SCIENTIFIC RESEARCH OF THE SCO COUNTRIES: SYNERGY AND INTEGRATION

上合组织国家的科学研究：协同和一体化

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

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摘要。本文探讨了在数字化背景下企业业务流程建模的实际方面。描述了企业业务流程建模的利益相关者群体。定义了企业业务流程建模的关键领域。提出了一套企业业务流程建模所需的解决方案和管理措施。

关键词：业务流程、建模、技术变革、数字经济、数字化、信息资源、建模领域、认知技术。

Abstract. *The article considers practical aspects of modeling business processes of an enterprise in the context of digitalization. The groups of stakeholders in modeling business processes at an enterprise are characterized. The key areas of modeling business processes of an enterprise are defined. A set of necessary solutions and management actions for modeling business processes of an enterprise is proposed.*

Keywords: *business process, modeling, technological changes, digital economy, digitalization, information resources, modeling areas, cognitive technologies.*

Modeling of business processes in modern conditions is a key tool for the analysis and formation of information systems that combine the processes of economic forecasting and planning of enterprise activities taking into account future trends in market development. Modeling of business processes includes a set of necessary decisions and management actions related to economic activity, are based on information regarding analytical data, use organizational and information resources of the enterprise in order to improve its operating efficiency and are a business process. At the same time, in the context of intensive technological changes, widespread introduction of information technologies into economic activity and widespread digitalization of business processes at all levels, there is a need to develop new methods for their modeling that meet the requirements and needs of the new digital economy.

The problematic of research into the specifics of business process modeling in modern conditions is widely covered in the works of such scientists as: L. A. Vatutina, E. Y. Zlobina, E. B. Khomenko [1], N.A. Efremova, G.V. Ignatova [2], O.S. Karashchuk, E.S. Kravchenko [3], V.V. Ovsyannikova [4], I.A. Arenkova, T.A. Lezina, M.K. Tsenzharik, E.G. Chernovoy [6], M.Y. Lev, Y.G. Leshchenko[7] and a number of others. At the same time, the dynamic changes that occur in modern economic systems at both the macro and micro levels in the context of the intensive introduction of information technologies into the economic activities of enterprises and the digitalization of the economy as a whole, indicate the need to take these trends into account when analyzing, forecasting and modeling business processes of various business entities [3].

The aim of the article is to study changes in scientific approaches to modeling business processes in complex economic systems that occur under the influence of intensive technological changes in the process of formation of the digital economy.

As practice shows, in order to understand the current and future problems of business process modeling in complex economic systems, it is important to identify the different key stakeholders that should be described in these models. At the same time, the nature or criticality of any business process modeling issue may differ significantly depending on the point of view of the relevant respondent. Therefore, traditionally, three groups of stakeholders are distinguished in this aspect (Fig. 1).

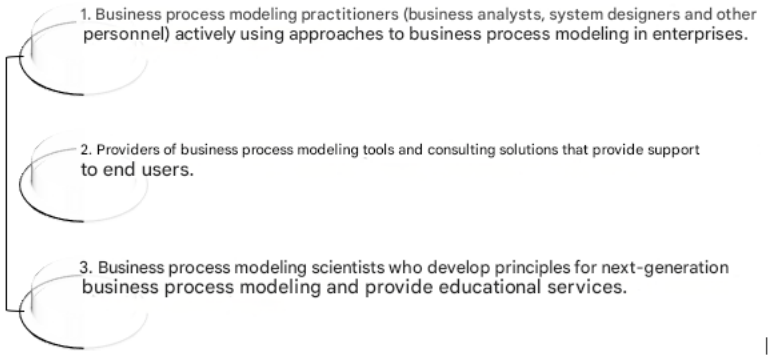

Figure 1. *Stakeholder groups in business process modeling at an enterprise [5]*

At the same time, as E. S. Kravchenko notes, "…the application of a systems approach to defining a business process system leads to the need for a more de-

tailed interpretation of a business process as a product of the enterprise itself and as an object of management from the point of view of the types of transformations and types of resources that they use to obtain the manager's result according to the business process standard, resources, inputs that are transformed into outputs, and information flows" [4, p. 265]. That is, the complexity of the systems that must be built when modeling business processes is determined not only by the volume and quality of the data that will be included in these models, but also requires the involvement of specialists who will be able to implement a complex formed business model in the practical activities of an enterprise or organization based on the development of it.

Thus, in order to better understand the nature and consequences of the problems that arise in the business modeling process, it is necessary to identify the key capability area to which the problem relates. For example, the problem of "support tools" clearly concerns the availability (or lack thereof) of appropriate IT solutions to support the modeling process itself, while the problems in the "management" area concern the establishment of appropriate organizational roles, responsibilities, and overall accountability for business process modeling. Therefore, in order to determine to which area, the business modeling problems belong, it is necessary to use an established and empirically tested model of the capability areas necessary for the establishment and progress of business process management in an enterprise [6, p. 106]. This model forms six areas of application, namely: strategic alignment, management, methods, information technology, people, and culture.

Since business process modeling is an important component of management, it is necessary to specify the specified areas of business process modeling.

Therefore, this model allows us to reflect and take into account the main problems in each of the six areas of application of the models and, in turn, to give a clear idea of what aspects of business process modeling are considered by the relevant groups of performers. It should be noted that an additional complicating element of the application of this model is the significant growth of the role of information technology in the activities of enterprises at present [1]. At the same time, it is necessary to highlight two main aspects of the specifics of business process modeling at an enterprise:

1. The increasing complexity of software makes it possible to take into account a significant amount of information in the modeling process and to construct more reliable, but at the same time more complex models on its basis.

2. The use of cognitive technologies and artificial intelligence in business processes is transforming their modeling into a separate element of the global digital economy.

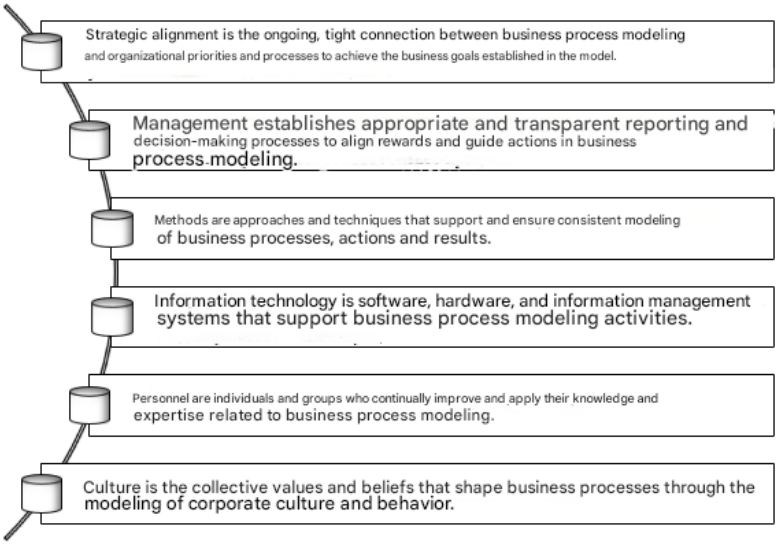

Figure 2. *Key areas of business process modeling in an enterprise [6]*

Thus, it can be argued that the functional approach to business process modeling is becoming dominant precisely due to the growing level of digitalization of economic systems to which this modeling relates. In particular, the main advantages of this approach, which are the sequence and logic of operations in business processes, allow, when using complex information technologies, to solve such problems, for modeling the solution of which by traditional methods, it was necessary to spend more time and involve analytical specialists [6].

In the context of increasing complexity of models characteristic of the digital economy, there is a need to use more complex specialized econometric methods when forming business process models with a constant increase in incoming data [2, p. 21]. Accordingly, the solution to this problem necessitates the use of methods characteristic of the digital economy. This indicates that successful and effective modeling of business processes in the context of digitalization is possible only on the basis of the use of specific methods and approaches associated with the use of artificial intelligence and cognitive technologies not only at the stage of analyzing the input data flows necessary for building the model, but also in the process of modeling itself. In this aspect, it is necessary to fully support the scientific position of E.S. Kravchenko and V.V. Ovsyannikova, according to which "... the main goals that encourage the construction of business process models (namely: description and study, improvement, automation) should also include: monitor-

ing and control of business processes, since it is thanks to them that feedback is formed in the enterprise business process management system" [5, p. 115].

Thus, business process modeling is a fundamental requirement of modern management and information systems projects, but at present it still represents a significant challenge for many domestic enterprises. Identifying the most important problems and challenges of business modeling from various theoretical and practical aspects allows us to better understand the principles of interaction of business processes and, based on this, propose a set of methods for developing successful business models. At the same time, the use of information technology elements in modeling, characteristic of complex digital economy systems, will contribute to increasing the maturity of business process modeling of enterprises. This, in turn, will contribute to the growth of the need for research into new approaches to modeling and the development of tools and techniques that most fully meet the needs of the market in accordance with the growing level of digitalization of the economy.

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压力测试：测试商业模式可持续性风险的实用方法
STRESS TESTING: A PRACTICAL APPROACH TO TESTING THE RISKS OF A BUSINESS MODEL'S SUSTAINABILITY

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摘要。本文探讨了企业商业模式压力测试的实际方面。压力测试的方法包括：资产组合对风险因素变化的敏感性分析、情景分析、反向压力测试。给出了企业商业模式压力测试的主要阶段。阐述了企业商业模式压力测试方案的实施方向。

关键词：商业模式、风险、风险承受能力、压力测试、风险状况、情景、建模。

Abstract. *The article considers practical aspects of stress testing of the enterprise business model. The methods of stress testing are characterized: analysis of sensitivity of the asset portfolio to changes in risk factors, scenario analysis, reverse stress testing. The main stages of stress testing of the enterprise business model are given. The directions of implementation of the stress testing program of the enterprise business model are substantiated.*

Keywords: *business model, risk, risk tolerance, stress testing, risk profile, scenarios, modeling.*

In modern conditions, stress testing has become widespread as one of the effective tools for assessing the risk tolerance of business models of enterprises. The results of stress testing allow us to identify problematic components of the business model and reasonably determine the directions for adjusting the enterprise management strategy, as well as make appropriate decisions regarding the strategic development of the business model in conditions of increased uncertainty and the action of a wide range of risks.

The conducted analysis of research and publications allowed us to determine the increased scientific interest in the study of practical aspects of risk assessment and stress testing of enterprises. Various practical aspects of stress testing and practical aspects of enterprise risk management are considered by scientists: O. V. Vershinina, Y. G. Labusheva, I. S. Sultaniev [1], Z. T. Galeeva [2], A. A. Grigoryan [3], O. V. Devyatkin [4], N. V. Krasheninnikov [5], I. S. Lola, A. B. Manukov,

M. B. Bakeev [6], M. S. Maramygin, E. V. Strelnikov [7] and a number of others. Despite the fact that the issue of risk minimization is currently quite relevant, the development of crisis phenomena and the emergence of new types of risks requires the expansion and qualitative deepening of research on the development of mechanisms for stress testing of business models.

Stress testing allows you to determine the most vulnerable components of the enterprise business model to the impact of risks. The expediency of stress testing is currently due to a significant number of threats to domestic enterprises, the need to identify risks, determine the magnitude of their impact, and prevent financial losses. The purpose of stress testing the business model of an enterprise is to assess risks, as well as determine the ability of the enterprise to withstand the negative impact of risk-forming factors. Based on stress testing of the business model, prerequisites are created for the enterprise to determine the number of possible losses in the event of extreme events. In addition, the enterprise has the opportunity to assess its potential ability to cover losses, analyze the state of its own capital, as well as the quality and compliance of the methods used in the business model risk tolerance management system.

As a result of stress testing of the business model, the enterprise should develop strategic and tactical preventive measures that will allow it to resolve possible problems and threats, as well as reduce the level of negative impact of risks on the enterprise's activities.

Scientists emphasize that quantitative and qualitative analysis is carried out during stress testing of the enterprise business model. The essence of quantitative analysis is to identify scenarios for the possible development of events. With this help, it is possible to determine the scale of changes in the market situation and fluctuations in its components that affect the level of economic security and the effectiveness of the implementation of the enterprise business model. Qualitative analysis allows you to determine the level of the ability of the enterprise's capital to cover projected losses, as well as develop a set of measures to reduce the level of risk, minimize losses, and preserve the capital of the enterprise.

To conduct stress testing of an enterprise's business model, two methods can be used:

1. stress testing scenario;
2. sensitivity analysis.

A business model stress testing scenario is developed as a model of the predicted development of the situation in the event of risk factors being realized. They must fully include all factors and conditions that, if realized, may cause significant damage to the enterprise. The purpose of using scenarios is to obtain a stress test result in a specific form, this may be the size of possible losses or the level of adequacy of the enterprise's regulatory capital.

Scenarios should cover factors that negatively affect the enterprise's business model and consider options for a relatively worse development of events. In addition, it is important to forecast probable changes that may be influenced by negative risk factors.

The essence of stress testing of the sensitivity of the enterprise business model is to study the level of influence on the enterprise's activities of one or several interrelated risk factors and assess the impact of an instantaneous change in one of them, while other basic parameters remain unchanged. Therefore, it becomes possible to assess possible significant changes without a deep explanation of their causes. The sensitivity indicator provides information on the degree of influence of a risk event depending on the changes that are envisaged by its implementation, i.e., the highest sensitivity level will indicate a greater level of influence of such an event.

Thus, stress testing of the enterprise business model is considered as a method for measuring risk and provides an opportunity to assess potential adverse effects of risks with the determination of the number of losses that may arise as a result of "shock" changes in various risk factors and conditions, as well as probable events. A stress scenario is a model of the probable development of events that are associated with the influence of various risk factors that can worsen the values of target indicators for the implementation of the enterprise business model.

The implementation of a business model stress testing program should ensure:

- determination of the size of the enterprise's losses both as a whole and in terms of individual types of activities, assessment of the enterprise's potential ability to cover such losses;
- conducting an assessment of the impact of the implementation of stress scenarios on compliance with mandatory economic standards and limits established at the enterprise;
- comparison of the obtained results with the established level of risk appetite;
- determination of the degree of dependence between the magnitude of risks and the influence of individual risk factors that can both mitigate and enhance their effect.

The main stages of stress testing of an enterprise business model are shown in Fig. 1.

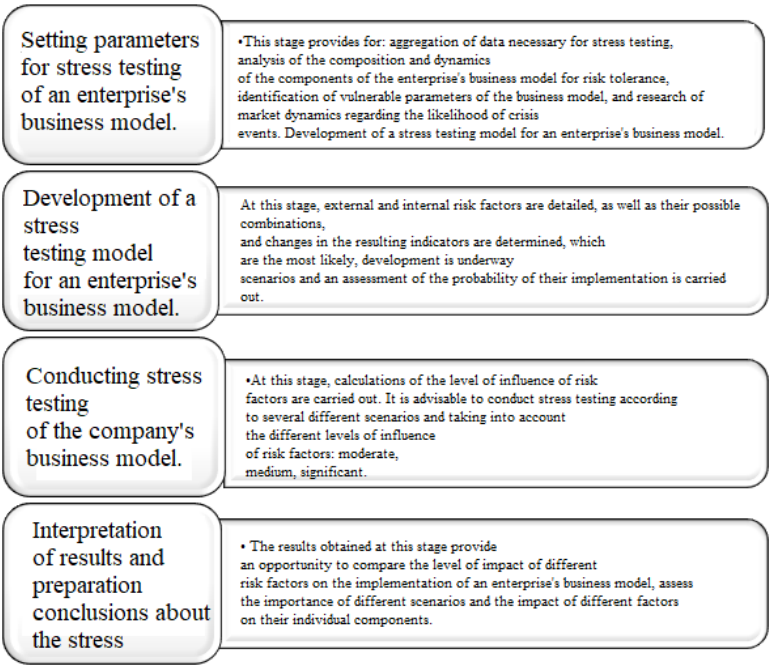

Figure 1. *The main stages of stress testing of the enterprise business model*

The methods of stress testing of the enterprise business model selected as optimal should cover quantitative and qualitative indicators for stress scenarios, and also take into account the risk profile of the enterprise and the main areas of its activity. The following may be classified as methods of stress testing of the business model:

1) analysis of the sensitivity of the asset portfolio to changes in risk factors. This method is implemented by modeling the consequences of changes in one risk factor or their interrelated group, but the immutability of other risk factors;

2) scenario analysis. This method is implemented through modeling consequences of simultaneous changes in several risk factors. In this case, the risk factors that have the greatest negative impact on the components of the enterprise's business model and can lead to the greatest losses must be taken into account (the worst-case scenario is worked out).

3) reverse stress testing of the enterprise business model. This method is implemented by developing such a combination of risk factors, as well as defining such a scenario, according to which the effectiveness of the implementation of the business model will be predetermined and negative.

Thus, stress testing of an enterprise's business model allows one to evaluate structural changes in its components in the event of a risky situation, to model alternative development scenarios with different risk profiles, and to predict the risk tolerance and effectiveness of the business model in a strategic perspective.

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当前离婚问题：理论与法律判断
CURRENT PROBLEMS OF DIVORCE: THEORETICAL AND LEGAL JUDGMENTS

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摘要。作者研究了离婚作为一种有助于加强家庭的制度的法律问题。需要指出的是，现行立法的目的不是保护和加强家庭，而是相反，重点是家庭的解体，因为法院基本上通过司法裁决指出家庭已经破裂，不能在这种状态下存在。作者认为，现行的家庭立法规范了婚姻终止程序，应该有助于加强家庭和婚姻关系，保护未成年子女的权利和利益，这对于维护社会稳定和确保俄罗斯联邦的人口安全至关重要。

关键词：家庭、离婚、法院、配偶、前配偶、未成年子女、离婚原则、加强家庭、国家家庭政策、调解员。

Abstract. *The authors examine the legal problems of divorce as an institution that helps strengthen the family. It is noted that the current legislation is not aimed at preserving and strengthening the family, but on the contrary, is focused on its disintegration, since the court, basically, states by a judicial decision that the family has broken up and cannot exist in this state. The current family legislation regulating the procedure for the termination of marriage, in the opinion of the authors, should contribute to the strengthening of family and marital relations and the protection of the rights and interests, first of all, of minor children, which is critically important for maintaining social stability and ensuring the demographic security of the Russian Federation.*

Keywords: *family, divorce, court, spouses, former spouses, minor children, principles of divorce, strengthening the family, state family policy, mediator.*

Modern relationships between people have different nature. For example, when forming relationships within a family union, marriage registration in the relevant state bodies is very relevant. The implementation of powers to register marriage

and marital relations becomes the basis for strengthening the family. The presence of divorce proceedings in domestic practice leads to destabilization of the social environment of society, leads to an increase in the inefficiency of disclosing the personality within the framework of relations with surrounding subjects. Thus, within the framework of this article, we will analyze the essence of the institution of divorce as a tool for strengthening the family.

Divorce is a legal fact in which the marital relationship between spouses, provided for by family law, namely, Articles 19 and 24 of the Family Code of the Russian Federation [1], is terminated.

According to the provisions of family law, divorce can be initiated by both a man and a woman, and, possibly by their mutual consent or, in extreme cases, at the request of one of the parties, through the court.

Thus, A.M. Nechaeva writes that «One of the reasons for the termination of a marriage union is not expressed in legal form; the main thing is that the court establishes that the further cohabitation of the spouses and the preservation of the family are impossible» [2, p. 104].

As M.V. Antokolskaya notes: «Since marriage is based on a contract, its termination is possible at any time by mutual consent of the parties, and not the reparable breakdown of the family, as the actual basis for divorce, has legal significance in the dissolution of marriage at the request of one of the spouses» [3, pp. 152-153].

Thus, L.M. Pchelintseva believes that: «Even with the mutual voluntary consent of the spouses, the court must establish that the family has irreparably broken up and the continuation of the spouses' life is impossible» [4, pp. 167-168].

The institution of divorce, which at first glance seems contradictory in the context of strengthening the family, can in fact play a key role in maintaining healthy family relationships. This idea is based on the understanding that the possibility of legally dissolving an unsuccessful marriage can contribute to the general well-being of all family members. The institution of divorce can be a tool for strengthening the family, first of all, its state regulation is aimed at maintaining a favorable climate for raising children.

However, the analysis of the current legislation shows that in most cases, when a marriage is dissolved, the family will disintegrate, rather than acquire a pronounced vector of strengthening within the framework of the established social society. Thus, the possibility of divorce by mutual consent of the spouses does not ensure the stable functioning of the social institution in question [5, p. 204].

The use of the institution of divorce as a tool for strengthening the family at the present stage can be actively used in the performance of state functions. However, this approach should be very rational and applicable to individual positions in the sphere of family relations.

The most pronounced problems in the implementation of the institution of divorce as a tool for strengthening the family are:

– the complexity of forming relationships between the participants in the divorce process;

– inconsistency in observing interests after the dissolution of the marriage.

On the other hand, the very possibility of divorce encourages spouses to take a more responsible approach to marriage. The realization that marriage is not something immutable and that it is possible to leave it can encourage people to take a more serious approach to choosing a partner and solving family problems. This, in turn, contributes to the formation of stronger and healthier family ties.

In addition, the process of divorce is accompanied by a number of legislative mechanisms aimed at a fair resolution of property and educational issues, which also helps to reduce the negative consequences of divorce for all participants. Laws regulating the divorce procedure ensure the protection of children's rights and the distribution of family responsibilities, which is critical for maintaining social stability.

It is necessary to clearly formulate the basic principles of divorce in family law. These principles include the possibility of preserving the family, forming contractual relations, maintaining the opportunity to communicate with children within the framework of the established contractual schedule.

Legislatively enshrine the grounds for divorce in accordance with the principles of compliance with family, parental and social rights. Establish the priority of the judicial procedure for divorce. This procedure should be comfortable and convenient to ensure the effectiveness of state management of the divorce process [6, p. 195].

Introduce mandatory compliance with conciliation and conciliation procedures in the divorce process. All previously concluded agreements should also be implemented in the established contractual field.

In order to develop the institution of divorce as a tool for strengthening the family, it is also possible to consider the possibility of using the mediation procedure; this practice will make it possible to resolve disputes arising in the divorce process within the established procedure, while preserving the interests of the parties acting as parents. Preserving the possibility of parental participation in raising children after divorce becomes the basis for improving the development of the child's personality.

Moreover, D.A. Medvedev once spoke about the need to introduce mediation into the judicial system of Russia: «... the number of judges per capita in our country is approximately the same as in most European countries. But let me remind you that Russian judges consider many more cases, tens of times more, primarily because about 80 percent of disputes in these countries are resolved with the help

of conciliation procedures, as was, by the way, the case in pre-revolutionary Russia... Unfortunately, at the present time we have practically no culture of negotiation and searching for mutually acceptable solutions. The laws on mediation that have been adopted are almost inoperative, and cases of concluding agreements are still isolated. It is necessary to more actively inform citizens about the possibility of resolving a dispute with the help of a qualified mediator, and also to think about the advisability of introducing mandatory use of conciliation procedures in resolving certain types of disputes» [7].

It should be noted that the adoption of the Federal Law of 27.07.2010 № 193-FZ «On the Alternative Procedure for Resolving Disputes with the Participation of a Mediator (Mediation Procedure)», which entered into force on 01.01.2011 [8], which defined the legal grounds for the establishment and development of mediation in the Russian Federation and one of the areas of action of this law is the settlement of disputes in family matters. It seems necessary to say that this law does not fully meet the realities of life and therefore needs to be improved to more clearly define the requirements for the mediator himself.

In our opinion, only professional intermediaries - mediators in the dissolution of marriage of spouses, first of all, should relieve tension between spouses, which, perhaps, in the future will change the vector of the divorce process towards the priority of protecting the rights of minor children of divorcing parents.

It is necessary to consider other forms of strengthening the family.

Despite the fact that the Concept of the state family policy of the Russian Federation [9] defines the main tasks of promoting family well-being and traditional family values, and the institution of marriage is key, therefore it is necessary not only to preserve it, but also to reduce the number of divorces, especially if the spouses-parents have minor children.

Among the public administration, it is worth considering the functioning of specialized centers for consulting and information support for solving problems of relationships in the family. The organization of specialized work with a psychologist becomes the basis for reducing the process and the likelihood of divorce.

The organization of state leisure children's and family centers, within which the overall socialization of the family will increase, cohesion and interaction will increase, also deserves attention. With the implementation of this initiative, social and family tensions will decrease, which will lead to a decline in divorce initiatives.

The specifics of implementing state interests within the framework of the functioning of the institution of the family is associated with the need to implement social, demographic and family policies.

Thus, within the framework of this article, we have considered the essence of the institution of marriage as a tool for strengthening the family and family relations.

Thus, although divorce is essentially the dissolution of marriage, it can serve as a tool for strengthening family relations, preventing long-term conflicts and creating a healthier emotional environment for all family members. In this context, the institution of divorce does not act as a threat to family values, but as a necessary mechanism for their protection and support in modern society.

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在中学教育过程中采用促进性方法
USING A FACILITATIVE APPROACH IN THE EDUCATIONAL PROCESS IN SECONDARY SCHOOL

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摘要。本文致力于探讨促进教学作为一种现代有效的中学外语教学方法。分析了教师在外语课上使用促进教学的方法、阶段和条件，以培养学生作为未来科学、文化和技术各个领域的专家的创造性、独立性和主动性。揭示了后工业信息社会框架下促进教学方法、独立学习活动和跨文化交流之间的联系。

关键词：促进教学；方法；跨文化交流；独立学习活动；效率；外语；后工业信息社会；教育过程。

Abstract. *The article is devoted to the consideration of facilitation as a modern effective approach to teaching foreign languages in secondary school. It analyzes the methods, stages and conditions of using facilitation by a teacher in foreign language lessons to develop a creative, independent and active personality of a student as a future specialist in various fields of science, culture and technology. The connection between the facilitative approach, independent learning activities and intercultural communication in the framework of the post-industrial information society is shown.*

Keywords: *facilitation; approach; intercultural communication; independent learning activity; efficiency; foreign language; post-industrial information society; educational process.*

Teaching foreign languages in Russia is going through a period of updating the content, goals, objectives and methods of teaching and achieving on this basis a new quality of its results. A feature of the current stage of Russia's development is that the socio-economic transformations taking place in the country coincided with global trends of transition from an industrial to an information society [10]. Russia's entry into the world community, the mixing and movement of peoples

and languages, the emergence of new goals of communication - all this cannot but pose new problems in the theory and practice of teaching foreign languages. Modern society needs highly qualified specialists in their field in various fields of science, who are able to adequately perceive what is happening, put forward creative innovations and quickly make constructive decisions. In the current conditions, it is no longer enough to simply be a certified specialist and have excellent knowledge of your subject, since society is open to people of a new formation, who have the skills of the 21st century and are able to work effectively in changing conditions. Education, in turn, is called upon to meet the demands of the time and the needs of society. In this regard, great responsibility falls on the shoulders of teachers, since the effectiveness of training depends on their professionalism, a modern teacher must be flexible in developing the knowledge and skills of students, use individual-personal, competency-based approaches and form their "meta-consciousness" - learning how to learn. Since specialists in the fields of culture, business, technology needed immediate training in foreign languages as a tool of production, they are interested in the real use of foreign languages as a means of communication in different spheres of society against the broad background of the social, cultural, political life of the peoples who speak these languages, in connection with which the main task of teaching foreign languages in high school is the preparation of future competent specialists in a wide profile, as well as teaching schoolchildren language as a real and full-fledged means of communication [6]. In order to teach a foreign language as a means of communication, it is necessary to create an environment of real communication in the lesson, establish a connection between the teaching of foreign languages and life, actively use foreign languages in living, natural situations. During a foreign language lesson, a teacher gradually instills in his students the skills of creative thinking, involves them in research activities, discusses issues relevant to modern society, skillfully combines individual and collective forms of work during the educational process, thereby revealing the potential of his students. Since in modern conditions traditional approaches to teaching are becoming irrelevant due to the fact that they do not stimulate interest in learning at a sufficient level, there is also a need for an interactive form of conducting lessons, for students to complete non-standard tasks [3]. The earlier a teacher begins to implement such an approach in his lessons, the more effective his work with older students will be. If students have already formed a study habit, new things must be introduced carefully. New values can cause a certain level of anxiety in students [8].

Accordingly, in order for a student to develop into an active, independent and creative person who knows how to learn, he needs the help of a teacher, the importance of which currently lies not only in the process of knowledge transfer itself, but also in the fact that the teacher becomes a mentor, advisor and friend

for his students, that is, a facilitator who, while maintaining neutrality, takes an active role in managing the work of the group and its course of action, using various trainings and consultations [7]. With the help of various techniques, the teacher teaches students to act meaningfully and independently. Thus, being the subject of learning, the student gradually takes the path of self-organization and self-realization, which significantly increases his chances of being noticed and in demand in the labor market of the post-industrial information society, which needs competent, mobile and successful specialists. At the initial stage of training, the teacher-facilitator only offers the most effective work techniques, and at subsequent stages, he monitors decision-making in the team and corrects the knowledge accumulated in the lesson. Since the facilitator's goal is to organize joint constructive activities, the widely practiced volitional order and administrative decision are no longer relevant. Thus, more and more teachers are leaning toward non-directive teaching based on the educational process, which allows creating the necessary conditions for developing the necessary motivation of students, as well as an atmosphere favorable for solving the tasks [1].

It is worth noting that effective facilitation involves a long process, which should ultimately lead to the disclosure of the potential of all group members. The teacher-facilitator thinks over the format and course of the lesson and event, discreetly observing everything that is happening from the outside, trying to optimize the process of group interaction with the help of various methods and ensure meaningful learning dictated by the desire to gain knowledge by the subject of learning himself. In this sense, the art of the teacher-facilitator involves directing the student into the channel of autofacilitation when the student is already ready for self-organization. It turns out that the preparation of schoolchildren for future practical activities is carried out during training under the supervision of a teacher, with the help of which they learn to organize their independent work. Many domestic and foreign psychologists, methodologists and didactics have repeatedly proven that the active nature of educational activities is the foundation of modern education. Only great diligence of the student combined with responsibility in mastering languages create the prerequisites for the formation of an interesting, sociable and developed personality, capable of creative and independent thinking. For a student who can work without the help of a teacher, prospects for self-improvement open up, due to which a sense of self-worth awakens in him. Students must have not only a certain experience, including social experience, but also master various strategies, techniques and methods in maintaining and using the studied foreign language in various communication situations and areas of knowledge. It is important that the use of any cognitive strategies by each student is purely individual. At the same time, working independently and showing creativity, the student must consider himself in a certain relation to all other students and

compare himself with them in order to further correct and regulate his learning activities. Since the teacher must keep in sight not only the group of students as a whole, but also each participant individually, he must teach schoolchildren to apply in independent work those strategies that seem most familiar and acceptable to them [6]. Thus, the maximum development of communicative abilities through the organization of independent learning activities of students is the main, promising, but very difficult task facing modern teachers of foreign languages. The teacher-facilitator helps students to realize their needs, their creative potential, develop independence in choice and decision-making, independence of action and take responsibility for the learning outcome [5]. At the same time, of course, it would be wrong to abandon traditional teaching methods: it is necessary to carefully select from them all the best, useful, tested by teaching practice.

Having considered the main features of the facilitation approach used at the present stage of development of education in the field of teaching foreign languages, it is necessary to define this concept and establish the origin of this term. Etymologically, the word "facilitation" is of Latin origin and is translated as "to simplify, to promote, to accelerate and to stimulate". The effect of facilitation was first described and recorded at the end of the 19th century in the works of N. Zajonc and N. Triplett, devoted to social psychology. At that time, "facilitation" meant the improvement of an individual result, an increase in the efficiency (in terms of speed and productivity) of an individual's activity in the conditions of its functioning in the presence of other people, who in the subject's consciousness act as either a simple observer or an individual competing with him [10]. Around the same time, the phenomenon of facilitation was also recorded in the experiments of the French scientist K. Feret, the discoverer of the psychogalvanic reflex. Later, the concept of "facilitation" was clarified in the works of K. Rogers, who interprets facilitation as a way of interpersonal communication between adults and children, students and teachers in a variety of areas [6].

I.V. Zhizhina agrees with him and adds that facilitation in pedagogy is a professionally significant quality of a teacher's personality, on which the success of mastering pedagogical activity, increasing the productivity of education, developing subjects of the pedagogical process and the formation of a special style of interaction between a teacher and students depend [4].

Thus, to facilitate means to facilitate the group process, and the main task of the teacher-facilitator is to stimulate and initiate meaningful learning based on the manifestation of tolerance, reflection, empathy and assertiveness towards students.

It is important that the facilitative approach is widely used in many countries and is quite relevant, therefore the Council of Europe welcomes and encourages those methods of teaching and learning foreign languages that help schoolchildren and older people develop a position, accumulate knowledge, acquire skills and

abilities that will allow them to become as independent and confident as possible in their actions and judgments, more responsible and open in relationships with others [10]. The Council of Europe strives to raise the quality of communication between Europeans speaking different languages and brought up in different cultures to a higher level. Co-study of language and culture will allow them to better understand each other, communicate more freely and enter into direct contact with each other, be more mobile, which will lead to closer and more fruitful cooperation. Currently, the establishment of connections between representatives of different national cultures, which makes possible not only adequate mutual understanding of the participants in the communicative act, but also the perception of their vision of reality, recognition of their values and understanding of their picture of the world, is understood as intercultural communication [2]. In this regard, the solution to the urgent problem of teaching foreign languages as a means of communication between representatives of different nations and cultures is that languages should be studied in an inseparable unity with the world and culture of the peoples speaking these languages. The teacher must understand that teaching schoolchildren to communicate (orally and in writing), to arbitrarily create, and not just understand foreign speech is quite a difficult task. The effectiveness of the communication process, in addition to knowledge of the language, depends on many factors: the conditions and culture of communication, rules of etiquette, knowledge of non-verbal forms of expression (facial expressions, gestures), the presence of deep background knowledge, as well as the successful use by students of independent work techniques in learning foreign languages [9].

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在教育和培养活动过程中培养未来语言学教师的精神和道德价值观

DEVELOPMENT OF SPIRITUAL AND MORAL VALUES IN FUTURE TEACHERS OF PHILOLOGY IN THE PROCESS OF EDUCATIONAL AND UPBRINGING ACTIVITIES

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摘要。本文致力于研究在教育活动过程中语言学学生的精神、道德和爱国价值观的形成。作为这项工作的一部分，对联邦国家预算高等教育机构“卢甘斯克国立师范大学”的 2-4 年级学生进行了一项调查，旨在确定价值观指导方针的重要性以及对国家成就的看法。结果表明，家庭价值观对未来的语言学教师至关重要。此外，学生们为国家在空间、文学和科学领域取得的成就感到自豪，这强调了文化和精神指导方针在他们的世界观中的重要性。这项工作的重点是在教育过程中引入新的精神价值观教育方法的必要性。

关键词：精神和道德教育、爱国主义、价值观指导方针、家庭价值观、教育、语言学、民族认同。

Abstract. *The article is devoted to the study of the formation of spiritual, moral and patriotic values in philology students in the process of educational activities. As part of the work, a survey was conducted among 2nd-4th year students of the Federal State Budgetary Educational Institution of Higher Education “Luhansk State Pedagogical University” aimed at determining the significance of value guidelines and perception of the achievements of their country. The results showed that family values are of the greatest importance for future philology teachers. In*

addition, students are proud of the country's achievements in the field of space, literature and science, which emphasizes the importance of cultural and spiritual guidelines in their worldview. The work focuses on the need to introduce new approaches to the education of spiritual values in the educational process.

Keywords: *spiritual and moral education, patriotism, value guidelines, family values, education, philology, national identity.*

Today, when the world faces the challenges of globalization and informatization, issues of spiritual and moral education of youth come to the forefront. In the conditions of a rapidly changing society, where traditional values and spiritual and moral guidelines should not be eroded, the formation of a sense of patriotism, citizenship, responsibility and morality in the younger generation is becoming a priority task of education. The formation of value guidelines in future teachers is one of the important goals of education [1, p. 277].

A future teacher-philologist should emphasize that learning a language is not only mastering a new means of communication, but also an opportunity to expand horizons, enrich your inner world, while remaining a bearer of your unique culture. Modern scientists suggest constructive approaches to further study of strategies for updating spiritual and moral education in higher education [2, p. 36], although the foundations of this issue were laid back in the 20th century [3]. It is precisely this harmonious combination that will allow us to educate spiritually and morally patriotically minded individuals, capable of intercultural dialogue and cooperation, but at the same time deeply respecting their roots and their national identity.

Despite the demand for a solution to the stated problem, scientific and methodological support for the process of forming spiritual, moral and patriotic values in students has not been sufficiently developed, especially in the context of integrating educational and extracurricular activities [4]. New approaches, methods and technologies are needed to effectively solve this problem.

An anonymous survey was conducted in groups of philology students of the 2nd to 4th years of full-time education at the Federal State Budgetary Educational Institution of Higher Education "Luhansk State Pedagogical University», aimed at determining the degree of importance of various value orientations for philology students, as well as assessing their perception of spiritual and moral values in the context of the educational process. Two key stages were carried out during the study: assessing the significance of value orientations and identifying national achievements that make respondents proud.

Stage 1. Evaluation of the importance of value orientations. The respondents were offered the categories "love for the homeland", "family", "friends", "career", "self-development", which must be assessed on a scale from 1 to 5 according to

their importance, where 1 is the least important category, 5 is the most important category. The data obtained can be divided into several key groups reflecting the students' preferences in relation to spiritual and material values (see Fig. 1).

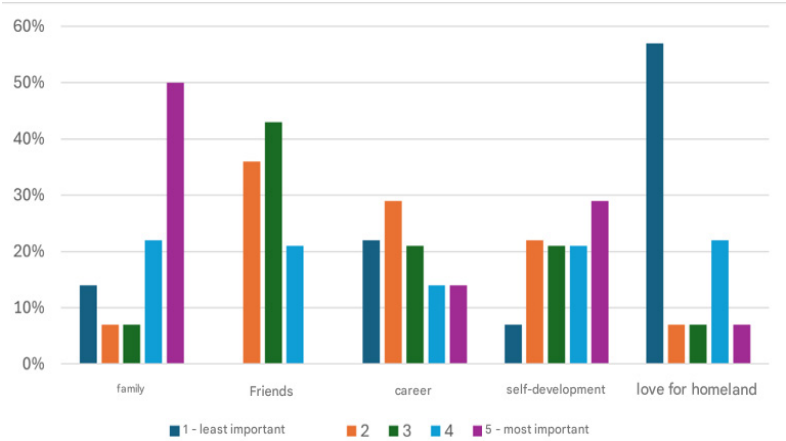

Figure 1. *Assessment of the importance of value orientations*

Thus, family turned out to be the highest priority for students, as half of the respondents (50%) gave it a rating of 5, which confirms the strong connection of future teachers with family values. This indicates a high level of commitment to traditional family foundations, which may also influence their teaching activities in the future.

Friends were rated less important. 43% of students rated the category "friends" as 3 (neutral), and 36% rated it as 2, indicating that friendships are important to students, but not a priority compared to other values such as family or career.

Career received moderate ratings, reflecting a balance between professional ambitions and personal values. 22% of students rated career as 1, indicating that career is not a primary focus for these respondents. However, a small number of students (14%) rated career as the maximum 5, indicating that some students desire career growth.

Self-development turned out to be quite a significant benchmark for future teachers. 29% of students chose the grade 5, which may indicate a high interest in personal and professional growth. At the same time, 22% gave the grade 2, which indicates some doubts about the priority of self-development for a significant part of respondents.

Love for the homeland was assessed as follows: 57% of students gave this benchmark a value of 1 (least important), 22% chose a rating of 4, and only 7%

rated it as 5 (most important). We believe that such results indicate a special need for developing a sense of patriotism and commitment to national values in future philology teachers.

Thus, the most important value orientation for students is family, which is confirmed by the high significance of this category in the research results. We can state that future teachers consider family as the main support and source of spiritual values. Love for the homeland occupies a relatively low place among value orientations, which may reflect the realities of modern youth culture, where national identity plays a less pronounced role compared to personal and family values. Friends and career received moderate assessments, which also confirms the presence of a balance between personal interests and professional aspirations. Self-development, although not the most important orientation for students, nevertheless occupies a significant position, which indicates a desire for personal and professional growth within the educational process.

Stage 2. Select national achievements that make students proud.

To analyze the importance of their country's achievements, students were asked to independently identify the three most significant national achievements that make them feel proud. The answers show a clear focus on national achievements in science and technology, art and literature, and achievements in space (see Fig. 2).

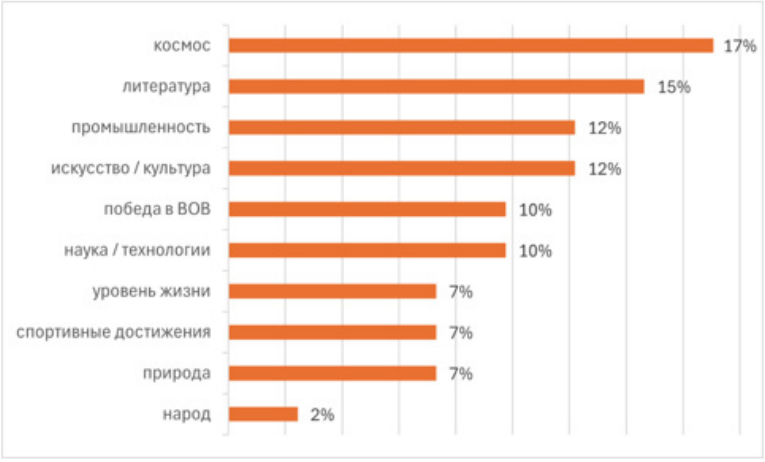

Figure 2. *National achievements that evoke a sense of pride*

Space was the most popular category, with 17% of respondents choosing it as a significant sector of the country's technological development. This figure may be

linked to the special historical and cultural context in which domestic successes in space exploration play an important role in shaping national identity.

Literature was also highly rated, which is not surprising given the students' background in philology. 15% of students chose Russian literature as one of their proudest achievements. This choice demonstrates deep respect for the country's literary heritage and the connection of future teachers with the national cultural tradition.

The categories of "industry" and "arts/culture" were also among the most mentioned achievements. 12% of students selected each of these items, which may indicate a high level of importance of cultural heritage for respondents, as well as a positive assessment of the country's industrial development.

The categories "science/technology" and "victory in the Great Patriotic War" received similar ratings (10% of students each), reflecting national pride in achievements in science, as well as in the most important historical victory that played a key role in the formation of the state.

Thus, students are largely proud of their country's achievements in space, literature, art, and technology. These data highlight the importance of cultural and scientific achievements in shaping identity and a sense of national pride. It is noteworthy that although sporting achievements and standard of living are also mentioned, their importance was significantly lower compared to other categories, which may indicate the priority of spiritual and cultural values over material ones. Separately, it is worth noting the category of "people", which, although it cannot be classified as an achievement, its very mention as an association with a sense of pride indicates positive value orientations of future philology teachers.

We can conclude that philology students have a strong commitment to family values and national cultural heritage. At the same time, moderate attention to career and self-development reflects an interesting interaction between the personal and professional guidelines of future teachers. The results of the study can serve as a basis for further research in the field of forming spiritual and moral values in future teachers, as well as for developing pedagogical programs aimed at strengthening the values of patriotism and spiritual development in educational practice.

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在未来语言学教师的专业培训过程中形成普遍和公民爱国价值观的重要性
IMPORTANCE OF FORMATION OF UNIVERSAL AND CIVIC-PATRIOTIC VALUES IN FUTURE TEACHERS OF PHILOLOGY IN THE PROCESS OF PROFESSIONAL TRAINING

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注释。本文探讨了在未来的语言学教师的专业培训中培养普遍和公民爱国价值观的重要性。它强调了人道主义教育在培养教师的个性、公民责任和爱国世界观方面的作用。它分析了一些有助于培养有效教学活动所必需的价值取向的教学方法和方法，这些方法和方法被引入到大学与学生的工作中。值得注意的是，将这些价值观融入教育过程不仅有助于教师的专业发展，而且有助于学生形成稳定的道德和公民态度。

关键词：精神和道德发展、专业培训、公民和爱国价值观、普遍的人类价值观、未来的语言学教师、成长、教育。

Annotation. *The article examines the importance of developing universal and civic-patriotic values in future teachers of philology during their professional training. It emphasizes the role of humanitarian education in developing the personality of a teacher, his/her civic responsibility and patriotic worldview. It analyzes some pedagogical methods and approaches that contribute to the development of value orientations necessary for effective pedagogical activity, which are introduced into work with students at the university. It is noted that the integration of these values into the educational process contributes not only to the professional development of teachers, but also to the formation of stable moral and civic attitudes in students.*

Keywords: *spiritual and moral development, professional training, civic and patriotic values, universal human values, future teachers of philology, upbringing, pedagogical education.*

Formation of universal and civic-patriotic values in the process of teaching foreign languages is one of the important tasks of the modern educational system. In the conditions of multicultural interaction, teaching foreign languages is associated with the need to solve a complex pedagogical problem - the integration of linguistic education with the formation of a system of values in students, including both respect for foreign culture and awareness of their own cultural identity.

Modern society needs teachers who are able to combine teaching foreign languages with cultivating respect for national culture and developing civic identity.

Future teachers of foreign languages are faced with the challenge of ensuring effective acquisition of foreign language culture without diminishing the importance of native culture, without weakening, but rather strengthening the sense of patriotism and national pride in students. The solution to the problem requires the development and implementation in the educational process of pedagogically sound methods and technologies aimed at developing in students a harmonious combination of multicultural competence with a deep understanding and respect for their own cultural and historical heritage.

Patriotic and civic education in foreign language classes is especially relevant in this context. A foreign language, being an instrument of intercultural communication, can serve as a powerful means of forming in students a sense of belonging to their Fatherland, responsibility for its future, respect for its history and traditions, creating conditions for students to become aware of their civic position, develop an active life position, and be ready to defend the interests of their country.

The relevance of the study is determined by the need for theoretical understanding and practical implementation of this approach, which will not only improve the effectiveness of teaching foreign languages, but also contribute to the formation of a civic-responsible, spiritual and moral personality.

The priority area of fundamental research in the field of history of philosophical and pedagogical thought is the problems of civic-patriotic education.

Having analyzed scientific sources, we come to the conclusion that pedagogical science has accumulated significant theoretical and practical experience in the field of education of civic qualities and patriotism, the development of which has a long history [1].

Public figures, educators, teachers, writers and poets have made a significant contribution to solving many educational issues in different historical periods. The rich scientific and educational heritage shows that civic-patriotic education has always been relevant for society, since the formed civic values are the basis for the existence and development of a strong and robust state.

An analysis of the works of Russian teachers and thinkers, such as A. N. Vyrshchikov, V. I. Lutovinov, N. V. Ippolitova and others, revealed that patriotism, which is a key element of personality, is formed as a result of systematic and comprehensive patriotic education [2].

Many thinkers have addressed the patriotic education of the younger generation, examining this issue from different points of view. Thus, L. F. Spirin and L. R. Bolotina studied it within the framework of ideological and political education; N. E. Shchurkova, I. F. Kharlamov – as part of moral education; T. A. Ilyina, I. T. Ogorodnikova singled it out into a separate section [3].

Many works on this topic note that in the educational process the main role in civic-patriotic education is given to the disciplines of the socio-political block. In this regard, the role of foreign language tools in solving educational problems is of particular interest.

Thus, the aim of the work is to determine the role and pedagogical potential of a foreign language in the system of formation of civic consciousness and development of patriotic feelings of future teachers-philologists.

The problem of educating patriotism has always been and remains the most relevant for pedagogical science. Patriotism is a fundamental concept for the existence and evolutionary development of the state.

Let us consider the concept of patriotism. Patriotism (from the Greek patriots - Motherland) is considered in scientific literature as one of the deepest and most stable human feelings, representing love for one's Motherland, devotion to one's people, pride in its achievements and the desire to protect its wealth, as well as to continue to increase its universal and national moral and spiritual values.

For example, the outstanding Soviet educator V. A. Sukhomlinsky emphasized that patriotism is one of the most striking emotional qualities of a person, which is a socio-psychological and moral feeling. It includes devotion and love for one's people, one's homeland, and the willingness to defend it [4].

Being an emotional quality, patriotism has a moral significance, since it manifests itself in a person's civic position, his memory and attachment to the traditions of his ancestors.

The scientist endowed the concepts of "civic consciousness" and "patriotism" with deep moral content, considering them inextricably linked with other universal values, such as national self-awareness, freedom and individual dignity.

Patriotic education should become a priority task for the entire society, starting with the smallest thing – the family. The family is the highest value, personifying love, reliability and experience of generations. Government agencies, educational institutions and public organizations should also contribute to this process.

Educating young people in the spirit of patriotism is aimed at forming individuals who possess human dignity, high national self-awareness, a culture of

interethnic relations, humanistic morality and the ability to defend their rights and freedoms in a civilized manner, promoting civil peace and harmony in society [4].

The feeling of true patriotism is a spiritual state that is formed in a person independently, in the course of gaining a certain spiritual experience. Any external influence can only harm this process, since love cannot be imposed.

Thus, the opinion of the outstanding Russian philosopher, publicist and public figure I. O. Ilyin, who claimed that no one is able to show a person his homeland, seems quite apt.

Patriotism is a spiritual state that can only arise autonomously, in a personal, but true and objective spiritual experience. Any external prescription can interfere with this experience or lead to its distortion. Love cannot be imposed or caused by someone else's will, it can only arise "by itself", in a light and natural state of joy that conquers and touches the soul [5]. So, we note that a true patriot is a person who loves his homeland according to the inner call of the heart.

It should be noted that the process of forming civic consciousness and patriotic feelings begins in early childhood – in the family – and continues throughout life. Educational institutions of all levels have a positive influence on the degree of socialization of a person, his or her indifference to public events, the development of civic-patriotic qualities and readiness for their active identification. Teachers use a whole range of educational activities, a special role among which belongs to the means of a foreign language. At the same time, the content and objectives of the practical lesson clearly determine the choice of specific forms of foreign language educational activity.

Among the educational tasks that will contribute to the implementation of the main goal and can be solved by means of a foreign language, the following are proposed: 1) fostering love for family and one's homeland; 2) forming respect for the cultural and historical heritage of one's people and a tolerant attitude towards other peoples, their cultures and traditions; 3) developing an active civic position and patriotic values of the individual; 4) instilling respect for the rights and freedoms of man and citizen; 5) awareness of the relationship between individual freedom, human rights and his social responsibility. The result of civic-patriotic education should be a formed sense of patriotism, which means the manifestation by the individual of universal and the following civic values: love for one's people, respect for one's own traditions, a sense of belonging to Russia, awareness of the community of one's own destiny with the destiny of the Motherland.

This result is achieved through the active use of various types of linguistic and cultural studies material by students of the 45.03.01 Philology program during their translation practice, along with the program material, which provides students with the opportunity to obtain new information of interest, compensates for the lack of background knowledge and helps to awaken cognitive motivation,

which undoubtedly arouses interest in both a foreign language and the history, culture, and traditions of their country, and contributes to the development of the creative beginning of the personality of the future specialist.

The following topics have great potential for the formation and development of universal and patriotic values in future philology teachers: “I am proud of my country. What can we tell guests of Russia? I am proud of my homeland. What can we tell guests of Russia?”, “Preservation of universal human values in the modern world. Preservation of universal human values in the modern world,” and “Culture and traditions of my country. Love and respect.” These topics make up the teaching aid “So sind wir: moderne jugendliche aus Russland,” which is used by the department’s teachers when studying the discipline “Practice of oral and written speech in German.” The following have proven to be the most productive teaching technologies when working with these topics: the “flipped classroom” technology, case technology, and simulation game technology.

In conclusion, we note that the study of a foreign language within the framework of a humanitarian education has significant socio-pedagogical and educational potential.

Thanks to the developed system of methods and approaches to teaching a foreign language, it is possible to achieve many educational goals within the educational process. This allows us to form civic consciousness in students, to educate them as patriotic citizens who are aware of their historical and cultural roots, respect the spiritual heritage of their people, have a sense of self-worth and pride in their homeland.

Such students are capable of not only strengthening the authority of their country, but also showing tolerance towards representatives of other nationalities, while remaining intolerant of manifestations of anti-humanism and nationalism.

Consequently, a specialist who possesses all the qualities that should be inherent in a teacher, an educator - here it is impossible not to quote A.S.Makarenko: “to the man in whose hands the soul grows.”

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俄罗斯及国外包容性教育学习经历
INCLUSIVE EDUCATION STUDY EXPERIENCE IN RUSSIA AND ABROAD

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注释。本文对包容性教育进行了全面概述，比较了俄罗斯、中国、匈牙利和美国的包容性教育实施情况，并讨论了更广泛的理论框架。本文将包容性教育定义为所有儿童（包括残疾儿童或有特殊需要的儿童）的联合教育，强调平等和参与学校生活的各个方面。详细介绍了不同的方法，包括专门机构的差异化教育、特殊班级的综合教育以及普通教室的完全包容性。作者指出，朝着完全包容的方向发展，旨在消除隔离的特殊教育系统。

本文综合了一些国家的不同经验，承认全球包容性教育运动中取得的成功和持续的挑战。作者强调耐心、宽容、一致性和全面方法对于实现有效包容的重要性。

关键词：包容性教育、援助、特殊教育、俄罗斯和国际经验。

Annotation. *This article provides a comprehensive overview of inclusive education, comparing and contrasting its implementation in Russia, China, Hungary, and the USA, while also discussing the broader theoretical framework. Defining inclusive education as the joint education of all children, including those with disabilities or special needs, emphasizing equality and participation in all aspects of school life is also presented in the paper. Different approaches are detailed, including differentiated education in specialized institutions, integrated education in special classes, and full inclusion in regular classrooms. The authors note the movement toward full inclusion, aiming to eliminate segregated special education systems.*

The text synthesizes the diverse experiences of some countries, acknowledging both successes and ongoing challenges in the global movement toward inclusive education. The authors emphasize the importance of patience, tolerance, consistency, and a comprehensive approach to achieve effective inclusion.

Keywords: *inclusive education, assistance, special education, Russian and international experience.*

The term "inclusion" comes from Latin and it means "inclusion" and "attraction". In relation to the education system, it means joint education of children, including those with certain problems or needs.

In the world, inclusive education is the norm rather than the exception to the rule. Children are not divided into different categories, but are perceived as equal, all members of the group are on the same level, equally included in social life and ways of life of their own stuff.

In modern Russia there is a huge number of disabled children and children with disabilities. All these children need special treatment, attention, special medical, psychological and pedagogical assistance and special education that meets their needs. An inclusive approach can change the current situation and eradicate stereotypes in people's minds. It is closely connected with the creation of an accessible environment for people with disabilities.

The United Nations Organization (UNO) is the initiator of the realization of equal rights of children with disabilities in the education system.

In Russia, the possibility of education for all children, regardless of their disabilities, is legally enshrined in the Law "On Education in the Russian Federation" of December 29, 2012.

Today, the system of education for children with special educational needs is on the threshold of inevitable changes. For the second decade in Russia, educational integration is realized by extrapolation, i.e. by experimental transfer and adaptation to domestic conditions, modification of some forms of educational integration that are well-tried and positively proved abroad.

Inclusion implies inclusion of everyone (pre-school pupil, pupil, student) in the educational process with the help of an educational program that corresponds to his/her abilities and satisfaction of individual educational needs.

In inclusive education, the model of continuous educational vertical assumes the scheme of building the route of education of a child with disabilities, taking into account the continuity and accessibility of:

a) preschool educational institution;

b) a general education institution;

c) a secondary professional educational institution;

d) higher education institution;

e) institutions of additional education;

f) other interested institutions (public organizations, polyclinics, social protection institutions, etc.).

An example of achievements in the field of inclusive education is the Krasnodar Region, where a comprehensive multilevel system for the education of children with disabilities has been created, providing them with educational and rehabilitation services. In the region, about 14,000 children with disabilities and more than 2,000 disabled children of preschool age attend compensatory groups established in preschool educational institutions. These groups are implemented by 1,167 teachers and speech therapists, 129 teachers and defectologists, and 600 pedagogical psychologists.

Alternative forms of preschool education are actively used: short-term stay groups, counseling centers, “Special Child” groups, “Lekoteka”, home care, “mobile pedagogical assistance” - visits by kindergarten specialists to remote settlements, “virtual kindergarten” - remote consultation of parents.

Kuban has a differentiated network of institutions for children with severe speech, locomotor, hearing, vision, mental retardation and mental retardation. To date, the number of special education schools and boarding schools is 54, of which 42 are attended by children with intellectual disabilities. About 9,000 children, including more than 3,000 persons with disabilities, study in remedial educational organizations in Kuban.

Since 2016, remedial educational organizations have become resource centers to support inclusive education. Their specialists provide consulting and methodological support to teachers of general education institutions, parents on various issues of education, upbringing and rehabilitation of children with disabilities.

At present, three approaches to teaching children with special educational needs are simultaneously applied in Russia:

1. Differentiated education of children with speech, hearing, vision, musculoskeletal, intellectual and mental retardation in special (correctional) institutions of I-VIII types.

2. Integrated education of children in special classes (groups) in general education institutions.

3. Inclusive education, when children with special educational needs are taught in classrooms. Based on news materials and the results of various competitions, it is possible to identify several regions that are particularly active in promoting inclusive education practices in Russia:

According to a number of publications, Crimea is recognized as one of the leaders in inclusive education. The “Accessible Environment” program is being successfully implemented here, and regional specialists are actively sharing their experience with other Russian regions.

The capital and the surrounding region traditionally have a high concentration of educational resources. Federal competitions and conferences (for example, award ceremonies for the best inclusive organizations) are held here, which demonstrates a systematic approach to the development of inclusion.

The winner in the Best Inclusive School nomination was secondary school No. 29 in Severodvinsk, which indicates the high quality of implementation of inclusive practices in the region.

Novosibirsk Region. The region is noted for the development of resource centers and successful implementation of programs to support children with special educational needs - it regularly records high scores in competitions for the best inclusive projects.

In nominations related to inclusive kindergartens, Tatarstan is also a leader (for example, kindergarten No. 33 in Kazan was highly rated).

Individual publications note that inclusive education for students is developing particularly strongly in the North Caucasus, reflecting successes in higher education as well.

Besides these leading subjects, other regions (e.g. Bashkortostan, Khakassia, Chelyabinsk, Orenburg, Sverdlovsk, Ulyanovsk, Volgograd, Tambov, Vladimir, Leningrad Regions, Yamalo-Nenets and Khanty-Mansi Autonomous Okrugs, Khabarovsk, Primorsky and Krasnodar Territories) participate in the competitions on inclusive practices, which indicates a broad interest in inclusion across the country.

Thus, according to the results of competitive assessments and analytical materials, the leaders in inclusive education in Russia are considered to be the Republic of Crimea, the Moscow Region (including the city of Moscow), the Arkhangelsk Region, the Novosibirsk Region, the Republic of Tatarstan and the regions of the North Caucasus.

International experience shows that the development of inclusive education as a form of integration of children with special educational needs is a long-term strategy that requires patience and tolerance, consistency, continuity, phasing and a comprehensive approach to its implementation.

The example of the USA shows that the modern American policy is to merge general and special education. Currently there are 3 concepts, or types, of merger there: mainstreaming, mass education initiative and inclusion. The goal of full inclusion is to place all children regardless of the severity of the defect in schools in the community and thus complete the abolition of the special education system [1].

According to the basic laws and principles of IDEA (Individuals with Disabilities Education Act), schools are required to provide free inclusive education and every disabled child receives an individualized education plan (IEP)-Individual educational plan.

Inclusive education in China is a dynamic field in which government policy, cultural traditions and Western experience are intertwined to create a system that provides quality education for all children, including those with special educational needs.

Since the late 1980s, China has been moving from isolated specialized institutions to integrated educational models. The idea of inclusion originally came from the West, but it was quickly adapted to local conditions. Chinese scholars note that traditional values such as justice and humanity are reflected in the new model, which allows for the inclusion of children with disabilities in mainstream schools.

The Government is actively supporting this process by adopting and improving regulations to guarantee the right of every child to education. Legislation provides for the creation of conditions for joint education, as well as for the adjustment of curricula and organizational forms, taking into account the individual needs of pupils.

In recent years, there has been an active introduction of inclusive practices in educational institutions in China. For example, projects are being implemented in Shanghai, whereby children with special needs are no longer confined to specialized schools, but are taught in regular classrooms after professional development of teachers. These programs develop the system of training specialists, improve teaching methods, and introduce innovative technologies to adapt the learning process to the needs of each student.

Studies show that the number of teachers who are able to work in inclusive settings is gradually growing in the country, and the experience of such projects is being used to further scale up successful practices across the country.

Despite the successes, the system faces a number of challenges [2]:

– Shortage of qualified personnel. Training professionals skilled in inclusive teaching methods remains a key challenge, especially in rural areas.
– Uneven distribution of resources. The conditions for inclusive education are much better in urban areas than in remote regions.
– Cultural barriers and traditional stereotypes. Historically, people with disabilities have often been isolated, and overcoming these attitudes takes time and effort on the part of society.

To overcome barriers to further development of inclusive education, the country plans to increase funding, improve infrastructure and expand teacher training programs. It is expected that further integration of inclusive practices will not only improve the quality of education, but also enhance social justice and the adaptation of children with disabilities to society.

Inclusive education in China is a process that combines elements of Western innovation and traditional cultural values. With the support of the state and the active participation of the teaching community, conditions are created for equal access to education for all children. In spite of the challenges, the experience of implementing inclusive models in major cities and at the regional level suggests positive dynamics and prospects for further development of this system.

Thus, China continues to improve approaches to inclusion, striving to provide every student with the opportunity for full development and social integration.

Among Western European countries we would like to mention Hungary, where inclusive education is part of the European trends aimed at integrating children with special educational needs into the general education system. Hungary follows the principles of the Salamanca Declaration (1994), which declares inclusion as the main direction of educational development. The country participates in UNESCO and EU programs, such as Education for All. This facilitates the exchange of experience with other countries, such as Finland and Sweden, where inclusion is integrated into national standards. And "partial inclusion" models, where special children study in mainstream classes but receive additional support through individualized plans, are being actively implemented. Online learning technologies are being introduced in schools, which is especially important for children with limited mobility.

Hungary shows the progress in inclusive education, combining legislative initiatives, training and infrastructure adaptation. However, to fully realize the principles of inclusion, further work is needed to overcome social barriers and improve funding in the regions. The country's experience can be useful for other states seeking to create equal educational opportunities.

There are many factors in an inclusive educational environment, which should be taken into account when introducing it into the educational system. The educational organization should be ready for changes in its activities. The system of formation of a valuable attitude of all participants of inclusive education to each other, educational organization to inclusive education is fundamentally important. Individualization of such a system implies the development of an individual educational route, creation of a special (inclusive) environment, special (inclusive) education, and the creation of a special education system.

The most important task of the development of inclusive education is the training of heads of inclusive educational institutions, teachers and specialists who realize the practice of inclusive education.

The process of development of inclusive education in different countries of the world is different, taking into account specific socio-cultural conditions and political priorities of the state. According to M.S. Astoyants and I.G. Rossikhina [3:56], "inclusive education is a long-term strategy that requires patience and tolerance, systematicity and consistency, continuity, integrated approach for its realization".

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文学文本中的典故作为一种语言现象：翻译问题
ALLUSIONS IN LITERARY TEXTS AS A LINGUISTIC PHENOMENON: TRANSLATION PROBLEMS

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摘要。本文探讨了文学文本中的典故现象，将其作为一种语言和认知手段，重点研究了它在创造意义中的作用及其在翻译中的挑战。典故作为一种文体工具，是语言、文化和认知之间的桥梁，使作者能够通过间接引用众所周知的历史、神话、圣经和文学资料来传达复杂的思想和情感。本研究强调了理解典故的认知语言学方法，强调了它们作为思想反映和认知推理工具的功能。本文根据典故的语义和结构特征对其进行分类；研究了各种类型的典故，包括专有名词、圣经和神话引用以及文本间呼应；还讨论了它们在文学作品中的作用。典故的翻译被认为是一项复杂的任务，不仅需要语言能力，还需要深厚的文化和历史知识。概述了翻译典故的几种策略。

关键词：认知语言学、互文性、典故、典故的分类、典故的功能、翻译。

Abstract. *The paper examines the phenomenon of allusion in literary texts as a linguistic and cognitive device, focusing on its role in creating meaning and its challenges in translation. Allusion, as a stylistic tool, serves as a bridge between language, culture, and cognition, allowing authors to convey complex ideas and emotions through indirect references to well-known historical, mythological, biblical, and literary sources. The study highlights the cognitive-linguistic approach to understanding allusions, emphasizing their function as reflections of thought and tools for cognitive inference. The paper categorizes allusions based on their semantic and structural characteristics; examines various types of allusions, including proper names, biblical and mythological references, and intertextual echoes; it also discusses their functions in literary works. The translation of allusions is identified as a complex task that requires not only linguistic proficiency but also deep cultural and historical knowledge. Several strategies for translating allusions are outlined.*

Keywords: *cognitive linguistics, intertextuality, allusion, classifications of allusions, functions of allusions, translation.*

Cognitive linguistics seeks to provide a theoretical foundation for the study of the brain, mind, and language, as well as for the analysis of conceptual systems, which is an important prerequisite for cognitive-linguistic thinking. In recent years, significant progress has been made in cognitive linguistics research, particularly in the study of various ways of expressing metaphorical thinking and the connection between language, culture, and cognition. Traditional stylistics mainly studies creativity in language use, while cognitive stylistics focuses on figurative language and the construction of figurative meaning in discourse.

Within cognitive stylistics, stylistic devices are viewed not only as linguistic expressions but also as reflections of thought. Thus, a stylistic device is understood as a structure of thought and a tool for cognitive inference, applied in creative expressions of ideas.

The stylistic device of *allusion* is striking in its abundance of expressions in practical use. Therefore, it is not surprising that empirical data not only confirm the diversity of this device but also reveal its complexity in both verbal and visual expressions.

Allusion is a well-known concept with a rich history. Even in ancient Greece, allusion was considered a rhetorical tool intended for indirect references in literature, especially in poetry, as well as in oratory.The English language possesses a vast number of allusions related to the Bible, which have become an integral part of its lexical arsenal. For example, in the Old Testament, the Garden of Eden symbolizes the biblical paradise on earth, created by God for the first humans, Adam and Eve. If we consider this symbol as an allusion, it is a phraseological expression that has acquired a stable and generalized metaphorical meaning. For instance,when the word “amen” is used, the place feels like a true paradise, thus symbolizing perfect bliss. Other examples include *Noah’s Ark, thirty pieces of silver, the kiss of Judas, to slaughter a fattenedcalf*, and many more.

Greek mythology and ancient Greek literature have long been rich sources of allusions. One example is the expression ‘*Achilles’ heel’,* which symbolizes a fatal or vulnerable area. It refers to the legend of the heroic warrior Achilles, whose mother dipped him in the River Styx while holding him by the heel in an attempt to make him invincible. In modern English, this expression is used metaphorically. Other well-known allusions include *the Trojan Horse, Sisyphean labor, Pandora’s box*, and *between Scylla and Charybdis*.

Thus, an allusion is an implied reference to something or someone. Over time, allusions have come to refer not only to mythology but also to historical, folkloric, cultural, social, and political phenomena and events. Allusions help convey

semantic and stylistic nuances and are essential for the clarity and understanding of a text.

The phenomenon of allusions is closely connected with the concept of intertextuality. The introduction of one text into another in a fragmentary form is one of the forms of literary intertextuality, and similar 'inclusions' and 'references' to preceding literary facts are commonly called allusions. This form of intertextuality is the most researched and developed.

M.D. Tukhareli and D. Durishin attempted to systematize the types of allusions and their allusive inclusions. M.D. Tukhareli proposes the following typology of allusions based on their semantics:

– Proper names. This group also includes anthroponyms – names of people; zoonyms – names of animals and birds; toponyms – geographical names; ktematonyms – names of historical events, holidays, artistic works, etc.;
– Biblical, mythological, literary, historical, and other realias;
– Echoes of quotes, popular sayings, contaminations, reminiscences [5].

Literary works often have a historical character. Therefore, it is highly likely to encounter historical allusions, which are not difficult to decode – they are specific and clear. However, it should be remembered that historical allusions lack expressiveness and emotionality. They provide the reader with only content-related intellectual information.

In contrast, biblical and mythological allusions are characterized by emotional coloring and expressiveness. Such allusions vividly describe heroes in a positive light. Mythological allusions are used to convey sensational information, while biblical and literary allusions are used to a lesser extent.

Based on their place and role in the text, M.D. Tukhareli divides allusions into:

- Predicative or pervasive – help to comprehend the content of a literary work;
- Relational – contribute to the development of the leading theme [5].

The classification proposed by D. Durishin is based on the assumption thatan allusion is the simplest form of perceiving integrality. Thus, the researcher divides allusions into:

- Direct and veiled quotations, i.e., quote allusions;
- Interfigural allusions;
- Allusions referring to a specific artistic device, motif, or idea of famous writers [1].

D. Durishin believes that quote allusions constitute a significant variety of non-authorial words. Such allusions can be implicit, distinguished based on the feature of partial allusiveness, as they are difficult to extract from the context, yet endowed with allusive properties, and explicit, realized through epithets, comparisons, and metaphors [1]. Implicit quote allusions are not used to directly point to the author or work. They are used to quote fragments of well-known works. Thus,

the association arises on its own. When a quote 'inclusion' of an allusion appears in the text, quote dialogues emerge between the characters. It is they that impose certain and necessary associations on the reader.

Allusions are important elements of a literary work and, as a result, possess great potential for creating subtext. Through allusions, the author can convey a large amount of information in a condensed form, as well as demonstrate their attitude towards the characters and guide the reader to a certain thought.

Among the main functions of allusions, researchers highlight the following:

- Creation of subtext – the allusive word is realized in the text meaningfully, so it is necessary to reveal the meaningful concept present in the pretext explicitly;
- Evaluative-characterizing – helps to express evaluative information about an event, as well as create and supplement the personal characteristics of characters or phenomena;
- Occasional – through references to historical facts and personalities, helps to recreate the spirit of the era in which the work's events unfold, i.e., this function endows a segment of the text with an extended historical perspective and, thanks to this, considers it in a temporal refraction:
- Function of creating features of historical correlation;
- Ornamental function of allusion;
- Text-structuring – allusion is capable of realizing intra-textual connections, which relate to the form of associative cohesion, and thus helps in binding the literary work and brings additional information from outside;
- Predictive – provides the reader with a hint about the presumed development of the plot line of the work through its correlation with another pretext, for example, a well-known event or historical event.

The choice of the method for conveying an allusion depends on the context, target audience, and translation goals. The translator should strive to preserve the pragmatics and the effect created by the allusion, and choose the most suitable method for conveying it in the target language [4].

1. Translation using an established equivalent is the simplest way to translate an allusion into another language – this means using an existing translation of the allusion that has become generally accepted and widely used in translations:

- 'International Velvet' – Международный приз «Вельвет» [2, 3].

The title of the film includes the name of the prize the translation of which is established, so the translator relies on the existing equivalent.

2. If it is impossible to translate the allusion with a complete equivalent, an allusive analogue can be used.

This translation technique conveys the same denotative and connotative meanings in terms of semantics, stylistic correlation, metaphoricity, emotional and ex-

pressive coloring, composition, and lexical-grammatical indicators. Most often, allusive analogues are used when translating biblical, mythological, and literary allusions:

- 'About a Boy' – «Мой мальчик» [2, 3].

The title of the novel 'About a Boy' is a reference to the song 'About a Girl' by Nirvana. This work resonates with the theme of identity and growing up, like the song, ironically reflecting the life of a boy, not a girl.

3. Transliteration / transcription is used when conveying allusive inclusions containing proper names, such as toponyms, anthroponyms, names of historical events, etc. According to S. Vlahov and S. Florin,theybelong to 'speaking names' that echo other proper names in a literary work. These include, for instance, folklore or literary names – components of proverbs, sayings, expressions, phraseological units [6]. Some examples include:

- The Muppets – Маппеты (a family of puppet characters created by Jim Henson in 1955);

- Arena – Арена (one of the largest indoor arenas in Europe) [2, 3].

4. Translation using other lexical means or a translator's commentary – this technique is applied when there are no equivalents or analogues in the target language to convey the allusion. In this case, adequate translation is only possible thanks to the translator's background knowledge. The translator establishes a connection with the source, identifies the semantic meaning, and selects an equivalent phrase or introduces a translator's commentary to explain the allusion.

- 'They'd had something about him on CBS Saturday-morning TV once, and they said he got taught in a caravan sort of thing by a private tutor [3]'. – «Про него что-то показывали в субботнем утреннем шоу: там сказали, что он занимается у себя в трейлере с частным преподавателем» [2].

The original phrase from the CBS *'Saturday-morning TV'* would evoke no associations among Russian-speaking readers, as they are not familiar with foreign TV shows. Therefore, the translator resorts to a descriptive translation, which literally means '*Saturday morning show'*. Thus, a wide range of readers immediately forms the intended concept through a direct connection with the source of the specific allusion.

Thus, translating allusions in contemporary British fiction is a labor-consuming task that requires both language proficiency and immersion into history, literature, and culture. It is only by considering all the factors above, that one can create a translation which is able to convey the depth of the original works and engage the reader.

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以《原神》和《崩坏：星轨》为素材的中国电脑游戏翻译之难
THE DIFFICULTIES OF TRANSLATING CHINESE COMPUTER GAMES BASED ON THE MATERIAL OF "GENSHIN IMPACT" AND "HONKAI: STAR RAIL"

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摘要本文探讨了中国电脑游戏在俄罗斯市场本地化方面存在的问题，分析了《原神》、《崩坏：星轨》等游戏中词汇翻译中存在的错误和文化不准确性，提出了更好的翻译方案和改进游戏本地化的建议。

关键词：本地化；翻译；电脑游戏。

Abstract. *This article discusses the existing problems in the field of localization of Chinese computer games for the Russian market. The existing mistakes and cultural inaccuracies in the translation of lexical units in such games as "Genshin Impact" and "Honkai: Star Rail" were analyzed, better translation options and recommendations for improving the localization of games were proposed.*

Keywords: *localization; translation; computer games.*

Currently, the video game industry is gaining popularity and continuously developing at an incredible rate. Nowadays, video games are not just a leisure activity. All over the world, including Russia, interest in video games is growing every year, attracting the attention of people of all ages. The gaming market is expanding daily, according to 2023 statics, the number of users has reached 3.38 billion.

The huge demand for computer games has provoked the need for translation and adaptation of the game for its sale in other countries. Thus, the field of game translation is becoming the most in demand. More precisely, the need for "localization".

According to B. Esselink's definition, localization is the process of transforming a product linguistically and culturally for consumers in a specific region [1, p. 3]. Localization allows a product is better received by the target audience, as

its embedded images are revised and adapted. In this sense, localization can be understood as “cleansing” a product of one country’s cultural characteristics and appropriating those relevant to a particular consumer requires. These changes are necessary when planning sell the product for use in different cultural settings. In other words, localization in the gaming industry prepares a computer game for its entry into the international market. This is a sure way for companies to increase their audience. Consequently, the success of a game’s market promotion depends on the quality of its localization. A poor translation can not only frustrate players but also make the product unplayable. Poor localization can also demonstrate a developer’s carelessness and lack of concern for the target players. Negatively impacting the game’s sales to the local audience.

Currently, China is considered one of the most developed countries in the world. The gaming industry, as a separate sector of the economy, is also rapidly developing in China. Over the past decade, China has become one of the leading game manufacturers, with 668 million gamers in the Chinese market. At the moment, the most influential company in the Chinese gaming market is HoYoverse. Its most successful projects are the games “Genshin Impact” and “Honkai: Star Rail”.

One of the obstacles to the successful localization of these games is the Chinese language itself. As you know, one of the oldest languages in the world is replete with well-established expressions and words that incorporate the cultural realities of the country and its people. This feature often complicates translation into Russian and requires translators to possess additional knowledge in Chinese culture, history, and religion. The main difficulty is expressed by finding suitable equivalents for Chinese phraseology in Russian. However, not every expression has a fully expression or even a partial one, in meaning. This is due to the fact that many Chinese idioms have no direct analogues and there is no established standard for their translation. [2, p. 147].

So, considering the constellations of the characters in the game “Genshin Impact”, it can be revealed that translation problems appear where additional cultural knowledge is required from translators. For example, one of the constellations of the character Zhong Li is referred to in the original language as “圭璋，暝仍不移其晖”, which literally translates into Russian as “the jade scepter, always shining in the dark.” However, in the Russian localization, the constellation is called “jasper shine”. The mistake is that “圭璋” has the meaning “jade scepter of princely dignity”, in this case referencing the emperor’s scepter. Replacing “jade” with “jasper”, is impractical, since in China jade is valued on a par with gold, and the emperor’s scepter would be made from it. Such a localization substitution removes the cultural meaning of the name and another reference to the character’s high position.

In the character Gan Yu, the third constellation is referred to in Chinese as "云行" and is the first part of the expression "云行雨施" – "clouds move, rains fall", which has a figurative meaning "to shower favors, to do good to subordinates". This expression was not chosen by chance – it reflects the character of the character. But in the Russian localization, the name of the constellation was translated as "cloud travels". Thus, both the cultural aspect and the connection with the personal quality of the hero were lost.

As in "Genshin Impact", in "Honkai: Star Rail", each character has "constellations", but in this game they are referred to as "eidolons". For example, consider the eidolon of the character Dan Heng: Moon Eater. In the original, "嘲风" in the Russian version of the game is called "the beauty of the light wind". However, the original version, according to the large Chinese-Russian dictionary, translates only as the name Chaofeng. Chaofeng is a creature with the body of a phoenix and the head of a dragon, the third in a row of the nine sons of the dragon according to Li Dongyang's list. His figures are often mounted on the ridge of the roof of a building. Thus, the correct translation would be "Chaofeng – the third dragon son" or "Chaofeng's Dragon Son". In this case, the original meaning embedded in the name of eidolon would have been preserved and, in addition, showing the character's connection with both dragon nature and imperial power.

The next example is the name of the light cone (a game weapon in Honkai: Star Rail) of a character named Blade. In the Russian version of the game, it is called "the inaccessible side". However, in the original, it is "到不了的的" and, if translated literally, it will turn out to be "an unreachable shore" or "a shore that can never be reached". Separately, "彼岸" refers to Buddhism, meaning "that light, nirvana". To understand the reference, you should refer to the hero Blade himself. After all, as you know from the hero's story, he is immortal, but not by his own will. His main desire is to find that very "shore". Therefore, due to the character's story, "the unreachable shore" is a more symbolic translation, containing a reference to the essence of the hero's path itself, but in the Russian localization, this aspect was lost.

It can be concluded that localization may not always fully reflect cultural phenomena, significantly impoverishing the game's text, and preventing players from learning about unique aspects of Chinese culture. These localization difficulties may be related to the large differences in the cultures of the countries. This can also be attributed to the increasing popularity of the niche of Oriental studies, particularly Sinology. All errors impact the user experience of the game product. Perhaps, in the future, game developers will hire not only translators but also specialists in Chinese culture, which will reducing translation challenges and errors in game texts.

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社会和人道主义科学认识论的哲学问题
PHILOSOPHICAL PROBLEMS OF EPISTEMOLOGY OF SOCIAL AND HUMANITARIAN SCIENCES

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注释。更新古典知识论的必要性是当前理论和哲学思想中迫切需要解决的问题。国内科学和哲学知识的特殊性也被认为是问题的关键，特别是克服意识形态认知态度的过程造成了严重的困难。在这方面，反思论在今天受到的批评最多。同时，需要从科学的角度克服的不是反思论本身，而是教条主义态度所制约的其简化形式。国内科学和哲学对知识论理解的另一个方面是需要从建设性对话的角度考虑各种认知实践。

关键词：知识、对话、个性、价值、科学、文化、精神、学派、理解、解释。

Annotation. *The need to update the classical theory of knowledge is currently a pressing issue in theoretical and philosophical thought. The specificity of domestic scientific and philosophical knowledge is also recognized as an essential point in the problem, in particular, serious difficulties are caused by the processes of overcoming ideological cognitive attitudes. In this regard, the theory of reflection is subject to the greatest criticism today. At the same time, it is noted that it is not the theory of reflection itself that needs to be overcame from a scientific standpoint, but its simplified form conditioned by dogmatic attitudes. Another aspect of domestic scientific and philosophical understanding of the theory of knowledge is the need to consider various cognitive practices from the point of view of constructive dialogue.*

Keywords: *knowledge, dialogue, personality, value, science, culture, spirit, school, understanding, explanation.*

Social and humanitarian knowledge is a special type of knowledge. This "peculiarity" is determined to a greater extent by the abundance of its immediate components, as well as the phenomena, occurrences and processes of socio-cultural reality that influence it. The interpenetration and mutual influence of such compo-

nents as science, culture, politics, personal experiences of an individual, one way or another are reflected in social and humanitarian knowledge, being the objects of its study. Of course, socio-cultural events also influence natural science knowledge, but this influence is of a different nature, if only because they are not able to influence nature as such, this cannot be said about the personality and man, his worldview, worldview, and the values he shares. In this regard, neo-Kantianism of the Baden School, which was formed in Western philosophy in the 19th century, plays an important role in the process of studying the patterns of development and existence of social and humanitarian thought.

The founders of the Baden School laid down unique fundamental concepts and categories that are of great interest to philosophy today, and this interest cannot be considered purely "historical". The most important category of the philosophy of the Baden School was the category of value. Value, "having become" the cornerstone of the process aimed at substantiating the uniqueness of the "sciences of culture", demonstrated a unique ability to solve and at the same time pose a number of important problems. The ideas formed in the philosophy of G. Rickert seem relevant today, despite the existing opinion about the removal of the problems formed by the Baden School by modern scientific analysis. German and Russian Neo-Kantianism: Between the Theory of Knowledge and the Critique of Culture/ ed. I. N. Griftsova, N. A. Dmitrieva, 2010, p.345]

To understand the essence of "value" as a category of neo-Kantian philosophy, it is necessary to understand the conditions under which it is formed and manifests itself; by the conditions of its formation, we will understand the logical constructions created by Rickert. The initial point that allows us to trace the logic of the philosopher in relation to his understanding of value can be considered the idea of the need to separate the concepts of "science of the spirit" and "science of culture", in this case this is a necessary condition for freeing the philosopher's further logic from the influence of "psychologism". In particular, G. Rickert points out the excessive overestimation of the significance of psychology "for some so-called sciences of culture". [Rickert, 1991, p. 52].Rickert's division of sciences is based on his overcoming of the understanding of "spirit" as the main criterion for the division of sciences; this division occurs on the basis of principles: material, leading to the formation of an understanding of the presence of a number of objects that can be "embraced by the term culture" and formal, based on the "purely logical concept" of history, which implies "the concept of a single being in all its peculiarity and individuality" which is the opposite of the general natural scientific law [Rickert, 1991, p. 53].

Rickert's logic thus allows us to move on to a further consideration of the role and place of value in the sciences of the "spirit" and in the world as a whole, which, despite the existence of various methods and approaches to its study, still remains one.

The category of "value" leads us to the need for a detailed consideration of objectivity as a fundamental component of science in general, this consideration becomes especially important in relation to the sciences "about culture". The objectivity of the "sciences of nature" is conditioned first of all by the objectivity of the being of nature itself, existing and developing according to its own laws, independent of the subject of cognition, even the idea according to which the subject of cognition in the process of studying nature can perform any actions that influence the object of study or introduce his subjective vision in the process of interpreting the results obtained, cannot cast doubt on the existence of the above-mentioned objectivity of nature. The objectivity of the "sciences of culture" has a different character, since its basis is not some independent process that fits into the classical opposition of subject and object, objectivity in this case has as its beginning a person, created by a person and subsequently interpreted by a person. This humanitarian origin of objectivity gives rise to a number of problems, the main meaning of which comes down to the question: is it possible to speak here at all about any objectivity generated not by conventionalism, but by true objectivity, "independent" objectivity? The answer to the above question can be found in Rickert's philosophy of value.

To understand the possibility of obtaining this answer, it is necessary to indicate the main characteristics of "value": a) "value" is embodied in cultural phenomena in the form of goods, but is not identical to it; b) "value" is of a supra-personal nature, expressed in the form of assessments; c) "Value" is not an integral part of any sciences, while influencing them [Rickert, 1998, p. 23].

The list of characteristics of "value" could be continued, but even based on what has already been indicated, its objective character, as indicated by Rickert, is visible, which can be correlated with the objectivity of the "cultural sciences" that we have indicated above.

Thus, the Baden school of neo-Kantianism, engaged in the methodology of the social and humanitarian sciences or, in neo-Kantian terminology, "cultural sciences", having formed the idea of an ideographic method aimed at the knowledge of a fact in its particularity, singularity, uniqueness and contrasting it with the nomothetic method of the natural sciences or "sciences of nature", thereby posed the problem of objective knowledge and solved it by forming the category of "value".

The value that divided the world in Rickert's philosophy into the "kingdom of value" and the "kingdom of reality" acquired a supra-historical and timeless character, rising above the relationship of the subject to the object, it began to contain the objectifying principle of the "sciences of culture". This objectivity, although created by man within the framework of the "world of reality", subsequently passes into the "world of values" and is no longer contained in "actual being", acquiring a transcendental character, just as value is not contained in an artist's painting, manifesting itself in it only in the form of "benefits". [Rickert, 1998, p. 22].

The neo-Kantian philosophy of G. Rickert, which laid the foundation for modern axiology and made a great contribution to the development of the methodology of social and humanitarian knowledge, seems relevant today. Here it is necessary to note that this relevance has certainly been partially overcome and removed in the sphere of methodology, but in the general philosophical sphere a similar overcoming does not seem so obvious.

The importance of neo-Kantian ideas is primarily great for understanding the need to search for foundations that serve to reunite the "split" image of the world that has been formed within the framework of modern science. The disciplinary "fragmentation" of the problems of social and humanitarian knowledge is a forced necessity today, this necessity stems primarily from the abundance of material that social and humanitarian knowledge has to work with, at the same time, the search for common foundations that do not allow "fixing" the fragmented image of a single studied world is necessary. This necessity is expressed, among other things, in the "new stage" of interaction between natural science and social and humanitarian knowledge observed today, which is carried out largely on the basis of searching for common value foundations that have a generally significant, universal character. In these conditions, the ideas formed within the framework of the Baden School of Neo-Kantianism and set forth in particular by Rickert acquire a special resonance and relevance.

Another important circumstance, substantiating the relevance of the philosophy of the Baden school and Rickert in particular, is the idea according to which social and humanitarian knowledge has close ties with culture, the term culture here must be understood in a broad sense, as the totality of everything created by humanity, to which man has applied his efforts. The ideas that previously seemed fundamental, subject to revision, again force us to turn to the question of the relationship between culture and science, science and values.

Culture acquires fundamental significance in the philosophy of Neo-Kantianism, which has created the need for its more detailed study. The formation of the methodology of the sciences of the spirit, which began in the 19th century, mainly within the framework of the Baden School of the Neo-Kantian direction in philosophy, demonstrated the most important tendencies inherent in the understanding of social and humanitarian knowledge. These tendencies seem possible to designate within the framework of binary oppositions: explanation-understanding; nomothetic-ideographic methods; nature-culture; sciences of the spirit-sciences of culture. The nature of the binary opposition was based on the desire to substantiate the independence of humanitarian knowledge in relation to natural science, which in turn required an appeal to the latter as a guarantor and example of the non-identity of the two types of knowledge.

The oppositions outlined, in the most general form, express the problematic field of social and humanitarian knowledge. Thus, understanding indicates a

close interconnection between the object of knowledge and the knower, when knowledge is not only and not so much an objective meaning or regularity, as the starting point of the formation of the worldview of the subject of knowledge. In comparison with the procedure of "explanation" directed outward, the procedure of "understanding" has an internal direction.

An explanation in this sense is an explanation to someone, that is, it has an external orientation, since to explain means to present a certain positive program that can be understood by a wide circle of people, provided that this group is guided by certain conventions or rules of the positive program within which the explanation was given, in other words, it adheres to the method. At the same time, an explanation can also be an explanation for oneself, an explanation to oneself. Nevertheless, even in this case, an explanation to oneself appears as an explanation to oneself as another, that is, as a possible element of the circle of people who assimilate the explanation within the framework of the positive program. Thus, an explanation appears to be fundamentally impersonal, but not subjectless, since it acquires its objectivity through the subjective activity of the explaining subject.

Understanding is understanding for oneself, that is, unlike explanation, it has an internal focus, in the sense that it does not pretend to some positive program that has the potential for its assimilation by another or others. In this case, it is precisely the internal focus that complicates the objective presentation of understanding, which often appears only through a number of its indirect features that have no direct relation to understanding and, as a result, do not allow the possibility of characterizing or explicating understanding through them. In this regard, we are notable for the difficulties of everyday, and often scientific, knowledge, which manifest themselves in attempts to characterize understanding in its relation to man, considered in the space of culture. The human capacity for understanding exhibits a paradoxical complexity. In our opinion, the indicated difficulty is determined primarily by two circumstances. The first is that human understanding is not given directly as a procedure, since it is not reducible to abstract understanding in general. Thus, human understanding is always concrete. The second circumstance is that the ability to understand is not given in its result directly, but only indirectly in the totality of the essential qualities of man. The result of the above is the impossibility of an objective consideration of understanding, which is fixed as a result of introspection and phenomenological description, that is, exclusively subjectively. At this stage of subjective consideration, understanding is faced with the need for its objectified explanation.

Thus, internally directed understanding requires its externally directed explanation in order to be understood as some objective order. Such a relationship between explanation and understanding is a dialectical relationship, and in the methodological field corresponds to the principle of complementarity.

The ideographic method considers the singular, unique and exceptional, points to the fundamental position of social and humanitarian knowledge about the existence of many unique meanings generated and transmitted in the space of culture and in this respect not identical to the physical singularity of a thing. The opposition of nature and culture can be considered a fundamental position, historically the first to record the externality of man in the animal world and, as a consequence, to create a "second nature" of exclusively humanitarian origin. The ideas about the need to demarcate the sciences of the spirit and the sciences of culture had their basis in the need to develop not natural science, but objective knowledge about man, based on the objectivity of cultural processes and going beyond subjective psychologism.

At present, epistemological analysis has partially overcome the problems developed by the Baden school of neo-Kantianism. [German and Russian neo-Kantianism: between the theory of knowledge and criticism of culture / edited by I. N. Griftsova, N. A. Dmitrieva, 2010, p. 345]. Thus, it is noted that "... in the humanities, although they are based on understanding, explanatory methods play a very significant role", and "... modern physics and natural science reveal a number of problems in their field that in the past prompted many to doubt the scientific nature of the humanities." [Borsyakov, 2005, pp. 4-5]. At the same time, the circumstances outlined above do not eliminate the relevance of considering the specifics of social and humanitarian knowledge, but on the contrary, project this relevance from the area of methodology into the worldview area, which finds its expression in the awareness of the fact that "... humanitarian knowledge is a paradigm of human knowledge in general, and natural science is a special case of human knowledge..." [Borsyakov, 2005, p.5]. Such an attitude contributes to the formation of an understanding according to which, consideration of the problems of social and humanitarian knowledge inevitably leads to its analysis in a broad socio-cultural context. When the area of methodological knowledge acts as a component of a multifaceted socio-cultural space that includes it, but is not reduced to it.

The development of methodological and general philosophical problems of social and humanitarian knowledge is impossible without understanding the current state of the socio-cultural environment, since the sciences of man and society cannot function without the very understanding of man and society in their socio-cultural "rootedness". At the present time, it is assumed possible to identify a number of central paradigmatic foundations of social and humanitarian knowledge expressed in its: subject-centrism, text-centrism, culture-centrism.

The necessity of updating the classical theory of knowledge is currently a pressing problem of theoretical and philosophical thought. The specificity of domestic scientific and philosophical knowledge is recognized today as an essential point in the designated problem, in particular, serious difficulties are caused by the

processes of overcoming ideological cognitive attitudes determined by the past in political, but still existing in scientific and philosophical and methodological fields.

The most important task on the path to rethinking the classical theory of knowledge is today recognized as the need to include in the cognitive field, previously excluded from it, the "living" cognitive subject. Within the framework of this task, serious efforts of methodologists and philosophers of science are directed at examining such problematic positions in the cognitive process as: value attitudes of the cognitive subject, socio-cultural determination of scientific knowledge, rationality of scientific knowledge, heuristic potential of extra-scientific forms of knowledge and, as a consequence, consideration of the cognitive capabilities of the subject in the "broad" sense, overcoming the framework of scientific classical rationalism. Ultimately, such fundamental categories as subject, object, truth are also subject to scientific and philosophical analysis and rethinking today.

Speaking about the processes aimed at including various cognitive practices in the problematic cognitive field, it is necessary to clarify that such inclusion is today quite extensive. This circumstance is expressed in the fact that at the present time it is possible to distinguish two general directions in the scientific and philosophical understanding of cognitive practices, namely: consideration of non-classical, but philosophically substantiated directions in cognition and analysis of the cognitive potential of non-scientific practices, such as faith, art, play, myth, magic, etc., the latter direction comes from the assertion, which is quite substantiated today, according to which: beyond the competence of science "... go, in particular, its own foundations." [Borsyakov, 2005, p. 3]. Kasavin I. T. notes that "gnoseological interest extends to both scientific and non- and non-scientific methods of cognitive development of the world, and each type of knowledge reveals its inherent features, spheres of applicability, forms of justification and criteria of acceptability." [Kasavin, 1998, p. 25]. The most important aspect arising from this is the idea of the need to reject the classical dichotomy of scientific and non-scientific forms of knowledge and, as a consequence of this, to reject the "demarcationist approach" and replace it with a typological approach to knowledge. [Kasavin, 1998, p. 28].

Thus, it can be stated that at the present moment in time there is confidence that cognitive practices, various in their forms and content, having undergone their refraction through the general paradigm of scientificity, will ultimately be able to avoid extremes. eclecticism and will acquire homogeneity in their goal, namely, in obtaining true knowledge about the world.

The above trends result in a number of significant changes in the understanding and interpretation of the main categories of scientific and cognitive activity, among which the key position is occupied by the categories of rationality and the

subject of knowledge. This state of affairs is explained primarily by the inevitability of considering rationality in its correlation with the diversity of cognitive practices and, as a consequence, the need to expand the field of rationality as a fundamental basis for science. Another significant point is the increased interest in the problem of the subject of knowledge, which is explained, on the one hand, by the fact that the classical relationship of subject-object of knowledge is gradually losing its absolute positions, at least in a number of leading cognitive practices oriented towards social and humanitarian knowledge, and, on the other hand, by the fact that paying special attention to the subject of knowledge and, accordingly, to subjectivity, acquires a decisive significance in the vision of further paths for the development of the theory of knowledge. In this respect, all guarantees that the subject will not ultimately give way to a "broader" and "living" personality or some modernized concept of the microcosm "disappear". The most important aspect directly related to scientific knowledge and the cognizing subject is the problem of rationality. In the context of the problem of rationality, a number of issues are currently highlighted concerning both the general cultural foundations of rationality and the scientific and philosophical understanding of rationality. The latter, in particular, is considered through historical-philosophical, philosophical-anthropological, semantic analysis of the category of rationality. Despite attempts to form synthesizing approaches, at present we have to state the fact that the process of studying rationality produces the idea of a plurality of rationalities, distinguished both in the historical perspective and in the "horizon" of modernity. In this regard, the problem of the relationship between reason and rationality acquires a special meaning, which currently has not only a historical-philosophical and semantic "sound", but also a directly epistemological one. The indicated problem reveals itself primarily through the idea of the unequal value and incompatibility of reason and rationality, when the latter is interpreted as historically changeable, demonstrating relativity with respect to historical and disciplinary perspectives. In this area, it is noted that "... the reasonable covers a wider cultural sphere than the rational." [Stotskaya, 2009. p. 123]. In this case, it is on this basis that reason begins to acquire its anthropological understanding, as a generic quality of man acting, among other things, in the role of a cognitive subject; in its extreme manifestations, such a tendency "risks" bringing the understanding of reason exclusively to the psychological realm, bypassing the scientific and philosophical level of understanding human knowledge as a whole. It can be said that a "gap" is being formed between reason as a social area and rationality as an area of scientific knowledge. Such problems, analyzed by P. P. Gaidenko, allow us to identify the cause of this contradiction in the tendency to eliminate the principle of expediency from the natural sciences of modern times and the subsequent transfer of this tendency "...on human life and activity, on the sphere of morality...", which

ultimately led to the narrowing of the concept of reason "...to the so-called scientific rationality, which meant the explanation of all phenomena by establishing a cause-and-effect relationship between them - in the sense of an active, mechanical, and not a target, final cause."[[Gaidenko 2003, pp. 25-26]. Thus, one of the possible ways to overcome such an exclusion of the cognitive personality from the scientific cognitive paradigm is to turn to the social and humanitarian fields of knowledge and their philosophical comprehension, when rationality is assessed as directly human and is interpreted not as ahistorical, but as lasting in time. It is in this case that memory, which is an integral part of the human mind aware of itself in a historical and cultural perspective, forces it to be assessed "... not only as a psychological phenomenon, a state of consciousness, but as an integral existential characteristic of human subjectivity, which significantly distinguishes it from the "unmemorizing thing."[Mikeshina, 2002, p.536].

The said "gap" was ultimately the result of many crisis phenomena, and not only in the scientific field itself, but primarily in ecology. In general, speaking about modern trends in the field of rethinking the theory of knowledge, it is necessary to point out that the need to change the approaches of traditional epistemology, which was largely formed on "...the desire to build epistemology as a doctrine about the nature of knowledge, its natural and psychological prerequisites, mechanisms, properties in abstraction from personal, cultural and historical "parameters" considered as a manifestation of psychologism or sociologism." needs to be reoriented towards the person himself. [Mikeshina, Openkov, 1997, p. 240]. The designated need to include the "living" cognitive person, "lost" in the classical theory of knowledge, thus forms the need for a scientific and philosophical analysis of cognitive practices that overcome traditional theoretical-abstract approaches to the cognitive subject.

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俄罗斯的钟声为谁而鸣?
FOR WHOM DOES THE RUSSIAN BELL RING?

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摘要。本文致力于探讨俄罗斯钟声的意义，是一篇特殊类型的文章：问文。
揭示了俄罗斯钟声与祈祷歌唱的联系，以及俄罗斯钟声的普遍性。
关键词：俄罗斯钟声、祈祷歌唱、人、世界、上帝、俄罗斯。

Abstract. *The article is devoted to the meaning of the Russian bell and is an article of a special genre: an article-asking.*

Russian bell's connection with prayer singing is revealed, as well as the Universal character of Russian bell ringing.

Keywords: *Russian bell, prayer singing, man, world, God, Russia.*

The proposed article, in a sense, is a continuation of my published article "About the Russianness of Russian music" [5] (1). The published article drew attention to the fact that the Russian bell ringing is the most striking manifestation of znamennoe penie, the main type of Russian Orthodox singing [5, p. 72].

Indeed, the sound of the Russian bell is the brightest expression (radiance) of znamennoe penie. But znamennoe penie is prayer singing, and therefore *the sound of the bell is bell prayer singing* (2). And this bell prayer singing is the *quintessence, the generalizing expression of prayer singing in Russia* (3).

The peculiarity of the sound of bell prayer is its *Universal character*, which is confirmed by the presence in the sound of the Russian bell of the sound of prayers used in other religions, in particular, the sound of *Om*, sung in Hinduism and Buddhism. As the Belgian researcher Jo Haazen points out, the sound of the Russian bell reproduces the sound of *Om:* "Our modern, dulled hearing, alas, is not so sensitive… But if you seriously want to test your ability to do this (listening. – *A.K.*), sit quietly, close your eyes and chant the sacred sound 'Om'. Pull it long enough and choose the most suitable height. After some time, you will hear… consonance is... a pure third. The main tone sounds from the chest... the third from the mouth...

and the fifth from the head... The triad... has a threefold meaning, contained in the divine trinity and reflected in man, since he was created in the image and likeness of his Creator (Gen. 1:26).

A good bell is an object with a deep meaning, reminding of much more than time or any event. We are talking about ... an equilateral triangle: *spirit – soul – body*, whose forces in a balanced interaction make a person's life harmonious" [1, p. 114] (4).

Thus, it can be argued that the Russian bell *prays for everyone, baptizes the world!*

And this has been confirmed experimentally. Thus, in the process of conducting a modal analysis of the bell structure, "it was noted that (the vibrations. – *A.K.*) of the bell parts have the form of ellipses oscillating in antiphase, that is, (two ellipses are detected. – *A.K.*) two ellipses whose axes are perpendicular to each other (a voluminous cross)". But what is interesting! The parts of the bell not only produced vibrations, but also radiated acoustic energy. The latter was discovered during the study of the spatial distribution of sound intensity near the surface of the bell. The study was carried out in two ways: "In the first case, 30 mm from the bell surface at the same ... points where the vibration acceleration spectra were determined during modal analysis… In the second case, the measuring surface was a cylinder with a diameter of 600 mm, the axis of which coincided with the axis of symmetry of the bell. At each point located on the lateral surface of the cylinder, the intensity vector was measured in the direction perpendicular to the axis of symmetry of the bell, and at points on the lower surface in the direction parallel to the axis of symmetry of the bell ... It was found that the characteristic of acoustic energy radiation resembles a voluminous cross" [8, pp. 230-231, 232-233].

Yes, the Russian bell prays for everyone, baptizes the world. But *who hears the Russian bell?* – the one who lived? is he alive? will he live?.. *For whom does the Russian bell ring?*

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(1) Editions of the article in Italian: [3; 4].

(2) A.B. Nikanorov concludes that the sound of the bell can be considered prayer singing: "Sometimes such bells could be melodically and rhythmically similar to individual phrases and even whole fragments of liturgical ... chants that existed at that time, the intonations of which were preserved in later bell compositions. This is reported by some authors as an ancient legend: '... there was a time when in some churches they rang the 'notes' (the expression of the bell ringers), for example, 'Lord, have mercy!', 'Holy God...' and so on, this is what the oral traditions of the old-timers say'. 'It is reported with admiration that once upon a time a special ringing was arranged, the bells were deliberately chosen so that it was possible to ring according to notes expressing a certain church chant'" [7, p. 12]. Of the known testimonies about "written notes" for ringing, perhaps the most mysterious is the memory of V.V. Stasov, published in the book by S.G. Rybakov: "Regarding the recording of bell ringing on sheet music, I consider it useful to quote the following message from V.V. Stasov. About 35-40 years ago, he saw an ancient image (by means of special signs) of church bells in the famous collector of Russian antiquities, Doctor of Medicine Sakharov, in the Public Library in St. Petersburg, in one of his tables, in faximile; this is a curious experience of writing down the music of bell ringing on paper in ancient Russia; since then, V.V. Stasov has not I have seen this record, but I am sure that it is kept somewhere in a Public Library and that someone will find it; if it had not turned out to be in Sakharov's collections beyond expectation, then maybe it will be found in the collections of

some other archaeologist who was and studied at the Imperial Public Library" [9, p. 69].

(3) Whereas ordinary prayer singing expressed *the communion of man with God*, which was emphasized by *the likening of angels singing in the temple to angels singing in heaven surrounding the Throne of God*, bell prayer singing, in fact, meant *the unity of man with Go*d, as evidenced by *the likening of the sound of the bell to the voice of God*. As priest Maxim Khudonosov wrote, "in the mighty ringing of the church bell, the believer's sense perceives *the voice of the Lord in the fortress, the voice of the Lord in splendor, the voice of the Lord crushing the cedars, the voice of the Lord shaking the desert* (ps. 28). The people are aware of this meaning of bell ringing when they call it the voice of God... Church ringing receives a certain meaning in the soul, causes or accompanies certain feelings, complements and enhances the state of mind..." [2, p. 1, 3]. Let us also quote theologian Nikolai Korsunsky on this subject: "Where it is a question of protecting the souls of all, there the invitation must reach everyone's ears… God calls to temples: it is necessary that the call should resemble God, and the sounds of the call would touch the heart. But what other instrument could fulfill this purpose to the same extent as the bell does" [6, p. 11].

(4) Russian bell recreates the *Om* sound, A.S. Yareshko also writes. According to the scientist, "the sound expression of the bell is 'Om' ... with a firm accent pronunciation of the vowel 'o' (in the Russian transcription – 'bom')... is ... a multiple (statement. – *A.K.*) – God! [Бог! – in Russ.] (Om, He [Он – in Russ.], Bom, God [Бог! – in Russ.] are different sound expressions of the same concept.)" [10, pp. 23, 24].

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传统家庭与现代化家庭的心理人格分离
PSYCHOLOGICAL SEPARATION OF PERSONALITY IN TRADITIONAL AND MODERNIZED FAMILIES

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注释。本文揭示了传统和现代（现代化）家庭形式及其特征，分析了"分离"、"心理分离"的概念，并研究了与父母分离的模式。首次确定了关于传统和现代化家庭形式跨文化人格分离的研究数据。本研究使用 J. Hoffman 的心理分离问卷来识别分离，并确定在组织独立生活活动中存在问题和困难的个人情况下的行为特征，使用了 R. Lazarus 的"应对策略"问卷，由 T.L. Kryukova、E.V. Kuftyak、M.S. Zamyshlyaeva 改编。本研究的目的是确定与父母心理分离的特征以及个人在传统和现代化家庭形式两个样本中组织个人独立生活活动的潜力。提供了研究的证据基础。

关键词：心理分离、跨文化研究、传统家庭、现代化家庭、民族象征、民族价值观、分化、情感自主。

Annotation. *The article reveals traditional and modern (modernized) forms of family and their characteristic features, analyzes the concepts of "separation", "psychological separation", and examines models of separation from parents. For the first time, research data on cross-cultural separation of personality from traditional and modernized forms of family are determined. The study used the Psychological Separation Questionnaire to identify separation J. Hoffman and to determine the behavioral characteristics of problematic and difficult personal situations in the organization of independent life activity, the questionnaire "Coping strategies" by R. Lazarus was used, adapted by T.L. Kryukova, E.V. Kuftyak, M.S. Zamyshlyaeva The purpose of the study was to determine the features*

of psychological separation from parents and the potential of the individual in organizing independent life activity of the individual between the two samples traditional and modernized forms of family. The evidence base of the research is provided.

Keywords: *psychological separation, cross-cultural research, traditional family, modernized family, ethnophor, ethnovalues, differentiation, emotional autonomy.*

Separation was considered as differentiation from parents in order to achieve intrapersonal autonomy. In the psychological aspect, the word “separation” implies psychological maturation, separation, and the process of separation itself occurs throughout the entire period of personality maturation.

The first researcher of the problem of separation in psychology is Z. Freud. According to his research, moments of childhood are associated with external separation, which subsequently have a stable influence on the development of personality in adulthood. (Freud, 1998) Separation is separation, Freud defined the Oedipus complex and infantile attachment to parents as the main problem of separation. An important factor in the development of personality, Freud noted, is to free the child from parental care, in particular from maternal care [12]. The phenomenon of separation is revealed in the concept of the theory of family systems by M. Bowen, which studies the influence of differentiation of family members on their relationships and how the family system reacts to the autonomy of family members. For the first time, to describe the process of separation, M. Bowen introduces the phenomenon of “differentiation - I”, which determines the ability of a person to be an individual, being a member of a social group [14].

Domestic scientists such as Vygotsky L.S., Petrovsky A.V., Polivanova K.N., Schneider L.B., Elkonin D.B. and others [1,6,7,10,11] believe that the separation process is associated with the transition to adulthood, age crises and separation from parents. According to scientists, psychological separation ends with young people achieving emotional autonomy, setting their own life goals, and entering an independent life.

Many scientists have developed models of separation from parents. J. Hoffman’s structural model of separation (Hoffman (c 170-178) is one of the most relevant in science. In his model, J. Hoffman reveals four types of separations from parents [15]:

- Conflictological independence – determines the absence of guilt, worry, anxiety, resentment, and mistrust in relationships with parents;

-*Attitude independence*-own opinion, beliefs are independent of the opinion of parents;

- Emotional independence – independence from the support and approval of parents.

- Functional independence - independence in decisions, actions, financial independence, absence of parental help.

Sytko T.I. in her research identifies a model of the process of family separation determined by the style of upbringing in different forms of family [9].

Chernyak E.I. examines various models and forms of family, the peculiarity of which is determined by historical, national, cultural traditions of ethnic groups. In modern studies, two forms of family are mainly distinguished: traditional and modern (modernized) [3].

A traditional family in which traditional family values, culture, system of relationships and upbringing are passed down from generation to generation. The characteristic features of a traditional family are:

- strict segregation of social and gender roles and functions;
- patriarchal hierarchy;
- complex family structure, cohabitation of married couples of several generations with children;
- concentration of all vital functions (economic, household, productive, reproductive, educational, etc.) in the family;
- respectful, deferential attitude of younger people towards older people;

In the process of globalization in the modern world, the modernized family model begins to prevail. Cultural traditions of family and upbringing become irrelevant.

The signs of this family model can be defined as:

- variability in the performance of family functions, blurring of boundaries between gender roles, deformation of the family (single-parent family, family without a middle generation, etc.)
- a nuclear family type consisting of one pair of parents and their children;
- regulated nature of reproductive behavior, reduction of birth rate;
- professional employment of parents, employment of women outside the home;
- a symmetrical model in the family, where a man and a woman have equal rights in managing family resources, raising children, etc.
- a category of deliberately childless families [8].

Comparative analysis of these models determines the level of changes in the institution of family and motherhood. Druzhinin V.N. claims that the main and only specific function of the family at all times in all ethnic groups was the development and socialization of children, and other functions are considered additional and change in the process of development of society. Other scientists, in particular Prsons T., Bales R., adhere to a similar point of view.

The traditional mountain way of family relations is preserved in many ways even today. This is partly explained by the fact that the sphere of private life is

more conservative than others, is not reduced to “rationality” or exclusively to “traditionality”. Although a certain rationalization, modernization of this sphere has also occurred. The role of women in the Caucasus has increased, and the upbringing of children is carried out not only on a traditional basis, but also taking into account the fact that in the modern world the so-called “instrumental” values are of great importance (Rokeach M.), without mastering which it is difficult to “fit in” in the modern industrial and post-industrial world”[5, p. 38].

The code of honor in the Caucasus land implies defending one’s dignity, respect for women, and caring for one’s family and friends. According to centuries-old Caucasian traditions, in families where the cult of the father is brought up by the mother, and the cult of the mother is supported by the father, unworthy sons and dishonest daughters cannot grow up, say travelers and scholars specializing in the Caucasus. You will not find a more reverent attitude toward the mother than in the Caucasus, the cult of the mother, from which the love for the native land originates, moral and ethical value guidelines are formed.

In Islam, which largely regulates public and private life in the Caucasus, there are several hadiths from the holy book “Koran” about the attitude towards mothers. One of the famous ones says that “paradise is under the feet of mothers.” Any disrespect for the mother, especially for an old woman, characterized the family in the most negative way.

Source: https://www.kavkaz-uzel.eu/blogs/1927/posts/16403[13]

In the culture of the peoples of the Caucasus, the feminine and masculine have their own spaces, separated by conditional, but universally recognized boundaries, which, however, not only and not so much divide as unite these two halves of humanity.

Respect and respectful attitude towards mother, parents, to a woman and to all elders is the most important feature of interaction in the Caucasian traditional family. Gerontotimia, as a clearly expressed socio-cultural phenomenon among the peoples of the North Caucasus, has been reflected in the studies of many ethnographers, historians, and teachers, who unanimously note that the basis of intergenerational relations of these peoples is strict submission to etiquette.

The attitude of the highlanders towards women and mothers is described quite accurately in the lines of Rasul Gamzatov:

In the mountains, horsemen used to quarrel,
But the woman hurried towards them and suddenly
She threw a scarf at the men’s feet,
And the weapons fell from the hands...

The traditional family in the Caucasus is specific. Family and kinship councils, where public opinion is formed, strict observance of ethnocultural traditions by ethnophors, strict division of labor between the sexes, dependence on the opinion

of the family, clan, ethnic group, caring attitude towards children, mutual assistance, hospitality. All this created favorable conditions for the formation of personality.

The moral content of etiquette required obedience and respect, politeness and modesty, restraint and readiness to render a service to elders from the younger generation. [5] The family values of the traditional family and the modernized, contemporary family and the methods of personality formation differ, is the psychological separation of personality in these forms of families different?

Hypothesis: The process of personality separation differs in traditional and modernized families.

We conducted a study to determine the characteristics of separation of ethnophors from traditional families and representatives of modern families.

The study involved 50 people aged 30 to 40 years, family men. There were 25 respondents, residents of St. Petersburg and Moscow, and 25 men of the Caucasus ethnicity from Karachay-Cherkessia, the village of Elburgan, and from Kabardino-Balkaria, the city of Nalchik, from traditional families.

Respondents from modernized families from Moscow and St. Petersburg live separately from their parents with their family. Respondents from the Caucasus some live with their parents, others separately from their parents.

The aim of the study is to determine the characteristics of psychological separation from parents and the potential for organizing independent life activities between two samples.

A questionnaire was used as a method for determining the level of separation among respondents. Psychological Separation Inventory (PSI) by J. Hoffman (1984), adapted by V.P. Dzukaeva, T.Y. Sadovnikova (2014).

The method consists of 124 items and allows one to assess four types of psychological separation: conflictological, attitudinal, emotional and functional independence or dependence.

The intrapsychic process of personality separation is aimed at determining the potential for functioning independently of family and friends.

High scores on the questionnaire scales indicate a high level of separation, low scores indicate a low level of separation from parents.

To determine the behavioral characteristics of problematic and difficult personal situations in organizing independent living, the questionnaire “Coping Strategies” by R. Lazarus was used, adapted by T.L. Kryukova, E.V. Kuftyak, M.S. Zamyshlyaeva in 2004.

The questionnaire includes 8 scales that reflect strategies coping behavior such as: confrontational coping, distancing, self-control, seeking social support, accepting responsibility, escape-avoidance, problem-solving planning, positive reappraisal.

During the processing, the profile is analyzed coping strategies on all scales. Then the final score is calculated on the scales - this is a percentage of the maximum possible sum, which reflects the level of expression of a particular coping strategy.

Research results.

For the first time, a comparative study of the separation process of respondents from a traditional family and a modernized family is being conducted. Interesting data were obtained from the questionnaire Psychological Separation Inventory (PSI) by J. Hoffman (1984), adapted by V.P. Dzukaev, T.Y. Sadovnikova (Fig. 1).

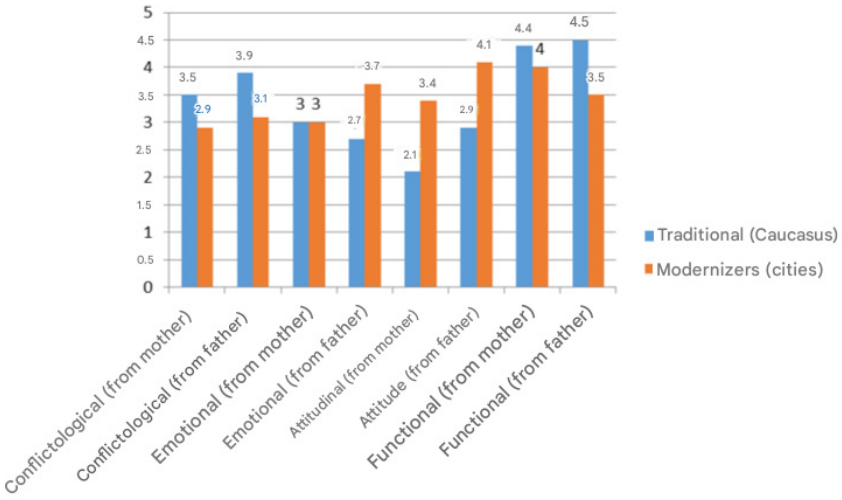

Figure 1. *Representation of separation types in the sample of subjects*

In Fig. 1. separation of respondents in a traditional family with traditional, ethnopedagogical methods of education, the data are as follows: high scores for conflict independence from mother and father - 3.5%, 3.9%, which determines the absence of guilt, worry, anxiety, resentment, mistrust in relationships with parents. High scores of 4.4% and 4.5% in functional separation, which indicates the ability of a person to independently, without the help of loved ones or other “significant” people, make decisions, manage their lives, set goals and follow them.

At the same time, the scores for emotional separation are quite low - 3.3%, and 2.7% for independence from father and mother, as well as low data - 2.1% and 2.9% for attitudinal separation, which proves the preservation of traditional family values among the peoples of the Caucasus, about the collectivist type of upbringing in the family, taking into account the mentality of ethnophors, the

psychological character of the people, ethno-value orientations that are passed on from generation to generation, ethnophors depend on the opinion of the family, clan, parents, and ethnic group. Family and clan, the opinion of elders remain the main ones in the adult and independent life of ethnophors, while the functional independence of both father and mother is high, which determines independence in decisions, actions, financial independence, and the absence of parental help in adulthood.

In the group of respondents from modernized family forms, the data on conflictological independence are lower - 2.9% from the mother and 3.1% from the father, which determines grievances, anxieties, experiences, conflict situations in relation to parents. Emotional separation is higher 3.3% and 3.7%, which indicates that in adulthood in modernized families, the emotional connection with parents weakens, and they do not need support and approval of parents. High rates of attitudinal separation 3.4%, 4.1% among representatives of modernized family forms mean their own opinion, beliefs are independent of the opinion of parents; the data on functional separation are lower than among representatives with a traditional family form 4% and 3.5%, which determines that despite the independence of opinions and the weakness of emotional ties with parents, parental assistance is required in financial matters.

The indicators of the diagram are confirmed by the statistical data in Table 1. We compared the data of the study of respondents from traditional and modernized forms of families in relation to raw scores using the T-criterion - Student (the program was used SPSS, v.19.0) Results are in table 1.

Table 1.

Results of comparison of parameters of personality separation in traditional and modernized families

Scale	Values		t-test	p– significance level	Correlation	P – level of correlation significance
	Traditional. (Caucasus)	Modern (cities)				
Conflictological (from mother)	3.5	2.9	-7,000	0,090	0.458	0.003
Conflictological (from father)	3.9	3.1				
Emotional (from mother)	3.0	3.0	1,000	0,500	0.634	0,000
Emotional (from father)	2.7	3.7				

Attitude (from mother)	2.1	3.4	25,000	0.025	0.718	0,000
Attitude (from father)	2.9	4.1				
Functional (from mother)	4.4	4.0	-2,333	0.258	0.394	0.004
Functional (from father)	4.5	3.5				

To confirm the research data from the questionnaire psychological separation (Psychological Separation Inventory, PSI) to what extent does low emotional and attitudinal separation of ethnophors in a traditional family affect independent living and overcoming difficult situations we used questionnaire "Coping strategies" by R. Lazarus, adapted by T.L. Kryukova, E.V. Kuftyak, M.S. Zamyshlyaeva in 2004determining the behavioral characteristics of problematic and difficult personal situations in the organization of independent living. Data in Fig. 2.

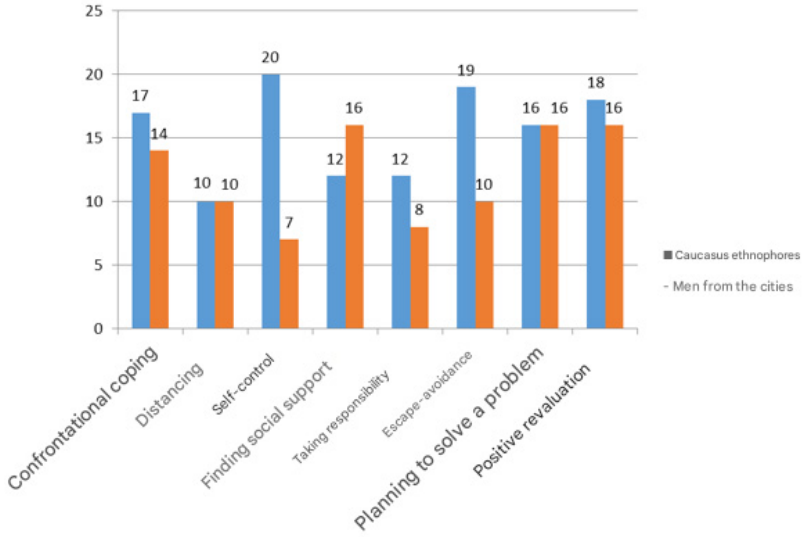

Figure 2. *Results of diagnostics of behavioral characteristics in difficult situations of independent life activity according to a sample of subjects*

According to the research data, in a problem situation, the cooperative behavior of the subjects is as follows: for confrontational coping, respondents from traditional families have -17%, while those from the modernized family have -14%, which determines the ability of an individual to resist difficulties, ener-

gy and enterprise in resolving problem situations, and the ability to defend their interests; for the scale of distancing from the problem, devaluation of one's own experiences, underestimation of the significance of the problem - in both samples, by -10%; there is a fairly large difference in the samples for the self-control scale, which determines the purposeful suppression and restraint of emotions, minimization of their impact on a problem situation and the choice of a behavior strategy, among respondents from the traditional family it is 20%, while among respondents from the modernized family it is 7%. For the scale of searching for social support, which determines the attraction of external resources, the possibility of a dependent position and excessive expectations from others, the data for respondents from the traditional family is 12%, while for respondents from the modernized family it is 16%. The scale of acceptance of responsibility shows the recognition and awareness of one's role in the emergence of the problem and responsibility for its solution, given by respondents from the traditional form of family 12%, and by respondents from the modernized form of family 8%. The scale of escape-avoidance determines the level of denial of the problem, fantasizing of the individual - according to this scale, respondents from the traditional form of family have indicators of 19%, and by respondents from the modernized form of family 10%. Planning a solution to the problem - this scale reveals the ability to analyze a problem situation, the ability to develop a strategy for solving the problem, planning one's own actions taking into account the conditions, the research indicators on the scale of respondents from the traditional form of family 16%, and by respondents from the modernized form of family 16%. And the data on the scale are positively reassessed by respondents from the traditional form of family 18%, and by respondents from the modernized form of family 16%.

Thus, the data of the study prove that respondents from the traditional form of family are independent, independent from parents in terms of overcoming problematic situations and difficulties, have high control over behavior, are enterprising, defend their own interests, which can indicate complete psychological separation and at the same time, despite the high level of independence, their actions and behavior are based on the attitudes and views of the family and clan, parents. Ethnic group, family values, opinion and assessment of the behavior of elders, family ties remain significant even in the psychological separation of ethnophors from the traditional family, which distinguishes them from representatives of modernized families.

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对出版物类型进行全面分析，确定科普类赠送出版物类别

A COMPREHENSIVE ANALYSIS OF PUBLICATION CLASSIFICATIONS BY TYPE, CARRIED OUT TO IDENTIFY THE CATEGORY OF GIFT PUBLICATIONS OF SCIENTIFIC AND POPULAR SCIENCE ORIENTATION

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注释。本文研究了国内研究人员和 GOST R 7.0.60-2020 提出的包括科学和科普在内的不同类型出版物的分类，目的是从中识别出礼品版。作者分析了版本的类型并写下了它们的措辞。

关键词：分类、综合分析、出版物、出版物类型、科学出版物、科普出版物、礼品版。

Annotation. *The article examines the classifications of different types of publications, including scientific and popular science, proposed by domestic researchers and GOST R 7.0.60–2020 with the aim of identifying gift editions from those presented. The author analyzes the types of editions and writes down the wording for them.*

Keywords: *classification, comprehensive analysis, publication, types of publications, scientific publication, popular science publication, gift edition.*

The technical process in the last decade has been gaining powerful popularity along with social networks and the Internet, and against the background of this powerful progress, book publishing has not lost its purpose and value. This article discusses popular science and scientific publications, which have acquired even more meaning and significance in recent years, when the President of the Russian Federation Vladimir Putin signed the “Decree on declaring 2022-2031 in Russia the Decade of Science and Technology” [5], the purpose of which is to attract the

attention of scientists to solving the problems of social development, as well as the popularization and dissemination of scientific discoveries and achievements to the masses. To achieve this goal, the state promotes the implementation of various projects, research aimed at the development of science and technology, the end result of which is scientific or popular science publications.

In the scientific field in recent years, previously published publications are often subject to a new reading, rethinking, revision, processing of information, on the basis of this new reading there is a need for a republication. The topics of research requiring reprinting are so diverse, as are the studies themselves, that there is a problem of correctly drawing up a passport of a new publication, for this it is necessary to clearly understand what category this publication belongs to. This task is faced not only by the publishing or leading editor of the publishing house, the author, but also by the graphic designer, art editor, the specialist developing the concept, and creating the original layout of the publication. The correct definition and correct understanding of the content of the publication gives the graphic designer an idea of what the book should ultimately be: its format, layout, color, layout - the final result. The high level of the ultimately implemented project depends on the skill of the graphic designer. A highly artistically developed original layout and high-quality printing of the publication is a wonderful gift for both a specialist and a wide range of readers.

This article set the task of understanding the classification of types of publications, analyzing these types and identifying those publications that can become gift editions. Also, this study identified publications that are not gift editions according to certain characteristics.

In the course of the scientific research work, the National Standard of the Russian Federation (System of standards for information, library and publishing. Publications. Main types. Terms and definitions. Official publication Moscow Stamdart inform GOST R 7.0.60-2020), which specifies the classification of publications by type [4], was reviewed and analyzed. The types of classifications were studied, analyzed, the characteristics of each type related to this research work, to scientific and popular science gift editions were formulated, and a classification of types of publications was identified. The concept of a gift edition was analyzed and a new formulation was given: “A gift edition is any publication of a scientific or popular science nature, highly artistically designed, corresponding to its intended purpose. A gift edition is an expensive edition intended as a gift.”

Classification of publications by types: this classification includes a non-periodical publication that comes out once and does not have reissues or continuations; a serial publication - united by series and a single title, each of which has its own issue number and is laid out according to a single template for all series; a periodical publication - most often a printed publication, published once a year

at a certain time and with the same number of issues, having the same name in each periodical, such publications include: newspapers, magazines, weeklies, calendars, reference books; an ongoing publication - a publication published in series with different release periods, the continuation of which depends on the readiness of the materials, and not on a pre-established schedule, also has, with numbering of each issue, with completely different content, but uniformly laid out, designed, with the same template, with the same name for each series; a series - a publication consisting of several serial parts, released in a certain order - a queue, united by a common theme and a single name for each series without exception; sub-series – part of a series, an additional part of a series with a different theme and title from the main series, but complementing it; serial publication – one of the parts of the entire series, with a single title with the entire series and having its own private title.

Types of publications by the composition of the main text are divided into: single-edition or monographs (which include one work); collection — a publication that includes a collection of works united by a common principle, such as an author, theme, or genre; a digest is a collection that includes a selection of texts, articles, or excerpts from them, usually reprinted or adapted from other publications; a multi-part publication consists of several different volumes, issues, or issues, but which form a single whole; a multi-volume publication is a multi-volume edition that is not a periodical and consists of several volumes, each of which has its own number; a single-volume edition is a one-volume edition, an independent publication, released in one volume, with no periodicity in its release; an academic publication is a publication, a carefully prepared and scientifically verified text of a work, found in numerous versions, consisting of a scientific reference apparatus, commentary, notes, references to sources, as well as other elements necessary for a deep and detailed analysis of the text; a collected works is a single-volume or multi-volume edition, of one or more authors; Selected works, works - a single-volume or multi-volume publication that includes a portion of the works of one or several authors, selected according to a certain principle; partwork - a thematic publication of a narrow specialization, collectible, educational, published strictly according to a plan, having a clearly fixed lifespan.

Types of publications by the nature of information: Text publication - a publication in which the main part of the information is conveyed by text, without graphic elements and illustrative materials, the text can be presented in the form of hieroglyphs, formulaic text, digital and mixed may be present; music publication; in a pictorial publication, most of the filling is occupied by images of any nature, and the text is less than half of the total sheet space of the publication; a cartographic publication is filled mostly with a cartographic image; an audiobook is not a gift edition, an edition with Braille is an independent printed gift edition, in the original layout of which it is desirable to add relief graphics.

The types of art publications include: art publication - a publication containing images related to the types of art: painting, graphics, sculpture, photography; album - a printed publication, a large area of which is occupied by an illustrative series; technical album - a publication consisting of drawings, technical drawings, photographs, diagrams, graphics, plans, old maps, map diagrams. For 2020, in the GOST R technical standard album not specified, but by its characteristics may refer to an art publication; photo albums - an album containing reproductions of photographic images made for a given publication, or borrowed from other publications and archival materials; an art album - a publication containing reproductions of works of art or the author's graphic images; an atlas - an album containing objects of various types, intended for different purposes: educational, practical. Atlases can be: anatomical, astronomical, botanical, geographical, zoological, linguistic, medical.

Any type of art publication can be a scientific and popular science gift publication in terms of its content. Such a publication can supplement, be attached, or glued to both the inside cover and the front cover: a pictorial postcard, engraving, woodcut, linocut, lithograph, etching, print, art reproduction, oleography, equilibris.

Types of non-periodical publications: scientific publication - a publication describing theoretical or experimental research, as well as cultural monuments and historical documents scientifically prepared for publication; popular science publication - a publication with a scientific or popular science focus, highly artistically designed, corresponding to its intended purpose; popular publication - a publication for a wide audience, for reading which no special professional knowledge is required, a dictionary and encyclopedic publication; educational publication. A literary and artistic publication can be a gift, but not a scientific publication. A spiritual and educational publication - a publication studying history, religion and rituals can be both a popular science gift publication and a scientific one.

Types of non-periodical publications by the nature of information include: scientific publication– and popular science publications; monograph – a scientific or popular science publication containing a deep and extensive study within the framework of one problem, one topic, performed and written by one or more authors; collection of scientific papers – a publication in which scientific research of authors of one scientific institution, educational institution and association is published; conference materials – a publication in the form of a collection containing reports of this conference; preprint, abstracts of reports – in the course of research on the topic of R&D it was determined that these publications are also a type of non-periodical publications by the nature of the information, but cannot be gift editions, since they contain preliminary materials; dissertation abstracts can be completed, revised, competently designed and be released as a popular science

gift edition; dictionary and encyclopedic edition. This publication can also be a gift edition if competently designed.

Types of publications according to features of content presentation: original edition – an edition published in the original language; a translated edition is a work translated from one language to another; a multilingual edition is an edition translated into several languages; a first edition is an edition published for the first time; a reprint is an edition published a second time without any changes or additions; a toy book; a multi-format edition; a complete edition is an edition consisting of several, or even many parts – complete units on homogeneous physical media, united in a certain way (cover, cuff, folder, case, box); a small-format edition is an edition the size of which varies from 100×100 mm to 107×140 mm; a pocket edition is a small-format/size edition that fits in a pocket and is used for carrying; a miniature edition is an edition smaller in size than a small-format edition, i.e. less than 100×100 mm; a miniature book is an edition of a small size not exceeding 50×60 mm; folio – a large-format publication printed on whole or folded sheets of paper; paperback – a pocket-sized publication with an inner block framed by a paper cover in mass circulation; improved edition – an edition published with improved artistic design and printing performance: using an original layout and fonts on high-quality paper; bibliophile edition – an edition published in a small print run, highly technically executed, having aesthetic value among bibliophiles and collectors; keepsec – a gift edition, a luxuriously designed book or album; facsimile edition – an edition made as similar as possible to the original, differing little from the original: the size, original layout, appearance, illustrations of which are preserved exactly; reprint edition (reprint) – an edition obtained by exact copying of pages, using photocopying or other technical methods; Anniversary edition – an edition dedicated to the anniversary of an event, person or enterprise. Own edition – an edition, the publisher of which may be the author him/herself and printed at the expense of the author. Joint edition – an edition issued by two or more authors, whose editorial and publishing work was done in co-authorship, and each participant of the co-publisher is the copyright holder for the entire edition or its parts. Branded edition – an edition issued by any association that has information related to this association. Free edition – an edition that is distributed free of charge among a certain circle of readers. Rare edition – an edition published in a small print run and of particular value. Numbered edition – an edition, each copy of which may have its own serial number, printed or stamped on the title page, on the back of the title page or on the cover. Signed edition. Limited edition – an edition published in a print run of less than 300 copies. Out-of-print edition – an edition, issued at the request of specific individuals. This may happen when the main print run is insufficient and, at the request of individuals, specialists in the field, or high-ranking officials, additional copies are printed.

Also, out-of-print replication can occur in situations, for example, when a printing house did not detect a defect in time during printing, and the print run was sent to the customer with a defect, the customer can agree and leave the print run, but ask to reprint several editions without the defect, then this print run can be called an out-of-print edition.

Published by individual factories - a publication that was printed in parts at different times or in different places.

In the course of the study, it was concluded that a gift edition of a popular science nature can be any edition, reprint, or supplemented edition that carries scientific information and is instructive, educational, or research in nature. Associate Professor of the Costume Design Department at the Moscow State Textile University named after A. N. Kosygin S. M. Bolkhovitinova asserts that popular science publications should discuss "science and its methods, research results, achievements, discoveries, problematic issues, hypotheses, and directions of scientific research" [3, p. 101]. We can summarize what has been said: a popular science publication should reflect current scientific problems and have a certain degree of scientific character: the problem should be described, solutions to these problems should be proposed, new methods of solution should be presented in the study, conclusions should be made, and the results of the work should be presented.

S. M. Bolkhovitinova notes two types of popular science publications: the first is scientific and artistic publications; the second is science fiction publications. The researcher specifies that "the difference between scientific and artistic literature and popular science is seen in the more active ability of the author (popularizer) to artistically see (or rather, depict) scientific facts" [3, p. 103].

The topic of popular science publications, according to S. G. Antonova [1, 171–172], has virtually no boundaries. The topic of a particular material should be determined based on the cognitive needs and interests of the readership. In this context, the content and topic of a popular science publication directly interact with the intended purpose of the popular science publication, as well as with the main function that the publication performs – popularization and dissemination of scientific knowledge [2, 316].

It is of no small importance to correctly determine to what category the research work belongs, especially if it is a reprint or an album of a historical nature, to correctly select what type of classification the publication belongs to, this is necessary first of all for registration in a single library system and for competent registration of the book passport, for a general understanding of the readership and target audience. The book passport is a publishing package that includes a set of library indicators (UDC, BBK, author's mark) and an ISBN number assigned to each book when it is printed in printing houses. Thanks to this registration in a single library system, in accounting systems and other repositories of various

information, the book can be quickly found and used both for reading and for further research purposes, analyzing this source, which leads to the popularization of scientific knowledge. The book is seen, the book can be tracked, the book can be used, researched.

And the most important thing is to correctly determine the classification category of the publication, which gives an accurate idea of the publication and information for its graphic design, development of the graphic structure and original layout, deep understanding and search for the layout features of this particular popular science gift publication. This publication, like any other, should be different, it should not be graphically repeated, and to solve this problem it is necessary to thoroughly understand, to determine the manuscript of which classification of publications is "in the hands" of the graphic designer or, in this case, more precisely, we are talking about the art editor.

The more accurate and deeper the understanding of this issue, the higher the result of the printed finished work will be.

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米根霉生物量生产：栽培优化
RHIZOPUS ORYZAE BIOMASS PRODUCTION: CULTIVATION OPTIMIZATION

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摘要。米根霉 F-814 是一种很有前景的生物技术应用微生物，因为它具有高生物量生长率和产生有价值的代谢物（包括几丁质-壳聚糖复合物、有机酸和酶）的能力。本研究旨在通过改变温度（17、20、25、30 和 35 °C）和搅拌速度（200 和 250 rpm）来优化深层发酵下米根霉 F-814 的培养条件。分析了生物量产量和 pH 动态，以确定真菌生长的最佳条件。

结果表明，在 17 °C 和 200 rpm 以及 25 °C 和 250 rpm 下观察到最高的生物量积累 - 5.87 ± 0.42 g/L。增加 250 rpm 的通气量可促进真菌生长，而 17 °C 的过度搅拌会导致生物质产量降低，这可能是由于机械应力或过度氧化造成的。观察到的 pH 变化表明，在较低的通气量和温度条件下，R. oryzae 会主动将碳水化合物代谢为乳酸，而在 (25 - 30) °C 和 250 rpm 下，真菌主要将代谢通量导向生物质积累而不是酸生成。

这些发现为了解 R. oryzae 在不同环境条件下的代谢适应提供了宝贵的见解，并突出了其在工业应用方面的潜力。本研究确定的优化培养参数可用于大规模生物质生产，旨在开发基于壳聚糖的肠道吸附剂、抗菌剂、伤口敷料、可生物降解材料和水净化吸附剂。未来的研究应侧重于精炼培养基成分、优化氧气转移速率以及探索真菌衍生的生物聚合物和代谢物的其他应用。

关键词：米根霉、生物质生产、壳聚糖、深层发酵、深层栽培、生物技术应用。

Abstract. *Rhizopus oryzae F-814 is a promising microorganism for biotechnological applications due to its high biomass growth rate and ability to produce valuable metabolites, including chitin-chitosan complexes, organic*

acids, and enzymes. This study aimed to optimize the cultivation conditions of R. oryzae F-814 under deep-submerged fermentation by varying temperature (17, 20, 25, 30, and 35 °C) and mixing speed (200 and 250 rpm). Biomass yield and pH dynamics were analyzed to determine the optimal conditions for fungal growth.

The results demonstrated that the highest biomass accumulation – 5.87 ± 0.42 g/L – were observed at 17 °C and 200 rpm and at 25 °C and 250 rpm. Increasing aeration at 250 rpm improved fungal growth, whereas excessive agitation at 17 °C resulted in reduced biomass yield, likely due to mechanical stress or excessive oxygenation. The observed pH changes indicated that R. oryzae actively metabolizes carbohydrates into lactic acid under lower aeration and temperature conditions, while at (25 – 30) °C and 250 rpm, the fungus primarily directed metabolic flux towards biomass accumulation rather than acid production.

These findings provide valuable insights into the metabolic adaptation of R. oryzae under different environmental conditions and highlight its potential for industrial applications. The optimized cultivation parameters identified in this study can be utilized for large-scale biomass production aimed at the development of chitosan-based enterosorbents, antimicrobial agents, wound dressings, biodegradable materials, and water purification sorbents. Future research should focus on refining medium composition, optimizing oxygen transfer rates, and exploring additional applications of fungal-derived biopolymers and metabolites.

Keywords: *Rhizopus oryzae, biomass production, chitosan, submerged fermentation, submerged cultivation, biotechnological applications.*

Introduction

The culture of the fungus *Rhizopus oryzae* is a promising microorganism for biotechnological production, as it is a source of a wide range of industrially useful products. When cultivating *R. oryzae*, various metabolites can be obtained, including chitin-chitosan complexes, organic acids, and enzymes.

Rhizopus oryzae belongs to the *Zygomycota* division, *Mucorales* order, and *Mucoraceae* family. A distinctive feature of this fungus is the presence of a chitin-chitosan-glucan complex in its cell wall [1-3]. In addition, because *R. oryzae* is classified as a lower fungus, its biomass growth rate is relatively high. This characteristic makes this species an economically viable producer of fungal chitosan, as it does not require large-scale production facilities for its extraction.

The process of chitosan synthesis in fungal cell walls can be influenced by a variety of factors, including both the composition of the nutrient medium and external conditions. In one study [4], the effects of various factors on chitosan formation in the cell walls of three *Zygomycota* strains were evaluated. The yields of the target product were compared using different carbon sources, including fructose, sucrose, glucose, starch, and lactose. The results showed that the highest chitosan yield occurred when cultivating with glucose.

A critical factor for obtaining fungal chitosan is the nitrogen source. Without an adequate nitrogen supply, the yield of the target biopolymer decreases significantly. For *R. oryzae*, preferred nitrogen sources include urea and ammonium nitrogen. The most commonly used nitrogen source for culturing *R. oryzae* is ammonium sulfate. Other potential nitrogen sources include ammonium nitrate, urea, yeast extract, and more. Increasing the nitrogen content in the nutrient medium positively affects the growth of *R. oryzae* biomass [5].

Potato, rice, and wheat are substrates that allow for high biomass and lactic acid yields when cultivating *R. oryzae* [6]. *R. oryzae* breaks down starch due to the presence of amylase, which simplifies the process of obtaining target products by eliminating the need for a hydrolysis step. Aerobic conditions are crucial for the life of *Rhizopus oryzae* because ATP energy is required to remove lactic acid from the cell, which is primarily formed under aerobic conditions during oxidative phosphorylation. When carbon sources dominate in the nutrient medium, *R. oryzae* actively converts them into lactic acid. As a result of glycolysis, glucose is converted into pyruvic acid, which, under the action of the enzyme lactate dehydrogenase, is converted into lactate [7].

When cultivating *Rhizopus oryzae*, lactic, fumaric, malic, and other organic acids are produced in the culture liquid. The yield and concentration ratio of these acids may vary depending on the cultivation conditions of the fungus. In a study [8], the researchers emphasized the importance of the pH indicator during cultivation and concluded that organic acid production decreases at low pH values. Furthermore, media of different compositions have been studied. The yield of these metabolites can be influenced and regulated by various additives in the nutrient media. The addition of calcium carbonate has a positive effect on lactic acid yield and slightly increases the yields of malic and fumaric acids [9].

The high growth rate, the ability to cultivate on accessible substrates, and the safety of use in the food industry make this species an attractive object for research. Previously, we had already selected the optimal composition of the nutrient medium and cultivation time, with the biomass yield serving as the optimization criterion [6, 10]. This study is dedicated to selecting optimal conditions for cultivating *Rhizopus oryzae* F-814 to obtain biomass, with variations in temperature and mixing speed under deep cultivation conditions. The biomass yield also served as the optimization criterion.

Materials and methods

Research subject

The study used the strain *Rhizopus oryzae* F-814, which is safe and approved for use in the food industry, certified by the Russian National Collection of Industrial Microorganisms (VKM). The strain was maintained in the laboratory of the Department of Microbiological Synthesis Technology at the St. Petersburg State

Technological Institute by periodic subculturing on agarized pea medium with additives.

Inoculum preparation

The inoculum was grown on a slanted agarized pea medium at 28 °C for 72 hours. The inoculum was then suspended from the surface of the agarized medium in 2 mL of sterile distilled water, followed by transfer of the suspension into 250 mL Erlenmeyer flasks containing liquid nutrient medium. Each flask was inoculated with the contents of one test tube.

Nutrient medium preparation

Pea medium with additives (extraction at low temperature) was used for deep cultivation. For the experiments at 200 rpm, the pH before sterilization was 6.68 ± 0.05, and after sterilization, it was determined as 5.71 ± 0.04. At 250 rpm, the pH before sterilization was 6.74 ± 0.05, and after sterilization, it was measured as 5.56 ± 0.03.

50 g of peas were soaked in 1 liter of distilled water at a temperature of (2 – 8) °C for 12 hours. The mixture was then brought to a boil and boiled for 30 minutes at 800 W (Lumme LU-3631 electric stove or equivalent). After settling, the mixture was filtered through cheesecloth and distributed into flasks, 150 mL per flask. To each flask, 1.5 g (10 g/L) of ammonium sulfate and 0.75 g (5 g/L) of glucose were added. The medium was sterilized under excess pressure of 101 kPa for 20 minutes.

Pea agar with additives was used for obtaining the inoculum and was prepared in the same way as the liquid medium, but with the addition of 3 g of agar per 1 liter of medium.

Cultivation conditions

Fermentation was carried out under aeration conditions using a shaker-incubator (ES-60, MIULAB, PRC) with variations in rotation speed (200 and 250 rpm) and temperature (17, 20, 25, 30, 35 °C). The cultivation duration was 72 hours. The working volume of the medium in the flasks was 50 mL.

At the end of fermentation, the biomass was separated from the culture broth using chemically inert, lint-free fabric and filtration through a Büchner funnel. The biomass was then dried to constant weight at 50 °C.

Results and discussions

The decrease in pH after sterilization may be related to the thermal degradation of organic components in the medium, such as proteins, amino acids, carbohydrates, and vitamins present in peas. Under high-temperature conditions, proteins denature and hydrolyze into free amino acids. Amino acids such as asparagine, glutamine, and serine can undergo deamination, forming corresponding organic acids (oxaloacetic, α-ketoglutaric, and pyruvic acids), which leads to acidification of the medium.

Additionally, Maillard reactions between amino acids and sugars may occur during sterilization, resulting in the formation of intermediate products with acidic properties. Glutamic acid, which is present in peas, can partially be converted into γ-aminobutyric acid (GABA), which also leads to changes in the acidity of the medium. Furthermore, the decomposition of sulfur-containing amino acids, such as cysteine and methionine, can lead to the formation of sulfur compounds, which may also influence the pH of the medium.

Thus, the decrease in pH after sterilization is caused by a combination of processes: thermal degradation of proteins, hydrolysis of amino acids into organic acids, and possible reactions between amino acids and sugars, leading to the accumulation of acidic compounds in the medium. During sterilization, proteins may undergo denaturation and hydrolysis, resulting in the formation of free amino acids. Among them, asparagine and glutamine can be converted into organic acids such as pyruvic and succinic acids, which contribute to the decrease in pH.

Moreover, carbohydrates, including starch and sugars, may hydrolyze under the influence of high temperature, forming low-molecular-weight organic acids (acetic, formic, lactic acids), which also contribute to the acidification of the medium. B vitamins present in peas, especially thiamine and riboflavin, may partially degrade, altering the buffering properties of the medium. Thus, the decrease in pH after sterilization is caused by a combination of processes: thermal degradation of organic substances, hydrolysis of carbohydrates and amino acids, and the formation of weak organic acids. During sterilization, protein hydrolysis with the formation of amino acids and organic acids can lead to a decrease in pH. Additionally, thermal destruction of some carbohydrates may occur, followed by the formation of acidic compounds.

The experiment studied the influence of temperature and mixing speed on the yield of dry biomass of *R. oryzae*. The obtained data are presented in the table 1.

Table 1

Biomass yield and pH at different temperatures and mixing speeds for R. oryzae

Temperature, °C	**200 rpm**		**250 rpm**	
	Dry biomass, g/ L	**pH**	**Dry biomass, g/L**	**pH**
17	5.87 ± 0.42	3.64 ± 0.02	2.47 ± 0.50	3.57 ± 0.11
20	4.80 ± 0.40	3.42 ± 0.05	4.13 ± 0.12	3.58 ± 0.02
25	4.07 ± 0.23	7.20 ± 0.14	5.87 ± 0.31	3.23 ± 0.08
30	3.27 ± 0.12	5.29 ± 0.07	4.93 ± 0.50	6.03 ± 0.23
35	2.87 ± 0.31	3.56 ± 0.07	3.88 ± 0.31	6.22 ± 0.17

Based on the obtained data, the following conclusions can be made: at 200 rpm, the maximum biomass yield ((5.87 ± 0.42) g/L) was observed at 17 °C, fol-

lowed by a decrease as the temperature increased. At 250 rpm, the maximum biomass yield ((5.87 ± 0.31) g/L) was observed at 25 °C, indicating more efficient fungal growth under increased aeration. High mixing speed (250 rpm) at low temperature (17 °C) led to a decrease in biomass yield ((2.47 ± 0.50) g/L) , which may be associated with increased mechanical stress on the cells or enhanced oxygen solubility inhibiting growth.

The optimal cultivation parameters under the experimental conditions can be considered to be 25 °C and 250 rpm, as these conditions resulted in the highest biomass accumulation. However, at 200 rpm, the optimal temperature regime was not reached, as the highest biomass yield was observed at 17 °C, and further reduction of temperature was not investigated. This may suggest that for this strain, at low aeration intensity, the temperature of 17 °C is not limiting, and lowering the temperature further could contribute to further biomass increase. Therefore, additional studies should be conducted at temperatures lower than 17 °C.

Moreover, the possible influence of pH levels and dissolved oxygen concentration in the medium on fungal growth and metabolism should be taken into account, as this could allow for more precise determination of optimal parameters for industrial cultivation.

Based on the pH data after cultivation, it can be concluded that its decrease in most cases is associated with the production of lactic acid by *R. oryzae*, which aligns with the literature data on the ability of this microorganism to produce organic acids under anaerobic and microaerobic conditions. Low pH values (3.23 – 3.64) indicate that the fungus actively metabolizes carbohydrates to produce lactic acid, which is characteristic of enzymatic fermentation processes. This may be due to both the substrate availability and the dissolved oxygen level in the medium.

It is interesting to note that at temperatures of 25 and 30 °C at 250 rpm, the pH remained above 6, which may suggest that under these conditions, the fungus predominantly used available carbohydrates for biomass growth rather than for organic acid production. This is further confirmed by the maximum biomass accumulation values at 25 °C and 250 rpm ((5.87 ± 0.42) g/L). This effect may be linked to changes in the expression of key metabolic pathways under different oxygen supply levels, as it is known that *R. oryzae* predominantly directs the carbon flow towards cellular structure biosynthesis under aerobic conditions, whereas fermentation with the production of acidic metabolites occurs under anaerobic conditions.

Thus, the observed pH changes could serve as an indicator of the metabolic direction of *R. oryzae*, which is important to consider when developing optimal conditions for the production of target metabolites and scaling the biotechnological process. At temperatures where medium acidification was observed (17, 20, and 35 °C at 200 rpm, and 17 and 20 °C at 250 rpm), active accumulation of lactic acid is likely. Meanwhile, at 25 and 30 °C at 250 rpm, where the pH remained

above 6, the acidification process was less pronounced, suggesting a priority for biomass growth without significant lactic acid accumulation. These data confirm that changes in pH can serve as an indicator of the metabolic direction of *R. oryzae* and should be considered when selecting optimal cultivation conditions.

Conslusion

The present study demonstrated a significant influence of temperature and mixing speed on the growth of *Rhizopus oryzae* F-814 under deep cultivation conditions. The optimal cultivation regime in the experiment was a combination of 25 °C and 250 rpm, which resulted in the maximum dry biomass yield ((5.87 ± 0.31) g/L). These findings indicate that *R. oryzae* exhibits more efficient biomass accumulation under increased aeration, likely due to enhanced oxygen availability and improved nutrient distribution in the culture medium.

At 200 rpm, the highest biomass yield was observed at 17 °C ((5.87 ± 0.42) g/L), while further increases in temperature led to a gradual decrease in biomass accumulation. In contrast, at 250 rpm, the biomass yield was maximized at 25 °C, highlighting the importance of mixing speed in optimizing fungal growth conditions. The significant decline in biomass yield at 17 °C and 250 rpm ((2.47 ± 0.50) g/L) suggests that excessive aeration at lower temperatures may induce mechanical stress on fungal cells or increase oxygen solubility to levels that inhibit growth.

The observed pH changes throughout cultivation provide additional insights into the metabolic activity of *R. oryzae*. The decrease in pH at 17, 20, and 35 °C at 200 rpm, as well as at 17 and 20 °C at 250 rpm, suggests active accumulation of lactic acid. This aligns with the known metabolic behavior of *R. oryzae*, which shifts towards organic acid production under microaerobic and anaerobic conditions. In contrast, at 25 and 30 °C at 250 rpm, the pH remained above 6, indicating that the fungus preferentially directed carbon flux into biomass growth rather than acid production. These findings underscore the dual role of *R. oryzae* in either biomass synthesis or acid production, depending on the oxygen supply and cultivation conditions.

Additionally, the observed decrease in pH after sterilization can be attributed to the thermal degradation of organic components in the nutrient medium, particularly proteins, amino acids, and carbohydrates. The breakdown of these compounds led to the formation of weak organic acids, further affecting the cultivation environment. This factor should be carefully considered in future process optimization efforts, as medium composition and sterilization parameters can influence both pH stability and microbial metabolism.

Given these results, further studies should be conducted to explore cultivation at temperatures below 17 °C, as the present findings suggest that lower temperatures could potentially enhance biomass yield at reduced aeration intensities. Additionally, the effects of dissolved oxygen concentration, pH regulation strategies,

and alternative nitrogen sources should be investigated to refine the cultivation process for industrial applications.

The high biomass yield of *R. oryzae* F-814, combined with its ability to produce chitin-chitosan complexes, organic acids, and other bioactive compounds, makes this strain a promising candidate for a range of biotechnological applications. Chitosan derived from *R. oryzae* has demonstrated excellent sorption properties, biocompatibility, and antimicrobial activity, making it valuable for various biomedical and environmental applications. The results of this study can serve as the foundation for optimizing fungal chitosan production, which has potential uses in:

- enterosorbents – chitosan-based materials are widely researched for their ability to bind toxins and heavy metals in the gastrointestinal tract, offering potential applications in detoxification therapies and dietary supplements.
- nutraceuticals and dietary supplements – the bioactive properties of fungal chitosan, along with organic acids produced by *R. oryzae*, make it a promising ingredient for functional foods and dietary supplements (BADs).
- antimicrobial agents and wound dressings – the antimicrobial activity of fungal chitosan opens possibilities for the development of bio-based wound dressings, coatings for medical implants, and protective films for biomedical applications.
- water purification sorbents – chitosan's high sorption capacity enables its application in the removal of heavy metals, dyes, and organic pollutants from wastewater, offering a sustainable approach to environmental remediation.
- biodegradable packaging and coatings – the combination of antimicrobial and biodegradable properties makes fungal chitosan a promising candidate for eco-friendly food packaging and surface coatings with protective properties.

Overall, the study provides valuable insights into the optimal conditions for *R. oryzae* F-814 growth and lays the groundwork for future optimization of fungal biomass production for biotechnological applications. These findings contribute to the development of efficient strategies for producing chitosan, organic acids, and other valuable fungal metabolites, which can be utilized in medicine, food industry, environmental protection, and advanced material science. Further research focusing on chitosan extraction, functionalization, and application-specific properties will enhance its potential for commercial use in various industries.

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儿童腹部脏器损伤的现代治疗
MODERN ASPECTS OF TREATING ABDOMINAL ORGAN INJURIES IN CHILDREN

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摘要。本文介绍了 52 例腹部创伤儿童的治疗情况。涉及肝脾损伤的诊断、手术策略和治疗问题。提供了在儿科紧急手术中将脾组织自体移植到肝脏伤口的原始方法。与现有的术中彻底预防脾切除术后腹腔积血的方法相比，该技术具有显著优势。

关键词：腹部创伤；肝损伤；脾损伤；自体脾移植。

Abstract. *The work presents the treatment of 52 children with abdominal trauma. The issues of diagnostics, surgical tactics and treatment of liver and spleen injuries are covered. The original methods of autotransplantation of splenic tissue into the liver wound, used in urgent pediatric surgery, are provided. The developed technique has a significant advantage over the existing methods of intraoperative radical prevention of postsplenectomy hemoperitoneum.*

Keywords: *abdominal trauma; liver injury; spleen injury; autolienotransplantation.*

In combined and combined abdominal trauma in children, 95% of injuries are due to trauma to the spleen and liver. 5-6% of liver and spleen injuries are combined with trauma to the pancreas. We observed 402 patients with severe abdomi-

nal trauma. 12.1% were preschool children, 36.7% were senior school age, 51.2% were junior school age. In this case, household trauma was observed in 13.9%, falls from height 25.1%, and road traffic accidents 61%. Combined trauma was recorded in 41.9%, combined damage to abdominal organs 58.1%.

The indication for hospitalization in the surgical department was decided on the basis of:

1) Anamnesis - a factor of trauma from height and sports injury.

2) Traces of a damaging agent on the abdominal wall.

3) Complaints of abdominal pain after injury.

4) Deterioration of condition and unstable hemodynamics.

The scope of examination in the emergency department was standard and included:

1) GBT, complete urine analysis, blood biochemistry, coagulogram.

2) Ultrasound of the abdominal cavity, kidneys, and pelvis.

3) CT of the abdominal cavity

It should be noted that given the obvious signs of damage to the parenchymatous organs of the abdominal cavity on ultrasound with intra-abdominal bleeding, there was no need for CT.

In case of isolated lesions of the spleen, a wait-and-see tactic was followed. The indication for surgical intervention was an increase in hemoperitoneum and unstable hemodynamics. In case of transcapsular injuries with a rupture line length of over 8 cm and a depth of up to 2 cm, hemostatic therapy and strict bed rest were prescribed, which made it possible to exclude surgical treatment in 80% of cases. In 20% of cases of ongoing bleeding from the splenic pedicle, splenectomy with autotransplantation of splenic tissue was performed. [1] According to clinical guidelines for the treatment of spleen injuries, any splenectomy should end with autotransplantation of splenic tissue in order to radically relieve hyposplenism syndrome. In modern practice, up to 28 methods of splenic tissue autotransplantation are used. In this case, a mandatory condition should be a physiological connection of the autotransplanted tissue with the portal blood flow, allowing the splenoid to produce tufsin for the normal functioning of hepatocytes. [2] Taking into account these circumstances, we have proposed an original method of splenic tissue autotransplantation under the liver capsule. The removed splenic tissue is homogenized to fragments of 1-2 mm. with all morphological elements of the spleen. Using a syringe with a needle with an internal diameter of 2 mm., the splenic tissue is injected under the spleen capsule, creating a subcapsular infiltrate. [3] This method excludes lysis of splenic tissue and ensures maximum proximity of splenic tissue to liver cells. According to ultrasound data after 6 months and 1 year, the splenoid with a tendency to grow is laced. No signs of hyposplenism were observed in patients. In case of ongoing bleeding and unstable hemodynam-

ics, in case of isolated injuries to the spleen, laparoscopic visual examination with local hemostasis, electro or ultrasound coagulation was used. With drainage of the damaged area with a silicone tube. The drainage was removed on the 3rd-4th day in the absence of discharge. In case of damage of 3rd-4th stage with the transition of the rupture line to the vascular pedicle and ongoing bleeding, open laparotomy was used. Splenectomy with autotransplantation of splenic tissue was performed. Patent for invention No. 2610361 dated 02/09/2017

This allowed in all cases to preserve the spleen tissue, radically prevent hyposplenism syndrome in the postoperative period. During the control study, immunodepression was not observed, the immunogram was within the age norm. The increase in intercurrent infectious diseases corresponded to normal indicators. In case of simultaneous damage to the liver and spleen, the decisive importance in the indications for surgery was unstable hemodynamics and an increase in hemoperitoneum in dynamics on ultrasound. In all combined liver and spleen injuries, open laparotomy was performed in 52 patients, allowing for a quick and reliable stop of bleeding. At the same time, if splenectomy was performed in case of damage to the spleen of 4-5 st., then autotransplantation of splenic tissue was performed into the liver wound. Patent for invention No. 2305502 dated 10.03.2007.

The developed method of autotransplantation of the spleen into the liver wound allows for radical hemostasis and creation of adequate conditions for revascularization of the splenic transplant. At the same time, in all 52 patients operated on using this method, a clear tendency towards splenoid growth was determined during a control ultrasound examination after 3 months, 1 year and 3 years. No hyposplenism was observed during immunological and clinical examinations.

Thus, the developed methods of autotransplantation of splenic tissue are minimally traumatic, technically simple and applicable in any surgical department without the use of complex equipment and applicable in practical healthcare.

The methods allow for radical relief of the syndrome of postsplenectomy immunodepression and postsplenectomy liver dysfunction.

The developed methods allow for the exclusion of the use of additional local hemostatics and electrocoagulation.

Allow to reduce the length of the patient's stay in the intensive care unit by 8.5%. The number of bed days of inpatient treatment by 21.7%.

The implementation of the presented technique gives a significant economic effect.

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顿巴斯青少年血液和造血器官疾病：环境和压力风险因素的影响
BLOOD AND HEMATOPOIETIC ORGAN DISEASES IN ADOLESCENTS OF DONBAS: THE IMPACT OF ENVIRONMENTAL AND STRESS RISK FACTORS

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摘要。本研究的目的是评估重金属对人造区域青少年血液和造血器官疾病发病率的非特异性影响，包括在军事和流行病困扰的后果条件下。随着军事冲突的开始，困扰成为主要的风险因素。压力诱发状态的后果加剧了重金属的不利影响，并导致这种病理的增加。

关键词：血液和造血器官疾病，青少年患病率；重金属；局部军事冲突。

Abstract. *The objective of the work was to assess the non-specific influence of heavy metals on the incidence of blood and hemopoietic organ diseases in adolescents in a man-made region, including in the conditions of consequences of military and epidemic distress. with the beginning of a military conflict, distress becomes the leading risk factor. The consequences of stress-induced states exacerbated the adverse effects of heavy metals and caused the increase in this pathology.*

Keywords: *diseases of the blood and hemopoietic organs, prevalence in adolescents; heavy metals; local military conflict.*

Scientific literature highlights various risk factors for diseases of the blood and hematopoietic organs: metabolic disorders, infectious and allergic diseases, poor nutrition, heredity, etc. [1-2]. However, insufficient attention has been paid to environmental factors and the consequences of stress-induced conditions in the development of this pathology [3].

The aim of the work was to assess the non-specific impact of heavy metals on the incidence of diseases of the blood and hematopoietic organs in adolescents in an eco-crisis region, including in the context of the consequences of military and epidemic distress. The soil of Donetsk was chosen as the environmental object,

and the concentration of 12 heavy metals and metalloids (hereinafter referred to as HM) was chosen as the model, and the half-life is from 13 years (Cd) to 5900 years (Pb). With the improvement of atmospheric air quality in the DPR and the deterioration of drinking water indicators, the soil is the least migrating object. According to WHO, up to 95% of HM enter the body through trophic chains from the soil with plant food and animal products [4]. Therefore, the content of HM in biomarkers (hair of residents) was also analyzed. The calculation and comparative analysis of the incidence rates of blood and hematopoietic organ diseases among the adolescent population were performed, taking into account gender differences for all districts and groups of districts in comparison with the average city indicators for 5 time periods: pre-war (I - 2012-2013), transitional military - the beginning of hostilities (II - 2014-2016), stable military (III - 2017-2019), pandemic (IV - 2020-2021) and SMO (V - 2022-2023). The groups of districts were formed taking into account the degree of soil pollution, their involvement in the local military conflict and localization, which made it possible to reduce the impact of inter-district migration: 1 - control ("clean") central district of V., not affected by hostilities; 2 - contaminated outlying, unaffected districts of B. and Pr.; 3 - contaminated central, affected areas of Ka., Ki. and L.; 4 - contaminated outlying areas of Kir., Ku. and P., which were in the zone of military conflict; 5 - average city indicators. To calculate intensive indicators, official accounting and statistical documents (form No. 12) and data on the average annual number of various groups of adolescents served by health care institutions in the districts were used.

Statistical processing was carried out by generally accepted methods using the licensed package of applied programs MedStat. Differences between the levels of the pre-war and war periods, gender groups of adolescents, city districts were estimated using the Scheffe multiple comparison method. The coefficients of linear and rank correlation ($p < 0.05$) were calculated between the maximum multiple of excess of heavy metal concentration in the soil of each district and the incidence of pathology among children.

Results and discussion. With the onset of hostilities, the number of urban adolescents began to decrease, mainly due to the central districts (primarily the control district), in the third period (since 2018) minimal indicators were noted in all districts, during the periods of the pandemic and the SMO, stabilization was observed with a gradual restoration in all districts of the number of adolescents to the level of the military stable period. No reliable inter-district differences in the dynamics of the process were found.

The highest incidence rates (trend) of the analyzed pathology in the pre-war period were determined in the most contaminated district B. (Figure 1), as well as districts Ka. and Ki., the lowest - in district Pr., control district V. and districts that were subsequently subjected to shelling, whereas throughout all military periods

the maximum levels were characteristic of 2 districts - Pr. and Ka., the minimum - in district B. and districts from the military conflict zone. The opposite dynamics of pathology levels in nearby districts (B. and Pr.; Ki. and L.; Kir., Ku. and P.) is obviously explained by migration processes (within the group of districts and from outside). In general, a clear tendency towards an increase in pathology levels is noted during military periods, most pronounced starting from period III, the inverse relationship is observed in districts B. and L. In the last two periods, a significant decrease in indicators is determined in districts V., Ki., Ku. and P.

Figure 1. Incidence of blood and hematopoietic organ diseases among adolescents in Donetsk (‰) by periods, M±m

Gender differences are characterized by the prevalence of pathology levels in girls over boys, isolated cases of the opposite trend were recorded in the districts of Ka., Ku. and P (Figure 2, 3).

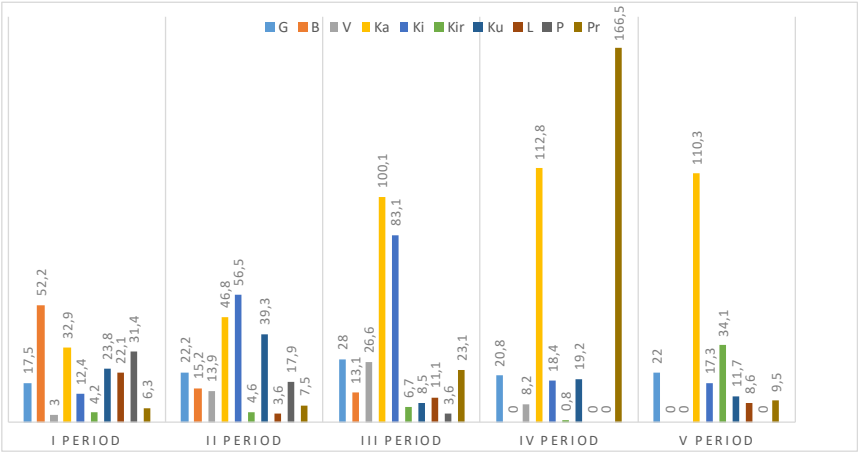

Figure 2. *Incidence of diseases of the blood and hematopoietic organs among young men of Donetsk (‰) by periods, M±m*

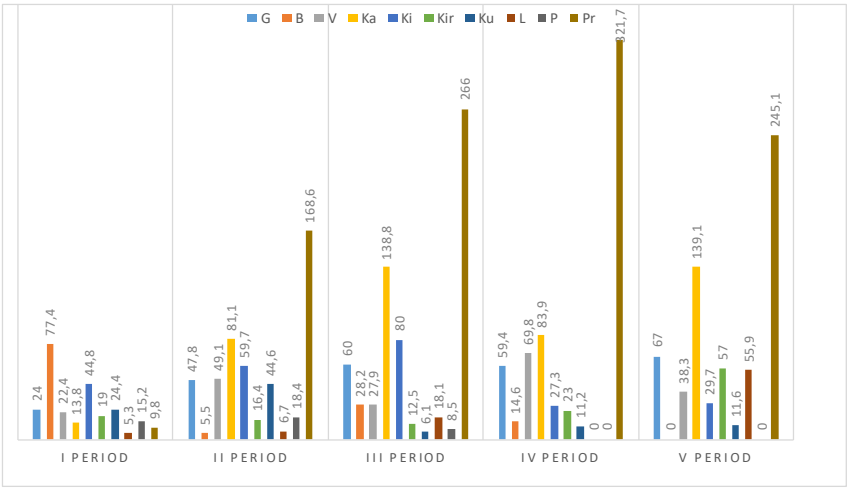

Figure 3. *Incidence of blood and hematopoietic diseases among girls in Donetsk (‰) by periods, M±m*

When comparing groups of districts, the highest rates of pathology were observed in the groups of contaminated outlying, unaffected districts (B. and Pr.) and contaminated central, affected districts (Ka., Ki. and L.): significant differences compared to the group of contaminated outlying districts that were in the military conflict zone (Kir., Ku. and P.) were noted in the group (B. and Pr.) among girls in the third period, and in the group (Ka., Ki. and L.) among adolescents and young men in the third period. The insignificant number of reliable differences in the indicated groups of districts is due to the pronounced variability of indicators by year and multidirectional trends in districts within each group.

At the same time, the city average levels significantly exceed those in the group of districts (Kir., Ku. and P.) in periods III-IV among adolescents, young men and women, in terms of prevalence - in periods II-V among adolescents and women, and in period III among young men. Gender differences are characterized by a reliable predominance of indicators in girls (caused by anemia): on average in the city - in periods II-IV; in the control district in periods I and V. Only in the pre-war period were correlations revealed between the incidence rates of the pathology under study and the maximum multiple of excess of TM concentration in the soil of the districts. A significant relationship was found between the incidence of pathology and the content of copper in the soil (in adolescents $R=0.725$, $p<0.001$, in young men $R=0.727$; in girls $R=0.664$, $p<0.03$; in adolescents $Tai=0.596$, $p<0.03$, in young men $Tai=0.671$, $p<0.01$; in young men the

Spearman index=0.745, p <0.03) and cadmium (in girls R=0.660, p <0.03). The absence of correlations in all war periods is due to population migration due to military and epidemic distress. Therefore, the correlation analysis was also carried out for groups of districts, which made it possible to reduce the variability of indicators by districts and years by leveling out inter-district migration within each group. Correlations were found between the incidence of pathology and the copper content in period I (in adolescents R=0.762, p <0.04, in girls R=0.794, p <0.01), phosphorus (in adolescents in period I R=0.800, p <0.001, in young men in period IV R=0.764, p <0.05. in girls - a weak connection in periods I, III and V). In addition, a weak connection was determined with the concentration of strontium and lead in adolescents in the last period. The identified dependencies are confirmed by studies of the content of TM in biomarkers of adolescents [3]. A weak connection was established between the maximum multiple of excess lead content in the soil of each region and the percentage of individuals with excess of the permissible concentration of this TM in biomarkers of the adolescent population of the regions. In case of exceeding the permissible content of combinations of toxic (including lead, cadmium, etc.) and potentially toxic (including strontium), the proportion of adolescents in the most polluted region B. is significantly (p <0.01) higher than in the control region V. Similar reliable differences compared to the "clean" region among adolescents from the areas of the military conflict zone: K. (for strontium) and P. (for lead and cadmium).

The study allows us to draw the following conclusions.

1. The studies confirm the adverse non-specific effect of TM on the incidence of blood and hematopoietic organ diseases in adolescents in the eco-crisis region.

2. With the onset of a local military conflict, military and epidemic distress become the leading risk factors for the pathology under analysis.

3. Under anthropogenic impact, the consequences of stress-induced conditions increased the adverse effects of TM, which led to an increase in blood and hematopoietic organ diseases.

4. A significant influence of TM as risk factors on the levels (Cu, Cd, P in combination with military and epidemic distress) of the adolescent population with diseases of the blood and hematopoietic organs was established.

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技术发生地区人口的白内障：重金属、军事和流行病危害
CATARACT IN THE POPULATION OF TECHNOGENIC REGION: RISKS OF HEAVY METALS, MILITARY AND EPIDEMIC DISTRESS

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摘要。本研究的目的是评估重金属对生态危机地区人口白内障发病率和患病率的非特异性影响，包括在军事和流行病困扰的后果条件下。随着军事冲突的开始，困扰成为主要的风险因素。压力诱发状态的后果加剧了重金属的不利影响，并导致这种病理的增加。

关键词：白内障，人口患病率；重金属；军事冲突。

Abstract. *The goal of the work was to assess the non-specific effect of heavy metals on the incidence and prevalence of cataracts in the population of an eco-crisis region, including in the conditions of consequences of military and epidemic distress. with the beginning of the military conflict, distress becomes the leading risk factor. The consequences of stress-induced states exacerbated the adverse effects of heavy metals and caused the increase of this pathology.*

Keywords: cataract, prevalence in the population; heavy metals; military conflict.

Scientific literature highlights various risk factors for cataracts: harmful and difficult working conditions, age-related changes in the organ of vision, complications after viral infections, poor nutrition, etc. However, insufficient attention has been paid to environmental factors and the consequences of stress-induced conditions in the development of cataracts [1-2].

The aim of the work was to assess the impact of heavy metals on the incidence and prevalence of cataracts in the population of Donbass, including in the context of the consequences of military and epidemic distress.

Materials and methods. We chose the soil of Donetsk as an environmental object, and the concentration of 12 heavy metals and metalloids (hereinafter re-

ferred to as HM: lead, zinc, cadmium, copper, manganese, phosphorus, arsenic, thallium, barium, mercury, aluminum, strontium) as a pollution model. Their half-life from the soil ranges from tens to thousands of years [3]. With the improvement of atmospheric air quality in the DPR and the deterioration of drinking water indicators, the soil is the least migrating object. According to the World Health Organization, up to 95% of HM enter the body through trophic chains from the soil with plant food and animal products [1,3]. The calculation and analysis of the incidence and prevalence rates of cataracts among the main population groups (children, adolescents and adults, including pensioners) was performed, taking into account age and gender differences in the most "polluted" (B.) and "clean" (V.) districts (not affected by hostilities until 2022) in comparison with the K. and P. districts, which were in the military conflict zone, and average city indicators for 4 time periods: pre-war (I - 2012-2013), transitional military - the beginning of hostilities (II - 2014-2016), stable military (III - 2017-2019) and pandemic (IV - 2020-2021). To calculate the intensive indicators, official accounting and statistical documents (Form No. 12) and data on the average annual number of various population groups served by health care institutions in the districts were used.

Statistical processing was carried out using generally accepted methods using the licensed package of applied programs MedStat. Differences between the indicators of the pre-war and war periods, age and gender groups, urban districts were estimated using the Scheffe multiple comparison method. Correlation coefficients ($p < 0.05$) were calculated between the maximum multiple of excess of heavy metal concentration in the soil of each district and the indicators of the health status of the population.

Results and discussion. The highest rates of both prevalence and incidence in the analyzed age groups were noted among the adult population, and the levels in the city and districts from the military conflict zone among pensioners were significantly higher in all periods than in other groups (see table). At the same time, during the first three periods in the unaffected districts, the indicators of the adult population as a whole exceeded those of pensioners (significantly in prevalence in periods I-II in district V., in period III in district B., in incidence in periods I and III in district B.). It should be noted that during all four periods, the prevalence levels of cataracts in adolescents were observed in the city and the most polluted district B., and incidence – only in the city. Among the child population, the prevalence rates of cataracts were observed in the city (periods I-IV), the most polluted district B. (I-III), district P. (I-II); only in the last periods do the prevalence levels (without incidence) of cataracts appear in the control district V. (III-IV) and district K. (IV), which is explained by migration processes. The general trend of the dynamics of the population structure of Donetsk is noteworthy, which consists of an increase in the share of the adult population, primarily due to people of retire-

ment age and men, with a decrease in the number of adolescents (mainly girls) and children (mainly preschool girls). At the same time, no reliable differences were found between the districts.

The proportion of cataracts among all pathologies of the visual organ of children is extremely insignificant: in prevalence - up to 0.1%, in incidence - from 0.01% to 0.1%. Isolated cases throughout all 4 periods were detected only in the most polluted district of B. (Table 1).

Table 1.

Prevalence of cataracts among the population of Donetsk districts, o/ooo

Period	District	Children (0-14 years old) – 1	Teenagers (15-17 years old) – 2	Adult population – 3	Including persons of retirement age – 4
I	G.	1,03±0,20	1,50±0,24^{*V,K,P}	186,4±7,4 ^{*1,2,II,III,IV**K}	598,7±27,0 $^{*1,2,3,II,III,IV,\ B,V**K}$
	B.	1,50±0,74	3,94±0,06^{*G,V,K,P}	156,0±55,3	10,8±5,8
	V.	0	0	344,5±2,2 ^{*1,2,4,III,IV,G,B,K,P}	60,8±6,2^{*1,2}
	K.	0	0	144,7±4,3^{*1,2,III}	460,9±12,4^{**3,III*1,2,IV,B,V}
	P.	4,29±1,53	0	183,5±8,0^{*1,2**II,III,IV,K}	540,4±18,1$^{*1,2,3,III,IV,\ B,V}$
II	G.	0,79±0,14	1,55±0,59	137,8±4,5^{*1,2}	403,5±12,4^{*1,2,3,B,V**IV}
	B.	3,51±0,24 ^{**I,III,Г,P*V,K}	1,37±1,37	123,6±5,2^{*1,2}	43,8±33,6
	V.	0	0	235,2±41,9^{*1,2**4,B,K}	36,9±7,2^{*1,2}
	K.	0	0	110,8±10,6^{*1,2}	326,0±17,9^{*1,2,3,B,V}
	P.	0,92±0,92	0	134,6±12,0^{*1,2}	389,4±63,2$^{*1,2,3,\ B,V}$
III	G.	1,08±0,22	2,37±0,60^{*V,K,P}	140,2±1,3^{*1,2,B,K}	367,1±26,3^{*1,2,3,B**IV}
	B.	1,81±0,11	1,75±1,75	116,4±1,4^{*1,2,4}	20,2±3,1^{*1,2}
	V.	3,36±1,08 ^{*K,P}	0	185,4±4,3$^{*1,2,Г,Б,\ K,P}$	159,5±137,8
	K.	0	0	107,4±4,9^{*1,2}	283,2±31,3^{*1,2,3,B}
	P.	0	0	145,6±2,1^{*1,2,B,K}	358,2±33,4^{*1,2,3,B}
IV	G.	1,24±0,23 ^{*P}	1,92±1,00	123,0±5,2^{*1,2}	251,4±10,2^{*1,2,3}
	B.	2,02±0,005^{*P}	4,73±0,03$^{*1,I,V,\ P}$	121,8±1,8^{*1,2}	257,8±5,2^{*1,2,3,I,II,III}
	V.	2,29±0,76	0	184,2±38,1^{**1,2}	418,5±76,5^{*1,2,I,II}
	K.	2,04±0,20 ^{*II,I,II,III}	1,45±1,45	102,5±14,8^{*1,2}	243,6±38,8^{*1,2**3}
	P.	0	0	142,9±0,8^{*1,2,G,B}	314,3±9,1^{*1,2,3}

The differences are significant: * $p < 0,01$, ** $p < 0,05$

The following patterns are typical for inter-district differences in the prevalence of cataracts in children: in the pre-war period, the maximum rates were observed in the P. district (significantly higher among preschool children than in other districts); in the second period, the highest levels were recorded in the most polluted B. district (significantly higher in all groups except boys); in the third and fourth periods, in the unaffected V. districts (significantly among preschool girls) and B. (significantly among schoolboys). Only trends were observed in the incidence of cataracts: in the first period, the maximum rates were in the P. district (primarily due to boys); in the third period, in the V. district (mainly due to schoolgirls). The results of the analysis allow us to speak about the increase in the toxic effect of heavy metals with the beginning of the military conflict in the most polluted region of B.

Gender differences are characterized by unidirectional trends: prevalence and incidence rates in girls over boys (in terms of prevalence, reliably in the city in periods II-IV, in the B. region in period II, in the K. region in period IV) with the exception of the P. region in periods I-II.

The levels of prevalence and incidence of cataracts during periods I-II among schoolchildren and preschoolers were practically the same. In periods III-IV, age dependence with priority of schoolchildren is determined in relation to both incidence (significantly in the city (III) and prevalence (significantly in district B. (III-IV), inverse dependence in district K. (IV), which can also be due to migration of children. Based on the previously considered patterns, the dynamics of cataract prevalence rates is characterized by a natural increase in districts K (the indicators of period IV significantly exceed those in periods II-III in all groups of children, except boys) and V. (the indicators of periods III-IV are significantly higher than in periods I-II in the schoolchildren group), a decrease in district P. in groups of girls and preschoolers (I ≥ III-IV). Among all children, girls and preschoolers in district B., with the onset of hostilities, prevalence rates significantly exceed the indicators in other periods (II ≥ I, III-IV), which indicates an unfavorable impact of the consequences of military distress on the development of cataracts in children. The incidence of cataracts is characterized by a tendency to decrease in indicators (reliably in the city as a whole in groups of all children, girls and preschoolers, (I ≥ II, IV). Clear correlations of cataract indicators with the content of TM were determined in periods I-II with barium, in period II with cadmium, and in periods III-IV - with manganese and copper. In the pre-war period, a strong relationship was noted between prevalence and the maximum multiple of excess concentration of barium in the soil ($R = 0.800$, $p < 0.001$) among all children and a weak relationship among schoolchildren, as well as a weak relationship between morbidity and the same TM in the above groups and among preschoolers. Beginning with period II, correlations were revealed only with prevalence levels.

With the onset of the military conflict, strong associations with cadmium content were observed in the group of all children (R=0.776, p<0.023), girls (R=0.799, p<0.001) and schoolchildren (R=0.794, p<0.005), weak associations with cadmium in preschoolers and with barium in boys. In period III, a strong association was observed in the group of boys with copper content (R=0.800, p<0.001), in the group of schoolchildren with manganese content (R=0.768, p<0.032), a weak association with manganese in all children. In period IV, a strong association was observed in the group of boys with copper content (R=0.800, p<0.001), a weak association in the group of schoolchildren with manganese content. Thus, in the conditions of the ecocrisis region, the consequences of stress-induced conditions aggravated the adverse effect of TM on the prevalence of cataracts. The share of cataracts among all pathologies of the visual organ of adolescents is extremely insignificant: in prevalence - up to 0.1%, in incidence - up to 0.07%. A few cases throughout all 4 periods (see table) were detected only in the most polluted district B. (in periods I and IV, significantly higher than the city average), and during the pandemic - also in the polluted district K. (apparently, the "appearance" of cataracts is associated with migration processes). Throughout the analyzed period, cataracts were not diagnosed in adolescents in districts V. and P. The incidence was noted only in the city in periods I-III.

An increase in the prevalence of cataracts was observed in period III in the city (significantly among girls, III>II) and district B., in period IV - in districts B. (significantly among adolescents and girls, IV>I-II) and K. It should be noted that there was a significant decrease in the indicators among young men during the pandemic (I>IV): prevalence in district B. and incidence in the city. An increase in the levels of pathology in recent periods indicates an unfavorable impact of the consequences of stress-induced conditions on the development of cataracts in adolescents. Gender differences are characterized, as a rule, by unidirectional dependencies: a prevalence of indicators in young men over girls (in prevalence, significantly in the city in period II, district B. in period I), with the exception of district B. in periods III-IV (significantly during the pandemic). Since the prevalence of cataracts in adolescents in periods I-IV were noted only in the B. region, the correlation with the copper content in the soil in periods I-II (in adolescents and young men), in period III (in adolescents and girls), in period IV (in girls) is not very informative; the same applies to the relationship between the prevalence of the nosology in young men in the K. region and the concentration of thallium in period IV. Strong relationships between the prevalence of cataracts among adolescents and the content of heavy metals were determined in period IV - with zinc ($R = 0.792$, $p < 0.01$), lead ($R = 0.781$, $p < 0.02$) and strontium ($R = 0.776$, $p < 0.03$). Thus, in the conditions of a technogenic region, the consequences of epidemic distress aggravated the adverse effect of heavy metals on the prevalence of cataracts.

The proportion of cataracts among all pathologies of the organ of vision of the adult population is high: in prevalence - 16.0-18.1%, in incidence - 9.0-14.4%, in persons of retirement age - respectively, 24.0-30.3% and 17.8-24.7%.

For inter-regional differences in the levels of both incidence and prevalence of cataracts in the adult population, general patterns and features are characteristic (see table). In periods I-II, the maximum indicators are noted in the control region V., with the exception of the group of persons of retirement age (regions K. and P.). In periods III-IV, the highest levels are observed in region B. (among men and pensioners in region P). The minimum prevalence rates in all periods are in region K., with the exception of the group of persons of retirement age (regions B. and V). Differences with minimum regional levels are reliable throughout the analyzed period. Gender differences are characterized by opposite trends: prevalence among both men (reliably in district P. - in periods III-IV in incidence and prevalence) and women (reliably in district V. - in period I in incidence, in I and III - in prevalence). Age-group differences were unchanged in all periods in the districts and the city as a whole: among people of retirement age, the incidence and prevalence levels significantly exceeded the indicators of other groups of the adult population, which is associated with the age dependence of the development of the nosology. The exceptions were district B. in incidence (periods I-III), in prevalence - districts B. (periods I-III) and V. (I-II), which were not affected by military action.

The general trend of cataract prevalence dynamics consisted in a significant decrease in the indicators from the pre-war period to the war, the only exception was the incidence of pensioners in the unaffected districts of B. and V., where the indicators of period IV were significantly higher than in the previous ones. A tendency towards an increase in morbidity was observed in contaminated areas (significantly in the city and district B.), and a significant decrease in levels - in the control district V. Correlations of cataract incidence levels with the maximum multiple of excess of TM concentration in the pre-war period were noted only in the group of pensioners with mercury (weak connection). Strong connections were revealed only in periods III-IV. Thus, - with the content of aluminum in the soil of the adult population in periods III (weak connection) and IV ($R = 0.793$, $p < 0.01$), in the last period also in women (weak connection) and pensioners ($R = 0.778$, $p < 0.03$). Only in women were correlations found in periods III-IV with lead (respectively, $R=0.759$, $p<0.05$ and $R=0.766$, $p<0.04$), with zinc (respectively, $R=0.786$, $p<0.02$ and weak correlation), with strontium (respectively, weak correlation and $R=0.758$, $p<0.05$), in period IV with phosphorus ($R=0.782$, $p<0.02$) and copper ($R=0.758$, $p<0.05$). Only in men were correlations found with barium in period III ($R=0.751$, $p<0.05$) and arsenic in period IV (weak correlation). Thus, in the conditions of an industrial region, the consequences of military and epidem-

ic distress aggravated the adverse effect of TM on morbidity levels, primarily in women (6 out of 9 TM). The revealed dependencies are confirmed by the studies of the content of heavy metals in biomarkers (hair) of the population [4].

Conclusions. 1. In the conditions of the ecocrisis region, the consequences of stress-induced conditions aggravated the adverse effect of heavy metals on the prevalence of cataracts in children (Ba, Cd, Mn, Cu + military + epidemic distress) and adolescents (Cu, Zn, Pb, Sr, Tl + epidemic distress), incidence rates among the adult population (Hg, Al, Cu, Zn, P, Pb, Sr, Ba, As + military + epidemic distress).

2. The maximum incidence and prevalence rates of cataracts in children, adolescents and pensioners are usually observed in contaminated areas, in adults - in areas not affected by military action (control in the first two periods, the most contaminated - in the last periods).

3. Cataract levels are higher in the group of school-age children (significant in prevalence). In people of retirement age, the incidence and prevalence rates significantly exceed the rates in other groups of the adult population, which is due to the age dependence of the development of the nosology. The exception in the early periods are areas not affected by military actions.

4. If in children, cataract rates generally prevail in girls, then in adolescents - in young men. Among the adult population, gender differences are opposite: in recent periods, cataract rates in the city and areas from the military conflict zone prevail in men, in unaffected areas - in women.

5. A decrease in cataract incidence is observed in children and adolescents, an increase in the adult population (with the exception of the control area). Among the child and adult population, a reliable decrease in the prevalence of cataracts is noted, and a significant increase in adolescents.

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胆脂瘤颞骨颈动脉管的解剖特点

FEATURES OF THE ANATOMY OF THE CAROTID CANAL OF THE TEMPORAL BONE IN PATIENTS WITH CHOLESTEATOMA

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简历。研究揭示了颈动脉管外口在个体发育过程中的变化模式。在男性中，杏仁状外口最多见（男性 75%，女性 15 至 40 岁 70%），而在 41 至 61 岁的女性中，椭圆形更常见，这与外口面积增加有关。这些变化可以通过与年龄相关的骨重塑过程（包括骨质疏松症）来解释。

鉴于颈动脉管在整个个体发育过程中的解剖学变异性，获得的数据对于临床实践很重要，在进行诊断、选择治疗方法和计划手术干预时应考虑到这一点。上述临床病例表明，考虑到颈动脉管结构没有发生重大变化，在治疗右中耳胆脂瘤患者时需要采取观望态度。这一观察结果强调了在选择治疗策略时个性化方法的重要性。

因此，考虑不同年龄和性别患者的颈动脉管解剖特征有助于提高诊断的准确性，提高治疗质量并降低手术并发症的风险。

关键词：中耳胆脂瘤，X射线计算机断层扫描，颞骨颈动脉管，个体发育。

Resume. *The study revealed a pattern of variability of the external opening of the carotid canal during ontogenesis. In men, the largest number of cases is*

the almond-shaped shape of the external opening (75% in men versus 70% in women aged 15 to 40 years), whereas in women aged 41 to 61 years, the oval shape is more often predominant, which is associated with an increase in the area of this opening. These changes can be explained by age-related bone remodeling processes, including osteoporosis.

The data obtained are important for clinical practice, given the anatomical variability of the carotid canal throughout ontogenesis, which should be taken into account when conducting diagnostics, choosing therapeutic approaches, and planning surgical interventions. The above clinical case demonstrates the need for a wait-and-see approach in the management of a patient with cholesteatoma of the right middle ear, taking into account the absence of significant changes in the structure of the carotid canal. This observation highlights the importance of an individualized approach when choosing a treatment strategy.

Thus, taking into account the anatomical features of the carotid canal in patients of different ages and genders helps to increase the accuracy of diagnosis, improve the quality of treatment and reduce the risk of surgical complications.

Keywords: *cholesteatoma of the middle ear, X-ray computed tomography, carotid canal of the temporal bone, ontogenesis.*

Introduction. The variety of shapes and sizes of the carotid canal observed throughout life is due to the complex interaction of genetic and environmental factors. In the early stages of ontogenesis, the bone walls of the canal and its lumen are formed, which is influenced by growth factors and mineralization processes. In the future, bone remodeling processes associated with age-related changes, hormonal background and mechanical stress can lead to changes in the configuration of the canal, its diameter and relative position relative to other anatomical structures of the skull. These changes are especially important when planning surgical interventions in the area of the base of the skull, where the proximity of the carotid canal to vital nerves and vessels requires extreme precision and caution [1].

Neuroimaging techniques such as computed tomography (CT) and magnetic resonance imaging (MRI) are widely used in modern medical practice to study the anatomical variability of the carotid canal in detail. CT allows you to obtain high-precision images of bone structures, which is especially valuable for assessing the shape and size of the canal, as well as identifying possible developmental anomalies or post-traumatic changes. MRI, in turn, makes it possible to visualize the soft tissues surrounding the canal, including the internal carotid artery and surrounding nerves, which is necessary to assess neurovascular relationships and identify signs of inflammation or compression [5].

Understanding the age and sex characteristics of the carotid canal structure is important not only for surgical practice, but also for the diagnosis and treatment

of neurological diseases. For example, stenosis or occlusion of the internal carotid artery in the canal can lead to the development of ischemic stroke, and knowledge of the individual anatomical features of the canal allows for more accurate planning of endovascular interventions to restore blood flow. In addition, anatomical variations of the canal can affect the prevalence and nature of pain syndromes in the head and neck, which must be taken into account in differential diagnosis and treatment strategy development [6].

The purpose of the study. Substantiation of the clinical significance of an individualized approach in the treatment of middle ear cholesteatoma due to anatomical features of the carotid canal, taking into account the age and gender of the patient.

Materials and methods. The study was conducted in accordance with Federal Law of the Russian Federation No. 323-FZ dated 11/21/2011 "On the Basics of Public Health protection in the Russian Federation", Order of the Ministry of Health of the Russian Federation No. 200n dated April 1, 2016 "On Approval of the Rules of Good Clinical Practice", standards of good Clinical Practice, principles of the Helsinki Declaration. The approval of the ethics committee was not required, since the data analysis was carried out retrospectively, all participants signed the consent necessary for the RCT study based on standard procedures of medical institutions. A study was conducted on the characteristics of the carotid canal in 20 women and 19 men aged 15 to 60 years, divided into groups from 15 to 40 years (7 men and 7 women) and from 41 to 60 years (10 men and 15 women). In both groups, the qualitative (shape) and quantitative (area) parameters of the external opening of the carotid canal were studied. Participants underwent X-ray computed tomography of the brain and skull using a GE Bright-Speed-16 device. The area and shape of the external opening of the carotid canal were measured and analyzed. The area of the external opening of the carotid canal was measured according to its geometric shape in the Inobitec DICOM Viewer program (the shape of the external opening of the carotid canal was assumed to be "oval" and "almond-shaped", respectively). As part of the study, a retrospective analysis of the clinical case of M. 18 years old with changes in the apex of the pyramid of the right temporal bone was carried out. A clinical examination and analysis of X-ray computed tomography and magnetic resonance computed tomography of the brain (Philips Medical Systems Nederland B.V. "INTERA 1.5T" tomograph) were performed.

The results and their discussion. As a result of the measurements, significant differences in the shape and area of the external opening of the carotid canal were revealed in men and women aged 15 to 60 years: the shape of the external opening of the carotid canal in men aged 15 to 40 years in 75% of cases was almond-shaped, at the age of 41 to 60 years the almond-shaped shape of the external

opening it was observed in 45% of cases. The shape of the external opening of the carotid canal in women aged 15 to 40 years was almond-shaped in 70% of cases, and almond-shaped shape of the external opening of the carotid canal was found in 27% of cases between the ages of 41 and 60 years. In men aged 15 to 40 years, the area of the external opening of the carotid canal ranged from 0.20 to 0.37 cm2, from 41 to 60 years – from 0.16 to 0.40 cm2. The area of the external aperture of the internal carotid opening in women aged 15 to 40 years ranged from 0.13 to 0.25 cm2, in women aged 41 to 60 years, this value ranged from 0.16 to 0.42 cm2.

There is an increase in the area of the external opening of the carotid canal in men and women in the age groups represented. In women, the shape of the external opening of the carotid canal has a more pronounced relationship with age (70% in the group from 15 to 40 years and 27% in the age group from 41 to 60 years), which can be concluded by the tendency to increase the area of the external opening of the carotid canal and, therefore, the “rounding” of its shape in women at different stages of ontogenesis. In the age group from 41 to 60 years, the area of the external opening of the carotid canal in women and men is comparable (0.16 cm2 to 0.42 cm2 and 0.16 to 0.40 cm2, respectively), however, the shape of the external opening of the carotid canal differs - in women in this age group, the almond-shaped shape of the external opening of the carotid canal is less common than in men of that age of the same age (27% and 45%, respectively). These changes may be associated with the phenomenon of osteoporosis, a systemic process, an indirect sign of which is also an increase in the area of the external opening of the carotid canal [4].

Among the analyzed CT scans, attention should be paid to the clinical case of M, 15 years old, who has CT signs of bone resorption with the formation of a cavity with sclerosed edges in the area of the apex of the pyramid of the temporal bone on the right, parallel to the carotid canal. This patient was seen by a neurologist three years later, at the age of 18, complaining of periodic dizziness, which increases with changes in head position, and a slight noise in the right ear that occurs periodically. These complaints have been troubling for several years, and the frequency and intensity of symptoms have not changed over time. Upon examination of the outer ear, no pathologies were found, the integrity of the eardrums on the left and right was not impaired. It is known from the medical history that the patient did not suffer from diseases of the middle ear, and there is no history of surgical interventions on the outer and middle ear.

Magnetic resonance imaging (MRI) of the brain was prescribed to clarify the diagnosis. On MRI, a pathological formation is visualized in the projection of the apex of the pyramid of the temporal bone on the right (Fig. 1), located medial to the stony segment of the right internal carotid artery and not affecting the vestibulocochlear nerve on the ipsilateral side.

Based on clinical and anamnestic data and the MR picture, the differential series consists of the following diseases: cholesteatoma, vestibulocochlear nerve neurinoma, meningioma. However, taking into account the location of the volumetric formation, its MR characteristics (hyperintensive MR signal on T1, T2 weighted images, as well as distance from the brainstem and cranial nerves and meninges, see Fig. 1), the most likely diagnosis is congenital cholesteatoma of the middle ear. Given the absence of clinical manifestations, dynamic follow-up and multispiral computed tomography of the temporal bones are recommended for this patient after 6-12 months, followed by specialist consultation. In this clinical case, the anatomical integrity and normal formation of the carotid canal of a young man is observed during ontogenesis, expressed in the absence of deformities, germination of the carotid canal of the temporal bone by a volumetric formation. The age and gender of the patient exclude systemic osteoporotic changes and associated additional changes in the walls of the carotid canal. These circumstances make it possible to choose dynamic observation as a management tactic for this patient.

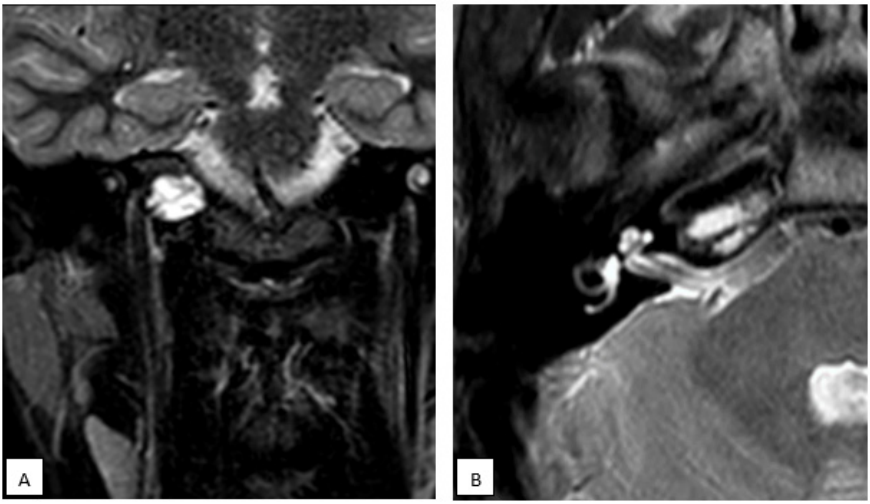

Figure 1. *MRI of the brain. A – T2 is a weighted image, the frontal plane. B – T2 is a weighted image, horizontal plane.*

The data obtained are essential for a personalized approach to the patient by doctors of many specialties [5, 6, 7]:

Traumatology: injuries to the occipital and temporal regions can lead to fractures of the pyramid of the temporal bone and damage to the stony part of the internal carotid artery, to damage to the middle ear. Venous plexus and fistulas in

case of injury to the tip of the pyramid of the temporal bone can mimic a carotid-cavernous fistula.

Vascular surgery: stony segment aneurysms are rare and may result from injury. The prolonged existence of an aneurysm may be the cause of deformation of the carotid canal wall. The carotid canal is important for microsurgical approaches to tumors and aneurysms.

Cranial base surgery: paragangliomas, schwannomas, cholesteatomas [2, 3], metastases occur in the carotid canal, and in some cases, inflammatory processes occur. Surgical resection is the method of choice in these cases. Surgical accesses through the mastoid process and petrosectomy require knowledge of the anatomy of the carotid canal of the temporal bone, taking into account its individual variability during ontogenesis.

Conclusions. As a result of the study, a pattern of variability of the external opening of the carotid canal during ontogenesis was found. The almond-shaped shape of the external opening of the carotid canal is most often recorded in men (75% in men compared with 70% in women aged 15 to 40 years), while the oval shape prevails in women aged 41 to 61 years, which is associated with an increase in the area of the external opening of the carotid canal. These changes can be explained by the processes of age-related bone remodeling, including the phenomena of osteoporosis.

The results obtained are of significant importance for clinical practice, taking into account the anatomical variability of the carotid canal during ontogenesis during diagnostic measures, the choice of treatment tactics and the planning of surgical interventions. The above clinical case illustrates the rationale for the wait-and-see management of a patient with cholesteatoma of the right middle ear, taking into account the absence of significant changes in the structure of the carotid canal. This observation confirms the importance of a personalized approach when choosing a treatment strategy.

Thus, taking into account the anatomical features of the carotid canal in patients of different ages and genders helps to increase the accuracy of diagnosis, improve the quality of treatment and minimize the risk of surgical complications.

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综合分析传统心电图和超声心动图数据标准与高血压持续时间的比较，早期发现左心室肥大的重要性

THE IMPORTANCE OF EARLY DETECTION OF LEFT VENTRICULAR HYPERTROPHY IN A COMPREHENSIVE ANALYSIS TRADITIONAL ECG AND ECHOCARDIOGRAPHY DATA CRITERIA IN COMPARISON WITH THE DURATION OF ARTERIAL HYPERTENSION

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摘要。本文致力于解决动脉高血压 (AH) 患者左心室肥大 (LVH) 的早期发现这一紧迫问题。该研究强调了 ECG 和超声心动图数据综合分析对于诊断 LVH 的重要性，尤其是对于不同持续时间的 AH 患者。结果表明，在男性中，LVH 的征兆，例如左心室后壁厚度 (LVPT) 增加，在疾病的早期阶段就已经出现，而在女性中，这些变化在疾病后期才会出现。使用现代仪器方法早期诊断 AH 和 LVH 可以及时开始治疗并预防心血管并发症。

关键词：左心室肥大、动脉高血压、ECG、超声心动图、早期诊断、心血管并发症。

Abstract. *The article is devoted to the urgent problem of early detection of left ventricular hypertrophy (LVH) in patients with arterial hypertension (AH). The study emphasizes the importance of complex analysis of ECG and* **echocardiography**

data for diagnosing LVH, especially in patients with different duration of AH. The results showed that in men, signs of LVH, such as increased left ventricular posterior wall thickness (LVPT), appear already at the early stages of the disease, while in women these changes are observed later. Early diagnosis of AH and LVH using modern instrumental methods allows timely initiation of treatment and prevention of cardiovascular complications.

Keywords: *left ventricular hypertrophy, arterial hypertension, ECG, echocardiography, early diagnosis, cardiovascular complications.*

Arterial hypertension (AH) is a syndrome of high blood pressure (BP) above 140/90 mm Hg, developing with essential hypertension and symptomatic AH [1;2] .

According to the clinical guidelines on arterial hypertension of the Ministry of Health of the Russian Federation from 2024 [2] , LVH is determined in patients with hypertension - in men from 55 years of age and in women from 65 years of age. However, at present, a tendency towards “rejuvenation” of arterial hypertension is being revealed, especially in males under fifty years of age [3,4] . Often, high blood pressure figures are revealed even in childhood and adolescence [5,6,7]. Hypertension among the young population is becoming a global problem and its prevalence depends on the region and country [3,4,6,8,9] . Late seeking of medical *treatment*, ignoring age-related medical examinations and underestimating the significance of high blood pressure numbers lead to early manifestation of hypertension complications in young men, cardiovascular risks and mortality.

The importance of sexual dimorphism in the development of such a complication of hypertension as left ventricular hypertrophy (LVH) is emerging [4,8] . At the same time, there is no consensus on this matter. It is observed that the prevalence of arterial hypertension in women is lower than in men before menopause, but after menopause it becomes higher than in men [10] . Another study showed that hypertension is more common in women than in men, but develops later [8]. Although estrogen is considered an important factor influencing blood pressure, the pathogenesis of its effect on cardiogenic complications has not yet been fully studied. Left ventricular hypertrophy developing for other reasons can level out gender differences in patients with hypertension.

Arterial hypertension is a syndrome of cardiovascular diseases that can lead to rapid progression if medical measures are not taken and can be complicated by LVH, i.e. an increase in the mass of the LV myocardium [2,11] .

Today, there are mandatory research methods for patients with hypertension, such as: electrocardiography (ECG) , echocardiographic examination of the heart (echocardiography) , 24-hour blood pressure monitoring (ABPM) .

ECG is a widely utilized diagnostic tool for assessing cardiac function and electrical activity, based on a graphic image of the heart’s electrical impulses. The elec-

trocardiograph measures the intensity of the heart muscle contractions and converts them into a graphic image on a tape in the form of teeth. The results are used to determine the presence or absence of disturbances in the electrical work of the heart [1,2,4,11] .

Echocardiography is a modern method of ultrasound examination of the heart. The essence of the echocardiography method is the use of ultrasound (high-frequency waves) that are not perceived by the human ear [2,8,11] .

ABPM is a test that involves automatic measurement of blood pressure over a certain period of time (usually 24 hours) and according to a specified program [4,5,9,12,13] .

The issue of early diagnosis of left ventricular hypertrophy (LVH) and the assessment of its regression remains relevant to this day, as numerous factors contribute to the development of hypertension in young individuals, which adversely affects long-term cardiovascular health, particularly the development of LVH. Latent (masked) hypertension can occur when the pressure in the doctor's office is normal, but increases when measured outside the clinic [12,13,14,15] . Hypertensive response to physical activity can also be a marker of masked arterial hypertension [8,12] .

Additional risk factors for the development of hypertension and LVH include an increase in body mass index [7,16] , anxiety disorders [17], and smoking [18].

Early detection of signs of LVH in patients with hypertension using the indicated diagnostic methods becomes an integral part of the prognosis formula for all complications of this disease, including fatal ones.

The aim of the study is to assess the importance of early detection of LVH in a comprehensive multilateral analysis traditional ECG and echocardiography data criteria in comparison with the experience of hypertension.

Material And methods:

52 patients with hypertension were examined, were located on outpatient treatment for the period from 2023 to 2025 in the clinic "VIDA Helix ", located in the Russian Federation, the city of Astrakhan. There are 25 men and 27 women, aged 45 [25;55] years.

The study included patients with LVH against the background of hypertension and did not take into account patients with cardiac hypertrophy that developed against the background of valvular heart defects, with concomitant ischemic heart disease (IHD) and echocardiography signs of right ventricular hypertrophy.

ECG and echocardiography research performed in one day after normalization of hemodynamic parameters. ECG recording was performed in the system of 12 generally accepted leads using software and hardware complex "Myocardium 12" (speed 25 mm/sec, 1mV/cm). The width of the teeth PQ, QRS were measured twice (automatically and visually) in all leads. Position the electrical axis of the heart

(EAH) was determined by the value of the angle α. The known ECG indicators LVH, analyzed quality criteria her diagnostics echocardiography study V M-mode were carried out on the MINDRAY ultrasound diagnostic device DC -55. Visualization of cardiac structures was performed from parasternal and apical access along the long and short axes with the patient lying on his left side or back. The thickness was determined interventricular septa (TIVS) And back wall left ventricle (BLVT) in at the end diastole in cm, diastolic size left ventricle in cm and the end diastolic dimension (EDD) of the left ventricle, according to criteria American Society of Echocardiography (ASE) . The groups were formed based on the duration of hypertension in patients according to ABPM data: group 1 (n = 15, men = 6, women = 9) - patients with hypertension duration of 1-5 years, group 2 (n = 17, men = 8, women = 9) - patients with hypertension duration of 5-10 years, group 3 (n = 20, men = 11, women = 9) - patients with hypertension duration of 10-15 years.

Analyzed indicators LVH included P ≥0.1 s, PQ ≥0.12-0.2 s, QRS≥0.08-0.09 s. Position EAH (angle α). Diary of blood pressure (BP) measurements of patients. The criteria for hypertension were an increase in BP above 140/90 more than 2 times a day.

Results

Based on the collected history of hypertension and the study of ABPM diaries, the total duration of hypertension in patients was determined (table).

ECG and echocardiogram data indicators in comparison with ABPM

ECG/ Echocardiogram indicators	Duration of hypertension from 1 to 5 years. n=15		Duration of hypertension from 5 to 10 years. n=17		Duration of hypertension from 5 to 10 years. n=20	
	Men	Women	Men	Women	Men	Women
PQ N: 0.12 – 0.2 s	0.21 [0, 20;0,22]	0,1 [0,1;0,2]	0.25* [0.24;0.26]	0.24* [0.23;0.26]	0.23* [0.19;0.24]	0.25 * [0.24;0.29]
QRS N: 0.08 – 0.09 s	0.10* [0.09;0.12]	0.09 [0.09;0.1]	0.15* [0.14;0.16]	0.13* [0.11;0.15]	0.13* [0,1;0,2]	0.15* [0.13;0.2]
TIVS N: 1.1 – 1.6 (syst), cm	1.7 [1.6;1.8]	1.65 [1.5;1.6]	1.9* [1.8;2.0]	1.78* [1,1;1,8]	1.8* [1.7;1.9]	1.85* [1.81;1.9]
BLVT N: Male – 0.24 – 0.42 cm; Female – 0.22 – 0.42 cm	1.1* [0.46;1.2]	0.43 [0.39;0.44]	1.9* [1.6;2.0]	1.33* [1.27;1.37]	1.59* [1.49;1.6]	1.85* [1.79;1.88]
EDD N: 3.1 – 4.2 cm	4.4 [3.9;4.1]	4.2 [3.9;4.2]	5.0* [4.9;5.2]	4.9 * [4.32;5.1]	5.3 * [4,9 ;5,4]	5.2 * [4,3;5,6]
EAH , degrees	$1,1^0$ [0.9 ; 1.3]	45.2^0 [44.9 ; 46.7]	45.4^0 [44.8 ; 46.8]	32.2^0 [31.4 ; 33.2]	-80.1^0 [- 76.5 ;- 82, 1]	-75.6^0 [- 73.8 ; 78.4]

* - level of statistical significance ($p \leq 0.05$) ; N - normal range; data are presented in Me [Q5;Q95] format.

In the first group, ECG data showed an increase in the QRS complex by 11.1% ($p \leq 0.05$) in men .

According to echocardiography data, the TIVS changed statistically insignificantly , and the BLVT in men increased relative to the norm by 261.9% ($p \leq 0.05$) .

QRS complex was widened by 66.6% ($p \leq 0.05$) in men and by 44.4% ($p \leq 0.05$) in women, the PQ interval was widened by 25% ($p \leq 0.05$) in men and by 20% ($p \leq 0.05$) in women . According to echocardiography, the TIVS increased by 18.75% ($p \leq 0.05$) in men and by 11.25% ($p \leq 0.05$) in women , and the BLVT increased by 352.3% ($p \leq 0.05$) relative to the norm and by 216.7% in women. ($p \leq 0.05$) . The EDD in men increased by 19% ($p \leq 0.05$), in women - by 16.7% ($p \leq 0.05$).

the QRS complex increased by 44.4% ($p \leq 0.05$) in men and by 66.6% ($p \leq 0.05$) in women. According to echocardiography data, the TIVS increased by 12.5% ($p \leq 0.05$) in men and by 15.6% ($p \leq 0.05$) in women, and the BLVT increased by 278.6% ($p \leq 0.05$) relative to the norm in men and by 340.5% in women (Figure). The EDD increased by 26% ($p \leq 0.05$) in men and by 23.8% ($p \leq 0.05$) in women (Table).

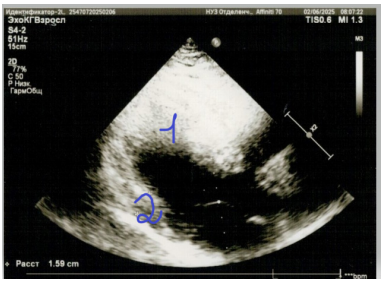

Figure. *Echocardiographic examination of the heart echocardiography — signs of LV hypertrophy. 1 — Interventricular septum, 2 — posterior wall of the left ventricle.*

Taking into account the obtained data for the three presented groups, an increase in ECG and echocardiography indicators of LVH is observed as the duration of hypertension increases. However, in men, BLVT increases already with a minimal duration of hypertension (in the first group). The position of the EAH indicates a deviation to the left in the 3rd group of subjects, indicating LVH.

Discussion

Patients with the shortest duration of the disease (included in group 1) had the least signs of LVH during instrumental examination at the time of examination. The collected history of the duration of hypertension allowed us to reveal that al-

ready in the early period of latent hypertension in men, the BLVT index begins to increase. Therefore, at the early stage of LVH formation, echocardiography is more informative. Data on increased ranges of PQ and QRS intervals are informative in older age groups. Negative values of the EAH position indicate the development of LVH. In our study, such were manifested in group 3 patients.

Analysis results given in comparison with literary data, reflects the current level of knowledge on this issue. Hypertension may begin unnoticed and be asymptomatic, which leads to later visits to the doctor. Current age-appropriate medical examinations at early stages may not record an increase in blood pressure above the norm, since they are episodic. The presence of risk factors such as obesity, smoking, stress [7; 16; 17; 18] are universal for both men and women. Ambulatory blood pressure monitoring (ABPM) serves as a critical tool for identifying and emphasizing the significance of elevated blood pressure. Our data suggest that women may demonstrate greater adherence to monitoring protocols and treatment, potentially reflecting a higher level of discipline in this context. Such the comparison reveals organization and conduct of the study and characterizes certain ECG signs of LVH. Interpretation of ECG and echocardiography signs is aimed at on assessment adequacy their use in practical medicine at present time. The LVH is the main, but not the only structural change hearts at hypertension. Therefore, the diagnostic value of ECG criteria for left ventricular hypertrophy (LVH) was assessed in comparison with all morphological parameters—wall thickness, myocardial mass, and the end-diastolic dimension of the left ventricle.

Conclusion

The study was conducted in an outpatient setting. The sample was formed from patients who visited the clinic between 2023 and 2025. Only patients with arterial hypertension (AH) were included in the study. It can be stated that the sample was of an unintentional random nature and can be considered largely representative of the population.

The relevance of this study is underscored by its focus on the early diagnosis of arterial hypertension (AH) and its associated complication—left ventricular hypertrophy (LVH). Despite the availability of various instrumental diagnostic methods, individuals often remain inattentive to their blood pressure levels and seek medical assistance late. The use of ambulatory blood pressure monitoring (ABPM) and the maintenance of a blood pressure observation diary facilitate the earlier identification of AH.

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齿轮珩磨过程中计算温度和残余应力的热物理模型
THERMOPHYSICAL MODELS FOR CALCULATING TEMPERATURE AND RESIDUAL STRESSES DURING GEAR HONING

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摘要。本文利用能量平衡法，基于拉普拉斯变换法求解傅里叶偏导数微分方程，提出了齿轮珩磨过程中接触温度和深度温度的计算公式，并考虑到温度模型，得出了估算残余应力的公式。
关键词：温度、方程、珩磨、齿轮。
Abstract. *In the work, using the energy balance and based on the solution of the differential equation in partial derivatives of Fourier by the Laplace transform method, formulas for calculating the temperature at the contact and by depth from it during the honing operation of gears are proposed, and taking into account the temperature model, a formula for estimating residual stresses is obtained.*
Keywords: *temperature, equations, honing, gear.*

Introduction

The honing operation is a finishing operation and involves increasing the accuracy of shape and size, as well as reducing the height of microroughness of the machined surfaces of holes, after preliminary processing operations. Despite the fact that during honing, processing is accompanied by fairly low bulk cutting temperatures, not exceeding 100 - 150 C, temperatures in thin layers can reach high values and have a significant effect on the accuracy of processing parts through residual temperature stresses [1-6]. The forces acting on the tool and the part during such processing are usually small, so they do not determine the temperature regime of the process. More important is the role of the heating rate and thermal expansion and thermoelastic deformations of the part and the tool. At the same time, if we take into account the law of thermal distribution, which shows that up to 90% of

the generated heat enters the workpiece and ten to 10% goes into the honing, then it becomes clear that determining the temperature and associated thermal residual stresses in the honing zone is the most important problem of this process.

Main part

We draw up an equation for the distribution of the total amount of heat.

$$Q = Q_1 + Q_2 \quad (1)$$

where Q_1 – the amount of heat received by the *instrument*;

Q_2 – amount of heat received by the *workpiece*.

The total amount of heat generated during honing.

$$Q = P \cdot v \cdot t \quad (2)$$

where, P – power; v – cutting speed; t – contact time.

Substituting (2) into (1)

$$Q_1 + Q_2 = P \cdot v \cdot t \quad (3)$$

Let's determine the amount of heat received by the hone

$$Q_1 = \rho_1 \cdot V_1 \cdot C_1 \cdot \theta_1 \quad (4)$$

where ρ_1 – density of the material (tool);

V_1 – heating volume of the hone contact zone;

C_1 – specific heat capacity of the hone material;

θ_1 – heating temperature.

Let's determine the amount of heat in the surface volume of the wheel

$$Q_2 = \rho_2 \cdot V_2 \cdot C_2 \cdot \theta_2 \quad (5)$$

where, ρ_2 – density of the wheel material;

V_2 – volume of the heated contact zone;

C_2 – specific heat capacity of the material;

θ_2 – heating temperature.

$\theta_1 = \theta_2$, since the temperature in the contact zone of the hone and the workpiece is the same.

The heating volume of the hone is found using the formula:

$$V_1 = h_1 \cdot A \quad (6)$$

where, $h_1 = 1{,}73\sqrt{\frac{\lambda_1}{C_1 \cdot \rho_1} \cdot t}$ – depth of heat pulse propagation in the hone;

A – contact area of the hone and the wheel (the same when calculating V_1 and V_2);

λ_1 – thermal conductivity of the hone;

t – contact time of the hone with the wheel (the same when calculating V_1 and V_2).

Substituting the formula for calculating the depth of heat pulse propagation into (6), we obtain:

$$V_1 = 1{,}73 \cdot A \sqrt{\frac{\lambda_1}{c_1 \cdot \rho_1} \cdot t} \quad (7)$$

Similarly, we obtain a formula for calculating the volume of wheel heating:

$$V_2 = 1{,}73 \cdot A \sqrt{\frac{\lambda_2}{c_2 \cdot \rho_2} \cdot t} \quad (8)$$

where, h_2 – depth of thermal pulse propagation in the workpiece;

A – contact spot area (the same when calculating V_1 and V_2);

λ_2 – thermal conductivity of the tool;

t – contact time of the wheel with the hone (the same when calculating V_1 and V_2).

Substituting (4), (5), (7), (8) into expression 3, we obtain:

$$\rho_1 \cdot 1{,}73 \cdot A \sqrt{\frac{\lambda_1}{c_1 \cdot \rho_1} \cdot t} \cdot c_1 \cdot \theta + \rho_2 \cdot 1{,}73 \cdot A \sqrt{\frac{\lambda_2}{c_2 \cdot \rho_2} \cdot t} \cdot c_2 \cdot \theta = P \cdot v \cdot t$$

Simplifying the expression, we get:

$$1{,}73 \cdot A \cdot \theta \cdot \sqrt{t} \cdot \left(\rho_1 \cdot c_1 \sqrt{\frac{\lambda_1}{c_1 \cdot \rho_1}} + \rho_2 \cdot c_2 \sqrt{\frac{\lambda_2}{c_2 \cdot \rho_2}} \right) = P \cdot v \cdot t \quad (9)$$

where a – thermal diffusivity $a = \sqrt{\frac{\lambda}{c \cdot \rho}}$, m^2/s

From formula (9) for calculating the average temperature on the contact patch during honing we obtain:

$$\Delta\Theta = \frac{P \cdot v \cdot \sqrt{t}}{1.73 \cdot A \cdot \left(\cdot \sqrt{\lambda_1 \rho_1 \cdot c_1} + \sqrt{\lambda_2 \rho_2 \cdot c_2} \right)}, \quad (10)$$

where P – normal honing force, N;

v – resulting speed, m/s;

t – hone-wheel contact time, s;

A – area of the cut layer, m^2;

1 and 2 – density of the tool and workpiece material, kg/m^3;

c_1 and c_2 – specific heat capacity of the hone material and workpiece material, J/kg·C;

λ_1 and λ_2 – thermal conductivity of the hone and workpiece material, 1/deg.

The actual area of the contact spot of the tool and the wheel is determined by the formula obtained by Kalinin (A = 66.9 mm 2 at a grinding depth of 0.11 mm)

$$A_r = 0{,}11 \sqrt{r S_{pao\partial}} \left(\pi \sqrt{S_{pao\partial} D_{kp}} + 2 S_{np} \right),$$

where r-radius of the main circle of the gear; S_{rad} - radial feed; Sprod - longitudinal feed of the circle; D - diameter of the circle.

Thus, a formula for calculating the average temperature in the contact zone during honing without taking into account heat transfer to the environment is derived.

However, formula (10) does not allow calculating the temperature distribution during honing by depth from the contact surface, which is extremely necessary when calculating residual thermal stresses.

To model the temperature for this case, it is necessary to solve the Fourier heat conduction equations in partial derivatives.

$$\frac{\partial \Theta}{\partial t} = a \frac{\partial^2 \Theta}{\partial z} \tag{11}$$

With initial condition

$$\Theta = 0 \qquad \text{at t=0}$$

and boundary conditions

$$-\lambda \frac{\partial \Theta}{\partial z} = \frac{PVt}{A}$$

$$\Theta = 0 \qquad \text{at z} = \infty$$

Equation (11) was solved using the Laplace transform method.

$$\Theta(z,t) = \frac{(1-\alpha_T)PV}{\sqrt{\pi} A\lambda} \left\{ 2\sqrt{at}\ \exp(-\frac{z^2}{4at}) - Z\left[1 - \Phi(\frac{Z}{2\sqrt{at}})\right]\right\} \tag{12}$$

where $\alpha_T = \frac{\sqrt{\lambda_1 c_1 \rho_1}}{\sqrt{\lambda_1 c_1 \rho_1} + \sqrt{\lambda_2 c_2 \rho_2}}$ -coefficient of heat flow distribution between the hone and the wheel

At Z=0, the formula for calculating the contact temperature (12) takes the form

$$\Theta(z,t) = \frac{2(1-\alpha_T)PV\sqrt{at}}{\sqrt{\pi} A\lambda}$$

The temperature flash from a single grain at a constant honing power can be determined by the analytical dependence

$$\vartheta_{всп} = \frac{(1-\alpha_T)PV\pi^{0,5}d^2}{2A_r\lambda}$$

Where *d* -average grain diameter

$$d = \frac{2\sqrt{\pi h_{\max}}}{\nu}\left(\frac{P}{A_c bC\sigma_T}\right)$$

Where A_c-contour contact area; *v*,*b*-parameters of the curve of the supporting surface; σ_T -yield strength.

Temperature residual stresses

During honing, as a result of heating, compressive stresses arise, which after cooling turn into tensile stresses. Tensile residual stresses cause cracks in the treated surface layer of the metal. They negatively affect the operational characteristics of the gear wheel. Therefore, their calculated engineering assessment is a very important and necessary task.

$$\sigma = \alpha E \theta \tag{13}$$

Substituting (12) into (13) we finally obtain

$$\sigma = \alpha E \frac{(1-\alpha_T)PV}{\sqrt{\pi} A \lambda} \left\{ 2\sqrt{at}\ \exp(-\frac{z^2}{4at}) - z\left[1 - \Phi(\frac{z}{2\sqrt{at}})\right]\right\}$$

Where α-coefficient of linear expansion; E-modulus of elasticity

Thus, based on the energy balance and the solution of the differential equation of Fourier heat conductivity, thermophysical models for the analytical calculation of temperature are proposed, which can be used to assess the residual stresses arising during honing.

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基于人工智能技术的通用装配系统发展前景
PROSPECTS FOR THE DEVELOPMENT OF UNIVERSAL ASSEMBLY SYSTEMS BASED ON ARTIFICIAL INTELLIGENCE TECHNOLOGIES

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注释。本文讨论了在机械制造企业中创建智能系统（虚拟助手），以提高成品装配过程中的劳动生产率。提出了该系统的一种实现方案。

关键词：智能系统、机械工程、劳动生产率提高、人工智能技术。

Annotation. *The article discusses the creation of intelligent systems (virtual assistants) used in machine-building enterprises that increase labor productivity during the assembly of finished products. A variant of the implementation of this system is proposed.*

Keywords: *intelligent systems, mechanical engineering, labor productivity improvement, artificial intelligence technologies.*

One of the areas of development of artificial intelligence (hereinafter referred to as AI), with projected growth in the long term, is a virtual digital assistant. These include a "chatbot" and a "virtual assistant". Intelligent virtual assistants actually serve as an "assistant" for the client - simulating human interaction, performing a wide range of tasks [1], so these systems are most widely used in the areas of finance, advertising, education, tourism and other services.

A critical trend in the development of the Russian economy is the shortage of personnel in the production sector, including expert-level personnel, which is associated with the existing structure of the economy.

Ambitious tasks for increasing labor productivity, including using AI technologies, have been outlined by Russian President V.V. Putin: "You yourself talk about this all the time - and with the use of robotics, artificial intelligence and all other achievements that exist in our country and in the world. We need to take the

best from everywhere and increase labor productivity on this basis. This is the key task for us in the near future" [2].

The specialists of the Studio of Intellectual Technologies LLC conducted an analysis of existing technologies used in mechanical engineering enterprises to increase labor productivity during the assembly of finished products. This analysis is provided below.

A system for visualizing an object for vehicles is known, for example, for assembling an aircraft (A) [3], Fig. 1, which contains production equipment for producing an A, a control system, and a device for controlling objects in the control system. The device for controlling objects contains a device for displaying selectable sections for assembling an A. For producing an A, the A model of the A is identified, the A sections are displayed in a graphical user interface on the display device, and the A assembly is controlled based on the displayed sections corresponding to the A parts. This reduces the time for assembling the A and reduces the time for training operators.

Disadvantage object visualization systems for vehicles, such as for aircraft assembly is the limited conditions of application.

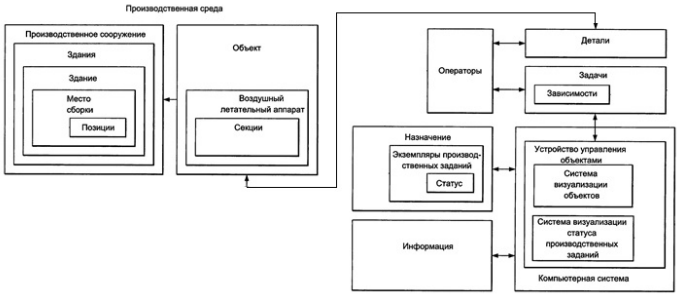


Figure 1. *Object visualization system for vehicles, such as for aircraft assembly*

A method and apparatus for assembling a complex product in a parallel product preparation system are known [4], Fig. 2, which feed a set of subcomponents and at least one base component into a part loading area for assembling said complex product. The set of subcomponents and at least one base component are automatically transported into one of the computerized assembly cells using a transport system. The set of subcomponents and the base component are automatically assembled into a complex product using a computerized assembly cell. The computerized assembly cell has at least one tool changer arm with a position set by a robot, which performs a plurality of assembly operations for assembling said set of subcomponents on said base component, in which each assembly operation

is performed using a corresponding tool selected from a plurality of tools. The complex product is automatically transported to an unloading station using the transport system.

The disadvantages of this method and apparatus are limited application, high cost and complexity of implementation of this method.

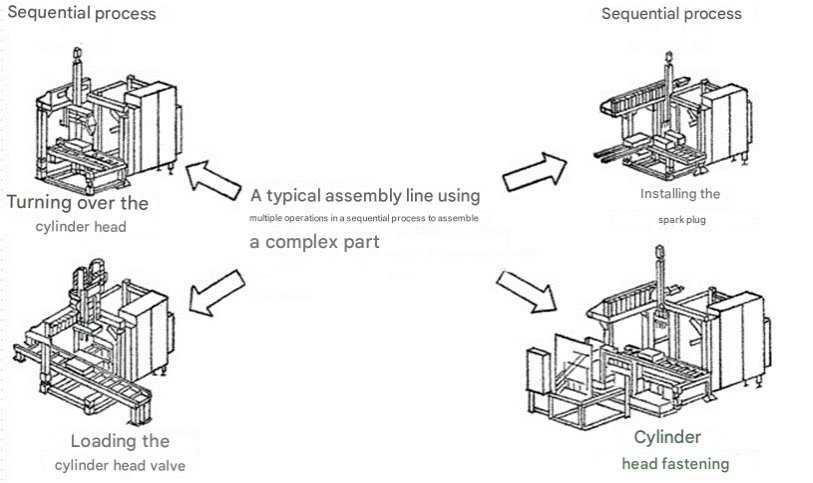


Figure 2. *Method and equipment for assembling a complex product in a parallel product preparation system*

A computer-implemented system for modeling and developing design documentation is known [5], which contains a subsystem of unified transformers of parts - transformer models, which are parametrically variable templates and ensure the development of design documentation of parts, a subsystem of analogs - transformer analogs, variable both in configuration and in size and parametrically, ensuring the creation of an electronic library of transformer analogs, a subsystem of typical and unified assemblies - models - transformer assemblies, centrally and parametrically variable templates consisting of interconnected assembly models and transformer parts, their drawings and specifications and allowing contextually from the assembly to carry out related changes in its entire structure, while the system ensures the storage and use of a group of templates-drawings of parts for transformer models and provides a certain structure of designations of parts and assemblies, as well as a certain structure of file names.

The disadvantages of this method are the need for highly qualified users of the system.

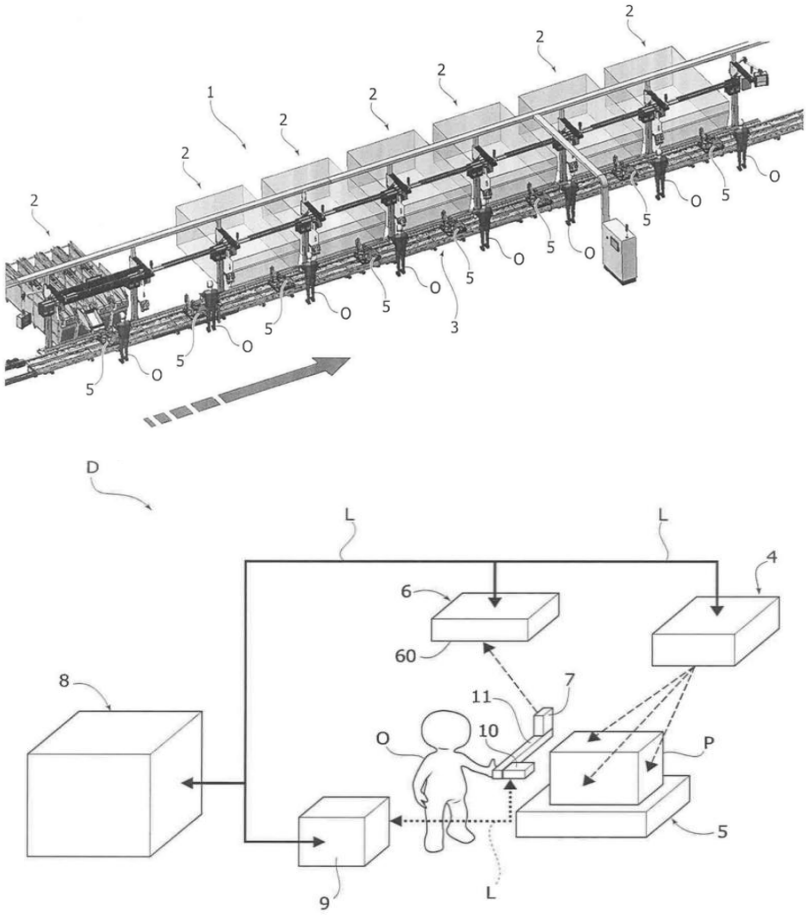
A programmable device is known [6], Fig. 3, placed in a production environment to assist an operator, used as an auxiliary means for performing manual assembly operations performed by means of an assembly tool on parts. The device comprises an input device designed to be used by an operator, a lighting device with a light source for illuminating a work area intended for the operator to work, a sensor for determining the spatial coordinates of the assembly tool, and an electronic control system which is designed to store a training sequence of manual assembly operations and to record the position of the assembly tool during the execution of the operations. In this case, the lighting device is designed to project onto said work area with the spatial coordinates of said assembly tool, determined by said sensor, a graphic instruction for manual assembly operations. The group of inventions also concerns a method for performing assembly operations using this auxiliary device.

The disadvantages of the method are the high cost of the proposed device and the limited conditions of use.

A method for assembling equipment using unique two-dimensional barcodes and a system for implementing it have been developed [7], Figure 4, which is implemented by applying a generated unique two-dimensional barcode to each assembly unit of equipment; during the assembly of equipment in accordance with the selected equipment layout, using the user's mobile device, the unique two-dimensional barcode applied to each assembly unit of equipment is scanned sequentially in accordance with the stored sequence of unique two-dimensional barcodes, wherein the scanned unique two-dimensional barcode is transmitted to the server, the technical documentation of each assembly unit is automatically displayed when scanning the unique two-dimensional barcode, and the next part is automatically displayed for scanning in accordance with the selected layout; using the server, the sequence of assembly of equipment of the corresponding layout is automatically tracked in accordance with the stored sequence of unique two-dimensional barcodes and in accordance with the technical documentation of each assembly unit displayed on the user's mobile device.

The disadvantages of this method are the need to mark parts with special codes, which requires additional costs and the reliability of their reflection on the assembly unit.

The analysis of existing methods and universal assembly systems made it possible to formulate a task for a promising assembly system implemented using artificial intelligence technologies, namely - unification, optimization and acceleration of the quality of assembly or repair of equipment, automated control over the quality of parts and compliance with assembly regulations, reducing the requirements for the qualifications of assemblers and instilling professional skills, increasing the level of industrial safety.



1 – Assembly line; 2 – Assembly station; 3 – Chain conveyor; 4 – Lighting device; 5 – Pallet; 6 – Sensor; 7 – Study unit; 8 – Electronic control system; 9 – Control unit; 10 – Button; 11 – Assembly tool; O – Operator; P – Part; L – Communication lines

Figure 3. *Programmable device placed in the production environment to assist the operator*

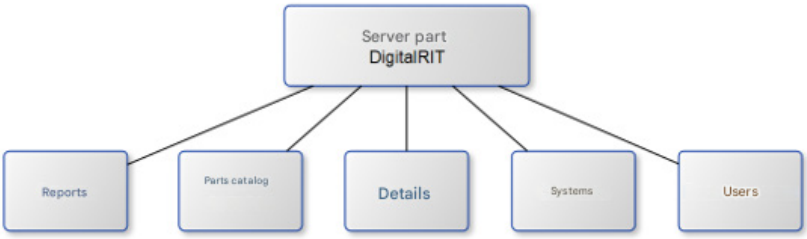
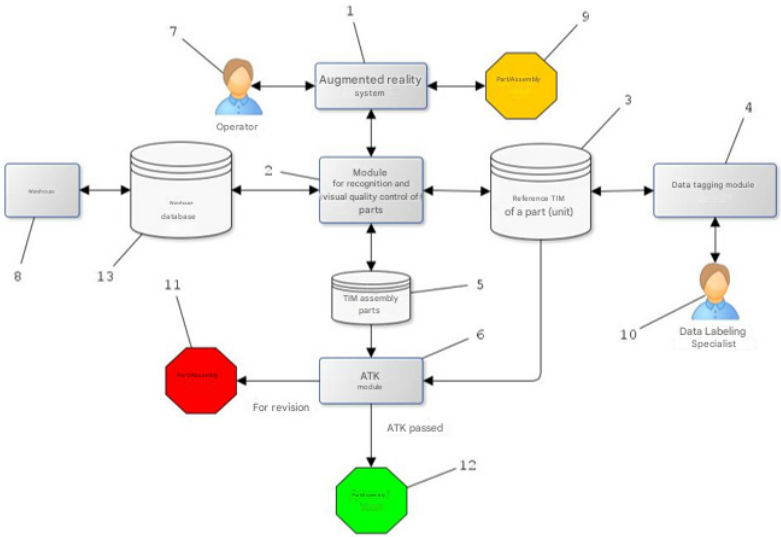


Figure 4. *Method and system for assembling equipment using unique two-dimensional barcodes*

The concept of this system is shown in Figure 5.



1 - augmented reality system, 2 - module for recognition and visual quality control of the part, 3 - reference three-dimensional information model (hereinafter referred to as TIM) of the part (unit), 4 - data marking module, 5 - TIM of the part assembly, 6 - automated process control module (hereinafter referred to as APC), 7 - operator, 8 - warehouse, 9 - part, 10 - data marking specialist, 11 - part sent for revision, 12 - part that has passed APC, 13 - warehouse database

Figure 5. *Universal automated assembly system*

The universal automated assembly system is a hardware and software complex that includes an augmented reality system 1, a module for recognizing and visually controlling the quality of a part 2, a reference three-dimensional information model (RTM) of a part (unit) 3, a data marking module 4, a RTM of the assembly of a part (unit, product) 5, an automated process control module (APC) 6, which creates an augmented reality environment with which the operator 7 interacts.

Based on the reference TIM 3, recognition and display of assembly parts, part (unit) assembly algorithms occur in real time, after which, under the control of the system, operator 7 performs assembly operations with parts 9, while the TIM of the assembly of part 5 is formed, if incorrect actions of the operator are detected, a warning is issued, and at the same time, operator 7 is trained.

The reference TIM 3 is formed with the help of the data marking module 4 using neural networks, machine learning and other technologies by a data marking specialist 10, based on drawings, existing TIM, etc.

At the stage of assembly of parts by the operator, the recognition and visual control module 2 carries out automatic technological quality control of parts 9 upon detection of defects and/or incorrect assembly, and issues a warning.

The TIM 5 part formed after assembly is compared by the ATC 6 module with the reference TIM 3 and if any discrepancies are detected, the part is sent for revision 11, and if the ATC passes, the part 12 is sent to the further technological process.

The module for recognizing and visually controlling the quality of part 2 is connected to the database of storage warehouse 13, which allows providing operator 7 with data on the availability, quantity and location of a part or unit in warehouse 8.

In conclusion, it should be noted that:

1. The implementation of artificial intelligence technologies in real production processes is local and unsystematic, as evidenced by the large number of certificates for computer programs based on AI, although they have not received widespread distribution.

2. The described trend occurs due to the lack of communication between process engineers, who must formulate requirements for systems as “owners” of production processes, while the initiative to create these systems comes from IT specialists.

3. The team of authors, trying to level out the described shortcomings, attempted to systematically approach the implementation of AI technologies in real production by proposing their own methodology for implementation and expansion of the scope of application of the assembly system, which is achieved by creating an augmented reality assembly environment in which the actions of operators and the quality of parts are monitored in real time, creating a TIM model of the assem-

bled unit, interaction of the system with physical warehouses and the possibility of using the system for training operators.

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家禽养殖场的替代通风系统
ALTERNATIVE VENTILATION SYSTEM FOR POULTRY FARMS

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注释。本文对家禽养殖场使用的通风系统进行了分类。考虑了这些系统的优缺点。分析了家禽饲养室微气候的规范参数。阐明了家禽在户外维护期间释放的主要危害。提出了一种利用家禽热流来准备送风的通风系统替代集成方案。确定了开发适合家禽综合体运行条件的热回收器的必要性。

关键词：通风系统、家禽综合体、散热、热回收器、微气候。

Annotation. *The article provides a classification of ventilation systems used in poultry farms. The advantages and disadvantages of these systems are considered. The normative parameters of the microclimate in the poultry keeping rooms are being analyzed. The main hazards released by poultry during outdoor maintenance are clarified. An alternative integrated scheme of a ventilation system using heat flows from poultry to prepare the supply air is proposed. The necessity of developing a heat recuperator adapted to the operating conditions at the poultry complex has been determined.*

Keywords: *ventilation system, poultry complex, heat dissipation, heat recuperator, microclimate.*

Modernization of existing microclimate management systems is an urgent task that makes it possible to increase the efficiency of the systems used in air treatment through the use of modern technologies and materials, new approaches and methods of heat recovery of exhaust air.

The classification of ventilation of poultry buildings by type of motivation is divided into natural and mechanical. The methods of organizing the supply of unsaturated impurities and the removal of polluted air from the room are divided into

supply, exhaust and supply-exhaust. The most commonly used systems used in livestock buildings are ventilation systems with mechanical, natural and artificial motivation, as well as mixed or combined.

The method of natural ventilation of air exchange is carried out through the pores of building materials, as well as various openings or openings that have formed as a result of the applicable construction technology, artificial channels are used instead of mechanical stimuli. With natural ventilation, the driving force of the air is the pressure difference between the indoor and outdoor air created by the force of the wind combined with the temperature difference between the outdoor and indoor air, which is expressed in the difference in air density.

According to these results and the technology of the described method, natural ventilation is not able to provide the necessary air exchange during certain periods of the year and cannot be regulated.

1. Shaft ventilation scheme, one of the ways to organize natural air exchange in poultry buildings. The air supply is carried out through openings in the walls, either window-sill or window-sill, and the air supply can also be carried out when the windows are opened. The exhaust is carried out by means of a roof shaft.

Practical experience shows that in the climatic zone of our country, one exhaust shaft with a cross-section of 1-2 m2 and a height of at least 5 m, or several shafts with a smaller cross-section, is sufficient for ventilation of livestock and poultry single-span buildings (see Fig. 1, a). The installation of ventilation shafts is especially convenient in buildings with an attic floor. The air extraction through the shaft is regulated using a throttle valve [1].

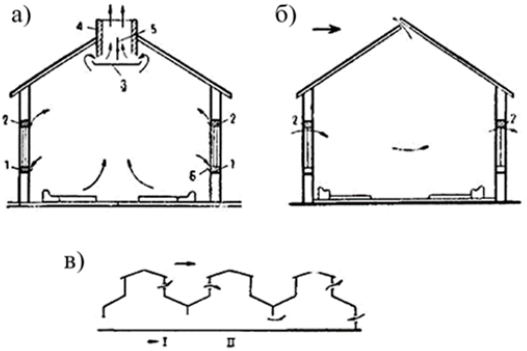

Figure 1. *Diagrams of the natural ventilation system.*
a - shaft (single-tube); b - horizontal; c - aeration of a multi-span building; 1 - sill intake opening: 2 - above-window intake opening; 3 - pallet; 4 - insulated shaft; 5 - throttle valve; 6 - control guide valve.

2. The second natural scheme of organization of air exchange, horizontal or tubeless ventilation scheme (Fig.1, b) allows for indoor air exchange using wind energy. The horizontal scheme is considered less effective than the pipe scheme. Above the windows, supply slit-like openings are arranged, which are filled with local porous material. Extraction is achieved by installing special ventilation slots along the ridge of the coating, choosing the correct width of the building and the orientation of the building on the ground, taking into account the prevailing direction of the winds. Ventilation slots on the ridge are widely used in the foreign practice of building livestock lightweight non-insulated buildings.

3. The last known method of organizing air exchange is aeration. The aeration scheme is based on the air circulation caused by the heat released by animals, the effect of wind pressure on the building, as well as the possibility of its regulation (Fig. 1, c). During the aeration of multi-span buildings, technological equipment with animals is placed in a certain way, and ventilation openings (transoms) are provided in the walls and lanterns. The air enters the middle aisles only through aeration lights.

An extreme disadvantage of aeration is the possibility of contamination of the supply air of subsequent buildings with the harmful substances removed from the previous premises. Therefore, it is recommended to organize gaps between the lanterns 2-3 times the height of the lanterns, but even if the recommendations are followed, the absence of admixture of the influx of harmful substances is not guaranteed.

More often, ventilation systems with mechanical traction are used in buildings of agricultural production complexes (Fig.2).

In a mechanical ventilation supply system, the outside air is forced into the upper part of the room, and the inside air is removed under air pressure through ventilation openings located in the lower part of the wall or through ventilation ducts installed in the upper part of the manure ducts. This system is good because the supply air can be heated or cooled, cleaned of dust, and humidified.

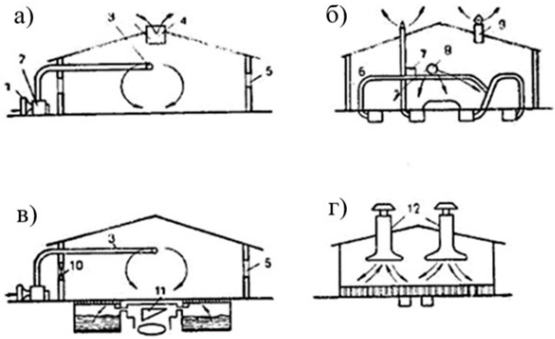

Figure 2. *Diagrams of the forced ventilation system.*
a - intake; b - supply and exhaust with a hood over underground manure removal channels; c - supply and exhaust with a hood over a slurry collector; d - supply and exhaust with a PVU or PVUR type installation.

The poultry houses use air-heated supply and exhaust air units “Climate” and evaporative cooling air conditioners, as well as installations such as HVAC and PVUR. Emergency natural ventilation is provided [7].

When organizing air exchange in poultry farms in our country, four schemes of forced ventilation are used (Fig.3).

The transverse ventilation scheme (see Fig. 3, b) is an option with minimal equipment costs. With this scheme, the outside air enters through the supply wall vents located on one longitudinal side of the housing, and is removed by exhaust fans installed on the opposite side of the housing in relation to the supply valves. This ventilation system is capable of providing a wide range of supply air volumes.

The longitudinal ventilation scheme (see Fig. 3, d) provides for the arrangement of supply air vents on both longitudinal sides of the housing, and exhaust fans are installed in one of the end walls of the housing. Such a ventilation system is designed due to good ventilation and air flow distribution in the room and is suitable for regions with a mild climate and low temperature fluctuations throughout all seasons of the year.

Roof ventilation (see Fig. 3, a) is a device in the roof of roof shaft housings with exhaust fans. The supply wall valves are evenly distributed along the longitudinal sides of the housing, which makes it possible to organize the air supply from top to top. This method of organizing air exchange is suitable for regions with a cold climate, it allows you to control small volumes of supplied air.

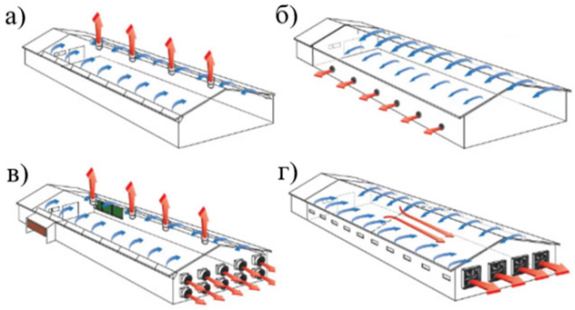

Figure 3. *Diagrams of the forced ventilation system.*
a - roof ventilation scheme; b - transverse ventilation scheme; c - combined ventilation scheme; d - longitudinal ventilation scheme.

In the tunnel scheme (Fig. 4) of the organization of air exchange, exhaust fans are located in one of the ends of the housing, and the air supply is carried out through the intake shutters located as close as possible to the opposite end of the housing. The operation of such a system is due to the high air flow rates in the room, which makes it possible to effectively remove heat flows inside the enclosure and has a cooling effect on the bird. The use of this system is more suitable for regions with warm and hot climates.

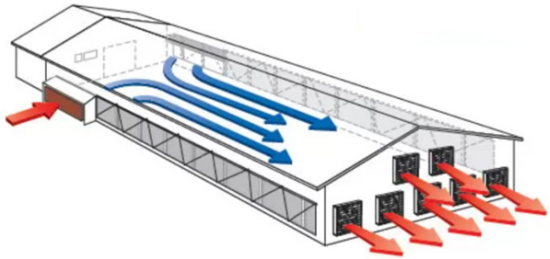

Figure 4. *Tunnel ventilation scheme of the poultry building.*

There is also a combination tunnel scheme (see Fig. 3, c), which, depending on the requirements for indoor microclimate, uses a combination of several of the above schemes, therefore, may have advantages or disadvantages of a particular system.

Indoor air contains varying amounts of ammonia, hydrogen sulfide, cloach gases and other toxic products of putrefaction and fermentation of organic substances (indole, skatole, etc.).

The deterioration of the gaseous composition of indoor air is also influenced by the animals themselves, releasing a significant amount of carbon dioxide from 1.44 to 1.54 l/h and water vapor from 3.75 to 4.5 g/h during respiration. High concentrations of harmful gases such as ammonia, hydrogen sulfide, and carbon dioxide are an adverse stress for animals.

The main harm released by the bird is heat. When kept outdoors, chickens of meat breeds weighing from 2.9 to 3.2 kg emit approximately 32.65 kJ per 1 hour.

At the same time, the ambient temperature has the greatest effect on animals, as it directly affects the thermal state of the body, thereby changing the course of vital processes [3].

The optimal parameters for keeping poultry indoors are given in Table 1.

Table 1

Optimal microclimate parameters for birds of different age groups

Indicators	**An adult bird**	**Young animals, age in days**		
		1-30	**30-90**	**90-160**
Temperature, °C	12-16* 16-18	28-18 33-20	18-16 18	12-16 16
Relative humidity, %	60-70	60-70	60-70	60-70
Air exchange, m3/h per 1 kg of weight: winter, spring-autumn, summer	1,6 3,0 5,9	9,8 12,0 16,0	5,5 8,0 10,0	0,75-1,0 - 5-6
Air velocity, m/s winter, spring-autumn, summer	0,2 0,4 0,6	0,1 0,3 0,5	0,1 0,3 0,5	0,1 0,3 0,5
Bacterial contamination, thousand microns. bodies per 1 m3 of air	220	150	200	220
Content of harmful gases: carbon dioxide, %; ammonia, mg/m3; hydrogen sulfide, mg/m3	0,2-0,25 10,0 5,0	0,15 10,0 5,0	0,2 10,0 5,0	0,2 10,0 5,0

There are four main problems with the operation of ventilation systems in poultry farms:

1. significant heat outflow. About 2/3 of the total volume of heated air is released from poultry houses into the atmosphere with other hazards, which leads to the need to use productive heating equipment with a ventilation system.;

2. The speed of indoor air flow directly depends on the direction and speed of the wind outside, which does not allow for the required indoor air mobility according to poultry keeping technology;

3. the inability to adjust the volume of supply air when using a natural ventilation system, which disrupts the air exchange inside the poultry house.;

4. uneven air distribution in the room, as a result, "dead" zones are formed in which ventilation is either insufficient or completely absent.

To solve the identified problems in the ventilation systems of poultry enterprises, we have developed a patent for invention No. 2799158 "Ventilation system for livestock premises" [5]. The description of the device is shown in (Fig. 5).

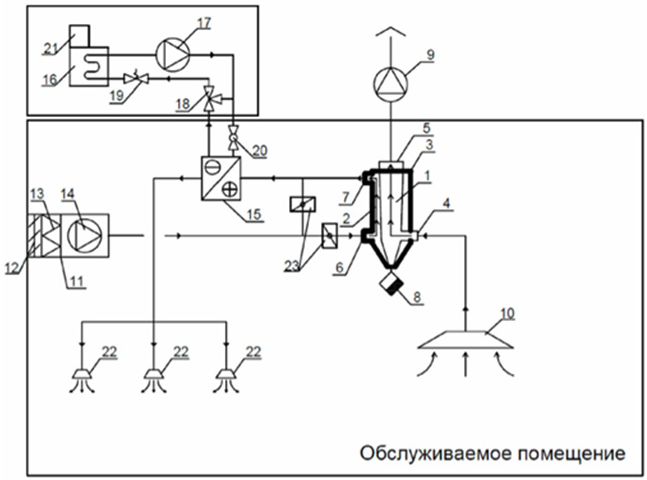

Figure 5. *Diagram to the patent "Ventilation system for livestock premises": 1. exhaust duct; 2. supply duct; 3. pipe-in-pipe heat exchanger; 4, 5. tangential inlet and outlet exhaust pipes; 6, 7. inlet and outlet pipes; 8. condensate drain; 9. exhaust fan; 10. exhaust umbrella; 11. intake device; 12. Supply air valve; 13. Filter; 14. Supply air fan; 15-21. heat pump; 22. air distributors; 23. shut-off valves.*

In our proposed solution, a key role is played by a heat exchanger (heat recuperator), which is designed to heat the supply air using the thermal energy of the exhaust air in winter and before cooling the supply air in summer. In addition, the proposed ventilation system is mechanically driven supply and exhaust,

which makes it possible to regulate the volume of supply and exhaust air [4]. Air distributors also allow you to adjust the speed of the air supplied to the room, in accordance with the technological requirements of poultry keeping. With the correct location of the air distributors in the room, the problem of "stagnant" zones is solved and air is supplied to all areas of the housing evenly. As for the aggressive environment in the room (excess ammonia and hydrogen sulfide) in relation to metal structures, it is advisable to use air ducts and switchgear made of polymer materials. The design of the heat exchanger device should also be made of corrosion-resistant materials, and the surface should be painted with a protective layer [6].

Thus, our proposed alternative ventilation system for livestock facilities will solve the current problems of operating poultry complexes. Namely, to improve the design of the heat exchanger, taking into account the gas composition of the removed air and large heat inflows from poultry. The heat exchanger plays a crucial role in solving the problem of energy saving, as it converts heat from the removed hazards into useful work during the preparation of the supply air. To develop the recuperator design, it is required to conduct computer modeling of heat and mass transfer processes [2], to identify the influence of hydrodynamic processes on the intensity of heat transfer. In addition, it is important to determine the rational overall dimensions and technical characteristics of the equipment and elements of the proposed system using three-dimensional modeling programs.

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静止矢量结构的量子性质
QUANTUM NATURE OF STATIONARY VECTOR STRUCTURES

Apartsev Oleg Rolenovich

摘要。本文对一维和二维矢量问题的分析结果使我们能够指出，简化为矢量描述的场会为与这些场相互作用的物体产生量子现象。在这种情况下，任何物体的量子现象都是场相互作用的矢量机制的表现，这些机制作为物体的附加外部属性而出现。

关键词：矢量结构、散点表示、量子现象、矢量场、矢量三角。

Abstract. *The results of the analysis of one-dimensional and two-dimensional vector problems obtained in this paper allow us to state that fields reduced to vector descriptions generate quantum phenomena for objects interacting with these fields. In this case, the quantum phenomenon of any objects is a manifestation of vector mechanisms of field interaction that arise as additional external attributes of objects.*

Keyword: *vector structures, stigmatic representation, quantum phenomenon, vector fields, vector triangle.*

1. Introduction

This article continues the study of attributes of vector structures that was started in previous works [1,2,3,4].

The main focus of the research is the vector equation:

$$\overline{\boldsymbol{a}} + \overline{\boldsymbol{b}} + \overline{\boldsymbol{c}} = \mathbf{0}, \qquad \textbf{(1)}$$

being transformed into a system of algebraic equations **(2),** the latter acquired the name “stigmatic representation of an arbitrary vector triangle”. Currently, the expressions **(1)** and **(2)** are completely identical to each other .

$$\begin{cases} [r_a][cos\alpha]P_a + [r_b][cos\beta]P_b + [r_c][cos\,\gamma] = 0, \\ [r_a][sin\,\alpha] + [r_b][sin\,\beta] = 0. \end{cases} \qquad \textbf{(2)}$$

Variables: $\mathbf{P_a} = \mathbf{a}\,|\cos\alpha|$, $P_b = b\,|cos\,\beta|$ – these are projections of the amplitudes of vectors $\overline{\boldsymbol{a}}$ и $\overline{\boldsymbol{b}}$ on the vector $\overline{\boldsymbol{c}}$, where $\mathbf{a}, \boldsymbol{b} \in \boldsymbol{Re}$.

Variables in square brackets: $[r_a], [r_b], [r_c] \in \{+i, 0, -i\}$ – “rotational” sign variables [3,4], showing the direction of vectors $\overline{\boldsymbol{a}}, \overline{\boldsymbol{b}}, \overline{\boldsymbol{c}}$ relative to any internal point of the vector triangle, according to the rule of the “right screw” in the direction of viewing the plane of the triangle by a certain Virtual

An External Observer. In the matrix view of the algebraic representation of a vector equation, the "rotational" sign variables are components of the "rota \ - vector" (from Lat. "rota" - wheel) [3,4]:

$$\bar{r} = \bar{r}(r_a, r_b, r_c) \in \{\pm i; \pm i; \pm i\}. \quad (3)$$

Other signed variables: $[cos\alpha], [cos\beta], [sin\ \alpha], [sin\ \beta] \in \{+i, 0, -i\}$ – called "foreshortened", they acquire the sign " – " or"+", in accordance with the sign of the trigonometric function of the angle of the corresponding vector relative to the direction of the vector $\bar{c}$, according to : $\bar{a} \leftrightarrow \alpha$; $\bar{b} \leftrightarrow \beta$.

A special interpretation is given to the variable $[cos\ \gamma] \in \{+i, 0, -i\}$, the value of which is set by the "right screw" rule of the rotational direction specified by the vector $\bar{c}$, relative to the projection point from the location of the External Observer on the plane of the vector triangle in the direction: from the Observer to the plane.

In [3,4], the consideration of the stigmatic representation of a vector triangle ends with the definition of the stationary state of the expression **(2),** in which none of the signed variables acquire the value **«0»**. Stationarity also implies that it is impossible to establish the value **«0»** for any sum of two terms of the first equation of the system **(2).** These conditions specify a nontrivial solution and unambiguity of all variables of the system, which is understood as stationarity.

The use of complex expressions for signed variables is not absolutely necessary, and serves only to distinguish them from real variables, which include the amplitudes of vectors and modules of trigonometric functions. For signed variables, one could use a set of numbers $\{+1, 0, -1\}$, not a complex set $\{+i, 0, -i\}$. But complex numbers are more convenient because they differ from real numbers by symbols , and they also "annihilate" in operations with similar signed variables when they are substituted into the system of equations **(2).** This is similar to the reduction of dimensions in physical formulas.

2. Isometry of the simplest triangulate

For the sake of brevity, "triangulates" are any objects consisting of connected triangles in spaces of arbitrary dimension. Connected triangles are defined as a set of triangles in which any triangle has one or more sides in common with other triangles of the same set. A single triangle\will be considered an elementary or simplest triangulate.

Consider the triangulate formed by the vectors $\bar{a}, \bar{b}, \bar{c}$. Considering the amplitudes and angular coordinates of vectors unchanged, but changing the direction options of vectors **(1),**

We can get versions of all possible isometric configurations of vector triangles, **Fig.1.**

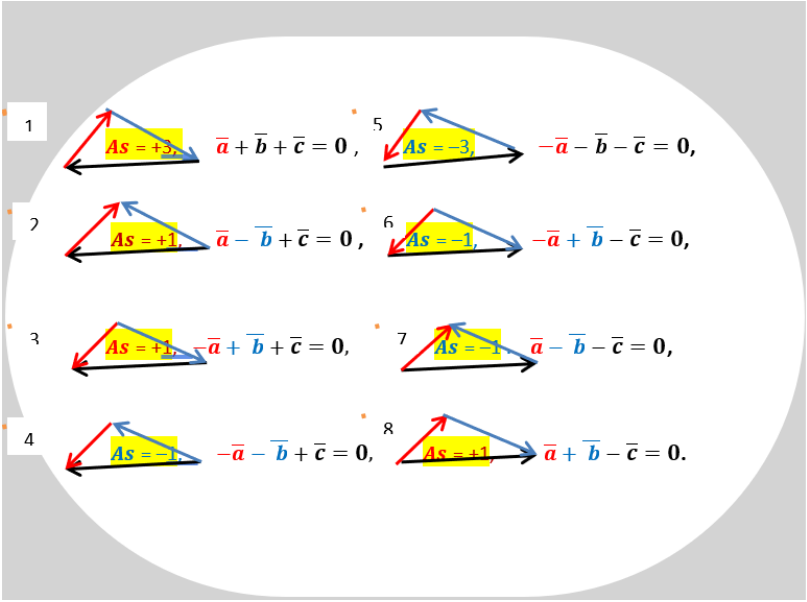

Figure 1.

Obviously, there are only **16** possible configurations. **Fig.1** shows only **8 pieces**, but you need to add **8 more pieces** to them , which are provided by the mirror position of the Virtual External Observer relative to the plane of the vector triangle, that is, they are determined by changing the sign of the variable (16 * 3) = 48 pieces.

3. Stationary solutions of the stigmatic triangle representation

Let us approach the question of the number of isometric configurations of triangles from the other side, based on the solution of the system of equations **(2).**

Note that the second equation of the system does not contain any real variables at all, operatingonly with the signed components of the rota - vector $\boldsymbol{r_a, r_b}$ based on the sign multipliers of the functions $\boldsymbol{sin\,\alpha}$ и $\boldsymbol{sin\,\beta}$, leaving only the following possible options **8** solutions**, Table 1**:

Table 1

$[r_a]$	$[r_b]$	$[sin\ \alpha]$	$[sin\ \beta]$
–1	–1	–1	+1
–1	–1	+1	–1
–1	+1	–1	–1
–1	+1	+1	+1
+1	–1	–1	–1
+1	–1	+1	+1
+1	+1	–1	+1
+1	+1	+1	–1

Relatively of the first equation it is obvious that when:

$$[r_a][cos\alpha] = [r_b][cos\beta] = +1,$$

$$[+1]|P_a| + [+1]|P_b| + [r_c] = 0,$$

Taking into account **(14)**: $P_a + P_b = 1.$

$$[+1] + [r_c] = 0,$$

$$[r_c] = -1.$$

Table 2

$[r_c]$	$[r_a]$	$[r_b]$	$[cos\ \alpha]$	$[cos\ \beta]$
–1	–1	–1	–1	–1
–1	–1	–1	+1	+1
–1	+1	+1	–1	–1
–1	+1	+1	+1	+1

Similarly, if: $[r_a][cos\alpha] = [r_b][cos\beta] = -1,$

$$[r_c] = +1.$$

Таблица 3

$[r_c]$	$[r_a]$	$[r_b]$	$[cos\ \alpha]$	$[cos\ \beta]$
+1	–1	–1	+1	+1
+1	–1	+1	+1	–1
+1	+1	–1	–1	+1
+1	+1	+1	–1	–1

Connecting all the solutions in one table, selecting from **Table 1...3** lines in which both equations of the system are fulfilled, the result is the following:

Table 4

№	$[r_c]$	$[r_a]$	$[r_b]$	$[cos\ \alpha]$	$[cos\ \beta]$	$[sin\ \alpha]$	$[sin\ \beta]$
5	–1	–1	–1	–1	–1	–1	+1
6	–1	–1	+1	–1	+1	–1	–1
7	–1	+1	–1	+1	–1	–1	+1
8	–1	+1	+1	+1	+1	+1	–1
4	+1	–1	–1	+1	+1	+1	–1
3	+1	–1	+1	+1	–1	+1	+1
2	+1	+1	–1	–1	+1	–1	–1
1	+1	+1	+1	–1	–1	–1	+1

As a result of solving the system **(2), Table 4** reproduces the complete list of triangles shown in **Fig.1**, the number of which must be doubled, due to two possible positions of the Observer: behind and in front of the plane of the vector triangle (see. Section.1 relatively $[cos\ \gamma]$).

Thus, we prove the complete identity of the graphical solutions of the equation **(1)** from the diagram in **Fig. 1** and algebraic solutions of the system **(2).**

A big achievement of the stigmatic representation, intended for displaying triangular vector objects in their own local coordinates on flat, spherical, or curved surfaces, is the understanding that a stationary solution is a collection of two real variables that are formed from four real variables, with the participation of eight signed ones, which are binary (bitwise) variables, which are the same as the initial value of the under constraints imposed by the system of equations **(2)** , give $\mathbf{2^5 = 16}$ variants of isomeric triangles.

A vector triangle described by such a set of coordinates can be bound to any global coordinates on the plane by setting the angle **γ** between the eigenvector of polarization of the triangle $\overline{\boldsymbol{c}}$ and the global polarization vector $\overline{\boldsymbol{e}}$ acting in the plane of the triangle's location, as well as using the multiplication coefficient **k** of the unit polarization vector, to set the amplitude of the vector $\overline{\boldsymbol{c}}$.

But perhaps the most important result of the stigmatized representation of vector objects is that it offers a mathematical model of quantum phenomena. Exactly:

An explanation is found for the existence of several positions for homogeneous abstract objects at a single point in the two-dimensional vector space. This corresponds to finding quantum states for physical objects at a certain point in real space, described in geometric, mechanical, or any other physical coordinates. That is, where an abstract description of the relationship between objects and fields can be represented by vector models.

4. Attributes of a single vector

Above are the results of studying the attributes of two-dimensional vector objects, but to understand the generality, it is necessary to mention the one-dimensional cases of vector objects.

Let's use the system of equations for this purpose **(2)**, having reduced the dimension of the compensated vector object described in it, for which we set the angle $\alpha = 0$, or $\cos\alpha = 1$, by doing so, we recognize that: $P_b = 0$, a $P_a = a\,|\cos\alpha| = c = 1$.

All terms of the second equation will turn into"0".

It should be noted that in this case, the compensation of the vector object that originally existed in the vector triangle does not disappear anywhere, it continues to be carried out only by two vectors: $\bar{a}$ и $\bar{c}$.

In this case, the system of equations **(2)**, in view of the initial certainty of the variables $[r_a]$ и $[\cos\alpha]$, will appear as the equation:

$$[r_a][\cos\alpha] + [r_c][\cos\gamma] = 0. \gg 1 + [r_c][\cos\gamma] = 0. \quad (4)$$

Thus, a single vector at a point on a certain line is defined by three local coordinates: the amplitude and two sign variab'es, previously called "stigmatic attributes", which form two opposite solutions:

$$\bar{c} = ([e]; [\cos\gamma]; 1),$$
$$c = [e]\,[\cos\gamma] \in (\pm 1), \quad (5)$$

where $[e], [\cos\gamma] \in \{+i, 0, -i\}$.

Therefore, starting from one-dimensional spaces, vector objects generate binary (quantum) structures in the physical sense, and bit structures in the mathematical sense..

8. The paradox of vector theory

All that has been described in this paper is just a statement of the fact that the attributes detected by "stigmatic vector algebra", and therefore properties based on trigonometric mathematics in three-dimensional space, cannot be proper properties of objects that are targeted by vector effects.

It follows inductively that physical objects are not themselves carriers of quantum properties. That is quantum properties are additional attributes of objects formed by the surrounding conditions.

In this paradigm, all quantum mechanics appears as a "shell" of the material world of particles, manifesting itself in the form of a kind of "clothing" for everything that exists, which is realized with the help of some, as yet unknown, material field substance.

But, of course, we are not talking about the indifference of the particle under the field action. A particle is both an object of perception of external influence, and an element that organizes the field effect on other objects.

8. Conclusions

1. The concept of studying the attributes of vector structures considered in this paper, which relies exclusively on mathematical methods, suggests a wide range of possible applications as a tool for scientific analysis for natural objects reduced to a vector description.

2. It is demonstrated that a mathematical object, a vector triangle in three-dimensional continuous space, generates a proper space of 16 quantum states for isomeric vector triangles. A single vector, like an object in a one-dimensional space, also generates a space of 2 quantum isomeric states. These properties of vector structures mean that the generation of quantum states is conditional for any objects that depend on continuous spaces (fields), regardless of the nature of these fields.
3. The main conclusion of this paper, which is based on the analysis of vector structures, is that the objects interacting with the vector field do not have quantum properties directly. Quantum properties are a manifestation of a field represented in vector form, both in a mathematical model and in the case of any physical field.

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数量遗传学在森林木本植物育种中的一些应用
SOME APPLICATIONS OF QUANTITATIVE GENETICS IN THE BREEDING OF FOREST WOODY PLANTS

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摘要。介绍了群体遗传评估中使用的主要统计参数，包括群体平均值、方差、标准差、变异系数（变异性）。给出了表型和基因型变异的主要成分。确定了一般和特定组合能力的内容。确定了在育种计划中使用特定组合能力的主要方向和困难。

关键词：群体遗传评估，群体平均值，方差，标准差，变异系数（变异性），表型和基因型变异，一般和特定组合能力。

Abstract. *The main statistical parameters used in the genetic assessment of populations are presented, including average value of population, variance, standard deviation, coefficient of variation (variability). The main components of phenotypic and genotypic variability are given. The content of general and specific combination abilities is determined. The main directions and difficulties of using a specific combination ability in breeding programs are determined.*

Keywords: *genetic assessment of populations, average value of population, variance, standard deviation, coefficient of variation (variability), phenotypic and genotypic variability, general and specific combining abilities.*

Main statistical indicators of populations. Each population can be described in several ways. The terms used to describe a population are called parameters. Usually the populations being studied are too large to measure all the individuals that make up the population. Therefore, to obtain an estimate of a parameter, sample data, or sample measurements of individuals from the population, are used. If chosen correctly, the resulting sample estimates coincide with the estimates of the population parameters. The most general and useful parameter used to describe a population is the population mean, or the average of the individuals that make up the population. Symbolically, the population mean is expressed as:

$$\bar{X} = \frac{\Sigma x_i}{n}, \quad (1)$$

where $\bar{X}$ – population mean,
x_i – individual observations,
n – number of observations.

That is, the population mean is the sum of individual observations divided by the number of observations. The mean can be calculated for any characteristic for which measurements are made or scores are obtained.

Although the mean is the most common and useful statistic, it says nothing about the variability that exists in the population for which the mean is calculated. The range and nature of the variability, or distribution, are vital to assessing and using information about the population.

Many of the quantitative characteristics have the so-called “normal” distribution, which is an extreme expression of the binomial distribution when the number of measurements of the characteristic tends to infinity, or at least exceeds 30 ÷ 100 observations for different characteristics. The nature or distribution of variability can be represented in Fig. 1.

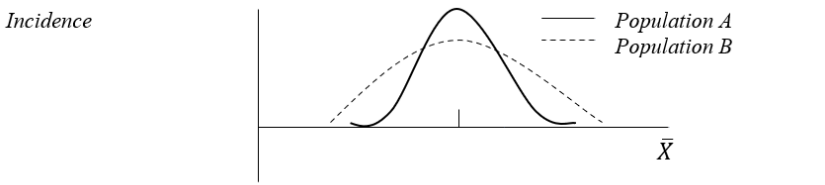

Figure 1. *An example of two populations with different distributions. The average values of both populations are the same, but individuals of population B have a wider distribution than population A. Due to this, population B has a larger variance value.*

In the case of a normal distribution, the more the samples differ from the average, the less often they occur. Although a normal distribution in its pure form is not often encountered, observations usually approach a normal distribution, so the assumption of a normal distribution allows for the corresponding statistical procedures. If other types of distribution are encountered, various methods are used to bring the observed data to a normal distribution (Cochran W. G. & Cox G. M., 1957 [3], Snedecor J. W., 1961 [11]; Rokitsky P. F., 1973 [10], Tsarev V. A., 2024 [14]., etc.).

Normal distributions are established for many tree characteristics, in particular for height, diameter, and other growth characteristics. Sometimes real measurements cannot be taken and point or rank estimates are used to describe phenotypes. For example, when assessing the straightness of trunks, condition, and other indicators, 5-point scales are used. The parameter that is most often used to describe the distribution of individuals within a population is called variance or dispersion. Variance is calculated using the following formula (2):

$$\sigma^2 = \frac{\sum(x_i - \bar{x})^2}{n-1}, \quad (2)$$

where σ^2 – variance,

$\bar{x}$ – average value of the feature,

x_i – individual observation,

n – number of observations.

The variance is the sum of the squares of the deviations of individual observations from the mean, divided by the number of observations, reduced by one.

The expression $(n-1)$ is usually called the number of *degrees of freedom* for estimating dispersion. Larger dispersions occur if individual estimates are widely scattered and, accordingly, smaller ones – with narrow dispersion (Fig. 1)

The next useful population parameter is the standard deviation or *average square deviation*, which is the square root of the dispersion, or:

$$\sigma = \sqrt{\sigma^2} = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}} \quad (3)$$

The standard deviation is expressed in the same units as the population mean and is a very useful parameter for describing the dispersion of individual observations. If the measurements are normally distributed, then approximately 67% of the observations fall within one standard deviation of the mean in either direction. $(\pm\sigma)$. 95 % observations are within two standard deviations of the mean $(\pm 2\sigma)$. An illustration of this situation is shown in Fig. 2.

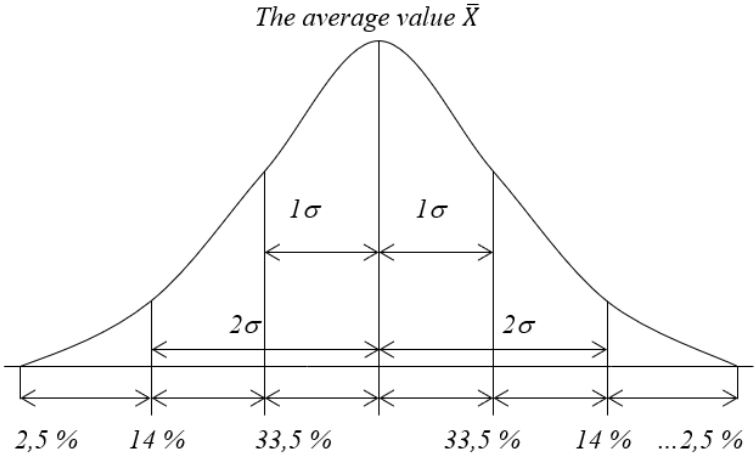

Figure 2. *Number of observations (in %) within standard deviations for a normal probability distribution of feature values.*

Populations are often described by their mean value and standard deviation:

$$\bar{X} \pm \sigma \quad (4)$$

For example, if the mean height of trees in a genetic experiment is described as 20±3 m, this means that the mean height of the stand is 20 m and the standard deviation is 3 m (the variance would be 9 m^2). If the heights in the experiment were normally distributed, about 67% of the trees would be within the standard deviation, or between 17 and 23 m in height.

If the deviations of individual measurements from the mean are between -2σ and +2σ, then they account for 95% of all observations in the population. In other words, values in a normal distribution exceed the deviation by 2σ (twice the standard deviation) less than 5% of the time. The deviation of 95% and 5%, or 19:1, is accepted as a reliable difference for many biological, agricultural, and forestry studies. Thus, when a value exceeds the deviation by 2σ from the population average, the deviation is considered significant enough that the biologist must look for a cause other than chance.

The standard deviation, expressed as a percentage of the mean value of the feature, is called the *coefficient of variation*, or the coefficient of variability. It is denoted by the letters C or V, %:

$$C(V) = \pm\frac{100\sigma}{\bar{x}} \quad (5)$$

The coefficient of variation can be used to compare different experiments with different units of measurement. A coefficient of variation of less than 10% is rare in biological data.

Depending on the value of the coefficient of variation, S. A. Mamaev [8] developed the following scale of variability for various characteristics of forest tree species (Table 1).

Table 1

Level of variability of quantitative characteristics of forest tree species

Variability level	Very high	High	Mean	Low	Very low
Variation coefficient, %	> 40	21-40	13-20	7-12	< 7

Although the parameters listed (average value, variance, standard deviation, variation coefficient) are often used to describe populations, they do not provide an idea of the nature of heredity or the proportions of variability due to genetic factors. Therefore, observed or estimated phenotypic variances must be divided into their genetic and non-genetic components due to environmental conditions. Calculating these components involves dividing phenotypic variability into parts that are genetic and non-genetic (due to environmental conditions).

Genetic assessment of populations. A simple model for assessing the phenotype of an individual tree can be expressed as:

$$P = G + E, \quad (6)$$

or phenotype = genotype + environmental effect.

This simple model for individual tree estimates can be extended to estimate the variability of a population of individuals as:

$$\sigma_p^2 = \sigma_G^2 + \sigma_E^2, \quad (7)$$

that is, phenotypic variability = genotypic variability + environmental variability. Genotypic variability in this case can be divided into additive and non-additive components:

$$\sigma_G^2 = \sigma_A^2 + \sigma_{NA}^2, \quad (8)$$

And the model of general phenotypic variability can be represented as:

$$\sigma_P^2 = \sigma_A^2 + \sigma_{NA}^2 + \sigma_E^2, \quad (9)$$

These are the general theoretical ideas, but how are these estimates obtained in practice? The best way to estimate the genetic advantage of a tree is to compare its progeny with the progeny of other trees. Such genetic experiments are undertaken to separate genotypic from environmental differences by growing all the progeny in similar habitats. Therefore, if parent A produces superior progeny to parent B in similar habitats, and these differences can be statistically confirmed, then parent A is said to produce genetically superior progeny (for a particular trait). The major effort in most breeding programs is to identify and rank selected phenotypes according to their genetic merit or value.

The genetic merit (value) of parent trees is expressed in terms of combining ability. There are two types of combining ability of interest to forest breeders: general combining ability and specific combining ability. General combining ability (GCA) is the average estimate of the deviation of the offspring of a given genotype from the average of all the obtained hybrids of all genotypes included in the experiment. According to the definition of D.S. Faulconer, 1985, 1996 [6, 7], general combining ability "is the average value for all F_1 for which a given line is a parent, and its value is expressed as a deviation from the overall average for all crosses". Then any specific hybrid or cross has an expected value equal to the sum of the general combining abilities of the parent lines. The result, however, may differ from the expected value to one degree or another. This deviation is called specific combining ability (SCA).

In statistical terms, general combining abilities correspond to main effects, and specific ones correspond to interactions. To understand the essence of combining abilities, consider the example given in the book by B. Zobel & J. Talbert [16]. The authors analyze the results of crosses between eight selected trees to establish

their genetic value. Four of them were chosen as male parents and four as female parents. Each male was crossed with each female, and the progeny were planted in test crops. Several years after the field trials, the progeny were evaluated. The average values of each cross were measured in units of volume and presented in the form of a table (Table 2). It also shows the average values of the progeny of each parent and the aggregate average value of the progeny of the experiment as a whole.

Table 2

Average values of the progeny volume of the trees tested

Female trees	**Male trees**				**Average values of offspring:**
	1	**2**	**3**	**4**	
5	9	17	12	14	13
6	10	16	12	10	12
7	11	20	10	15	14
8	14	15	6	17	12
Average offspring:	11	17	10	14	13 (aggregate average)

It can be noted that the average value of the offspring of a single cross of trees (5×1) is 9 volume units, while the average size of the offspring from all crosses of the parent tree No. 5 is 13 volume units. The aggregate average value for all the offspring of all the trees is also 13 volume units.

The general combining ability (GCA) is defined as the average value of the offspring of an individual tree when it is crossed with many other trees.

Although the GCA values can be expressed in absolute units, it is usually considered more convenient and meaningful to express them as deviations from the aggregate average. That is, the GCA of a tree is its ability to produce a certain average level of trait development when crossed with other trees. The GCA will be higher for the tree whose average value of the offspring trait is higher than for others. Thus, a parent with a GCA of 0 has an average GCA. A positive GCA indicates a parent that produces above-average offspring, while a negative GCA indicates a parent that produces offspring that are below the population average.

The data in Table 2 can be used to calculate the GCA for each parent. For example, the GCA of the paternal tree No. 2:

GCA_2 = average value of tree No. 2 – aggrigate average = 17 - 13 = +4.

Therefore, tree No. 2 has a GCA_2 in volume of +4 units. Other GCAs can be calculated in the same way. For example, the GCA for tree No. 4 is +1 volume unit, while the GCA for tree No. 3 is -3 units.

The selection value of each tree is defined as twice the GCA. The difference between the selection value and the GCA is due to the nature of these indicators. The selection values are higher because the parent in question contributes only half of its genes to its offspring, the other half coming from other members of the population. Thus, the selection value of parent No. 2 can be calculated as:

$$2(SCA_2) = 2(4) = 8.$$

Specific Combining Ability (SCA) is a term that refers to the average value of the offspring obtained from crossing two particular parents, which differs from the value expected taking into account only their GCA. It can also be negative or positive. SCA always refers to a specific cross (hybrid) and never to an individual parent by itself.

SCA for the cross between tree No. 3 and tree No. 6 (cross value is 12) can be calculated as follows:

1. GCA is calculated for both parents:

$$GCA_3 = –3; GCA_6 = –1.$$

2. The GCA values are added to the average value of the population to form the expected value of the cross (3×6), based on the general combining abilities:

Expected value = aggregate average of the experiment + GCA_3 + GCA_6 = 13 + (–3) + (–1) = 9.

3. Then subtract the calculated expected value from the observed value (value) of the cross (3×6). The result is the SCA.

$$SCA_{3\times6} = \textit{observed value} – \textit{expected value} = 12 – 9 = +3.$$

This means that the 3×6 cross is 3 volume units better than would be expected based on the GCA values of parents 3 and 6.

It should be emphasized that nothing can be said about the usefulness of crosses based only on their SCA. Since the SCA is a deviation from the expected values based on the GCA values, a cross can have a positive SCA, but not yet be good in relation to other crosses, as shown in the example with parents No. 3 and No. 6.

The cross has $SCA_{3\times6} = +3$. But its average value of 12 units is still lower than the aggregate average of the population (13 units) due to the low values of the GCA of both parents used.

It should be emphasized here that the GCA, selection value and GCA are indicators of the genetic value of parents or crosses only for the trait under study (in

this case, volume). For example, parents can have higher average GCA values for volume and at the same time lower average GCA for density.

Considering the above example, one more aspect of the issue should be noted. Initially, the values of the GCA and SCA were determined for inbred lines, and the methods for their evaluation proposed by G. F. Sprague and L. A. Tatum in the 1940s and by B. Griffing in the mid-1950s applied precisely to such inbred lines. However, these methods were subsequently applied to other types of source material of agricultural plants, and then to forest woody plants (E. L. Berezin, 1981 [1]; Ya. Birgelis et al., 1981 [2]; A. M.Danchenko, G. B. Dubinin, 1981 [4]; V. I. Dolgolikov, 1981 [5]; A. P. Tsarev, 1981 [12]; B. Zobel, J. Talbert, 1984 [16]; B. Zobel, J. Jett, 1995 [15]; S. P. Pogiba et al., 1991 [9], Tsarev A. P. et al., 2013 [13]).

The two types of combining ability reflect different types of interaction between alleles in a gene locus. The GCA represents the average value of the progeny of a parent when crossed with many other parents. It therefore reflects the additive genetic value of a parent. This means that it reflects that part of its genotype for a given trait that the parent can pass on to its progeny, regardless of the other parents involved in the cross. The GCA represents the additive interaction of the genes mentioned earlier. Parents with a high GCA for a given trait are considered as good partners for crossing. But they are not always desirable. Why? Because some of them may have high combining ability for disease susceptibility, stem curvature, or other observable characteristics.

If the GCA allows to predict the additive effect, it is sometimes considered a dependent part of the genetic constitution of a tree. It is that part of the combining ability that is realized in forest seed orchards that consist of many parents. The improved value of planted trees obtained from forest seed orchards is due to the accumulation of preferred alleles that have an additive genetic effect on the phenotypes of trees obtained from forest seed orchards.

The SCA found for a given cross reflects the interaction of two alleles of a gene locus affecting a given trait (dominant gene action) and the interaction between alleles of different gene loci affecting a trait, or epistatic gene action. As shown above, these two types of genetic effect usually refer to non-additive gene effects. The SCA may be an indicator of the dominant type of gene effect in most cases. Since the SCA is expressed as a result of interaction between specific alleles, or between gene loci, its value cannot be predicted from the phenotypes of the parents until the crosses are made. It cannot be used in forest seed production programs involving multiple parents because open pollination results in many different combinations of alleles at gene loci.

There are two ways of using SCA in breeding programs. The first is the use of vegetative propagation to produce large quantities of reproductive material identical to the tree from which it is taken. With vegetative propagation, the genotype

of the parents remains unchanged and the SCA of the alleles of all gene loci is preserved.

The second way is to use SCA to create crosses for the purpose of mass production of seeds from a certain combination of parents. This can be realized through controlled pollination and the method of creating biclonal seed plantations.

Both of these methods, especially the method of vegetative propagation, are used to produce improved reproductive planting material in some forest tree species capable of vegetative propagation. However, for most species, the cost and technological difficulties associated with the use of SCA make GCA more preferable in the implementation of breeding programs.

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