1 and M2 Macrophages. *PLoS ONE* 10(12): e0145342.

37. Yuwei Wu, Yanfei Liu, Ting Wang, Qiao Jiang, Feng Xu, Zhenbao Liu, *Living cell for drug delivery, Engineered Regeneration, Volume 3, Issue 2, 2022, Pages 131-148, ISSN 2666-1381.*

38. Jiaxin Zhang, Yuge Zhao, Tianling Hou, Hairong Zeng, Dipika Kalambhe, Bing Wang, Xiaoyan Shen, Yongzhuo Huang, *Macrophage-based nanotherapeutic strategies in ulcerative colitis, Journal of Controlled Release, Volume 320, 2020, Pages 363-380.*

39. Patent RU: 02137479 IMMUNOMODULATING AGENT/RU - 20.09.1999 Appl.No 97114477/14, Applicant Solagran Limited (AU), Inventor Roshchin V.I.(RU).

40. Patent USA. US5731357 - Immunomodulating active substance, United States of America, Application Number -08588129, Application Date - 18.01.1996, Publication Number -5731357, Publication Date -24.03.1998. Inventors: Rubens Juris, Poluektova Larisa, Gromova Nadezda, Seleznovs Jurijs.

41. Toda, Gotaro & Yamauchi, Toshimasa & Kadowaki, Takashi & Ueki, Kohjiro. (2021). Preparation and culture of bone marrow-derived macrophages from mice for functional analysis. *STAR Protocols*. 2. 100246. 10.1016/j.xpro.2020.100246.

42. Korotkaja K, Jansons J, Spunde K, Rudevica Z, Zajakina A. Establishment and Characterization of Free-Floating 3D Macrophage Programming Model in the Presence of Cancer Cell Spheroids *Int J Mol Sci*. 2023 Jun 28;24(13):10763. DOI: 10.3390/ijms241310763.

43. Trofimova O, Korotkaja K, Skrastina D, Jansons J, Spunde K, Isagulians M, Zajakina A. Alphavirus-Driven Interferon Gamma (IFN γ) Expression Inhibits Tumor Growth in Orthotopic 4T1 Breast Cancer Model. *Vaccines (Basel)*. 2021 Oct 27;9(11):1247. doi: 10.3390/vaccines9111247.

残疾人权益保障社会政策
**SOCIAL POLICY IN RELATION TO THE PROTECTION OF
RIGHTS OF DISABLED PEOPLE**

Dymochka Mikhail Anatolyevich

*Doctor of Medical Sciences, Chief Federal Expert
Federal State Budgetary Institution of the ITU of the Ministry
of Labor of the Russian Federation*

Naumenko Lyudmila Leonidovna

*Doctor of Medical Sciences, Head
Scientific and Methodological Center of the Federal State Budgetary
Institution of the ITU Ministry of Labor of the Russian Federation*

Stasevich Natalia Yurievna

*Doctor of Medical Sciences, Head of Department
Federal State Budgetary Institution of the ITU Ministry of Labor
of the Russian Federation*

Grigorieva Irina Vladimirovna

*Ph.D, Researcher
Federal State Budgetary Institution of the ITU Ministry of Labor
of the Russian Federation*

总结。当前，国际社会注意到残疾人数量的增加，认识到由此产生的社会挑战的重要性，也强调需要找到有效的方法来解决这些问题。

关键词：残疾人、社会保护、残疾人权利。

Resume. *Currently, the international community notices the increase in the number of people with disabilities and recognizes the importance of the social challenges arising from this, and also emphasizes the need to find effective methods to resolve them.*

Keywords: *disabled people, social protection, rights of disabled people.*

Introduction. According to the World Health Organization's World Report on Disability, there are over one billion people worldwide living with some form of disabling condition, representing about 15 percent of the world's population - a significant increase from the 10 percent recorded in previous reports by the same organization.

Approximately 15 percent of people in the world (over one billion people) face health limitations, and of this number, about 10 percent (approximately 70 million people) experience severe mobility difficulties, which necessitates the use of a wheelchair [1]. In the Russian Federation, according to available statistics, 59 percent of citizens are classified as persons with limited mobility [2].

According to the Concept for the development of programs that help the recovery and adaptation of people with various disabilities, including children, until 2025, adopted in Russia (approved by the decision of the Government of the Russian Federation of December 18, 2021 No. 3711-r), it is planned to create personalized service packages for these people. These services are focused on many key areas, including medical, social (everyday, environmental, psychological and pedagogical), cultural, pedagogical-psychological and professional rehabilitation, as well as physical training, which uses elements of adaptive physical education and sports. Services can be provided simultaneously or sequentially in order to maximize the development of a person's rehabilitation potential, restoring or compensating for the loss of body functions and limitations in everyday life, promoting social adaptation and integration, improving the ability to live independently and independently, and improving the overall quality of life.

In Russia, over the past decades, important changes have been taking place in supporting people with disabilities and strengthening their rights to rehabilitation services and assistance, including technical means. These changes are reflected in a series of laws and regulations, among which the key one is the Federal Law "On the Social Protection of Disabled Persons in the Russian Federation" (Federal Law No. 181-FZ). Another important milestone was Russia's ratification of the UN Convention on the Rights of Persons with Disabilities on May 3, 2012, and subsequent steps aimed at fulfilling the assigned obligations.

However, like many countries in the world, Russia faces problems in providing access to high-quality and effective rehabilitation and habilitation services. This problem was noted and reflected in the recommendations following the meeting of the President of the Russian Federation Vladimir Putin with representatives of public organizations for disabled people and specialists involved in issues of assistance to people with disabilities, which took place on December 5, 2017. As a result, the need was expressed to take additional measures to create and develop regional and municipal centers providing comprehensive rehabilitation services with the participation of doctors, psychologists and teachers, in order to improve the availability and quality of these services.

All of the above prompted us to consider issues of social policy regarding disabled people.

Results. Disability is a phenomenon that every society faces, and depending on the stage of development of the country, its priorities and resources, socio-economic strategies aimed at supporting people with disabilities are formed. The most

important aspect of state activity concerning people with disabilities is the development and implementation of an effective support system that provides them with the opportunity to meet their needs, according to the generally accepted system of values of society [3,4].

The legislative basis for social support for people with disabilities in Russia is based on the principle of equal opportunities for them and other citizens in the exercise of personal, economic, political and other rights and freedoms. The regulations of federal laws and other normative legal acts include rules whose purpose is to guarantee the active participation of people with disabilities in public life and ensure the protection of their legal interests. In accordance with Article 35 of the UN Global Compact on the Rights of Persons with Disabilities, the Russian Federation has fulfilled its international duty by providing the United Nations with a report on the activities carried out within the framework of the implementation of the articles of the said Convention and the progress achieved in this direction, summing up the results by September 1, 2014.

Before the national report on compliance with the Convention was submitted, there was activity by authorities in various regions of Russia in drafting their parts of the report in accordance with the powers delegated to them by the Russian Federation or related to their own competence.

In Russia, as in many other countries, people with disabilities are among the most vulnerable segments of the population. Physical, psychological or other limitations make it difficult for them to fully realize their rights. Despite significant improvements in living conditions over the past hundred years in developed countries, the situation of people with disabilities often remains without due attention. As a rule, the interests and rights of this category of people are the last to be prioritized by the state and society. According to UN statistics, there are more than 650 million people with disabilities in the world, and every day 2 billion people face difficulties related to disability, including their families and caregivers.

Today, persons with disabilities have the right to protect their interests using the following list of legal acts (the list is far from complete): The UN International Convention on the Special Rights of Persons with Disabilities, ratified on December 13, 2006, together with the key legislation of the Russian Federation, creates a reliable legal foundation for protecting the interests of this category of citizens. The most significant regulatory legal acts include:

- The Constitution of the Russian Federation, which affirms the basic values of the rights and freedoms of each individual;
- The Criminal and Civil Codes of the Russian Federation, which formulated the foundation for legal relations between individuals and the state;
- The Labor Code of the Russian Federation, which defines the norms of labor organizational relations and specific rules for the direction of work of disabled people;

- The Code of the Russian Federation on Administrative Offenses, which relates to the laws governing the application of norms in the context of administrative violations;
- Federal Law on the social protection of persons with disabilities in the Russian Federation (No. 181-FZ), which outlines the range of support for these persons;
- The Laws “On Education” (No. 273-FZ) and “On the Fundamentals of Social Services for Citizens” (No. 442-FZ), detailing the procedures for access to educational opportunities and social services;
- The Federal Law “On the Fundamentals of Health Protection of Citizens” (No. 323-FZ) and the Law “On Employment of the Population” address elements of health care and employment policy;
- The laws that set the framework for pension provision, including “On State Pension Provision” (No. 166-FZ) and “On Insurance Pensions” (No. 400-FZ), describe in detail the mechanisms for calculating pension payments [https://lawyer-consult.ru/social_security/prava-invalidov/zashhita-i-otvetstvennost.html].

Conclusion. The state strategy for people with disabilities is built around the importance of their rehabilitation. In order to implement the integration of people with disabilities into the family and social spheres, as well as to improve their standard of living, the social strategy of the Tambov Region places special emphasis on relevant measures.

At the level of regional and municipal authorities, a set of measures was implemented covering disease prevention, disability prevention and rehabilitation processes for people experiencing limitations in their daily functions. However, the current state of the system shows its low productivity and effectiveness. A significant difficulty is the lack of approved state standards for rehabilitation procedures, as well as objective criteria for assessing the quality and effectiveness of rehabilitation measures.

This is why it is necessary to strengthen the launch of individual rehabilitation programs to subsequently reduce the disability rate of the population.

References

1. *Disability and Development Report. Realizing the Sustainable Development Goals by, for and with persons with disabilities 2018;. Disability and health: Fact sheet Reviewed November 2016 [Electronic resource]. // World Health Organization. – Geneva: WHO, 2020.*
2. *The concept of improving the state system of medical and social examination and rehabilitation of disabled people [Electronic resource] // Laws, codes and normative legal acts of the Russian Federation: website. - M., 2015-2020. - Access*

mode:<https://legalacts.ru/doc/kontseptsijasovershenstvovaniya-gosudarstvennoi-sistemy-mediko-sotsialnoi-ekspertizy-i/>

3. Kirsanov D.A., Yakushin M.A., Shamatava N.E., Sherafetdinov A.K., Viryasov A.V. *Justification for the implementation of the therapeutic environment methodology for patients with leading moderate cognitive deficit and motor disorders as an aspect of rehabilitation // Bulletin of the Medical Dental Institute. 2023. No. 1 (64). P. 37-39.*

4. Chernyshev A.V., Chernysheva M.L., Klovov R.V., Stasevich N.Y., Tarkinskaya D. *Se27MAX12/W/*

5. Kirsanov D.A. *Socio-economic factors of active longevity and state policy regarding an active lifestyle of the elderly (literature review) // Bulletin of the Medical Dental Institute. 2022. No. 3 (62). P. 65-67.*

DOI 10.34660/INF.2024.43.47.046

远程医疗心电图监护技术在脑卒中患者高科技神经康复治疗心脏安全性监测过程中的应用

**TELEMEDICINE ECG MONITORING TECHNOLOGIES IN THE
PROCESS OF MONITORING THE CARDIAC SAFETY OF HIGH-
TECH NEUROREHABILITATION OF PATIENTS AFTER A
CEREBRAL STROKE**

Neprintseva Natalia Viktorovna

*Candidate of Medical Sciences, General Practitioner
S.I. Spasokukotsky Moscow Centre for research and practice
in medical rehabilitation, restorative and sports medicine of
Moscow Healthcare Department*

Schikota Alexey Mikhailovich

*Candidate of Medical Sciences, Associate Professor, Scientific Secretary
S.I. Spasokukotsky Moscow Centre for research and practice
in medical rehabilitation, restorative and sports medicine of
Moscow Healthcare Department*

Kostenko Elena Vladimirovna

*Doctor of Medical Sciences, Professor, Deputy Director for Research
S.I. Spasokukotsky Moscow Centre for research and practice
in medical rehabilitation, restorative and sports medicine of
Moscow Healthcare Department*

Pogonchenkova Irena Vladimirovna

*Doctor of Medical Sciences, Professor, Director
S.I. Spasokukotsky Moscow Centre for research and practice
in medical rehabilitation, restorative and sports medicine of
Moscow Healthcare Department*

注释。安全是卒中患者康复的主要方面之一。目的。研究在缺血性卒中早期和晚期患者康复过程中使用心电图远程监测评估和纠正心血管风险的可能性。材料和方法。该研究包括83名缺血性卒中早期和晚期患者。所有患者均接受了一套高科技康复方法，以恢复上下肢功能障碍。使用便携式心脏综合心电图适配器监测患者的心电图参数并实时评估。结果与讨论。缺血性卒中早期和晚期恢复期患者均出现了一系列心电图异常。发现的心电图变化不是继续康复的禁忌症。在心电图发

生变化的情况下,调整了康复计划,并根据需要进行药物治疗。这使所有患者都能成功完成康复过程。结论。研究表明,需要在康复过程中控制风险。在脑卒中早期和晚期康复活动中,通过心电图远程监测可以实现这一点。

关键词:缺血性中风、医疗康复、远程心电图、远程监测、心脏安全。

Annotation. *Safety is one of the main aspects of medical rehabilitation of patients who have suffered a stroke. Purpose.* To study the possibilities of assessing and correcting cardiovascular risks using ECG telemonitoring in the process of medical rehabilitation of patients in the early and late periods of ischemic stroke. *Material and methods.* The study included 83 patients in the early and late periods of ischemic stroke. All patients underwent a set of high-tech rehabilitation methods to restore dysfunction of the upper and lower extremities. The ECG parameters of patients were monitored using a portablecardiocomplex ECG Dongle and evaluated in real time. *Results and discussion.* A range of ECG abnormalities was revealed in patients in the early and late recovery periods of ischemic stroke. The revealed ECG changes were not contraindications for continuing medical rehabilitation. In the presence of ECG changes, the medical rehabilitation program was adjusted, as well as, if indicated, drug therapy. This allowed all patients to successfully complete the rehabilitation process. *Conclusion.* The results obtained in the study indicate the need to control risks in the rehabilitation process. Which is possible through ECG telemonitoring during rehabilitation activities in the early and late recovery periods of cerebral stroke.

Keywords: *ischemic stroke, medical rehabilitation, tele-ECG, remote monitoring, cardio safety.*

Stroke is one of the major health problems of the adult population and ranks third among causes of death in developed countries. In Russia, stroke is the second leading cause of death after myocardial infarction. The incidence of stroke ranges from 460 to 560 cases per 100,000 population. A large number of patients (84-87%) die or remain disabled, only 13-16% of patients fully recover. This indicates the need to improve approaches to medical rehabilitation after stroke.

According to the literature, in patients with cerebral stroke, the cause of death during the first month is acute cerebrovascular disease. During the following year, comorbid pathology acts as the main factor of death [1].

Comorbidity is a combination of two or more syndromes or independent diseases, none of which is a complication of the other. Comorbidity may be associated with a single cause or a single mechanism of pathogenesis of these conditions. The presence of concomitant pathology in patients after a stroke can have a significant impact on the course of the underlying disease and limit the implementation of rehabilitation measures. This affects the effectiveness of the restoration of impaired functions.

Among the concomitant diseases in patients who have suffered a stroke, the most common are diseases of the circulatory system, diseases of the nervous system, and diseases of the musculoskeletal system [2]. The presence of concomitant pathology should be taken into account when compiling a rehabilitation program. Given the frequency of heart disease in stroke, rehabilitation technologies should be accompanied, first of all, by monitoring the safety of the cardiovascular system.

Currently, the use of information technology (IT) in medicine is becoming widespread. The use of IT in the healthcare system forms the concept of “electronic health” (eHealth). Separately, we can highlight “mobile health” or “mHealth” - this is a component of digital health, defined by the World Health Organization as “medical clinical practice and public health practice based on data from mobile devices, including mobile phones, monitors, personal digital assistants and other wireless devices” [3].

Digital health, and mHealth in particular, has been shown to improve the quality and coverage of health care, expand access to health information and services, and promote positive changes in patient health behavior to prevent acute and chronic diseases.

For patients with cardiovascular diseases, telemedicine rehabilitation allows increasing the availability of medical rehabilitation. Remote monitoring programs make it possible to assess physical activity, blood pressure, ECG, heart rate variability, and saturation.

Purpose of the study. To study the possibilities of assessing and correcting cardiac risks using ECG telemonitoring in the process of medical rehabilitation of patients in the early and late periods of ischemic stroke.

Material and research methods. The study included 83 patients in the early and late periods of ischemic stroke aged 35 to 80 years. Of these, 42 patients were in the early recovery period, 41 patients in the late recovery period. The diagnosis of cerebral infarction was confirmed by neuroimaging data (CT/MRI of the brain).

A multidisciplinary approach was used to assess the patient's health. The patient was examined by a neurologist, therapist, cardiologist, psychotherapist, and a physician specializing in physical and rehabilitation medicine. Laboratory and instrumental examination methods were used. The assessment of cardiovascular and cerebrovascular risks included an assessment of the degree of arterial hypertension, functional class of angina, chronic heart failure, pulmonary hypertension, assessment of tolerance to physical activity, determination of the peak heart rate to calculate submaximal activity. After assessing the rehabilitation risks, an individual medical rehabilitation program was developed with determination of the frequency and duration of procedures, and rest periods.

All patients received drug therapy in accordance with the standards of medical care. Drug therapy was aimed at secondary prevention of stroke and correction of risk factors for cardiovascular diseases.

The medical rehabilitation program was aimed at restoring post-stroke motor disorders. Rehabilitation measures included: stabilotraining using biofeedback, training with functional electrical stimulation, and the robotic trainer using hand exoskeleton.

For remote monitoring of the rehabilitation process aimed at controlling cardiovascular risks, the portable device "Cardio complex ECG Dongle" was used to record ECG. It connects to a mobile phone via a USB cable. The ECG is recorded in 6 leads. The ECG data is transmitted and stored on the mobile device, with the option to send the data to a doctor. The results can be evaluated in real-time.

Results and discussion. ECG changes were assessed in groups depending on the duration of the ischemic stroke (early and late recovery period). In addition, patients were divided into groups depending on the subtype of ischemic stroke according to the TOAST classification.

Recording an ECG using a cardio flash drive ECG Dongle was performed before the start of medical rehabilitation, between procedures and after their completion. The following deviations were considered clinically significant: sinus tachycardia ≥ 100 beats per minute, sinus bradycardia ≤ 55 beats per minute, ST segment depression ≥ 2 mm, frequent ventricular, supraventricular extrasystoles, intraventricular conduction disturbances (widening of the QRS complex ≥ 0.12 s), slowing of AV conduction (prolongation of the PQ interval > 0.18 s).

Changes in cardiac activity in the early recovery period were recorded in 61.9% of patients and consisted of the development of sinus tachycardia in 16.7% of patients, less frequently bradycardia was observed - in 9.5% and ventricular extrasystole - in 11.9%. Conduction function disorders were recorded in 14.3% of patients in the form of slowing of atrioventricular conduction (5.3% of patients) and prolongation of the QT interval (9.0% of patients). Repolarization disorders were detected in 4 patients (9.5%): in the form of a negative T wave in 3 patients (7.1%) and in 1 patient (2.4%) - transient depression of the ST segment > 2 mm.

Clinical example: Patient F., 58 years old, with comorbid pathology (hypertension, type 2 diabetes mellitus). Rehabilitation in the early period of ischemic stroke. During the fourth session of medical rehabilitation, ST segment depression was registered (Figure 1) without clinical symptoms. The patient's medical rehabilitation procedures were temporarily canceled. The patient was examined by a cardiologist. In accordance with the results of additional examination (including echocardiography, Holter ECG monitoring), drug therapy and the medical rehabilitation program were adjusted.

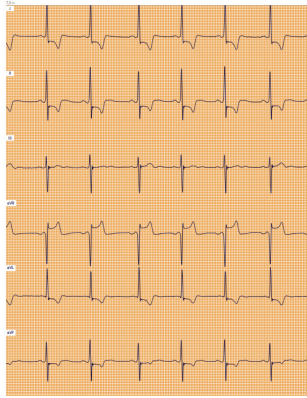


Figure 1. ECG in myocardial ischemia.

In patients in the late recovery period, ECG changes such as sinus tachycardia, supraventricular and ventricular extrasystole, intraventricular conduction disturbances, and QT interval prolongation were recorded significantly less frequently. Repolarization disturbances detected in 4.9% of patients were manifested by transient ST segment depression ≥ 2 mm.

Clinical example: Patient T, 66 years old, with comorbid pathology (hypertension, hyperlipidemia type 2a) without a history of atrial fibrillation. Rehabilitation in the late period of ischemic stroke. Supraventricular arrhythmia was registered during the fifth session of medical rehabilitation (Figure 2). The patient was examined by a cardiologist, additional examination was performed, drug therapy and medical rehabilitation program were adjusted.

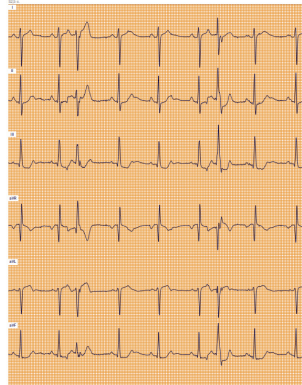


Figure 2. ECG in supraventricular arrhythmia.

In patients with the cardioembolic subtype of ischemic stroke (IS), a higher percentage of clinically significant abnormalities in ECG parameters was detected compared to other studied IS subtypes: ventricular extrasystole - in 37.5%, episodes of atrial fibrillation - in 85.7%, intraventricular conduction disturbance - in 41.2% of cases. This correlated with the frequency of occurrence and severity of concomitant cardiovascular pathology in this category of patients.

In patients with clinically significant disorders, additional examinations were carried out, drug therapy and motor rehabilitation programs were adjusted in terms of intensity and frequency of loads.

Conclusion. Cardiac safety monitoring is an important component of neuro-rehabilitation programs for patients who have suffered a stroke. The presence of cardiovascular comorbidity and reduced functional capabilities after a stroke increase the risk of clinically significant ECG abnormalities during rehabilitation. The conducted scientific study showed a high percentage of ECG abnormalities in patients in the early and late recovery periods of ischemic stroke. Cardioembolic stroke is the subtype that is most threatening in terms of cardiac abnormalities during rehabilitation, both in the early and late recovery periods of ischemic stroke, and requires more careful ECG monitoring. ECG monitoring, using telemedicine technologies, allows for timely detection and correction of cardiac abnormalities in patients after a stroke, preventing the development of cardiovascular complications (events) and achieving the rehabilitation goal.

The study was supported by the Moscow Government Grant 1503-7/23.

References

1. *Basentsova N.Y., Shishkin A.N., Tibekina L.M. Cerebrocardial syndrome and its features in patients with acute cerebrovascular accident. Bulletin of St. Petersburg University. 2017; 12(1): 31-47.*
2. *Kostenko E.V., Polunin V.S., Polunina N.V. The influence of comorbidity on the characteristics of the rehabilitation process after stroke. Medicine. 2017; (4): 27–33.*
3. *Varma N, Cygankiewicz I, Turakhia M, et al. 2021 ISHNE/HRS/EHRA/APHRS collaborative statement on mHealth in Arrhythmia Management: Digital Medical Tools for Heart Rhythm Professionals. Cardiovascular Digital Health Journal 2021;2(1):1-54.*

DOI 10.34660/INF.2024.40.48.047

康复潜力和康复预后定义的方法
**METHODOLOGICAL APPROACHES TO THE DEFINITION
OF REHABILITATION POTENTIAL AND REHABILITATION
PROGNOSIS**

Demuria Lyubov Edwardovna

PhD, Chief Physician

Royal Clinic LLC, Moscow, Russia

Naumenko Lyudmila Leonidovna

Doctor of Medical Sciences, Head

*Scientific and Methodological Center of the Federal State Budgetary
Institution of the ITU Ministry of Labor of the Russian Federation*

Kirsanov Dmitry Alexandrovich

Postgraduate student

*Tambov State University named after G.R. Derzhavin,
Tambov, Russia*

Denisov Konstantin Ivanovich

Postgraduate student

*National Research Institute of Public Health named after
N.A. Semashko,
Moscow, Russia*

Morozov Ivan Nikolaevich

Postgraduate student

*National Research Institute of Public Health named after
N.A. Semashko,
Moscow, Russia*

总结。由于一些地区人口减少、居民人数减少、人口老龄化、劳动年龄人口比例下降、人口差距扩大和残疾人人数增加，俄罗斯联邦目前的人口和健康状况令人担忧。这些趋势可能对该国的动态发展构成威胁。它们导致劳动力减少，给社会保障、卫生和养老金制度带来额外压力。在这方面，迫切需要审查国家计划，并改变旨在支持残疾人及其家庭的社会战略，该战略基于康复潜力的定义。

关键词：残疾人、康复潜力、康复预测、方法论。

Resume. *The current demographic and health situation in the Russian Federation is alarming due to the population decline in a number of regions, the decrease in the number of residents, the aging of the population, the decrease in the share of people of working age and the deepening of the demographic gap and the growth of disability. These trends may pose a threat to the dynamic development of the country. They contribute to the reduction of the workforce, create additional pressure on the social security, health and pension systems. In this regard, there is an urgent need to review state programs and make changes to the social strategy aimed at supporting disabled people and their families, which is based on the definition of rehabilitation potential.*

Keywords: *disabled people, rehabilitation potential, rehabilitation prognosis, methodological approaches.*

Introduction. A significant step in the development and implementation of the state strategy for supporting persons with disabilities was the ratification of the Convention on the Rights of Persons with Disabilities by the Russian Federation. This event necessitated a number of changes to the current legislation and other regulatory documents.

The area of legal regulation concerning the rehabilitation of persons with disabilities is characterized by complexity and multifacetedness [1-3].

Analyzing the section of the first part of the third article of federal legislation number 181-FZ, adopted on November 24, 1995 and dedicated to the social protection of disabled people in the Russian Federation, scientific experts note significant transformations that have occurred not only in the interpretation of the term “rehabilitation of disabled people”, but also in the general strategy of rehabilitation procedures and practices since that time.

The amendments introduced by Federal Law No. 132-FZ of October 23, 2003, expanded the concept of rehabilitation by adding new procedural elements. Now rehabilitation includes the development of systems and processes aimed at the full or partial restoration of the ability of people with disabilities to live independently in society, including in everyday life and the professional sphere.

In accordance with the provisions of the Federal Law of the Russian Federation No. 419-FZ, dated December 1, 2014, the modern interpretation of the term “Medical Rehabilitation” excludes from its application such types of treatment measures as reconstructive surgery, prosthetics and orthopedic services, as well as spa treatment. The consequence of the adoption of Federal Law No. 323-FZ of November 21, 2011 “On the Fundamentals of Health Protection of Citizens in the Russian Federation” [4] was the introduction of innovative concepts into the healthcare system and the beginning of the development of additional legislative regulations concerning medical rehabilitation and specialized treatment in sanatoriums.

Legislative acts such as No. 273-FZ “On Education in the Russian Federation”, approved on December 29, 2012, and No. 329-FZ “On Physical Culture and Sports in the Russian Federation”, adopted on December 4, 2007, establish norms and procedural mechanisms aimed at promoting inclusive education and the integration of persons with disabilities into sports activities. These laws provide for the creation of sufficient conditions for access to educational programs, the development of adaptive sports, and the organization of specialized events aimed at physical rehabilitation and strengthening the health of persons with disabilities [5].

A thorough analysis of specialized publications shows the need for a systematic approach to improving the living conditions of people with disabilities using a program-targeted methodology. Of particular importance is the development of a comprehensive system aimed at preventing disability and comprehensive rehabilitation, which includes the formation of an accessible social infrastructure for people with disabilities, their integration into public life and the implementation of the provisions of international conventions on the protection of the rights of people with disabilities. These are responsibilities that lie not only on government agencies at various levels, but also on organizations dealing with disability issues.

Results. This article describes the methodology for forming criteria that are necessary for assessing the effectiveness of rehabilitation programs in institutions. These criteria should take into account such factors as the characteristics and severity of the disabled person’s illness, the degree of limitations of his/her life activities, the potential for rehabilitation and the predicted results of the rehabilitation process (Table 1).

Table 1

Criteria and indicators for assessing the results of medical rehabilitation, analyzed for the periods of the beginning and completion of the implementation of rehabilitation of a disabled person

Criteria	Indicators	Evaluation of the indicator in points
The degree of violation of the functional systems of the body, leading to the restriction of the vital activity of a disabled person - (a1)	Grade 1 - minor violations	4
	Grade 2 - moderate violations	3
	Grade 3 - severe violations	2
	Grade 4 - significantly pronounced violations	1
The level of physical endurance (tolerance to physical exertion, anaerobic performance, functional reserve) - (a2)	Functional class (f.c.) of the body condition: I. f.c. - a slight decrease in physical endurance;	4
	II f.c. - moderate decrease;	3
	III f.c. - marked decrease;	2
	IV f.c. - significantly pronounced decrease in physical endurance.	1
The degree of violation of psychological status (pathopsychological, neuropsychological disorders, deformations of the system of violation of personal relationships, adequacy of professional orientation, social competence) - (a3)	Grade 1 - minor violations of the psychological status;	4
	Grade 2 - moderate violations;	3
	Grade 3 - severe violations;	2
	Grade 4 - significant violations.	1

Thus, the effectiveness of rehabilitation depends on an individual prognosis, taking into account the clinical picture and medical data on the disease and therapy.

The prognosis of rehabilitation outcomes depends on many aspects: the patient's current health, psychological well-being, physical ability to work, adaptation to emotional and physical stress, and the risks associated with existing diseases. Based on this, the outlook may vary from good to relatively good, uncertain, or even bad.

Conclusion. Thus, in order to reduce the disability rate of the population, one of the strategic directions is the development of new organizational, structural, technological and, subsequently, medical and economic standards of rehabilitation for persons with disabilities, which will become the basis for further improvement of the quality of rehabilitation services, which, in turn, are based on the methodological basis for studying and assessing the rehabilitation prognosis and potential.

References

1. Puzin S.N., Shurgaya M.A., Dmitrieva N.V. et al. *Epidemiology of disability of the adult population in the Russian Federation // Epidemiology and Vaccine Prevention. 2019. Vol. 18, No. 5. Pp. 14–23. <https://doi.org/10.1134/j.2019.10.10.14.org/10.31631/2073-30462019-18-5-14-23>*
2. Puzin S.N., Shurgaya M.A., Memetov S.S., Sviridenko A.V. *Modern trends in regional differentiation of disability due to diseases of the circulatory system in elderly citizens in the Russian Federation // Bulletin of the All-Russian Society of Specialists in medical and social expertise, rehabilitation and rehabilitation industry. 2017, No. 1, pp. 33-41.*
3. Saygitov R.T., Chulok A.A. *Cardiovascular diseases in the context socio-economic priorities for the long-term development of Russia // Bulletin of the Russian Academy of Medical Sciences. 2015. Vol. 70, No. 3. P. 286-299. <https://doi.org/10.15690/vramn.v70i3.1324>*
4. Federal Law No. 181-FZ of 24.11.1995 “On social protection of disabled persons in Russia”. http://www.consultant.ru/document/cons_doc_LAW_8559/
5. Federal Law No. 442-FZ of 28.12.2013 “On the Fundamentals of Social Services for Citizens in the Russian Federation”. http://www.consultant.ru/document/cons_doc_LAW_156558/

医疗改革的历史阶段
**STAGES OF HEALTHCARE REFORM IN THE HISTORICAL
ASPECT**

Gabrielyan Artur Rudolfovich

PhD, Chief Physician

*State Medical University named after A.K. Yeramishantsev DZM,
Moscow, Russia*

Demuria Lyubov Edwardovna

PhD, Chief Physician

Royal Clinic LLC, Moscow, Russia

Kechaykin Alexey Nikolaevich

Chief Physician

*Polyclinic "RZD-Medicine" Necklace, CHUZ,
Kashira, Moscow region, Russia*

Serov Denis Vladimirovich

Chief Physician

*GBUZ Polyclinic No. 46 DZM,
Moscow, Russia*

简历。俄罗斯联邦 (RF) 2015–2030 年长期卫生发展战略确定了卫生领域国家政策和法律监管的优先事项和主要方向。确定了任务，解决这些任务的目的是通过提高医疗服务的可及性和质量来维护和加强俄罗斯联邦公民的健康。迫切需要对计划改革的活动、科学验证标准的应用以及结构和功能变化的实施进行更深入的历史分析。

关键词：历史分析、改革、卫生保健、发展战略。

Resume. *The strategy for the development of healthcare in the Russian Federation (RF) for the long-term period 2015-2030 defines the priorities and main directions of state policy and legal regulation in the healthcare sector. The tasks are defined, the solution of which is aimed at preserving and strengthening the health of citizens of the Russian Federation by ensuring increased accessibility and quality of medical care. The need for a more in-depth historical analysis of the activities of the planned reforms, the application of scientifically proven standards, and the implementation of structural and functional changes is a pressing issue.*

Keywords: *historical analysis, reforms, health care, development strategy.*

It is well known that the level of socio-economic development of a state, along with the general direction of the changes occurring in it, determines the state of healthcare in that state.

In the history of the development of healthcare in Russia, two significantly different periods are distinguished: the Soviet period (before the 1990s) and the period of the beginning of market reforms, or post-Soviet. Healthcare in Russia in the period before the 1990s was characterized by many positive aspects. There was a high degree of protection of the population, the presence of financially secure guarantees for the provision of free medical care, the presence of uniform financial standards for servicing citizens living in different regions of the country; there was no factor of influence of different economic conditions for different regions. There was also strict state supervision of the conditions for the provision of medical care and strict control over reporting on the expenditure of public funds. Uniform standards for planning, financing and strict budgetary and financial discipline determined the process of development of healthcare in the Soviet period [1].

At the same time, following the ideology of the state, health care remained a sphere of secondary importance, since it did not provide its own funding, existed at the expense of the production sector and was financed on a residual basis. In this area, there was high employment of the workforce and relatively low mechanization of labor. Higher management bodies approved performance indicators, made plans and estimates of operational activities for medical institutions, which formed a strict budgetary system of health care at that time. Any changes to the approved indicators could only be made with the permission of higher officials. During the year, medical institutions received their funding exclusively according to the established cost estimate and the actual implementation of the provided operational plan for the activities of a particular institution. Three days were allocated for storing the received income and unused balances in the institution.

The nationwide economic crisis of the early 1990s immediately affected the state of the country's economy, management processes and healthcare organization; there was a sharp decline quality of medical care provided to the population, since the strict command-and-control management system assessed the activities of multidisciplinary hospitals only by quantitative indicators. The emergence of this trend was also facilitated by the low level of material and technical and drug provision of inpatient outpatient institutions, the uneven distribution of financial and material resources between them, and the established system of wages for medical workers did not take into account the volume and quality of services provided [2]. Thus, it became completely obvious that it was impossible to further develop the health care system using only a constant annual increase in the capacity of beds, the outpatient network and personnel. The process of increasing the growth of budgetary allocations without changing the conditions of economic

activity of medical institutions did not provide the necessary efficiency in the development of state health care.

It became obvious that the time had come to move from extensive to intensive methods of development aimed at more economical use of health care resources, rather than their thoughtless increase in favor of accepted indicators. The question also arose about the vital need to develop and introduce into the economy a system of stimulating the quality of work of a huge army of medical workers.

The radical reforms that took place in Russia in the last decade of the last century dictated the need for a fundamental change in the state of affairs in all areas of state development: political, socio-economic and, accordingly, in the health care sector, where there was an urgent need for a whole system of targeted measures for the gradual structural reorganization of the entire system of domestic health care as a whole. In the context of the formation of market relations, the low economic, medical and social efficiency of domestic health care has jeopardized the health of children and adults in Russia.

The reform of Russian healthcare, carried out from the early 2000s to the present, has defined its main objectives as:

- ensuring constitutional guarantees for citizens in the area of health protection by expanding the legal and material base;
- maintaining the leading position of the state system in healthcare;
- stable functioning of medical institutions;
- increasing economic and medical-social efficiency of medical institutions;
- active use of material, technical, financial and human resources in medical institutions;
- reasonable savings and more rational use of saved funds in solving problems in priority areas of activity of medical institutions [3].

Based on the study and analysis of existing scientific literature on issues of healthcare reform in the field of medical care for the population and the conditions of professional activity of doctors, five main areas of research were identified.

The first direction concerns economic experiments that were conducted in the state. These experiments were aimed at increasing the economic efficiency of multidisciplinary hospitals and improving the financial situation of medical personnel. The issues of quality management of medical care formed the second direction of research. The third direction of scientific work affected research on the analysis of the development and implementation of hospital-substituting technologies. Research on the problems and technology of functioning of non-governmental medical enterprises constituted the fourth direction of scientific activity. The fifth direction is devoted to issues of staffing and the health of medical personnel.

Over the past 40 years, the state has repeatedly tried to improve the system of financing, planning and stimulating the activities of medical personnel in multidis-

ciplinary hospitals in various regions, territories and areas of the country. This has not always been effective enough. In particular, in healthcare institutions, with the scientific and methodological support of the N.A. Semashko Research Institute of Social Hygiene, Economics and Healthcare Management, a number of economic experiments described in the literature were conducted, the purpose of which was to develop and create measures aimed at improving the quality of medical care and labor efficiency, as well as the rational use of financial and material resources.

The first experiment consisted of two stages. Stage I started in 1967, stage II in 1974-1975 [4].

Subsequently, to the participants of the experiment 24 more multidisciplinary hospitals joined. The essence of the experiment consisted in granting heads of healthcare agencies and institutions broad powers to change the staffing schedule, staff workload standards, and opportunities for material incentives for the work of medical personnel. Conditions were developed for the formation of a special financial fund for institutions for their managers, who now had the opportunity to direct funds from this fund to material incentives for high-quality staff work and to improve the cultural and everyday services of employees. The funds of the fund could also be used for additional purchase of medicines, inventory, and uniforms. The standards initially in effect determined the cost estimate. The staffing schedule and administrative and management expense estimates were now exempt from registration in financial bodies of staffing schedules and administrative and management expense estimates, and the annual estimate, except for wage items, food and medicine expenses, was approved in total. Unused funds as of January 1 of the following year were no longer closed and were not written off from the institution's account, but were credited to the institution's funds. These unused funds could be spent on purchasing equipment in excess of the established limits. Unused property of a medical institution was allowed to be sold with the institution's loans credited. Part-time work was introduced with an additional payment of up to 30.0% of the official salary, and home duty was allowed with payment of up to 50.0% of the official salary. Due to the savings, it became possible to form a fund of extra-budgetary funds and use it to reward employees (up to 70.0% of the fund) and improve the material and technical base (up to 30.0%, respectively).

Thus, multidisciplinary medical institutions received an excellent opportunity to save money by deploying additional beds in hospitals, improving the performance of inpatient institutions and equipping medical institutions with equipment, inventory, medicines, and items that create a comfortable workplace for staff, as well as conditions for patients. However, the first attempt to introduce new methods of economic activity into the country's health care system did not find due application.

It should be noted that by the 80s of the last century, the economic mechanism of domestic health care was a fairly integral system, however, based on strictly

centralized regulation, planning and management. In the conditions of excessive centralization of management, underestimation of economic approaches, there was a deformation of the criteria for assessing and methods for stimulating the work of medical workers, while the equal approach to the payment of wages of medical workers was combined with purely administrative measures, and the low level of wages of workers objectively stimulated bribery and the activity of the “black” market of medical services. The inability to use the laws of economic relations in practice became one of the main reasons for the growth of negative processes in the industry. It is noted that the rigidity in the implementation of planning and management of health care in the context of radical reforms came into conflict with the need to adapt health care to the new economic situation.

As Klimkin M.V. and Zaitseva T.S. (2001) point out, during the same period of time the ratio of extensive and intensive factors of the country’s economic development changed significantly in favor of the latter, which in turn required the development and wider use of economic management methods, improvement of the economic mechanism in the activities of multidisciplinary hospitals, and the use of various methods and forms of scientific organization of labor of medical workers. The issue of forms of labor organization in health care institutions was quite acute [5].

In connection with the above, the second most important experiment was recognized as the organizational and economic experiment in the use of the team form of organization and payment of labor of junior and middle medical personnel, which required the activation of the economic interests of medical workers, increasing the responsibility of each team member for the final results of the work. Of the various methods and forms of scientific organization of labor that appeared in health care in the early 80s, it was the method of team organization and material incentives for labor that contributed most to the involvement of each medical worker in the management process. The authors note that elements of the team form of labor organization were used in health care earlier, especially in rural areas: team visits of doctors to districts of the region for the purpose of medical examination of the rural population; cooperation of personnel of one medical post in a hospital; teams of operating surgeons and operating nurses; medical and engineering teams at enterprises [6].

At the same time, many scientists point to the fact that all the necessary conditions and prerequisites were available for the introduction of the team method into the practical activities of outpatient and inpatient institutions. The following conditions for the introduction of the team method into the practical activities of multidisciplinary hospitals were determined: continuity of the treatment and diagnostic process, requiring coordinated actions of medical workers; low labor standards of medical workers; dependence of the quality and efficiency of some

specialists on the diligence and conscientiousness of others; availability of work with an expansion of the service area and combination of professions; collective responsibility for the fate of the patient; involvement of a large number of employees in the management of labor activities; moral and material incentives for innovations and innovation. Two stages are distinguished in this experiment.

The first stage was carried out in the therapeutic departments of three Moscow clinics in 1981-1982. Its main goal was to improve the quality of patient care and maintain proper sanitary and epidemiological conditions in the departments with a significantly smaller number of junior medical workers (compared to the staffing standards). According to the conditions of the experiment in question, the personnel could unite into teams for sanitary and hygienic care of patients, cleaning of premises and other types of activities. Specific work standards and performance indicators for junior medical personnel in the department, without taking into account the staffing indicator, were developed directly in the multidisciplinary hospital itself and approved by the administration in agreement with the trade union committee. The team members received additional payment and bonuses for an increase in the volume of work and proper quality according to the labor participation coefficient (LPC). As noted by Lisitsyn Y.P., Ioffina O.B., Savelyeva E.N. (1998), the main result of this stage of the experiment was the strengthening of labor discipline, an increase in the quality and culture of patient care, and an increase in the material interest of workers in performing additional work.

The second stage of the experiment on the introduction of collective forms of work organization was the use of the team form of organization and material incentives for doctors' work. It was found that if moral incentives, with all the variety of their forms, were ultimately insufficiently effective and unpromising, then material incentives really contributed to the improvement of indicators. A direct interdependence was determined between the quantity and quality of work and the wages of the personnel, in other words, the number of wages for the personnel depended on the individual contribution of each team member in accordance with the labor participation coefficient (LPC).

A positive fact was that under the conditions of collective work, it became easier for department heads and team leaders to organize the treatment and diagnostic process, strengthen labor discipline, and reduce the need for constant external control. The problem of shortage of personnel, not only of junior and middle level, but also of doctors, practically disappeared; interchangeability of workers became the norm. The volume of work of absent staff members was willingly performed by working team members, who did not refuse additional workloads, but actively sought them. The maintenance of medical records by doctors significantly improved, the queue for diagnostic tests was reduced to a minimum, the number of complaints from patients about inattention and rudeness significantly decreased.

Medical personnel began to treat their work more conscientiously, proactively, with a high degree of personal responsibility for the assigned area of work. The development of team forms of organization and material incentives for labor, the inclusion of doctors in teams, in some cases of different specialties, yielded positive results and created self-regulating production teams, which was a qualitatively new approach to the problem of improving medical care for the population. Since the end of 1987, the team method of work of medical personnel began to be widely introduced in multidisciplinary hospitals of the Russian Federation.

The advantages of the new economic mechanism include the emergence of hope for the possibility of adequate planning of expenses, determination of priority areas, assessment of management efficiency not by the number of buildings constructed, availability of personnel, but by the results of work, orientation of medical workers to improve the quality of medical care. The merit of the NHM also lies in the fact that it caused the need for structural changes in health care, that is, restructuring processes aimed at solving the strategic and tactical goals of health care - the search for ways to meet the growing needs of the population for accessible, qualified medical care in market economic conditions and the objective need to reduce the cost of maintaining the social sphere, improve the quality, medical and economic efficiency, and ultimately, overcome the crisis of public health and the critical situation in health care.

During the preparation and implementation of the new economic mechanism based on the use of the previous positive experience of the team form of organization and payment of labor (essentially, being an equalizing form of payment of labor), more advanced forms were developed and proposed to health care institutions, which include team, collective and rental contracts. Moreover, multidisciplinary hospitals, in which the team form of labor organization was previously tested, began to switch to various forms of contracting faster and easier. In the collective contract, which refers to a more advanced form of activity of the work collective in comparison with the team, a distinction is made between the actual collective contract and the collective contract with intra-structural business accounting.

According to Nakatis Y.A. and Romanyuk G.N. (2001), such a division is entirely justified, since in this case it becomes possible to determine the contribution of each division separately to the business accounting income, however, the highest form of labor organization is a rental contract [7].

In general, the introduction of contract work forms in healthcare institutions played a significant role in the restructuring of the system of wages for medical workers, since a real opportunity arose to organize the work of medical personnel so that wages depended on the final results of their work, and so that the wages of each medical worker depended on the quantitative and qualitative indicators of the

activities of the entire contracting team. Research devoted to the work of medical personnel in the conditions of contracting teams, as well as the development of effective mechanisms for remuneration of doctors depending on the volume and quality of services rendered, continues to this day.

To assess the quality of medical care, a number of scientists have developed a multi-stage quality control system and “end-result models,” which have been widely implemented in healthcare practice in experimental areas. Clinical-statistical groups proposed and developed in the United States in the late 1970s and early 1980s were used as a unit of measurement for medical care, as well as to create the basis and improve the national healthcare management system [8].

The groups in question were widely used by foreign countries and are known as Diagnostic-related groups (DRG). As Pope GC and Burge RT (1996) note, their introduction in the USA has reduced growing health care costs, reduced the average length of hospital treatment, and increased hospital bed turnover. At the same time, testing of DRG has revealed not only its supporters, who noted the positive results of using this model, but also its opponents, who considered this model to be flawed and proved that doctors use this system of assessing the quality of medical care provided for their own selfish interests to the detriment of patients’ needs (INOSTR) [9].

Conclusion. Thus, based on the analysis of scientific literature on improving medical care for the population and professional activities of medical specialists, we can conclude that the implementation of organizational and economic experiments and the introduction of innovative processes in healthcare have a high scientific and practical significance and prospects. Unfortunately, a comprehensive assessment of the medical, social and economic efficiency of the experience of implementing innovations of various kinds in the activities of multidisciplinary hospitals has not been sufficiently reflected so far; the role of medical personnel in the implementation of innovative processes has not been sufficiently defined and a system for managing medical personnel in the context of innovative activities of a multidisciplinary hospital has not been formed; objective and subjective criteria for the effectiveness of the interactive patient treatment system and health improvement of medical personnel have not been sufficiently studied. At the same time, a detailed and comprehensive study of the innovative activities of inpatient institutions, a comprehensive assessment of its effectiveness deserve attention; the development of a model for managing personnel of a multidisciplinary hospital and preventive work with it in the context of implementing innovations requires scientific justification.

References

1. *Current issues of legal support for medical and preventive institutions / Edited by A.I. Vyalkov, N.F. Gerasimenko, V.Z. Kucherenko. M, 2002.*
2. *Alekseev N.A., Yakushev A.M. Structural reorganization of hospitals in a large city // Healthcare. 2000. No. 1. P. 10-11.*
3. *Belyaeva N.V. Sources of financing in the system of accounts of health care in Russia // Health care economics. 2001. No. 7. P. 48-61.*
4. *Komarov Y.M. Reorganization of inpatient medical care in the Russian Federation and foreign countries. - M.: NPO "Medsotsekoninform" of the Ministry of Health of the Russian Federation, 1998. 31 p.*
5. *Klimkin M.V., Zaitseva T.S. The system of accounts of health care of Russia. Methodological aspects of accounting of business activity and "shadow" economy // Health care economics. Thematic issues. 2001. P. 68-71.*
6. *Lebedeva I.V., Ekimov A.K., Shchurabura I.D. Analysis of pricing in the compulsory medical insurance system and paid services // Healthcare Economics. 2000. No. 4. P. 5-9.*
7. *Nakatis Y.A., Romanyuk G.N. Quality management of diagnostic and therapeutic care in a multidisciplinary medical institution // Healthcare Economics. 2001. No. 6. P. 33-36.*
8. *Brazil K., Bolton C, Ulrichsen D., Knott C Substituting home care for hospitalization: the role of a quick response service for the elderly // J. Community Health. Canada. - 1998. - V. 23, No. 1. - P. 29-43.*
9. *Pope GC, Burge RT Economies of scale in physician practice. // Med. Care Res. and Rev. 1996. v. 53. p. 417 – 440.*

DOI 10.34660/INF.2024.44.58.049

牙科实践中锥形束 CT 密度参数准确性的客观评估
**OBJECTIVE EVALUATION OF DENSITY PARAMETERS'
ACCURACY IN CONE-BEAM COMPUTED TOMOGRAPHY IN
DENTAL PRACTICE**

Hossain Shazmim Jahan

Assistant lecturer

*Peoples Friendship University of Russia,
Moscow, Russian Federation*

Muraev Alexander Alexandrovich

Doctor of Medical Sciences, Professor

*Peoples Friendship University of Russia,
Moscow, Russian Federation*

摘要。X射线法在现代现实中是评估骨组织状态的主要方法。锥形束计算机断层扫描已在牙科实践中证明是一种评估牙槽系统骨组织的可靠方法。在种植牙中，获得良好结果的一个重要因素是定性评估上下颌骨组织的结构和形态。不幸的是，在测量感兴趣区域的光密度时，并不总是能够获得有关骨组织状态的正确数据，此外，种植牙医在实践中通常必须目视评估治疗的骨密度质量，但我们知道这是主观的。这项工作旨在确定使用Dicom查看器程序计算骨组织光密度的误差。

关键词：CBCT，光密度，种植牙中的放射诊断。

Summary. *X-ray method in modern realities is the main method for assessing the state of bone tissue. Cone beam computed tomography has proven itself in dental practice as a reliable method for assessing the bone tissue of the dentoalveolar system. In implant dentistry, an important factor in obtaining a good result is a qualitative assessment of the structure and morphology of the bone tissue of the upper and lower jaws. Unfortunately, when measuring the optical density of the areas of interest, it is not always possible to obtain correct data on the state of the bone tissue, moreover, implant dentists often have to visually assess the quality of bone density for treatment in their practice, but we understand that this is subjective. This work is aimed at determining the error in calculating the optical density of bone tissue using Dicom viewer programs.*

Keywords: *CBCT, optical density, radiation diagnostics in implant dentistry.*

Introduction

Cone-beam computed tomography (CBCT), specifically designed for imaging the maxillofacial region, is a major additional diagnostic tool in dentistry and maxillofacial surgery. The first CBCT machines appeared in 1998. In clinical practice, the first commercial devices were used in 2001. In a relatively short period of time, CBCT has become a cost-effective and low-dose alternative to computed tomography. However, it is important to remember that this method is relatively new and not fully studied in terms of the accuracy of results in relation to anatomical structures [1, 2, 3].

The use of CBCT in practice allows for visualization of objects of interest in any multiplanar projection or as a volumetric image. Therefore, CBCT is used as the main additional method for visualizing changes, planning treatment volumes, monitoring treatment progress, and tracking long-term results of manipulations performed by a dentist [4, 5].

CBCT not only allows for planning but is also used as a navigation method, which allows for visual guidance and control of the accuracy of surgical interventions in real time [6].

Image formation is based on the physical process of attenuation of X-ray radiation by matter, which depends on the absorption spectrum of anatomical structures of X-ray radiation and is mediated by a complex mathematical model implemented in the CBCT software [7]. The mathematical system for reproducing the obtained data into an image is a proprietary development of the CBCT manufacturer, contains a large number of individual imaging features that can be the cause of errors in planning dental implant manipulations. Unfortunately, reconstruction algorithms have not changed significantly in the last 25 years [8]. To overcome this drawback, several approaches have been proposed using different algorithms and cone beam geometry (for example, dual orthogonal circles, helical orbit, orthogonal circle and line), and they will undoubtedly be included in future CBCT projects [9].

The CBCT software tools allow for detailed examination of the clinical situation with the possibility of comprehensive diagnostics. Computer-aided surgical planning. The program allows for virtual implant placement on an accurate computer model of the patient's jaw [10]. As a result, their sizes, positions, and relationships with the future prosthetic construction are determined. The most optimal solutions for the upcoming surgery are objectively chosen. However, in implant dentistry, an important factor for a good result, besides the above-mentioned possibilities, is a qualitative assessment of the structure and morphology of the bone tissue of the upper and lower jaws, since the bone in the area of implant placement must ensure its primary stability and have regenerative potential to ensure secondary stability of the implant. Unfortunately, when measuring the optical density of

zones of interest, it is not always possible to obtain accurate data on the state of bone tissue [11]. In addition, often implant dentists in their practice have to visually assess the quality of bone density for treatment, but we understand that this is subjective. Furthermore, to assess bone density, the clinical classification of bone density according to Misch is combined with the classification of bone optical density proposed by Hounsfield (HU) [12]:

- D1 - Dense, compact bone with an average bone density greater than 1250 Hounsfield units;

- D2 - Thick bone with uniform expression of compact and cancellous tissue with an average bone density on the Hounsfield scale from 850 to 1250 units;

- D3 - Thin bone with porous compact plate and loose cancellous tissue with an average bone density on the Hounsfield scale from 350 to 850 units;

- D4 - Loose, thin compact bone substance and a layer of very loose cancellous bone, the average bone density on the Hounsfield scale is from 150 to 350 units;

- D5 - Solid, large-mesh cancellous bone below 150 Hounsfield units.

Objective

To evaluate the accuracy of determining the bone density of the area of interest using Dicom viewing software during implant placement planning.

Materials and Methods

For the study, reconstructions obtained during the scanning of the upper jaw of an experimental animal (sheep) with a phantom containing distilled water placed in the tooth socket were analyzed (Figure 1). Scanning was performed in standard upper jaw scanning modes. Image analysis was performed using four different Dicom viewing programs, where one program was the CBCT manufacturer's program used for the study, and three other programs were freely available and often used by dentists for analyzing CBCT studies. Results of automatic calculation of X-ray density were analyzed with the actual density of the fluid contained in the phantom. Deviation from the true density was calculated by converting the scale of the clinical classification of bone density according to Misch into a percentage ratio where the upper limit of the values of the most favorable optical density for implant surgery is 1250 HU, thus $12.5 \text{ HU} = 1\%$.

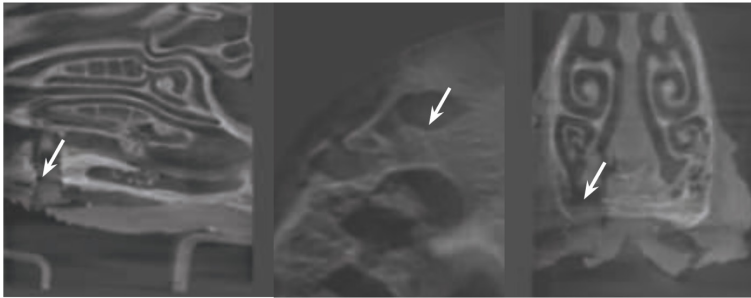


Figure 1. Computed tomography scan of a sheep’s upper jaw. The arrow indicates the position of the phantom.

Results

Upper Jaw:

Maximal Intensity Projection (MIP).

Table 1

Program	Maximum Value (HU)	Minimum Value (HU)	Average Value (HU)	Deviation of Obtained Average Value from True Density (%)
1 (CBCT Manufacturer’s Software)	62	-12	25	2
2	137	-414	-49,92	3,99
3	164	53	55,5	4,44
4	43	-170	-55,73	4,46

Minimal Intensity Projection (MinIP).

Table 2

Program	Maximum Value (HU)	Minimum Value (HU)	Average Value (HU)	Deviation of Obtained Average Value from True Density (%)
1 (CBCT Manufacturer’s Software)	62	-12	25	2
2	137	-414	-49,92	3,99
3	164	53	108,5	8,68
4	50	-213	-86,3	6,9

Average Intensity Projection (average).

Table 3

Program	Maximum Value (HU)	Minimum Value (HU)	Average Value (HU)	Deviation of Obtained Average Value from True Density (%)
1 (CBCT Manufacturer's Software)	67	-64	1.5	0.12
2	137	-414	-49,92	3,99
3	164	53	55,5	4,44
4	43	-219	-97,75	7,82

Conclusions

1. Dicom viewing software used in this study exhibited varying degrees of error when calculating radiographic density, ranging from 0.12% to 8.68%.
2. Due to the difficulty in determining the degree of clinical classification of bone density according to Misch using examinations with artifacts, reliance on the optical density scale for borderline results should be avoided.
3. For assessing radiographic density, using the CBCT manufacturer's software proved most optimal for obtaining the most reliable data for treatment planning, with a maximum deviation of 2%.
4. The most reliable results for radiographic density evaluation were obtained in the "average" reconstruction mode, with a deviation of 0.12%.

References

1. Наумович С. С., Наумович С. А. Конусно-лучевая компьютерная томография: современные возможности и перспективы применения в стоматологии// Современная стоматология. – 2012. – No 2 (55). Naumovich S. S., Naumovich S. A. Cone-beam computed tomography: modern possibilities and prospects of application in dentistry //Modern dentistry. – 2012.– No 2 (55).
2. L. Feldkamp, L. Davis, and J. Kress. Practical cone-beam algorithm. *Journal of the Optical Society of America*, 1984; 1(6):612–619. https://www.researchgate.net/publication/287772957_Practical_Cone-Beam_Algorithm.
3. Scarfe, William C., and Allan G. Farman. «What is cone-beam CT and how does it work?» *Dental Clinics of North America*. 2008; 52(4): 707-730. <https://pubmed.ncbi.nlm.nih.gov/18805225>.

4. Марусина М.Я., Казначеева А.О. *Современные виды томографии / Учебное пособие*. – СПб: СПбГУ ИТМО, 2006. – 132 с. – 100 экз. Marusina M.Ya., Kaznacheeva A.O. *Modern types of tomography / Textbook*. – St. Petersburg: St. Petersburg State University ITMO, 2006. – 132 p.

5. Sidky EY, Pan X. *Image reconstruction in circular cone-beam computed tomography by constrained, total-variation minimization*. *Phys. Med. Biol* 2008; vol. 53:4777–4807. <https://pubmed.ncbi.nlm.nih.gov/18701771>.

6. Patsrisawat T, Gacic A, Franchetti F, Puschel M & Moura JMF in *Proceedings. (ICASSP '05). IEEE International Conference on Acoustics, Speech, and Signal Processing, 2005 v/153–v/156 (Philadelphia, PA, USA, 2005)*.

7. Hosny A, Parmar C, Quackenbush J, Schwartz LH, Aerts HJWL, Biologic C, et al. *Artificial intelligence in radiology*. *Nat Rev Cancer*. 2018;18(8):500–10. <https://pubmed.ncbi.nlm.nih.gov/29777175>.

8. Freitas DQ, Fontenele RC, Nascimento EHL, Vasconcelos TV, Noujeim M. *Influence of acquisition parameters on the magnitude of cone beam computed tomography artifacts*. *Dentomaxillofac Radiol*. 2018 Dec;47(8):20180151. <https://pubmed.ncbi.nlm.nih.gov/29916722>.

9. Bezerra ISQ, Neves FS, Vasconcelos TV, Ambrosano GMB, Freitas DQ. *Influence of the artefact reduction algorithm of Picasso Trio KJKT system on the diagnosis of vertical root fractures in teeth with metal posts*. *Dentomaxillofac Radiol* 2015; 44:1-8.

10. Leite, A. F., Vasconcelos, K. D. F., Willems, H., & Jacobs, R. *Radiomics and Machine Learning in Oral Healthcare. PROTEOMICS–Clinical Applications, 2020, p. 1900040*. 11. Zhang Y, Yue N, Su MY, Liu B, Ding Y, Zhou Y, Wang H, Kuang Y, Nie K. *Improving CBCT quality to CT level using deep learning with generative adversarial network*. *Med Phys*. 2021 Jun;48(6):2816-2826. <https://pubmed.ncbi.nlm.nih.gov/33259647>

11. Chen W, Li Y, Yuan N, Qi J, Dyer BA, Sensoy L, Benedict SH, Shang L, Rao S, Rong Y. *Clinical Enhancement in AI-Based Post-processed Fast-Scan Low-Dose CBCT for Head and Neck Adaptive Radiotherapy*. *Front Artif Intell*. 2021 Feb 11;3:614384. <https://pubmed.ncbi.nlm.nih.gov/33733226>.

DOI 10.34660/INF.2024.20.24.050

呼吸器官解剖的年龄相关特征
**AGE-RELATED FEATURES OF THE ANATOMY OF THE
RESPIRATORY ORGANS**

Ilyasov Abusupiyan Butashevich

Student

Guseinova Sabina Tagirovna

Doctor of Medical Sciences, Associate Professor,

Head of Department

Kurbanova Patimat Arsenovna

Student

Akaeva Diana Rizvanovna

Student

Dagestan State Medical University,

Makhachkala, Russia

摘要。本文重点介绍了呼吸系统生理学中与年龄相关的特征，这些数据对医生来说很重要，而这个问题的研究在理论医学中仍然是一个悬而未决的问题。本文描述了呼吸器官与年龄相关的可变特征。

关键词：喉、气管、支气管、肺、腺泡、人类。

Abstract. *Our article highlights data on aspects of age-related features of respiratory system physiology that are important for physicians, and the study of this problem remains an open question in theoretical medicine. The article describes age-related and variable features of the respiratory organs.*

Keywords: *larynx, trachea, bronchi, lungs, acinus, human.*

Introduction. The respiratory organs are a set of organs that provide the function of external respiration in humans (gas exchange between atmospheric air and blood circulating in the pulmonary circulation). Their function is to provide tissues with oxygen necessary for metabolic processes and to remove carbon dioxide (carbon dioxide) from the body [1].

The respiratory organs in children are relatively smaller in size and are distinguished by incomplete anatomical and histological development.

Breathing is a prerequisite and one of the main signs of life of an organism. The onset of respiratory movements after the birth of a child means that he was born

alive. Long before birth, the fetal chest makes rhythmic movements from time to time, similar to breathing. Such movements with a frequency of 38-70 per minute have long been described in human fetuses. These movements are amplified and become especially noticeable during hypoxemia. In laboratory experiments, the movements are amplified, for example, when the umbilical vessels are compressed. Apparently, in natural conditions, one of the stimuli for such movements is also changes in the gas composition of the fetal blood caused by the features of the maternal body.

The respiratory system provides the body of animals and humans with two essential functions:

- 1) gas exchange (oxygen and carbon dioxide);
- 2) non-respiratory (water and maintenance of acid-base balance, immune, voice-forming, resonant, olfactory, depository, excretory, etc.).
- 3) The respiratory organs are involved in sepsis [2,3] and other pathologies.

The achievements of modern pulmonology have become possible due to significant advances in anatomy, not only of the lung as a whole, but also of its individual component systems [1].

Profound age-related changes in the human respiratory organs are useful in MRI, CT, ultrasound, and radiography for a number of lesions of the respiratory system structures (Covid-19, pneumonia, bronchitis, laryngitis, rhinitis, tuberculosis, bronchial asthma, etc.).

The respiratory organs are closely related to other organs (heart, liver, skeleton, kidneys, endocrine glands, bone marrow). The age-related anatomy of organs has been poorly studied and requires further research.

Research results and their discussion.

From age-related features, it should be taken into account that in newborns, the paranasal sinuses, except for the maxillary (maxillary) sinus, are not expressed.

The maxillary sinuses in newborns and children 1-3 years old are poorly expressed.

In newborns, except for the maxillary (maxillary) sinus, other sinuses are not expressed.

The maxillary sinus in newborns and children aged 1-3 years is poorly expressed. With the return, this sinus increases in volume, pockets are formed: alveolar, orbital and posterior.

The frontal sinus develops at 2 years and reaches the size of 1×2 cm by 5 years, the sphenoid sinus is formed by 3 years, at 8 years - 2×3 mm, and the ethmoid cells - at 3-6 years and by 14 years it reaches the size of adults.

In a newborn, the nasal cavity is low, its height is 17.5 mm and narrow.

The nasal turbinates in newborns are relatively thick.

The upper nasal passage in a newborn is absent, the middle and lower are poorly developed,

The lower nasal turbinates in a newborn touch the bottom of the nasal cavity. In a newborn, the nasal conchae do not reach the septum of the nasal cavity, the common nasal passage remains free and breathing occurs through it, at this age the choanae are low.

By 6 months of postnatal life, the nasal cavity height increases to 22 mm and the middle nasal passage is formed, by 2 years - the lower, after 2 years - the upper [4,5].

In newborns, the larynx is relatively large and is located 2/3 of the vertebra higher than in adults. In relation to the cervical vertebrae, the skeletotopy of newborns corresponds to II, and in adults to IV-VI, i.e., with age, the larynx descends.

During fluoroscopy, the upper border of the larynx in newborns and children is projected onto the II cervical vertebrae.

The upper end of the epiglottis in newborns and infants is located at the level of the lower edge of the atlas and the back surface of the tongue, so it can be examined without special instruments when the child's mouth is open. The anatomical and physiological status is important in the act of breathing and sucking (swallowing) simultaneously, unlike in adults. The larynx at this age is adjacent to the hyoid bone, the thyroid cartilage is located close to the hyoid bone at the level of the sp. The protrusion of the larynx is not pronounced.

In newborns, the larynx is rounded, crow-shaped, short, wide, vocal cords and folds are short, thin, flat, the entrance to the larynx is wide, they do not have thyrohyoid ligaments. In children, the sounds of the voice are high (thin vocal cords are located high).

The prevestibulary (false) vocal folds and cords in newborns and children are richly vasculature (mucous membrane and submucosa) easily swell, edema, which is a common cause of false croup and Quincke's edema in a child. The entrance to the larynx in a newborn is wider than in adults in comparative terms. The most intensive growth of the larynx occurs in the first 4 years, which is obviously associated with speech activity. At the age of 4-10 years, the latent period begins. The larynx reaches its final position and development of all structures after puberty (17-18 years).

During adolescence, boys experience increased growth of the larynx. The length of the glottis increases from 12-17 years by 1.5 times, i.e. a mutation occurs, in girls the voice mutation is weakly expressed. By the age of 7, the larynx descends to the 1st vertebra, and at 13 years by 2 vertebrae and reaches ... as in adults.

The length of the larynx in newborns is 1.53 cm, by the end of the 1st year - 1.36 cm, 5-6 years - 2.33 cm, 15-16 years - 3.42 cm. Accordingly, the diameter is 0.38; 0.55; 0.61; 1.27 cm. The angle of the thyroid cartilage in newborns is 120-135° and decreases with age. The epiglottis is short, its edges are curved.

The length of the vocal cords of the larynx according to D.A. Zhdanov (1979) is 2-2 cm in men, 1.6-1.9 cm in women. The length of the intermembranous part of the vocal cord in men is 1.5 cm; in women 1.2 cm. With a calm inhalation, the glottis is open by 0.5 cm, and with a forced inhalation by 1.5 cm, i.e. it widens 3 times. The length of the vocal cords in newborns is 5-6 mm, and in adults, 3 times more. Sexual differences in the structure of the larynx are detected from the age of 3, in girls the larynx is shorter and smaller than in boys. In newborns and children, the length of the intermembranous and intercartilaginous parts is 3-3.5 mm. The weight of the larynx in newborns is 1/950 of the body weight, in adults 1/4000.

In newborns, the laryngeal protuberance is absent, the cartilages are thin. The upper opening of the larynx is wider than in adults and has a horizontal position and direction, and in adults the same - oblique.

The interarytenoid notch appears in the larynx during puberty.

The angle between the larynx and the windpipe in newborns is 162° , i.e. more acutely inclined backwards, and in adults - 178° , which must be taken into account during intubation in pediatric medical practice, i.e. the longitudinal axis of the larynx in adults coincides with the trachea, and in children it forms an angle.

In newborns and children, the elastic cone of the larynx is narrow, short, poorly expressed, low (9-10 mm). At this age, the muscles of the larynx are poorly developed.

Sexual differences in the structure of the larynx begin to appear at 6-7 years old and especially note these differences during puberty.

Conclusion. With the onset of pulmonary breathing, blood circulation through the pulmonary circle also increases. At the same time, the resistance of the vascular bed in the pulmonary artery system decreases and blood flow accelerates. However, in the first days, even weeks after birth, the Botallo duct, connecting the pulmonary artery with the aorta, still remains open. Factors causing hypoxia contribute at this time to an increase in pressure in the pulmonary artery and the direction of part of the blood through the duct into the aorta, bypassing the pulmonary circulation. Such a reaction, of course, enhances the effect of hypoxia.

Based on our study, it can also be argued that the respiratory organs are subject to age-related and variant changes, which pulmonologists should be guided by.

References

1. Borovaya T.G., Cherkasova M.N., Zhukhovitsky V.G. *Reactive changes in the lungs in the sepsis model // Morphology, 2020, v. 157, no. 2-3, pp. 38-39.*
2. Vyrenkov Yu.E., Klebanov V.M. *Clinical anatomy of the lungs. // M: Medicine, 1985 – 165 p.*

3. *Guseinov T.S. Anatomy of the respiratory organs // Makhachkala, 2021 – 35 p.*
4. *Kopkareva O.O. Age-related anatomy, physiology and hygiene. Textbook allowance. – Tver: Tver. state univ., 2016. – 114 p.*
5. *Sapin M.R. et al. Human anatomy // M.: GEOTAR – Media, 2018, vol. 1,2.*

评估过早衰老患者的健康状况

ASSESSMENT OF THE HEALTH STATUS OF PATIENTS WITH PREMATURE AGING

Saprykina Alice Igorevna

Postgraduate student

*N.A. Semashko National Research Institute of Public Health,
Moscow, Russia*

摘要。俄罗斯联邦目前的医疗和人口状况面临许多复杂的挑战：劳动年龄人口死亡率高、出生率下降、老年人口比例增加。这些过程对该国人口结构产生了重大影响，从而对整个经济体系产生了重大影响。

关键词：老龄化、过早衰老、伴随病理学、慢性病。

Abstract. *The current medical and demographic situation in the Russian Federation consists of many complex challenges: high mortality rates among people of working age, declining birth rates, and an increasing percentage of elderly citizens in the population. These processes have a significant impact on the structure of the country's population and, as a result, on the entire economic system.*

Keywords: *aging, premature aging, concomitant pathology, chronic diseases.*

Introduction. The phenomenon of population aging is a global process that affects many aspects of government regulation. Statistical data published by the UN indicate that in 2000, the total number of elderly people on the planet reached 600 million individuals. By 2021, this figure had increased to over 761 million people. Scientists' forecasts indicate a continuation of the growth trend: it is assumed that by 2050, the number of elderly people in the world population may increase to 1.603 billion [1,2]. It is noted that the proportion of elderly people will soon exceed the proportion of children. In the context of the Russian Federation, the issue of population aging is particularly relevant, and finding ways to solve it is defined as one of the key priorities of the state strategy [3]. This is reflected in a specially developed government document - "The Concept of the Demographic Policy of the Russian Federation until 2025", approved by the Decree of the President of the Russian Federation of October 9, 2007 No. 1351 (last revised on July 1, 2014), which sets out the goals of increasing the population, increasing the birth rate and reducing the mortality rate. It is planned to achieve these goals through

measures to strengthen the health of the nation, as well as to improve the quality of life of citizens [Collection of Legislation of the Russian Federation, 2007, No. 42, Article 5009]. In the context of demographic research, the Russian Federation is faced with a dual problem, as noted in UN reports: a simultaneous decrease in the population and an increase in its average age. The population of Russia has noticeably decreased: if in 1991 it numbered 148.5 million people, then by 2005 it had decreased to 142.7 million. At the same time, the proportion of elderly people increased to 13.8% in 2005. UN forecasts indicate that by 2025 the population may fall to 129.2 million, and the percentage of elderly people will reach 17.6%. Research by specialists from St. Petersburg adhere to more pessimistic estimates, suggesting a decrease in numbers to 96 million by 2050 [<http://dlib.rsl.ru/rsl0101000000/rs101010249000/rs101010249800/rs101010249800.pdf>]. The natural limit of human life expectancy is between 110 and 120 years. But the average life expectancy in countries with a stable position most often does not exceed 70-75 years due to early aging. Thus, the life potential of 30-45 years is often not fully realized due to genetic disorders caused by negative factors such as stress, poor nutrition, bad habits, environmental problems, and so on [<https://www.sechenov.ru/upload/iblock/887/DISSERTATSIYA-Skrebneva-AV.pdf>].

Results and discussion. As part of the study of the middle-aged population, an analysis of morbidity was carried out based on survey data, supplemented by data from extracts from statistical documentation of laboratory studies. Data on the presence of chronic diseases were studied in 1080 patients.

Table 1 presents the data obtained on the frequency of registration of chronic pathology based on survey data and self-assessment, extracts from laboratory research data.

Table 1

Frequency of registration of chronic pathology in middle-aged individuals (according to survey data, self-assessment, extracts from medical records)

Наименование заболевания	Число опрошенных (n=1080)	
	Абс.ч.	Р%
Артериальная гипертензия	525	48,6
Сахарный диабет	344	31,8
ИБС	293	27,1
Хроническая венозная недостаточность	482	44,6
Хроническая артериальная недостаточность	415	38,4
Дыхательная недостаточность	223	20,6
Хроническая сердечная недостаточность	476	44,0
Остеоартроз суставов	874	80,9
Ожирение	814	75,3

As shown in Table 3.3, each respondent in the middle-aged group had a chronic non-communicable disease, which indicated the need for long-term observation, and given the high frequency of registration of these diseases, one can talk about a combination of chronic pathology and, accordingly, the need to combine several long-term observation programs in the main group of middle-aged people.

Table 2 shows information related to the prevalence of chronic diseases among middle-aged people, taking into account age categorization.

Table 2
Concomitant diseases in the middle-aged patients studied (in absolute numbers and in %; $p < 0.05$)

Сопутствующая патология	Пациенты 45-54 лет (n=645)		Пациенты 55 - 59 лет (n=435)	
	Абс.	%	Абс.	%
Артериальная гипертензия	207	32,2	318	73,3
Сахарный диабет	168	26,1	176	40,6
ИБС	134	20,8	159	36,7
Хроническая венозная недостаточность	221	34,3	261	60,2
Хроническая артериальная недостаточность	131	20,4	284	65,3
Дыхательная недостаточность	76	11,8	147	33,9
Хроническая сердечная недостаточность	239	37,1	237	54,6
Остеоартроз суставов	474	73,5	400	92,0
Ожирение	426	66,1	388	89,2

According to the sociological survey using the self-assessment method, arterial hypertension was diagnosed in 525 middle-aged individuals, including 32.2% (207) of individuals aged 45-54 years and 73.3% (318) of individuals aged 55-59 years. Ischemic heart disease was detected in 293 middle-aged individuals, including 20.8% (134) of individuals aged 45-54 years and 36.7% (159) of individuals aged 55-59 years. Chronic heart failure was present in 476 individuals, including 37.1% (239) of individuals aged 45-54 years and 54.6% (237) of individuals aged 55-59 years. Type 2 diabetes mellitus was diagnosed in 344 middle-aged individuals, including 26.1% (168) of individuals aged 45-54 years and 40.6% (176) of individuals aged 55-59 years. Obesity was present in 66.1% (426) of individuals aged 45-54 years and 89.2% (388) of individuals aged 55-59 years. Respiratory failure was noted in 11.8% (76) of individuals aged 45-54 years and 33.9%

(147) of individuals aged 55-59 years. Chronic venous insufficiency was present in 34.3% (221) of individuals aged 45-54 years and 60.2% (261) of individuals aged 55-59 years. Chronic arterial insufficiency was present in 20.4% (131) of individuals aged 45-54 years and 65.3% (284) of individuals aged 55-59 years. Osteoarthritis of the joints was detected in 73.5% (474) of individuals aged 45-54 years and 92.0% (400) of individuals aged 55-59 years.

Comparative analysis showed that the incidence of cardiovascular diseases increases with age in patients:

Ischemic heart disease: The incidence increases from 20.8% in individuals aged 45-54 years to 36.7% in individuals aged 55-59 years.

Arterial hypertension: The incidence increases from 32.2% to 73.3%, respectively.

Chronic heart failure: The incidence increases from 37.1% to 54.6%, respectively.

The incidence of other systems also increases:

Respiratory system: The incidence increases from 11.8% to 33.9%, respectively.

Endocrine system:

Type 2 diabetes: The incidence increases from 26.1% to 40.6%, respectively.

Obesity: The incidence increases from 66.1% to 89.1%, respectively.

The incidence of chronic venous insufficiency increases with age: from 34.3% in people aged 45-54 to 60.2% in those aged 55-59.

For chronic arterial insufficiency, the incidence also increases with age: from 20.4% to 65.3%.

Cases of osteoarthritis become more common in older age groups: the incidence increases from 73.5% to 92.0%.

Thus, statistics on chronic diseases can be collected not only through medical care and examinations, but also through surveys among people of different age groups.

Conclusion. Questionnaires help to identify pathologies for which citizens do not always seek professional medical advice. It should be noted that information on diseases established on the basis of a survey may be incomplete and contain inaccuracies, since in some cases respondents may report symptoms and syndromes instead of specific diagnoses. Consideration of questionnaires in tandem with the analysis of medical documents allows us to ensure maximum completeness and reliability of information on the health of people who are the object of the study.

References

1. Grishina E. N., Trusova L. N. *Development of the Russian healthcare system and life expectancy. Symbol of science.* 2017; (2): 43–5.
2. Skrebneva A. V., Gubina O. I. *Analysis of demographic aging of the population in the Voronezh region. Applied information aspects of medicine.* 2016; 19 (4): 66–70.
3. *Decree of the President of the Russian Federation of October 9, 2007 No. 1351 (as amended on July 1, 2014) “On approval of the Concept of demographic policy of the Russian Federation for the period up to 2025”.* *Collection of Legislation of the Russian Federation.* October 15, 2007; No. 42: 500

DOI 10.34660/INF.2024.12.79.052

非线性控制系统优化中控制轨迹集合的优势
**ADVANTAGES OF CONTROLLING ENSEMBLES OF
TRAJECTORIES IN NONLINEAR CONTROL SYSTEM
OPTIMIZATION**

Zavadskiy Sergey Vyacheslavovich

Ph.D., Researcher

St Petersburg State University, St Petersburg, Russian Federation

摘要。考虑了控制轨迹集合对于非线性控制系统优化问题的优势。这使得不仅可以在存在一组初始和外部扰动的情况下估计非线性稳定性的质量，还可以优化整个非线性运动集合的动态。

关键词：非线性控制系统、轨迹集合优化、反馈控制、磁悬浮、实时反馈、稳定性。

Abstract. *It's considered the advantages of controlling the trajectories ensembles for nonlinear control system optimization problems. This made it possible not only to estimate the quality of nonlinear stabilization in the presence of a set of initial and external disturbances, but also to optimize the dynamics of the entire ensemble of nonlinear motions.*

Keywords: *nonlinear control system, trajectories ensembles optimization, feedback control, MagLev, real-time feedback, stabilization.*

Unstable dynamic control objects require the design and implementation of real-time feedback control systems [1]. It is well known that such objects can be divided into two types which are linear and nonlinear. As examples of the design of nonlinear control systems, the task of stabilizing the MagLev levitating platform can be cited [2-4], and the task of searching for plasma control in a tokamak [7], and further, the optimization of flight characteristics of multicopters [8].

The works above show that these objects are not only highly dynamic and unstable objects, but also have highly nonlinear dynamics [5, 6]. This significantly limits the possibility of applying to them the well-known linear methods of optimal control designing [9-12]. Among linear methods, the methods based on solving the matrix linear Riccati equations [11] and optimization approaches with the metrics in spectral spaces [11-16] are widely known. But for the objects presented above, the area of state-space in which this objects can be stabilized by linear methods is quite small, therefore, the

development of new nonlinear approaches to the design and optimization of feedback control systems is extremely in demand [12-17].

In linear objects which are closed by stabilizing control, all movements are stable and each trajectory can be represented as a linear combination of basic solutions. Therefore, it is often not necessary to compute the dynamics of the trajectories bunch. In this situation, an researcher just needs to check the appropriate stability criterion.

But for the considered nonlinear objects, with many deviations that are interesting from an engineering point of view, the nonlinear components have such a high influence that they make the dynamic trajectories very different. In this case, the linear approach does not provide necessary quality of stabilization with various perturbations that need to be worked out [11].

In this case, considering not one trajectory, but an entire ensemble of dynamic movements, which are perturbed by a set of initial and external disturbances, allows us to estimate more accurately the quality of the stabilization [17].

In the presented examples, the control system which are closing the initial nonlinear equations of the control objects is considered as a set of parameters to be searched. For these tasks, a representation of the first variation of the integral quality criterion, which is defined on the ensemble of nonlinear trajectories, was obtained, and an optimization approach was programmed based on this representation [17]. This made it possible not only to evaluate the quality of nonlinear stabilization when working out a given set of initial and external disturbances, but also to optimize the dynamics of the entire ensemble of nonlinear movements.

References

1. Amoskov, V.M. and et al. (2016). *Simulation of electrodynamic suspension systems for levitating vehicles. iv. discrete track systems. Vestnik of Saint Petersburg University Applied Mathematics Computer Science Control Processes*, 3, 4–17.
2. Amoskov, V.M. and et al. (2018). *Modeling ems maglev systems to develop control algorithms. Cybernetics and Physics*, 7(1), 11–17.
3. Andreev, E.N. and et al (2019). *Combined electromagnetic suspensions with reduced energy consumption for levitation vehicles. Technical Physics*, 64(7), 1060–1065.
4. Belov, A. and et al. (2022). *Stability and Control Processes, chapter Optimization of a Real-Time Stabilization System for the MIMO Nonlinear MagLev Platform. Lecture Notes in Control and Information Sciences - Proceedings. Springer International Publishing. Bachle, T., Hentzelt, S., and Graichen, K. (2013). Nonlinear model predictive control of a magnetic levitation system. Control Engineering Practice*, 21(9), 1250–1258.

4. Hajjaji, A.E. and Ouladsine, M. (2001). Modeling and nonlinear control of magnetic levitation systems. *IEEE Trans. Industrial Electronics*, 48(4), 831–838.
5. Horibe, T. and Sakamoto, N. (2017). Optimal swing up and stabilization control for inverted pendulum via stable manifold method. *IEEE Trans. on Control System Technology*, 26(2), 708–715.
6. Horibe, T. and Sakamoto, N. (2019). Nonlinear optimal control for swing up and stabilization of the Acrobot via stable manifold approach: Theory and experiment. *IEEE Trans. on Control System Technology*, 27(6), 2374–2387.
7. Ovsyannikov, D. and Zavadskiy, S. (2018). Pareto-optimal choice of controller dimension for plasma stabilization system. *IFAC-PapersOnLine*, 51(32), 175–178.
8. Zavadskiy, S. *Dynamics Characteristics Optimization for the UAV Ensemble of Motions*, 2020.
9. Post, R. and Ryutov, D. (2000). The inductrack: a simpler approach to magnetic levitation. *IEEE Trans. Applied Superconductivity*, 10(1), 901–904.
10. Rosinov'a, D. and Hypiusov'a, M. (2021). Comparison of nonlinear and linear controllers for magnetic levitation system. *Applied Sciences*, 11(17), 7795.
11. Sakamoto, N. (2013). Case studies on the application of the stable manifold approach for nonlinear optimal control design. *Automatica*, 49(2), 568–576.
12. Sakamoto, N. and van der Schaft, A.J. (2008). Analytical approximation methods for the stabilizing solution of the Hamilton-Jacobi equation. *IEEE Trans. Automatic Control*, 53(10), 2335–2350.
13. Schmid, P. and Eberhard, P. (2021). Offset-free nonlinear model predictive control by the example of maglev vehicles. *IFAC-PapersOnLine*, 54(6), 83–90.
14. Tran, A.T., Suzuki, S., and Sakamoto, N. (2017). Nonlinear optimal control design considering a class of system constraints with validation on a magnetic levitation system. *IEEE Control Systems Letters*, 1(2), 418–423.
15. van der Schaft, A.J. (1991). On a state space approach to nonlinear H_∞ control. *Syst. Control Lett.*, 16(1), 1–18.
16. Yaseen, M.H. (2017). A comparative study of stabilizing control of a planer electromagnetic levitation using PID and LQR controllers. *Results in Physics*, 7, 4379–4387.
17. Zavadskiy S., Ovsyannikov D., Melnikov D. (2023). Optimization approach to the design of nonlinear control system controllers. *Vestnik Sankt-Peterburgskogo Universiteta, Prikladnaya Matematika, Informatika, Protsessy Upravleniya*, 2023, 19(1), 109-119. DOI: 10.21638/11701/SPBU10.2023.109.

科学出版物

上合组织国家的科学研究：协同和一体化

国际科学大会的材料

2024 年 9 月 11 日，中国北京

编辑A. A. Siliverstova

校正A. I. 尼古拉耶夫

2024 年 9 月 11 日，中国北京

USL。沸点：98.7。 订单253. 流通500份。

在编辑和出版中心印制

无限出版社

