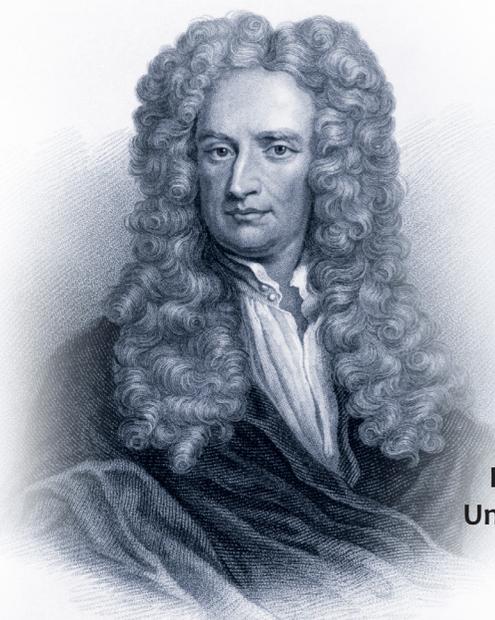




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**PROCESS  
MANAGEMENT AND  
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# **International Conference “Process Management and Scientific Developments”**

Birmingham, United Kingdom  
(Novotel Birmingham Centre, January 16, 2020)



Materials of the International Conference  
**"Process Management and Scientific Developments"**  
(Birmingham, United Kingdom, January 16, 2020)

M67

ISBN 978-5-905695-79-7

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

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

UDC 330

**ISBN 978-5-905695-79-7** ©Scientific publishing house Infinity, 2020  
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# CONTENTS

## **ECONOMICS**

Investment valuation: Discussion of three methods

Gribov Alexander Fedorovich.....7

Sales features of industrial products

Hasanov Babak Mikayil, Mammadli Zeynab Tahir, Huseynova Lala Zakir,

Aliyeva Sakina Elchin.....15

Analysis of the legislation of Malaysia in terms of supervision of margin lending and the possibility of implementing certain requirements in the current Russian legislation

Emelyanova Ellina Sergeevna.....21

Management of innovative development of high-tech industries using simulation models

Khrustalev Evgeny Yuryevich, Larin Sergey Nikolaevich, Khrustalev Oleg Evgenievich.....27

Assessment of the level of innovation of high-tech and knowledge-intensive enterprises using expert methods

Khrustalev Evgeny Yuryevich, Khrustalev Oleg Evgenievich.....32

Theoretical aspects of studying the reasons for the population outflow from Kamchatsk krai

Kulakova Lyudmila Ivanovna, Gadetsky Oleg Yuryevich.....36

## **PEDAGOGICAL SCIENCES**

Discussion of the reforms of Peter the Great in the process of training teachers to teach debatable issues of history

Varyuschenko Viktor Ivanovich, Gaikova Oksana Viktorovna.....45

Teacher self-improvement during the period of innovative transformations in the modern professional - educational space

Manzhos Lyubov Vladimirovna, Hakunova Mira Medzhidovna,

Akhtaov Ruslan Akhmedovich.....49

## **SOCIOLOGICAL SCIENCES**

Assessment of student anti-corruption training

Kirillov Vladimir Petrovich, Kirillova Galina Vladimirovna.....56

## **PHILOLOGICAL SCIENCES**

Analysis of the semantic group "Colour names of cars" in comparison of two languages Sokolov Kirill Leonidovich.....	64
The image of China and the "Chinese text" in Russian literature of the 19th – 21st centuries Krasnoyarova Anna Alexandrovna.....	69
On the functions of the Evenki language in the Sakha Republic (Yakutia) Struchkov Kirill Namsaraevich.....	76

## **HISTORICAL SCIENCES**

The Church diplomats in the Orthodox East in the middle of the 19th century: A.N. Muravyov, archimandrites Porfiry (Uspensky) and Antonin (Kapustin) Smirnova Irina Yuryevna.....	82
---	----

## **EARTH SCIENCES**

Impact on the environment of sheet rolling production in the metallurgical industry Sokolov Leonid Ivanovich.....	92
--	----

## **MEDICAL SCIENCES**

Clinical risk factors and causes of venous thromboembolic complications in the Republic of Sakha (Yakutia) Vinokurov Mikhail Mikhailovich, Yakovlev Anton Antonovich, Vinokurova Lyudmila Mikhailovna.....	96
The dynamics of the circadian rhythm of body temperature in the acute period of severe traumatic brain injury in children Muhitdinova Hura Nuritdinovna.....	101
Features of intraoperative pain relief in severe traumatic brain injury in children Muhitdinova Hura Nuritdinovna, Abdusaliyeva Tyrsunoy Mutanovna, Tursunov Daniyol Kamilganovich.....	110

## **BIOLOGICAL SCIENCES**

Anatomical and topographic features of the pancreas of the European badger Strygina Olesya Aleksandrovna, Kletikova Lyudmila Vladimirovna.....	118
---	-----

## **CHEMICAL SCIENCES**

Methods for the synthesis of polyetheretherketones and polyetheretherketones Salamov Ali Khasmagometovich.....	124
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## INVESTMENT VALUATION: DISCUSSION OF THREE METHODS

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**Annotation.** The article deals with the problems of investment valuation based on three well-known methods that are widely used in practice. It is shown that the use of a generalized cash flow model for evaluating real investments differs significantly from the results obtained using the classical Modigliani-Miller models. It is noted that the formulas known in corporate Finance are a special case of the generalized model. The use of a generalized model makes it possible to Refine the estimates of investments with a debt load and give them a more adequate character.

**Keywords:** cost, investment project, equity and debt capital, investor, capital structure.

Theoretical and practical problems of valuation of companies are in the focus of the scientific community. This is due to a number of reasons.

1) The Role and place of the state in stimulating investment activity is difficult to overestimate. But Russia is a specific country. Along with traditional forms of state participation in the investment process, there are a number of features that are unique to Russia. These include the problem of state participation in business.

2) The state's Share in the ownership of state corporations is too large, and there is no reason to reduce it. This leads to a number of negative consequences, not to mention the fact that it significantly undermines the foundations of the market economy, since the state is not interested in forming a number of institutional conditions that directly affect the investment climate. Second, the state often behaves as a monopolist, reducing or completely destroying competition-the basis of economic growth. And finally, the state by its active participation in the ownership of state corporations violates the fundamental laws of the market economy.

3) Dividend policy. Since the dividend policy does not affect the value of the company, the Russian leadership, in particular top managers make

the following conclusions: do not pay dividends, because they reduce the investment activity of the company. But we live in the real world, with taxes, debt capital, etc. In these conditions, the value of the company depends significantly on the formed financial policy. Moreover, the investment and financial activities of the company are interconnected. Dividends are paid when the state is experiencing the "severity" of sanctions and, as a result, lack of funds to cover budget expenditures. During this period, the state (read officials) remember the large state property and decides on the decision to pay dividends. At the same time, ordinary shareholders accidentally win, although this "win" is not unambiguous. The fact is that the market does not like sharp jumps, including dividends. It turns out a paradoxical situation: the increase in the dividend yield of ordinary shareholders' shares can be compensated by a fall in the capital value of shares.

Various arguments are considered, which, in fact, are reduced to one: the state should significantly change its share in the business, i.e., sell some of its shares. This can lead to large-scale privatization. Experts estimate that the scale of privatization will be 20-25 billion dollars. It is important to understand who can provide such large amounts. Should there be any strategic investors. This is a big problem. Probably, there will be large strategic shareholders for some state assets. But, as is usually the case, the main focus will be on ordinary shareholders. Here it is necessary to estimate the amount of money from the population. Given that in recent years, to put it mildly, income has not grown. Therefore, such standard measures as obliging large state-owned companies to pay dividends stably may not bring the desired result. Although this prospect is tempting and attractive. It assumes that this circumstance will ensure the desire of ordinary shareholders to hold shares of large companies profitably instead of placing funds on Bank deposits. In addition, this stability has a positive effect on the growth of the stock price. At least - this is world practice.

4) Borrowing is another important aspect of the problem under consideration. When taking into account the tax policy and the "tax shield" and the payment of interest on borrowed capital, it can be stated that the capital structure significantly affects the value of the company and the cost of projects. At the same time, it is important to emphasize that the implementation of these dependencies is entirely determined by the investment policy of the state, and it itself is the largest shareholder in our country. Therefore, it cannot play the role of an independent arbitrator by definition. Borrowing is a key issue that is being addressed and discussed within the framework of modern capital structure theory. We must not forget these banal truths. However, for a long time, Russian state-owned companies were allowed to

cheap loans, which allowed them to pursue an aggressive policy in the field of borrowing. The aggressive policy of companies in the field of borrowing has led to sad consequences. State-owned companies have formed a debt of such magnitude that it turned out to be in doubt was the very existence of companies, while implicitly relying on the state. And, indeed, the state came to the rescue. It couldn't have been any other way. The state is the owner-shareholder. At the same time, let us remember that the budget is also fully controlled by the state, Thus, by means of taxpayers, i.e. ordinary shareholders. That is, patched holes created by top managers and government officials. It is clear that there is another major problem, and in fact a contradiction, due to significant state ownership in Russian corporations, which gives rise to a very strong belief among managers that the state will help. At the same time, the theory clearly indicates that there is a concept of the optimal ratio "debt-equity". You can find a ratio that provides more favorable conditions for maximizing the total market value. At the same time, the main problem, from a theoretical point of view, is that it is difficult to implement a policy of maintaining a constant, even at an optimal level, the ratio of "debt-equity". Thus, we come to the need to develop essentially dynamic models, or, to put it another way, we have to go on the path of creating generalized models compared to the traditional theory of Modigliani-Miller.

5) Often hear that Russian companies are undervalued. But what does undervalued mean? We again come to the problem of valuation of companies. It is important to emphasize that the shares of Russian corporations will not be highly quoted, probably never. Why? Because the market will never appreciate Russian companies with the institutional and dividend policy that is cultivated by the state.

Let us emphasize once again that MM presupposes a perfect market. Everyone understands that the very concept of a perfect market requires clarification. As a matter of fact, we come to the statement that it is necessary to consider not conditions of equilibrium in the market, but to build generalized models within which it is possible to consider a deviation from equilibrium.

6) Useful to compare the experience of leading economies in terms of the share of state use in business. In China, the share of the state is comparable with Russia, but there is active privatization. In Germany, France, the share is significantly less than in Russia. The US has the lowest state participation rate. Even in such an area as weapons, the state places an order to private companies. Perhaps we should think about the fact that Russia has developed a hypertrophied, centralized system in the best traditions of the socialist economy. Historical experience has shown that it is not effective.

Based on the above, it is clear why in modern theory is given increased attention not only to clarify the concept of the value of the company, but also to methods of assessing the value of the company and business. As part of the problem of cost estimation, the key is that this issue is solved in fundamentally different ways in European and Russian schools in the field of project analysis. Russian scientists are of the opinion that the project increases the cost of equity, while the Western European point of view: the project increases the market value of the firm. There are objective reasons for this, which we will consider later. But the main thing is that both points of view have a right to exist. The main thing is which of the three methods of evaluating performance we use. Moreover, it is important to distinguish between two different tasks: 1) determining the market value of the company; 2) the target setting of the company in the implementation of the investment project.

To answer these questions, it is necessary to abandon a number of assumptions underlying the MM theorem and consider the so-called generalized model of cash flows. In fact, generalizations lead to the construction of a dynamic model.

When evaluating a company and a business, in the framework of generalizations of the Modigliani-Miller theory (MM), the following assumptions are accepted – sometimes implicitly – the following assumptions: a) the absence of arbitration; b) the equality of the rate at which the tax is levied; c) the dependence of cash flow from assets on the capital structure; d) the present value does not depend on the capital structure.

### **Generalized model [2]**

The generalized model is designed to show that if you remove the restriction on the constancy of the debt load, and abandon a number of classical limitations of the MM theory, you can get fundamentally new results that differ significantly from the known, classical approaches. Consider the solution of the problem of investment valuation, widely used in modern literature:

- adjusted present value (*APV*) method);
- the method of increase of share capital (flows to equity, *FTE*);
- weighted average cost of capital (weighted average cost of capital, *WACC*).

It is generally accepted that " all three methods should result in the same *NPV* score for an investment project"[3]. " Let's try to question this far from obvious fact. In fact, L. Kruszwicka these methods as a separate, generally is not allocated. In separate examples, he States that "total cash flow and adjusted present value are equivalent concepts and that "adjusted

discount rate is an alternative to adjusted present value" [4]. From this we can conclude that the "adjusted discount rate" and the method of capital gains are also equivalent concepts? Vaguely.

What to do? What concept should I follow? Let's try to understand this issue. To do this, consider a generalized model. We use post-tax operating cash flow (free cash flow-*FCF*). In this case, there is a saving on taxes, the so-called "tax shield" *TS*. Cash flow for debt investors (cash flow to debt-*CFD*), consisting of interest payments, payments to repay the principal amount of existing debt and new borrowings. Cash flow to equity (*CFE*). And so we get

$$FCF_t + TS_t = CFE_t + CFD_t. \quad (1)$$

Cash flow for all capital, *CCF* (capital cash flow). This is the post-tax cash flow from assets, supplemented by tax savings from interest payments. The valuation obtained by discounting the *CCF* at a rate corresponding to the risk of this cash flow will give a  $V^L$  valuation of the company as a whole with mixed financing.

According to the principle of additivity of discounted cash flows, from the expression (1) we can come to the ratio

$$V_t^U + V_t^{TS} = E_t + D_t. \quad (2)$$

The sum of the value of equity and debt is the value of  $V_t^L$  of the company as a whole with mixed financing

$$V_t^L = E_t + D_t \quad (3)$$

The value of  $V_t^L$  we can get by adding the value of  $V_t^U$  of the company, provided that it is financed only from its own capital, with the value of the benefits of the tax shield:

$$V_t^L = V_t^U + V_t^{TS}, \quad (4)$$

$$\text{and, } V_{t-1}^U = \frac{V_t^U + FCF_t}{1+k_t^U}, t=1,2,3,\dots,N. \quad (5)$$

where  $k_t^U$  is the rate of period t of the expected return on investment for equity without debt load (cost of unlevered equity):

Given that  $TS_t = k^D D_{t-1} T$  and we get the "almost" standard formula for WACC.

$$WACC = (1 - L)k^E + Lk^D(1 - T) \quad (6)$$

And finally, we get the cash flow discount rate for the entire company's capital, *CCF*.

$$k^{CCF} = (1 - L)k^E + Lk^D.$$

An important special case is the deterministic amount of debt in each period. In this case,  $k_t^{TS} = k_t^D$ . Accordingly, the formulas for  $WACC_t$  and  $k_t^E$  will take the form:

$$WACC_t = k_t^U - (k_t^U - k_t^D) \frac{V_{t-1}^{TS}}{V_{t-1}^L} - \frac{TS_t}{V_{t-1}^L}. \quad (7)$$

$$k_t^E = k_t^U + (k_t^U - k_t^D) \frac{D_{t-1}}{E_{t-1}} \left(1 - \frac{V_{t-1}^{TS}}{D_{t-1}}\right) \quad (8)$$

Another important option is a policy focused on the target capital structure, i.e. a pre-determined share of debt  $L = D/V$  in relation to the company's valuation. In this case, the risk of the tax shield is considered to be equal to the risk of free cash flow:  $k_t^{TS} = k_t^U$ .

General formulas for  $WACC_t$  and  $k_t^E$  will take the form:

$$WACC_t = k_t^U - \frac{TS_t}{V_{t-1}^L}. \quad (9)$$

$$k_t^E = k_t^U + (k_t^U - k_t^D) \frac{D_{t-1}}{E_{t-1}} \quad (10)$$

Why in Western literature the value of a company is estimated as equity plus debt. If a part of the shares is formally replaced by debt (by buying out the company's bonds), the shareholders will act as creditors at the same time. It is believed that it is beneficial for the shareholders themselves to do so under the very strict postulates of the Modigliani-Miller theory. Then indeed the wealth of shareholders is equal to  $E + D$  and then there is a natural goal-to maximize the wealth of shareholders. If the loan rate is equal to the lender's cash flow discount rate and  $D_T = 0$  - the loan is paid at time  $T$ , then the lender's  $NPV$  is zero for any loan repayment scheme [5].

It follows that the  $NPV$  defined by the three methods  $APV$ ,  $WACC$ ,  $FTE$ , will match. This is noted in all classical works. For us, the main thing is that we understood under what conditions this conclusion is true.

In English-language literature, preference is given to  $WACC$  -apparently because of its simplicity. As already noted, many textbooks provide examples of calculating  $NPV$  in three ways:  $WACC$ ,  $FTE$ ,  $ANPV$ . The authors note that these methods should lead to the same assessment of  $NPV$ . The authors rightly explain the discrepancy by applying the formula (6), while the constancy of the ratio of debt capital to the value of the firm is not observed. Let's recall our generalized model. But what is important is that it is implicitly assumed that the loan rate is the same as the cash flow discount rate on the loan, so the corresponding  $NPV$  of the lender has become zero. In addition, in the example there were one-time investments (there was no question about the discount rate for negative flows) and the profit was always enough to pay the interest, i.e. the tax shield always worked. But there are more serious errors in the example. The authors use formulas (6) to calculate  $WACC$  and (10) to determine  $k^E$ . At the same

time, they put that  $k^{TS} = k^D$ . However, in this case it would be necessary to use formulas (7) and (8) and not to appeal to a fixed capital structure. The result is a complete mess: the authors put  $k^{TS} = k^D = 10\%$ ,  $k^U = 13\%$ , but  $k^E = 16\%$  is determined by the formula (10), which requires equality of  $k^{TS}$  and  $k^D$ , which is not met.

Similar examples are given in the monographs Bodie-Merton, Brayley-Myers. In these examples, the discount rate on the loan also coincided with the interest on the loan. However, in Bodie-Merton's work it is noted that "the formula used for the calculation is applicable only if the debt obligations of the firm are risk-free. Extending it to drawn bonds by simply replacing the risk-free rate is illegal. The correct assessment of the "tax shield" in the case of risky debt obligations is a difficult task" [3]. Apparently the authors are referring to a generalized model. Once again, we are convinced that simple numerical examples obscure many important problems. The main question: "the purpose of investment is to increase the market value of the firm ( $V=E+D$ ) or the cost of equity of the firm  $E$ . It's not the same thing" [1]. What we've come to. Evaluation of  $NPV$  by three different methods  $WACC$ ,  $FTE$ ,  $ANPV$  lead to different results. Assessment of  $NPV$  by  $WACC$ ,  $ANPV$  methods gives an increase in the market value of the company, and the  $FTE$  method - the increase in equity. In other words, the increase in the value of the firm and the increase in equity is not the same thing. It is reasonable to distinguish between two tasks: 1) the target setting of the company in the implementation of the project and 2) the valuation of the company.

As a conclusion, it can be stated that external financing puts the company in strict dependence on the capital market, access to which imposes more stringent requirements for the development of investment plans, and increased requirements for the quality and value of the company.

Financing with borrowed capital brings a number of surprises in both practical and theoretical terms. From the point of view of the development of the theory of credit, credit restrictions play a crucial role in obtaining adequate models and results. Here are closely intertwined as the issue of debt obligations in the form of securities such as bonds and mortgages.

In an ideal financial environment, i.e. in theory, there are fundamentally different laws and laws. Life is more diverse than those ideal schemes, postulates, axioms that prevail in an ideal world, and therefore it is worth looking for new models, often more complex and confusing, but they allow you to solve the contradictions that often arise in reality. And at the same time simplifications are extremely important, they provide the Foundation without which there is no qualitative theory.

There are three methods for estimating the net present value described in the article. Precisely, these methods cause a number of contradictions, which are pointed out by well-known authoritative authors.

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## SALES FEATURES OF INDUSTRIAL PRODUCTS

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**Astract.** Industry marketing can be understood as an activity aimed at meeting the needs of industrial enterprises in exchange for goods. Its main purpose is to determine the state and dynamics of demand and market conditions, to make the right decision on demand, and to maximize its production. In order to investigate the demand for products sent by the enterprise to a specific market during the sale of industrial products, the market structure of the market, the technical level and quality of the products to be marketed, the commodity movement system, and the services of competitive companies, it is necessary to study safety regulations.

**Keywords:** industry marketing, demand, sales, market segmentation, marketing complex,

Marketing in the industry is an integral part of microfinance. It is understood as an activity undertaken to establish and strengthen the favorable image of an industrial enterprise or organization. In production, special marketing services are usually involved.

Industry marketing can be understood as an activity aimed at meeting the needs of industrial enterprises in exchange for goods. Its main purpose is to determine the state and dynamics of demand and market conditions, to make the right decision on demand, and to maximize its production. Industrial marketing is the activities of industrial, agricultural, transport, construction companies and other manufacturing industries in the market of manufactured goods and services in connection with the demand for machinery and equipment, raw materials and licenses, as well as leasing, engineering and other industrial services. In general, the main purpose of industrial marketing is to ensure that all the activities of an enterprise are

based on the study of consumer demand and the changes that may occur in the future. In addition, one of the objectives of industrial marketing is to identify the unpaid demand of the enterprise by focusing on its production. Marketing studies the processes of production, production and sale of goods that are in real demand.

The marketing system in the industry is functionally dependent on the need and produces the variety and volume of goods that the buyer needs. It is important to remember that industry marketing services are not only the brain center and source of information of the market, but also the production, scientific, technical and financial policies of the enterprise. Here, on the basis of a comprehensive analysis of the demand situation and dynamics, the issues regarding the necessity, prospects and profitability of the production of a particular product are solved.

Marketing management in an enterprise involves continuous monitoring to detect changes in the external environment, the functioning of the marketing system, and the deviation between planned and actual results. It aims to provide more efficient use of financial, material and other resources of the enterprise.

The marketing management process in the industry consists of the following steps:

- Market Opportunities Analysis;
- Selection of target markets;
- development of the marketing complex;
- implementation of marketing measures.

The actual market capacity is the actual amount of goods sold on the market, and the potential capacity is the quantity of goods that can be sold in the market over a certain period. An increase in the share of industrial enterprises in the commodity market will lead to greater profits and will increase its competitiveness. Therefore, when an enterprise's share of the market falls, it is necessary to search for new market opportunities and choose a marketing strategy. The search for new market opportunities is conducted through constant monitoring of market changes.

Selection of target markets. This stage of marketing management in an industrial enterprise is a group of market segments that are most suitable for the target market entity. The choice of the target market involves the study of consumers and the segmentation of the market. Market segmentation divides the goods into consumer groups characterized by the same reaction and marketing efforts. Market segmentation provides a deeper understanding of consumers' needs and competition, takes into account the needs of individual market segments, and concentrates the limited re-

sources in an even more efficient way for the enterprise. After market segmentation, the marketability of each market segment is determined and the target market is selected. The attractiveness of the target market for the enterprise is determined by the size of the segments, the rate at which they change, the structural attractiveness of the segment and the resources of the enterprise that are necessary for the segmentation. The choice of the target market ends with the discovery of the goods.

Product position refers to the formation of an ideal product, the desired new products in the market, and the consciousness of the target consumers.

Development of marketing complex. This stage of industry marketing management includes the aggregate of enterprise performance indicators used to better meet the needs of the target market. The marketing complex includes the following indicators: goods, prices, sales, marketing of goods. The company can use these indicators to influence the demand for their goods.

Realization of marketing measures. It is important to take into consideration that the analysis of market opportunities, the selection of target markets, the development and implementation of the marketing complex requires the existence of a subsidiary marketing management system in the industry. The firm should have its own marketing information system, marketing planning, marketing service organization and marketing control. Each firm should clearly understand how to achieve its goals. Strategic and tactical planning of marketing should be used for this purpose. Strategic marketing plan is long-term and has been developed for several years.

Tactical plan depends on the content of the strategic plan of marketing and the information at the disposal of the enterprise. The main sections of the strategic marketing plan for industrial enterprises are:

- long-term objectives of the enterprise;
- marketing strategy;
- development of economic activities of the enterprise.

The mentioned sections of the industry-wide strategic plan are one of the key prerequisites for marketing activities in the enterprise.

The main sections of the industry marketing tactical plan are:

Annotation - The main purpose of the plan is explained herein;

The current marketing situation includes analysis of official information, enterprise statistics, competitor information, and market information based on the results of marketing research. This section characterizes the target market and the market share of the enterprise.

Hazards and Opportunities - It provides information on potential threats and opportunities for goods in the market. The main purpose of this section is to foresee significant events that could have a profound impact on the firm.

The purpose of marketing

Marketing strategy

Program of activities

Marketing budget

Thus, each of the marketing management processes in industrial enterprises makes it necessary for the firm to organize this service. Therefore, its management is carried out in the context of different marketing structures. The structure of marketing is an integral part of the organizational structure of the enterprise and reflects the whole service of the enterprise.

Marketing service organization is crucial for efficient business management.

The firm or enterprise should develop such a structure for marketing that it undertakes all marketing activities, including planning. There is no universal scheme for the organizational structure of marketing in the current industry.

Marketing department can be created on different bases. As it is known, it is part of the business sector of the enterprise. It should be noted that in industrial enterprises this department is sometimes considered an element of the technical sphere. Every business seeks to create a marketing department in such a way that it achieves the best marketing objectives. At the same time, it is important to know that the structure of marketing depends to a large extent on the resources of the enterprise, the characteristics of the products and markets.

Experts believe that it is advisable to use a functional organizational structure of marketing for industrial enterprises with small quantities of goods and markets. In this case, a specialized unit is created as markets and products are identical. It should be noted that the functional organizational structure of marketing in the industry plays a key role for other structures. As part of this structure, marketing planning, new goods and other groups can be created. The functional organization of marketing is considered to be efficient in the conditions of stable production and sales, as well as in stable market conditions. The advantages of the functional organizational structure are the functional specialties and simplicity of management, and the disadvantages of the products are mainly the product nomenclature, which reduces efficiency, lack of new product releases, and the need for coordination of different marketing units.

In the marketing organization of marketing it is possible to coordinate the marketing complex for each commodity or commodity group and to respond quickly to the market problems. It is advisable to create a marketing organization for industrial enterprises that produce products in a wide range. It is more important for businesses that sell their products in different markets where there is a similar market advantage, to apply a market-based organizational structure of marketing. It is recommended to use a regional organizational structure of marketing for industrial enterprises whose products are purchased in many regions. Such a structure can be found in large firms with a large market. Generally, businesses may have different options for organizing a marketing department, which also has its own features, advantages and disadvantages. When selecting any of the options for implementing one or another organizational marketing structure in the industry, it is important to keep in mind that it has a simple structure.

The issue of product sales and buyers' involvement in industrial enterprises, regardless of the form of ownership, is solved with the help of marketing. Marketing is a system of managing and organizing production, sales and trading activities of businesses, firms, and organizations that focus on meeting buyers' needs for goods and services and for market demand.

The concept of marketing is dual as one of the management functions and as a concept of management in a market economy. Marketing also acts as a business activity aimed at meeting the consumer's needs. In terms of the functions it performs, an enterprise marketing service is created. In a market economy, virtually all large and medium-sized companies in the world have independent marketing services. Marketing services for large firms are led by the Vice President of Marketing. In smaller firms, marketing is carried out by economic service professionals. In order to investigate the demand for products sent by the enterprise to a specific market during the sale of industrial products, the market structure of the market, the technical level and quality of the products to be marketed, the commodity movement system, and the services of competitive companies, it is necessary to study safety regulations. The implementation of such an event is very important. It gives you the right idea of what type and volume of products can be implemented in the selected market. Studying the market structure of the market will help to avoid significant losses associated with delivering the product to new markets.

The organizational structure of the enterprise study includes:  
analysis of the competitiveness of the industry market;

## Process Management and Scientific Developments

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researching the level of competition in the market through research projects;

analysis of the intellectual potential of employees

ability to quickly adapt to changing environment;

analysis of the creative potential of the team;

the presence of new ideas;

Evaluation of the technical level of production of competitive companies;

study of the demand for high quality, environmentally friendly and socially useful products and technologies in the market.

Assessment of the enterprise's competitiveness should be carried out now and in the future. The purpose of the study is to select the development directions of the enterprise based on socio-ethical principles, resource research, competitiveness and renovation policy, and adaptation to internal market opportunities. The methods of studying the internal environment of the enterprise include analytical activities, expert evaluation and situational analysis with the help of external experts and specialized organizations.

In order to solve the problem, it is necessary to form a pricing policy, as it provides efficient operation of the production structures of the enterprise at all stages of the marketing organization. The price ultimately provides planned profit for the enterprise, contributing to the competitiveness of the commodity structure.

In the marketing activity, pricing policy is well-implemented. The essence is that an enterprise independently determines the price for its products and changes them depending on market conditions. This will help achieve short-term and long-term goals. Proper pricing policy also enables the sale of products at certain stages of the product cycle, as well as the solution of operational tasks related to the activities of firms competing in the market.

**ANALYSIS OF THE LEGISLATION OF MALAYSIA IN TERMS OF SUPERVISION OF MARGIN LENDING AND THE POSSIBILITY OF IMPLEMENTING CERTAIN REQUIREMENTS IN THE CURRENT RUSSIAN LEGISLATION**

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**Abstract.** The article analyzes the international supervisory experience of Malaysia in terms of control over the implementation of short sales: the regime of regulated short sales, the regulation of short sales in the corporate bond market and in the money market. The analysis was carried out in order to identify further key areas of development of the Russian margin lending market. The results of the analysis made it possible to assess the regulatory requirements existing in Malaysia for possible implementation in Russian jurisdiction.

**Keywords:** margin lending, uncovered positions, short sales, unsecured trades.

Since July 1, 2019, the Russian legislation regarding margin lending has undergone changes affecting not only changes in the calculation formulas of margin indicators for providing leverage to the client, but also the regulatory perimeter has expanded due to the permissibility of including futures contracts in the client portfolio [7]. In the future, in addition to linear derivatives contracts, the client is supposed to be given the opportunity to add options and nonlinear derivatives contracts to the single portfolio. The planned modernization of the existing regulation of margin lending predetermined the purpose of this study: to analyze the international experience of Malaysia in order to predict possible ways to develop supervisory regulation of short sales in the Russian jurisdiction.

The world practice of supervision over margin lending is currently extremely diverse. The European Union and the United States prohibit uncovered short sales, and in addition, the United States and Canada set short marking requirements. In Malaysia, short sales are regulated by a number of regulatory documents that establish, among other things, the regulated short sales regime, as well as the regulation of short sales in the corporate bond market and the money market [1 - 4].

The rules of the Malaysian Exchange established that short sales can be carried out only in relation to the list of securities approved by the exchange, as well as only by the participating organization [2, 3].

Securities are included in the official list of securities if they satisfy the following parameters:

- daily market capitalization of shares is at least 500 million Malaysian ringgit at least three months before the date of inclusion of the security in the official list;
- value of outstanding shares is at least 50 million shares prior to the date of inclusion in the official list;
- average monthly trading volume with these securities is at least 1 million units 12 months before the date of inclusion in the official list.

As a participating organization, a securities trading entity may act. At the same time, the participating organization must be registered in Malaysia and activities related to the implementation of operations with securities should be fixed among the types of economic activity in its charter. This organization must also be licensed to carry out operations with securities and satisfy all financial requirements set forth in Chapter 13 of the Malaysian Exchange Rules. In addition, the participating organization must have qualified employees and mechanisms sufficient for efficient and consistent transactions with securities on the stock market. At the same time, the participating organization may begin the activity of implementing regulated short sales only if it:

- developed internal standards for regulated short sales in accordance with the requirements of the exchange;
- introduced the necessary systems and infrastructure for the implementation of regulated short sales;
- sends a written declaration in the form established by the exchange, at least 2 trading days before the start of regulated short sales activities.

In April 2017, the Malaysian Securities Commission published the Guide to Regulated Short Sales of Corporate Bonds [5], which established that short sales of corporate bonds can only be concluded if they are covered by a reverse repurchase agreement or by mechanisms through an agreement on borrowing and lending with securities, as well as subject to the inclusion of bonds in the list of eligible securities.

Corporate bonds may be included in the list of eligible securities if they satisfy the following conditions:

- free of any security rights or rights to revoke a bond before the maturity date;
- nominated in Malaysian ringgits;

- non-convertible and not related to equity securities;
- not secured by assets or mortgages;
- the total value of the bond issue is at least 500 million Malaysian ringgit;
- have guarantees from the Malaysian government and a minimum AA credit rating of a credit rating agency regulated by the Malaysian Securities Commission.

The Guidelines for Regulated Short Sales of Corporate Bonds also provides an approved mechanism for conducting a short sale transaction. In accordance with it, a person entitled to carry out a short sale transaction concludes it on day T0 with the settlement date on day T2. In order to avoid an uncovered short sale, a person must borrow a security also on day T0 for settlements no later than T2 for the first part of a reverse repurchase transaction (purchase of a security) or under a security loan agreement. Closing the reverse repurchase transaction (making settlements on the second part of the transaction involving the reverse sale of the security) or returning the security in accordance with the agreement on its borrowing should be carried out after day T2. At the same time, the person conducting the short sale must inform the electronic trading platform or other system designated by the Malaysian Securities Commission about all short sale operations as of the date of their conclusion, about the operations of borrowing securities to cover short sale transactions, as well as about all transactions to close short positions.

The Guidelines for Regulated Short Sales of Corporate Bonds also established that a short position on corporate bonds should not exceed 10% of the nominal amount of issued securities and the term of a short sale transaction should not exceed 12 months.

In November 2017, the Central Bank of Malaysia issued the Guide to Regulated Short Sales of Government Securities of Malaysia and their Special Investment Issues [6], the purpose of which was to promote the development of market support dealerships, portfolio hedging operations, repos and securities lending transactions securities and sales and repurchase operations, as well as increasing the liquidity of the bond market.

In accordance with the guidelines, market participants who are entitled to make short sales with government securities are divided into three categories (A, B and C). Category A participants, including licensed banks, investment banks and financial development institutions, and category C participants, combining non-resident legal entities registered with the Central Bank of Malaysia, are entitled to carry out short sale transactions of both government securities and their special investment issues. Category

B participants, including licensed Islamic banks and financial institutions licensed to conduct Islamic financial business, are allowed to carry out short sale transactions only with special investment issues of government securities, based on a bilateral agreement.

In accordance with clause 12 of the Guide to Regulated Short Sales of Government Securities of Malaysia and on their special investment issues, market participants of categories A and B must inform the electronic trading platform or other system specified by the Central Bank of Malaysia of all short sale operations as of the date of their conclusion, securities transactions to cover a short position, including securities borrowing, repos, securities lending transactions and transactions sale and repurchase transactions as well as to close the short position.

In addition, category A and B participants must report to the Central Bank of Malaysia on the daily volume of short positions and outstanding short positions, classified based on the trading code determined by the date of the transaction, in the form specified in Appendix 2 of the Guide to Regulated Short Sales of Government Securities of Malaysia and their special investment issues. Participants must also immediately inform the Central Bank of Malaysia of any short position of 5% or more of the outstanding securities.

For category C participants, there are no requirements for informing the electronic trading platform, but similar requirements are set for reporting to the Central Bank of Malaysia. A participant in this category must provide information to the Central Bank of Malaysia on all concluded short sale transactions, as well as on operations to cover a short position and close short sale transactions during offsetting operations in the format specified in Appendix IV of the Guidelines for Regulated Short Sales of Government Securities of Malaysia and on their special investment issues, on a weekly basis.

Given the requirements of the regulation of Malaysia for the supervision of margin lending, as well as the further transformation of the Russian regulation of margin lending, the following areas can be identified for the development of regulation of leverage transactions.

1. Notification of the regulator on exceeding the threshold volume values for concluded short positions. To minimize the risk of position concentration, as well as to increase transparency of information on the securities market, it can be assumed that it is advisable for the broker to notify the supervisor of the achievement of a short position of a threshold value (for example, as established by Malaysian law in the amount of 5% or more of outstanding securities) include in the current regulation.

2. Expansion of the requirements for securities included in the list of allowable for short sales. At present, the Russian requirements for inclusion in the list are disclosure by clearing organizations of risk rates for the corresponding financial instrument. Perhaps, to improve the quality of financial instruments included in the list, it is necessary to add qualitative criteria for the selection of financial instruments directly, for example, include the condition for the absence of any security rights on corporate bonds or the condition of security by the government in the form of a guarantee.

3. An analysis of the laws of Malaysia regarding the supervision of margin lending allows us to conclude that the regulation of short sales and conclusion of unsecured transactions in the Russian jurisdiction can be expanded not only by including option contracts in the client portfolio, but also by establishing requirements for notifying the regulator on exceeding volume thresholds for short positions to be entered, as well as in view of the addition of requirements for securities included in the list of allowable short positions rodazham. Such changes are likely to increase the transparency of intermediary activities and the financial market, which will increase the reliability of protecting the interests of clients of financial intermediaries

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**MANAGEMENT OF INNOVATIVE DEVELOPMENT OF HIGH-TECH  
INDUSTRIES USING SIMULATION MODELS**

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**Abstract.** The problems of improving the methods of managing the processes of innovative development of knowledge-intensive enterprises, which allows creating new competitive samples of technical devices and complexes, can be successfully solved with the help of model tools. The article proposes a simulation model that allows you to predict the amount of financial and other necessary resources, determine the costs of scientific research, and calculate the prices of manufactured products. A new criterion is developed for the optimality of expenses allocated for innovative development, which allows us to determine the relationship between the pace of industrialization and the quality of living standards.

**Keywords:** enterprise management, simulation model, innovation, forecasting, adaptation, pricing, financing, resource costs, research, economic development, quality of life.

**Introduction**

Based on economic and mathematical methods, new simulation models can be built that are designed to improve the management of knowledge-intensive enterprises. In particular, these models can be used to improve the mechanisms of innovative progress, update products manufactured by enterprises and justify the rational amount of financial resources allocated for the development of domestic knowledge-intensive production.

**Main part**

Under market conditions, mechanisms for creating new equipment and technologies can significantly increase the volume and quality of innova-

tive products produced and reduce the risks of failure to fulfill the approved plans for the development of knowledge-intensive production. The corresponding complex simulation model is based on model tools, the basics of which are described in the works of K.A. Bagrinovsky and M.K. Isaeva [1, 2].

The model consists of four interconnected components.

The first is designed to predict and determine the volume of production resources that are required to fulfill the approved plans of the enterprise. During the operation of this component of the model, a resource vector is formed.  $P=\{P_i\}$ , where  $i=1, \dots, m$ .

The second component is designed to determine the values of the coefficients  $a_j$  ( $j=1, \dots, n$ ), characterizing the technologies used to produce obsolete and new innovative products. At the same time, with the help of experts, the coefficients  $b_j$  ( $j=1, \dots, n$ ), are determined, which characterize the financial and resource costs of scientific research, allowing you to create and implement real-life knowledge-intensive samples of new products and technologies.

The third component is used to determine the main parameters of the model, which allows to obtain the maximum possible amount of the final product of a new sample. For this, forecast values of price indices of new enterprise product samples are determined, which allows substantiating the prices of products  $p_j$  ( $j=1, \dots, n$ ), where  $n$  – is the number of products studied. In this model, the input data are the volumes of production of new innovative products and those that are already outdated..

In a simplified form, the optimization problem at time  $t$  has the form

$$F = \sum_{j=1}^n (p_{jt} - a_{jt}) x_{jt} - \sum_{j=1}^n b_{jt} x_{jt}^2 \rightarrow \max \quad (1)$$

under the following conditions  $\sum_{i=1}^m q_{ijt} < R_{jt}$ ,  $x_{jt} > 0$ ,  $j=1, \dots, n$ . Variable  $x_j$  – desired intensities of the used technological processes,  $q_{ijt} > 0$  – consumption coefficient of the  $i$ -th resource required for the production of a unit of the  $j$ -th product.

If the vector  $z_t = \{z_{jt}\}$  at  $j=1, \dots, n$  represents a solution to the optimization problem at time  $t$ , then the quantity  $F_{jt} = b_{jt} z_{jt}^2$  ( $j=1, \dots, n$ ) determines the amount of funding that is required to conduct scientific research that allows us to develop an innovative product with number  $j$ .

To evaluate the effectiveness of the research work carried out at this stage, the simulation model provides for an inverse relationship between the third component at time  $t$  and the second component at time  $t+1$ . This

relationship allows us to evaluate the impact of the results of studies on the reduction of the values of the expenditure parameters and can be represented as follows:

$$a_{jt+1} = a_{jt} \exp\{-k_{jt} F_{jt}\}, \quad (2)$$

where  $k_{jt} > 0$  – research performance indicator,  $j=1, \dots, n$ .

The fourth component of the complex simulation model contains the main adaptive controls for knowledge-intensive production complex.

The management of the real knowledge-intensive production process is usually carried out in the context of the introduction of new information technologies [3] and promising strategies for innovative development [4, 5], as well as uncertainty and risks, therefore, it is impossible to use traditional control laws [6, 7]. The mathematical tools proposed by the authors, based on a comprehensive simulation model, can improve the accuracy and efficiency of managerial decisions. This toolkit uses a control mechanism with variable parameters. Setting (changing) the parameters is performed using the adaptation algorithm, which automatically processes the incoming information on the efficiency of the enterprise.

The adaptation algorithm is formed by a special technique, which allows us to evaluate the situation at the enterprise and contribute to the achievement of the management goal in conditions of unpredictable changes in production processes.

It should be especially noted that the most important methodological feature of knowledge-intensive production is that its effect on economic development is carried out not in an additive but in a multiplicative manner. So, if the results of a balanced economy are expressed by a certain set of volumes of knowledge-intensive products produced in traditional sectors producing goods and services, and if the quality of life criterion  $W_h$  (aka generalized optimality criterion) is expressed by a certain function of these volumes, for example, a “standard” set of goods and services consumed by the “average” citizen of the country, when taking into account the action of knowledge-intensive and high-tech industries, the new optimality criterion ( $W_s$ ) can be expressed as follows::

$$W_s = Q \times W_h + (1 - Q) \times W_m, \quad (3)$$

where  $Q$  –likelihood of economic progress (preventing crises and suppressing unlawful illegal actions) for the period under consideration, for example, during the financial year under review;

$W_m$  – value of the “quality of life” for a citizen in conditions when financial, economic and industrial safety could not be ensured, and a crisis erupted.

Usually  $W_m < 0$  for most states and citizens.

These estimates are only illustrative in order for the country's leaders to feel the size of the quantities under consideration, trying on various types of financial, economic and production risks to their own state and thinking about it and their national and regional security.

At a qualitative level, the meaning of the proposed criterion means the following. With excessive industrialization of the state, the probability of  $Q$  approaches unity, and the quality of life of citizens is, although guaranteed, but low. With insufficient attention to the needs of knowledge-intensive production, the quality of life may be  $W_h$  higher, but the likelihood that there will be no crises and this standard of living can be realized is low. The rational level of expenses for the production of innovative products in numerous consolidated knowledge-intensive enterprises will determine the maximum possible value of  $W_s$  [8].

Obviously, the increase in the standard of living of citizens, which is mentioned in many government documents, can be expressed in this case either by the derivative  $dW_s/dt$  with respect to time  $t$ , which would be unnecessarily formalized, or by increment

$$\Delta W_s(T) = W_s(T) - W_s(T-1) \quad (4)$$

for year  $T$ , which seems more productive.

This indicator can be real and sustainable only if our economy and the very lives of citizens are reliably protected [9]. Methodologically, this means that by varying the deduction mentioned above and determining the value of the  $Q$ , index corresponding to this deduction, it is necessary to ensure the maximum of the function  $W_s$ , or the maximum of  $\Delta W_s$  and, accordingly, to find a rational value of the level of expenses for the development of knowledge-intensive production.

The methodically posed problem is extremely complex, but it must be posed, formalized, and sought for solutions.

It is often suggested that in the beginning it is necessary to find some maximum permissible value of these expenditures, at which the annual increment of the country's GDP remains positive. And then look for their rational meaning, departing from the maximum permissible. This approach cannot be rejected. It should be remembered that the federal expenses include social, educational, and many other expenses. They also need to be taken into account and varied, and this dramatically complicates the problem.

### Conclusion

In this statement, the problem of scientific substantiation of the rational share of the costs of developing knowledge-intensive production in our

country seems relevant, scientifically and practically significant. At the same time, in a fuzzy statement, the task of establishing the level of expenditures of this type in Russia is solved in practice annually by intuitive and / or voluntaristic methods in the formation of the budget and its execution.

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Originality of the text (03.01.20) – 97,44% - link - <https://text.ru/antiplagiat/5e0f1a1511207>

## ASSESSMENT OF THE LEVEL OF INNOVATION OF HIGH-TECH AND KNOWLEDGE-INTENSIVE ENTERPRISES USING EXPERT METHODS

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**Abstract.** Modern high-tech and knowledge-intensive enterprises develop and industrially produce innovative and competitive products, practically realizing the results of scientific research. The article proposes economic and mathematical tools that take into account the level of knowledge in a particular subject area, the quality of the information systems used on them, and is intended to assess the level of scientific and practical developments performed by enterprises.

**Keywords:** innovation, high-tech and knowledge-intensive enterprises, ratings, share ratios, mathematical modeling, instrumental methods, planning.

### **Introduction**

Innovative activities related to the creation of fundamentally new products, processes and technologies can help expand the economy's ability to enter the world market for goods and services, attract direct investments (including foreign ones) into the sphere of science and production, and bring real economic and social effects. In parallel with the creation of our own innovations, the import and development of advanced foreign technological products is necessary, which should also affect the technological level of production. But the basis for technological development should still be domestic scientific and technological achievements that better take into account the specifics and needs of the Russian economy, ensuring continuous self-growth of its intellectual potential and technological safety.

**Main part**

Innovation is the most significant source focused on the effective use of the results of fundamental and applied research on economic growth [1]. For this reason, the activity of innovatively active, knowledge-intensive and high-tech enterprises stimulates the development of scientific theories and practical developments, and also defines the most important areas of economic development of individual countries and interstate associations [2, 3, 4]. Currently, in terms of the dynamics and level of innovative development, Russian industry is 4-6 times behind the advanced industrial powers and 2-3 times behind most of the countries of Eastern and Central Europe.

The scientific, technical, technological and organizational level of research and development carried out by innovative-active, knowledge-intensive and high-tech enterprises is determined by analogy with the assessment of their industrial products using the specific gravities of these research and development ( $Y_p$ ) in the entire volume of R&D, which correspond to qualitatively different technical characteristics and also take into account possible uncertainties and risks arising from the production of new innovative products [5, 6]:

$Y_a$  – R&D share by technologies (products) that have no analogues of the same purpose;

$Y_{cy}$  – R&D share in technologies (products) that correspond to the world level and whose creation at the enterprises of industrialized countries is at the very initial stage;

$Y_{mn}$  – R&D share in technologies (products) that have already been introduced into production and are being implemented on national and international markets, but they are necessary to strengthen the state’s economic, defense and national security and to significantly increase its export potential;

$Y_m$  – improvement and modification of existing technological processes and products, aimed at increasing the economic efficiency of knowledge-intensive production and increasing its competitiveness.

For various types of research and development, share (rating) coefficients can be determined using expert estimates and methods (see table).

Assessment of the level of research and development carried out by innovatively active, knowledge-intensive and high-tech enterprises is calculated as follows [7]:

$$S_m = \sum_{p=1}^5 \frac{K_p \times Y_p}{100}, \tag{1}$$

where  $K_p$  – share (rating) coefficients for various types of research and development;

$Y_p$  – the proportion of research and development that meets the specific parameters of the studied indicator in the integral volume of industrial production (%).

**Table**

**Assessment of the technical and technological level of research and development, conducted by innovative-active, knowledge-intensive and high-tech enterprises**

Share (rating) estimates of technological and technical levels	
Share (rating) score	Technological and technical levels
3	Creation of technologies (products) that have no analogues.
2	Creation of technologies (products) that correspond to the world level and whose production at the enterprises of industrialized countries is at the very initial stage.
1	Creation of technologies (products) that have already been introduced into production and are being implemented on national and international markets, but they are necessary to strengthen the state's economic, defense and national security and significantly increase its export potential.
0	Improvement and modification of existing processes and products.

Depending on the quantitative values of the total (summary) assessment obtained as a result of calculations, the level of research and development carried out by innovatively active knowledge-intensive and high-tech enterprises is recognized:

- extremely promising and significant (range of ratings > 2);
- relatively promising and insignificant (range of assessments 1-2);
- poorly promising and practically insignificant (range of estimates < 1).

The development of science contributed to the intensive economic growth of those countries that actively contributed to the development of scientific, educational and research centers. In the twentieth century, new scientific results and knowledge embodied in technical devices, new types of products and technologies began to play a decisive role in the development of production complexes, corporations and states. It was during this historical period that science became the main source of economic growth.

In the process of globalization, countries lose their sovereignty, which inevitably leads to a situation where the management of the world economic system is concentrated not in the hands of those who possess natural and labor resources, but those who have knowledge and control information flows.

The global innovation system is developing both in a qualitative and in a territorial direction. High-quality development implies innovative activity in the priority areas of science and technology. Territorial development is manifested in the formation of new and evolution of famous international innovation centers.

### Conclusion

Thus, we described an approach to assessing the innovativeness level of high-tech and knowledge-intensive enterprises using expert methods, which include a set of particular indicators, their characteristics, weight coefficients and metrics for computing, which can be used to take into account scientific, technical, technological and organizational level of research and development carried out by innovative-active, knowledge-intensive and high-tech enterprises. Of course, the proposed toolkit is not universal. Obviously, more advanced approaches will be gradually developed, and the composition of particular indicators, their characteristics, weighting coefficients and metrics for computing will change in accordance with the requirements for the functionality of the new toolkit.

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- Originality of the text (03.01.20) – 89,65 – link - <https://text.ru/antiplagiat/5e0f1b8c81687>

## THEORETICAL ASPECTS OF STUDYING THE REASONS FOR THE POPULATION OUTFLOW FROM KAMCHATSK KRAI

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**Annotation.** This article discusses the issues dedicated to the causes and consequences of the growing demographic crisis in the Far East, in particular in the Kamchatka Territory. Particular attention is paid to the migration of young people from the region. A statistical analysis of the dynamics of migration and some socio-economic parameters affecting the quality of life of the population is carried out. Based on the results obtained, the need for research through questionnaires and surveys to identify subjective views of young people on the urban environment is revealed. The key aspects of the need to study the causes of the outflow of youth from the region and hypothetical methods for solving the problem are identified.

**Keywords:** urban environment, youth, regional development strategy, demographic crisis, population outflow.

Currently, the Government of the Russian Federation is implementing a socially oriented economic policy, the main purpose of which is to improve the quality of human life. Much attention is paid to the regions of the Far East. A number of managerial decisions have been taken to facilitate the implementation of projects aimed at creating the conditions for doing business with the aim of attracting investments, attracting, and most importantly keeping the population in the Far Eastern regions, these are the Far Eastern Hectare, TOSERS and the Free Port of Vladivostok with special management regimes tax privileges and preferences, etc. However, against this background, unpreparedness for significant growth and the general unstable socio-economic situation of the subjects of the Far Eastern Federal District are becoming more clearly visible.

So, in the Kamchatka Territory, along with the dynamic development of the region's infrastructure, an increase in the number of enterprises and the appearance of foreign investors at specialized economic sites, the demographic crisis exists and strengthens. Its criticality in the region is associated not so much with the proportional difference between the total fertility and mortality rates — the natural decline, but with the migration outflow. According to statistics, the natural population decline in 2018 in the amount of 2470 people amounted to 15.9%, and the migration outflow amounted to 84.1% of the number of people (13069 people), which reduced the population of the region. It is easy to see that the predominantly large weight is the outflow of the population. At the same time, migration outflow is observed in the amount of 702 people.

Kamchatka Territory is a promising region for the development of commercial and industrial relations. The rich reserves of marine biological resources and minerals, the unique geographical location and unique natural monuments make it significant in the sphere of economic interests of Russia. The potential possessed by the region, if properly developed, will allow attracting capital and major commodity flows, with the right management of available resources and the corresponding competence of specialists.

In addition to the well-known negative consequences that the outflow of the population from the region brings with it, it is necessary to highlight the so-called "brain drain". Currently, a significant proportion of young people are leaving the region in search of ways to get education in professions that are not possible to get in the region; work with a high level of wages or improving the quality of life. Such an outcome of events deprives the region of its own qualified specialists and increases the costs of enterprises to search for them or completely deprives them of the opportunity to develop in some highly specialized areas due to the lack of competent personnel.

Thus, the scientific community is faced with the task of studying the causes of such an active migration of the population from the region. Since the solution of this problem will not only solve demographic and economic problems, but also determine the most significant shortcomings of the region that have a negative impact on the perception of the territory of residence, including the city by youth.

The efforts of the federal authorities to break the negative migration dynamics do not bring the proper result. So the active development of the socio-economic environment in the region does not have a significant impact on the outflow of the population. Which proves the insignificant dynamics of the population of the region.

The distribution of population by age groups is presented in table 1.

**Table 1 - The distribution of the population by age groups in the Kamchatka Territory for the period 2014-2018**

Years	2014	2015	2016	2017	2018	Growth rate, %
<b>Whole population</b>	<b>319864</b>	<b>317269</b>	<b>316116</b>	<b>314729</b>	<b>315557</b>	<b>-1,35</b>
including age, years:						
0-4	19492	19848	20345	20408	20115	3,2
5-9	17777	18000	18025	18444	18866	6,1
10-14	16071	16261	16624	16930	17100	6,4
15-19	15830	15555	15264	15097	15483	-2,2
20-24	21587	19647	18265	17142	16660	-22,8
25-29	29831	28594	27169	25248	23666	-20,7
30-34	28800	28886	29236	29645	30080	4,4
35-39	27320	26904	26684	26733	27138	-0,7
40-44	25646	25850	26187	26147	26052	1,6
45-49	22350	22069	22326	22526	23405	4,7
50-54	24925	24056	22936	22004	21282	-14,6
55-59	22063	22010	22204	22390	22348	1,3
60-64	19437	19120	18882	18564	18540	-4,6
65-69	11738	13529	14774	15335	15699	33,8
70 and more	16997	16940	17195	18116	19123	12,5

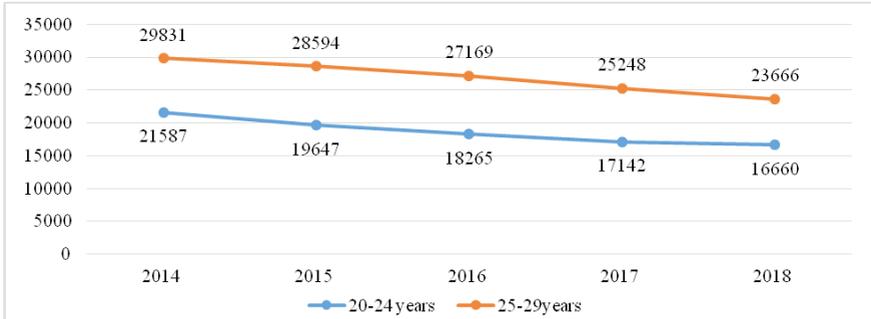
Source: compiled by the authors according to [1]

Based on the data presented in the above table, we can note the actual negative dynamics in the age groups of 20-24 years and 25-29 years. The interest in these age groups is due to the fact that the choice of an educational institution at this age is already generally made, since the age of graduation from grades 9 is 15-17 years, and 11 grades 17-19 years. This means the most probable reason for the outflow of young people from the region: the insufficient number of educational institutions for professions in demand by the population cannot be considered the main one. The age group of 15-19 years shows mixed dynamics.

The change in the population of the age groups of 20-24 years and 25-29 years is graphically presented in Figure 1.

In the analyzed period, the number of residents of the region aged 20 to 24 years decreased by 4927 people or 23%. The age category from 25 to 29 years old decreased by 6165 people or by 21%. At the same time, it

should be noted the increase in the rate of decline in the number of people in the group of 20-24 years over the past 3 years, and a slight stabilization in 2017-2018 in the group of 25-29 years.



Source: compiled by the authors according to [1]

**Figure 1 - Dynamics of the population of the Kamchatka Territory by age groups of 20-24 and 25-29 years in 2014 - 2018, people**

It is worth paying attention to the fact that the age category of 20-24 years coincides with the time for obtaining a diploma of higher education, therefore it can be assumed that there are a number of problems in the region that make it difficult for young professionals to get jobs that satisfy their needs.

The solution to this problem, in the understanding of youth, is to move to another region in order to obtain better work and prospects for professional development. Such a decision is usually associated with a number of additional costs for accommodation, job search, adaptation and more. However, even the need to solve these problems does not constrain and does not prevent migration.

At the same time, the average salary in the Kamchatka Territory is one of the highest in our country (Table 2). However, it should be noted a high level of expenses for ensuring the livelihood of the population. The region has one of the highest 1kW in the country. hours of electricity, 1 GK of heating calories, consumer goods and services. So, Table 2 shows the average wage in the constituent entities of the Russian Federation according to the Federal State Statistics Service and Kamchatka Krai takes 5th place in it.

**Table 2 - Average wages in the constituent entities of the Russian Federation in 2018**

Subject of the Russian Federation	Average salary for 2018, rubles
Chukotka Aut. constituency	98571,77
Magadan Region	86111,49
Moscow	83580,49
Sakhalin Region	75121,23
<b>Kamchatka Territory</b>	<b>72962,75</b>
Tyumen region	68550,63
Republic of Sakha (Yakutia)	67459,85
St. Petersburg	60224,71
Murmansk region	57612,99

Source: compiled by the authors according to

Outflow of the population, including highly qualified personnel provokes unemployment. According to the Agency for Employment and Migration Policy of the Kamchatka Territory, the number of officially registered unemployed citizens at the end of April 2019 amounted to 2668 people, decreasing by 3.6% compared to April 2018. The level of registered unemployment in the Kamchatka Territory remains at the level of 2017 and amounts to 1.5% of the labor force. Employers of the Kamchatka Territory declared 7.6 thousand vacancies to the employment service, the coefficient of tension in the labor market (supply and demand ratio) - 0.4 people per vacant position [3].

Thus, an analysis of the qualitative and quantitative parameters of the number of young people in the region does not allow us to speak about clearly expressed reasons for the outflow of the population. It seems necessary to analyze the most significant shortcomings of the region based on the subjective perceptions of members of the socio-age group of youth in the Kamchatka Territory. Such an approach is possible due to a survey and questionnaire, as well as the use of techniques to assess the following factors.

1. The level of identification of youth with the city in which they live. Urban human environment has a significant impact on physical and mental health, perception of the world, social adaptation and other aspects of human life. Including many factors created by man and nature, it forms a person's attitude to the city or other locality, and determines the way of life in it. On the one hand, the city provides a person with a number of socio-economic, social and cultural advantages, which positively affects his intellectual development, provides an opportunity for better realization of professional and creative abilities, on the other hand, a person moves away from nature and enters an environment with harmful impacts: pollut-

ed air, noise and vibration, limited living space, complicated supply system, dependence on transport, constant forced contact with many unfamiliar people - all this has a significant impact on him.

Studies of the urban environment in Russia for a long time did not offer to interpret it as an element of a social system with psychological properties that can cause specific reactions in human behavior. Nevertheless, the urban environment is not only the background against which social processes and behavioral actions of people living in the city take place. This environment can act as a full-fledged participant in the joint activity of a person and a city, embedding and determining the axiological content, creative intentions and social manifestations of the activity of an individual and society [4].

At the same time, as part of the urban population, young people build special relationships with the urban environment. Builds a special system of interaction with her, which forms their attitudes and emotional-value orientations. The urban environment acts as an object for the manifestation of one's own activity and acts as an initiator in the formation of responses.

The developed infrastructure of the city allows to ensure high efficiency in meeting the social and cultural needs of a person, to help him in self-realization, and also to determine his emotional state. In this case, specific conditions are necessary for young people, which together will create favorable conditions for the organization of youth in an urban environment.

2. Values of youth and their ideas about the possibility of realizing these values in an urban environment. As already mentioned, urban infrastructure can both contribute to the self-development and organization of youth, and can have a negative impact on them. Those values that young people aspire to in the social, cultural, entertainment spheres of the urban environment must be satisfied, otherwise the youth will seek to satisfy them in another city.

While in an urban environment, a person builds a special interaction system with him, determined by his relationships and emotional-value relationships with the environment as an object, field of activity, partner or initiator of the formation of human reactions [4].

The formation of the sociocultural space of youth should be carried out in conditions that ensure a prosperous and comfortable environment, introduce youth to culture, provide opportunities for the socialization of youth, as well as provide broad opportunities for its harmonious development.

The development of infrastructure is thus measured by the availability of urban leisure: educational centers, restaurants, clubs, fitness centers, shopping and entertainment centers, youth associations and organiza-

tions, sports sections and more. The impact on the satisfaction of young people is also provided by the holding of entertainment events in the city and other factors.

3. In particular, the idea of youth about the opportunity to get a quality education in popular professions and get a job in the future. The urban environment has the ability to indirectly form the vector of human development, its interests and goals. So youth under the influence of the realities of different conditions of the urban environment can strive for different professional fields of activity. This factor is proportionally effective and useful for the city attention to this issue. The lack of a formed system of views and development strategies in this problem contributes to the annual graduation of many specialists who do not meet the requirements of the local labor market. Thus, even with the appropriate education, young people can find a job in the region and move to another region in search of it.

4. Prospects for the implementation of entrepreneurial, labor, creative, etc. abilities of youth in the field of tourism. This is due to the special opportunities for the development of the tourism sector in the region, arising from unique natural monuments and the actively developing brand of the Kamchatka Territory. The formation of a clear idea of youth about the relevance of recreation in Kamchatka, the popularization of such recreation can form the image of a successful, constantly improving region and cause a desire to become an active participant in its socio-economic development.

Forming the opinion of young people about the needs, causes and factors that can attract specialists to the Russian Far East and / or restrain the population in the region will draw the attention of authorities and local governments to the criticality of the demographic situation. Making managerial decisions regarding the interaction of government and business on the effectiveness of the socio-economic development of the region in the context of implementing national projects, by creating new jobs with wages above the subsistence level in the region, attracting qualified specialists for training and / or advanced training of specialists involved in the implementation of innovative and investment projects within the framework of TOSED, the development of state orders to local universities for training personnel for priority sectors of the regional economy, etc.

The creation of a high-quality brand in the region, the targeted satisfaction of the needs of youth identified during the questionnaire and survey, will help draw the attention of the authorities to the criticality of the demographic situation, increase the efficiency of the socio-economic development of the region by releasing and organizing qualified specialists.

Against the backdrop of modern demographic problems, in particular, the outflow of young people from the Kamchatka Territory, information characterizing the attitude of young people to the city and ideas about the possibility of implementing basic values in it are of particular importance. The study will determine the fundamental factors in maintaining psychological well-being or identify the causes of maladaptive tendencies.

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**DISCUSSION OF THE REFORMS OF PETER THE GREAT IN THE  
PROCESS OF TRAINING TEACHERS TO TEACH DEBATABLE  
ISSUES OF HISTORY**

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**Abstract.** In the process of preparing teachers for teaching of controversial issues in the classroom, the most relevant among teachers was the problem of reforms of Peter the Great. The article presents a variant of the organization of classes in the process of training teachers of history on the importance of reforms of Peter I for Russia. Attention is focused on the architecture of the reforms themselves, their interrelation, consistency and complexity. The proposed option can be integrated into the modular course «Didactic bases of formation teacher's readiness to teaching of debatable questions of historical science», developed by the authors for the system of additional professional education, allowing the teacher of history in the process of teaching to avoid falsification on this subject. The article is aimed at teachers of secondary schools teaching history and social studies, graduate students and researchers interested in pedagogical problems and people interested in historical subjects.

**Keywords:** Discussion questions, professional development, methods of teaching history, the Slavophiles, the Westerners.

At all levels of historical education, subjects related to the reforms of Peter I arouse increased interest of the audience. Moreover, it is impossible to bypass this plot when considering debatable issues of historical science [4; 6; 11]. Since there are a lot of interpretations, judgments and falsifications on this topic, it is necessary to pay due attention to the preparation of teachers to cover this issue [5; 7; 8] when organizing the study of debatable issues of historical science in the general education system.

This work was successfully carried out in the framework of approbation of the study "Formation of didactic readiness of history teachers to study debatable issues of historical science" in the course of training of history and social science teachers at the Department of History, Social Science and Economics of the Novosibirsk Institute of advanced training and retraining of education workers in the first decade of this century [2; 3; 9; 12-15].

After this introduction, the problem can be formulated: can extraordinary measures, which gave such a tangible result, as was the brilliant victory over one of the strongest States of the world – Sweden, be recognized as a universal and only suitable means of achieving the "common good" in the conditions of Russia [1, p. 9]. It is important to organize the work so that the formulation of the problem arose in the process of entering the audience into the topic of the lesson.

In the unfolding process of debate the first group of participants proves that the Slavophiles regarded the transformation of Peter as a violent intervention of state power in the course of social development, as a transfer to Russian soil of alien ideas, customs, whether the Swedish system of administrative division of the country or the German cut of the dress.

The second group of participants focuses on the fact that the Westerners proceeded from the fact that Peter The Great started and carried out a useful thing for the country, accelerating its development and reducing the backlog of Russia from Europe [16].

Both groups develop historiographical sheets in preparation for the discussion [10]. Moreover, the historiographical sheet of the first group should be arranged so as to give arguments against the position of the second group. And vice versa.

The leader of the discussion naturally brings its participants to the question: "Could the subordination of the entire course of reforms to one imposed goal—the strengthening of the state, the increase of its military power—give the reforms an artificial character?"

Now there is a need to determine why the main areas of reform of Peter The Great were the army, public administration and Finance? Why reforms affecting certain areas of public life were somehow subordinated to military and political tasks, and could it be otherwise in those historical conditions? Why did Peter I initially did not have a well-thought-out plan of reforms, and could there be such a plan at all?

Reasoning in the process of discussing the issues raised allow participants to correctly determine the priorities of reforms, to understand why, grasping the link of military reform, it is possible to build the whole chain of Peter's reforms. This allows us to understand that real significant changes

are possible in the absence of a developed, prescribed and publicly presented reform program. As well as the developed, registered and publicly presented program of reforms in the absence of any real significant transformations is possible. But this is the topic of the next lesson.

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**TEACHER SELF-IMPROVEMENT DURING THE PERIOD  
OF INNOVATIVE TRANSFORMATIONS IN THE MODERN  
PROFESSIONAL - EDUCATIONAL SPACE**

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**Abstract.** Mankind has moved to a new stage of development in which the destruction of traditional moral values and uncertainties in the future are reflected in the mass psychological processes of modern society in which a person is dehumanized. The article pays special attention to the growing role of the teacher during the period of innovative transformations, which throughout its life should strive for self-development and self-realization through self-education, self-organization and self-improvement. The construction of his professional activity is based on humanistic principles and is projected into certain expressively instrumental characteristics. It is concluded that the improvement of pedagogical competence, which involves the teacher seeing a holistic scientific picture of the world in its modern sense, becomes necessary for the formation of a creative person.

**Keywords:** teacher, personal development, self-realization, self-improvement, creativity.

According to scientists, humanity has entered a new phase of transition from one type of its development to another. The transition to a new type of society is largely determined by the paradigm of education. The crisis of education in this regard is a component of the global civilizational crisis and can be considered as a mismatch of its goals and results [3, 5, 6, 11]. Incon-

sistency leads to the fact that the system of those values that are really rewarded in life will win. However, on the other hand, by adopting the existing system of values and focusing on education, we run the risk of never being exalted in social and personal development. Are we really going to take as a model the values of a mafia-corrupt society that are spreading now?

The education system today is nothing but the service sector, in fact trade is the sale of their educational skills to the state or private individuals. As a natural consequence, we have appeared in education with a lot of advertising, shows, hyperbolic promises - all that accompanies successful trading. The modern educational process is becoming more and more a kind of innovative management, turning into a technology for the production of intelligent "products". Intellectual property is "commercialized." Innovative management technologies invade the humanitarian spheres of not only education, but also culture and art, which leads to their degradation. The destruction of traditional moral values, uncertainties about the future are reflected in the mass psychological processes of modern society, in which a person is dehumanized. In this approach to education, the personality disappears, is "depersonalized" [5 p.12].

The Russian education system, according to G. P. Sikorskaya, has come to a "bifurcation point" - a deep crisis, as evidenced by the following factors:

- sharp decrease in the moral and ethical potential of education;
- weak influence of education on the general cultural level of the population;
- falling interest in a person's education in society;
- the concepts of high morality, responsibility, honor and conscience, ethical assessment of one's actions in relation to nature and society, as well as one's behavior in interpersonal interactions that disappear from everyday life;
- low international ranking of Russian universities;
- failures and incompleteness of numerous reforms of general education;
- traditions of the Russian school that are forgotten and many other phenomena [7 p. 88-89].

The modern education system, which bears "superresponsibility" for the future of the state, since the solution of the problems of training and upbringing the younger generation depends on this system, needs to search for new conceptual ideas and methodological foundations that can strengthen the spiritual and moral side of education, notes G. P. Sikorskaya [7].

In this regard, the main contradiction in the education system, in our opinion, is the lack of an ideological vector of development in state educational institutions of the upper echelon of power, which previously formed spiritual moral meanings and values. Therefore, it is necessary to build ideals in the new coordinate system. The world is changing, and approaches must be changing with it. Modern pedagogy must be presented with other, non-classical requirements. The essence of the non-classical approach is the comprehension of the fact that science still defines the material world as the only and unshakable sphere of attention. And in accordance with this, humanity completely naturally, having built, not without the help of science, a consumer society - the inhuman, anti-natural, aggressive has come into a modern crisis state from which official science knows no way out. The survival of mankind lies only on the path to transition to a new one - a spiritual, highly moral society (civilization), which implies a harmony of material, spiritual and social, while carefully selecting all the best from the past, abandoning the unnecessary, accepting the present.

We agree with the statement of B. S. Gershunsky, who writes: "Education and only education can maintain the mental values of society at the proper level and guarantee their enrichment and development. Education and only education, acting as a kind of intermediary, a spiritual traveling salesman between the mental space, spiritual values of society and the environment of consumption of these values, is designed to help not only spontaneously formed demand in society determine mental supply, but also mental offerings themselves actively form demand" [2, p.69-70]. Then B. S. Gershunsky comes to conclusions, arguing that overcoming the crisis of modern education is possible only on the path of spiritual convergence of different societies (including professional pedagogical educational space) [2, p. 72].

It is during this period of innovative transformations in the field of education that the role of the teacher as a carrier and translator of certain semantic models of human-world interaction increases. Therefore, the construction of a teacher's professional activity should undoubtedly be based on humanistic values and meanings, projected into certain expressively instrumental characteristics of his activity. A talented teacher is distinguished by the ability to understand the student, is able to captivate, lead. But this is not enough. At the present stage, the teacher, as a subject of professional activity, must tirelessly strive for personal and professional development, expanding his competencies, constantly shaping and improving himself. Consequently, individuality and its personal potential should be the basic characteristics of the integrity of the personality in terms of the implementation and enrichment of its individual resource capabilities.

Therefore, the modern educational concept is focused on the formation of pedagogical competence, which involves the teacher seeing a holistic scientific picture of the world, and in the process of pedagogical activity, in its modern sense, it becomes necessary to form a teacher of a creative type (homocreator). And creativity is the ability to generate new knowledge by expanding and transforming the vision of reality as the future, capable of systematically organizing the present, i.e. creativity is creative construction in the mode of self-organization. This implies the development of a fundamentally new culture of thinking by the teacher. And this means that it is more important to think correctly than to know a lot: "Imagination is more important than knowledge" (A. Einstein) [8, p. 86].

The teacher himself in the education system during his conscious life should strive for his personal, professional development and self-realization through self-education, self-development, self-improvement and self-organization. Self-realization in this context is understood as the main mechanism for the formation of the spirituality of a person. And here we agree with the opinion of K. A. Abulkhanova-Slavskaya that self-realization is a kind of the highest stage of development of a mature personality, the result of personal growth and development. Moreover, self-improvement is understood as a process of familiarization with culture, a continuous increase in the level of one's knowledge and active realization of oneself in life [1, p.21].

This is also indicated by L. A. Korostyleva, arguing that self-realization is a definite desire for self-improvement, that is, "one of the highest needs of the individual, aimed not only at the realization by a person of his abilities, improving the quality of his activities, which are based on the highest universal human values" [10, p. 39].

According to R.K Serezhnikova, the upbringing of a person with an appropriate level of spiritual, material, interactive culture begins with setting goals. Self-improvement involves four processes: self-determination, self-prediction, self-preparation and self-realization [9]. Let's consider them in more detail:

- self-determination of the teacher as a subject of pedagogical activity includes self-analysis and compilation of auto-characteristics;
- self-forecasting consists of goal-setting and planning of possible results;
- self-training is the formation and subsequent development of attributive personal and professional qualities of a teacher. The composition of self-training includes self-education and self-discipline;
- self-realization is the embodiment of what is planned. A very import-

ant process - self-realization - is a combination of self-expression, self-affirmation and self-correction [9, p.10].

The process of self-improvement of the future teacher involves passing the following stages:

- An unconscious need for self-improvement (the presence of an unrecognized internal conflict situation);
- awareness of the existence of an internal conflict situation;
- development of the need for self-improvement in process motivation;
- goal setting;
- forecasting;
- design (creation of the author's self-improvement system);
- planning (resources - time budget - resource and calendar planning);
- step-by-step implementation of the planned;
- analysis of current results, adjustment of the process of self-improvement;
- awareness of a new internal inconsistency;
- repetition of the process of self-improvement (starting from the third step) at a new level [10, p.128-129].

The process of self-improvement is influenced by favorable and obstructive factors, which are divided into objective and subjective. In the structure of objective both favorable and inhibiting factors, social (public) and service factors are distinguished. At the same time, all favorable subjective factors can be divided into mental formations and subjective qualities. Mental formations include general and special knowledge, skills, abilities and experience. And subjective favorable factors include: individual typological qualities (temperament and its manifestations, character, orientation, abilities), professionally important qualities, reflective culture and acmeological invariants (empathy, professional reflection, creativity, attraction, responsibility, etc.) [10].

The basic criterion for a spiritually developed personality is considered to be its mastery of the creative process, therefore, creativity should also be an invariable attribute of the teacher. There may be a direct connection between the creative process and the implementation of the teacher's abilities in a socially significant form of activity, such as education, which undoubtedly has signs of self-realization. And the most complete disclosure of the makings and talents of a teacher is possible only through the implementation of socially significant activities. Moreover, it is quite important that the implementation of such activities is determined not only by external factors (of society), but also by the internal needs of the individual. Under such conditions, the activity of the teacher is transformed, and

the realization of abilities in pedagogical activity acquires the features of self-realization. It follows that the teacher's creative activity is a "self-activity" encompassing personal self-realization in the process of creating spiritual values. Creative self-realization of the teacher allows you to also expand the boundaries of his potential as a person. The mastered creativity means that the teacher follows the path of development of the spiritual component of personal growth.

Thus, for the current society, the question of the implementation of the teacher in the professional sphere is becoming a key. The teacher achieves a certain degree of creative self-realization, applying creativity and expresses his creative essence. This creates the prerequisites for self-development and self-realization in the professional activity of the teacher.

### **Conclusions**

The Russian education system has come to a deep crisis and therefore needs to seek new conceptual ideas and methodological foundations.

The need has ripened for presenting modern pedagogy with other, non-classical requirements that can strengthen the spiritual and moral side of education. In this regard, it is necessary to build ideals in the new coordinate system, carefully select all the best from the past, abandon the unnecessary, and accept the present. Overcoming the crisis of modern education is possible only on the path of spiritual convergence of various societies.

During the period of innovative transformations in the field of education, the role of the teacher as a carrier and translator of certain semantic models is growing. For this, the educational concept today is focused on the formation of pedagogical competence, which involves the teacher seeing a holistic scientific picture of the world. In pedagogical activity in its modern sense, it becomes necessary to form a teacher of a creative type (homocreator). This format implies his relentless pursuit of his personal and professional development, and for this, the teacher should strive to realize himself through self-education, self-development, self-improvement and self-organization. Signs of self-realization may be the realization of the teacher's abilities in a socially significant form of activity, such as education. The basic criterion for a spiritually developed personality is considered to be its mastery of the creative process, which should also be an invariable attribute of the teacher's activity, because there may be a direct relationship between self-realization, the creative process and the realization of the teacher's abilities in a socially significant form of activity that has signs of self-realization. Creative self-realization of a teacher allows expanding the boundaries of his personal potential.

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## ASSESSMENT OF STUDENT ANTI-CORRUPTION TRAINING

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**Abstract.** Currently, corruption, covering all spheres of life and activities of the state and society, causes serious damage to the socio-economic development of the country and threatens its national security. Against it, the efforts of the legislative, executive and judicial authorities are directed, which are tasked with eradicating this negative phenomenon. Their successful solution depends not only on the governing bodies, but also on the active citizenship of all members of society. Graduates of higher educational institutions, prepared for activities to combat corruption, are called upon to play a significant role in this.

This article presents a modern assessment of the anti-corruption training of graduates and analyzes the public opinion of students on anti-corruption issues. An attempt has been made to open up unused reserves for improving the quality of anti-corruption training of graduates for activities in the positions of state civil servants and specialists of government bodies.

**Keywords:** Corruption, anti-corruption, the legislative framework for the fight against corruption, the level of anti-corruption training of students, improving the effectiveness of preparing graduates for the implementation of anti-corruption policies.

In the message of the President of the Russian Federation to the Federal Assembly of the Russian Federation, it was noted that "Corruption is on a par with terrorism as the main danger threatening the national security of Russia" ... therefore, "the fight against it will be waged publicly, without compromise" [1, p. 2]. In accordance with this, the Department of Management of the RSU A.N. Kosygin adopted a plan of research work (R&D) for 2019-2020 under the name "Corruption through the eyes of students."

The relevance of scientific research is due to the need to determine the quality of anti-corruption training of students, to assess the level of university training of graduates for anti-corruption activities in the positions of senior staff and specialists of government bodies; summarize best practices, identify weaknesses and justify the main directions for improving training, education and the willingness to actively participate in the implementation of the National Anti-Corruption Plan in the Russian Federation [2, p. 3-12].

The research plan includes several stages aimed at studying the public opinion of students regarding the increasing role of graduates in the implementation of the anti-corruption policy of the Russian Federation. The aim of the study is: to assess the quality of anti-corruption training in a higher educational institution, to identify students' attitudes and their degree of readiness to fight corruption, to reveal shortcomings and formulate proposals for improving education and upbringing in the interests of implementing state anti-corruption policy.

The objectives of the first stage of the study are: to determine the level of knowledge of students on the problem of corruption and the fight against it, legal support of anti-corruption policies, students' attitudes to corruption, identifying reserves to improve the quality of training and willingness to combat corruption.

The methods for collecting information and conducting the research identified: oral, written and online surveys, formalized interviews, testing, questionnaires, solving situational problems, working as part of small groups, studying documents, analyzing the educational process on anti-corruption training of future leaders and specialists in the field of state and municipal administration and transport of the Russian Federation.

The study was conducted among students of the Russian State University A.N. Kosygin, engaged in the direction of 38.04/03.04 State and municipal administration. In the interest of comparing and summarizing the best practices, the study was attended by students of the Russian Open Academy of Transport of the Russian University of Transport, studying in the direction 20.03.01-01-BB-Life Safety in the technogenic sphere. The sample size of the respondents was 200 people. Pilot testing of the research methodology was carried out on the basis of the study group G-116 RSU. A.N. Kosygin, who showed positive results.

The theoretical novelty of the article is the provision of real data on the level of anti-corruption training and the readiness of graduates to combat corruption, as well as the formulation of proposals to enhance the role of university training in the fight against corruption in state and municipal governments (SMG) and transport enterprises (Russian Railways).

The applied value of the work is the possibility of using its results in the process of training and education of students of humanitarian and technical universities and strengthening the role of graduates in the fight against corruption in government.

A sufficiently high degree of scientific elaboration of the problem of the fight against corruption and the reliability of the data obtained are confirmed by comparative data provided by the Academic Center for Strategic Studies, the Center for Strategic Research under the Government of the Russian Federation, the Center for Economic and Political Reforms, the All-Russian Center for the Study of Public Opinion, the Center for Problem Analysis and State Management Design.

Assessment of the level of anti-corruption training of students of humanitarian and technical universities was carried out on the basis of solving control tests among all categories of students. The central link was a test of knowledge of the regulatory framework, of which federal laws "On Combating Corruption" [3, p. 4-18], "On the State Civil Service of the Russian Federation", "On Monitoring the Compliance of Expenses of Persons Filling Government Positions and Other Persons with Their Incomes". Decrees of the President of the Russian Federation "On the National Anti-Corruption Plan for 2018 - 2020" [2, p. 1-12], "On some issues of combating corruption" have considerable significance. Decisions of the Government of the Russian Federation "On the approval of the rules for verifying the accuracy and completeness of information on income, on property and property obligations submitted by citizens applying for filling the positions of heads of federal state institutions, and by persons filling these positions" and others.

One of the tasks defined by domestic regulatory documents is "increasing the effectiveness of educational and other activities aimed at creating anti-corruption behavior of state and municipal employees, popularizing anti-corruption standards in society and developing public justice" [2, p. 2].

Students and undergraduates of all courses were tested. The results are presented in table 1.

**Table 1**  
**Test results of students on knowledge of regulatory acts aimed at combating corruption (the number of correct answers in %% of the total number of respondents)**

RSU A.N. Kosygin						ROTA (MITE)					
1 year	2 year	3 year	4 year	Master students	Total	1 year	2 year	3 year	4 year	Master students	Total
72,7	76,9	87,5	89,0	90,0	83,2	80.7	82.0	85.7	86.7	80	83.0

As can be seen from the above data, the majority of students (about 83%) successfully master the norms of anti-corruption legal acts in both the humanitarian and technical universities, demonstrating improved results as they move to older courses. And, nevertheless, from 11 to 13% of students showed negative results.

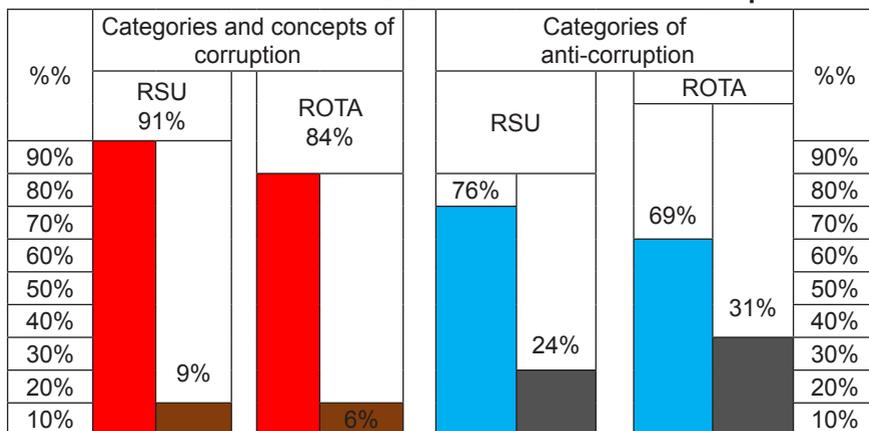
Much worse is the situation with knowledge of international anti-corruption law, including the United Nations Convention against Corruption ratified in the Russian Federation of March 8, 2006. Here 56% of students at RSU and 48% at ROTA received positive results (from 3 to 5 points). ROTAs. Accordingly, students of RSU (46%) and ROTA (52%) received negative marks. It should be noted that knowledge of the anti-corruption norms of law of neighboring states is mandatory for civil servants and heads of international transport communications.

Particularly noteworthy are the results of an analysis of the level of knowledge of graduates in the field of basic concepts and categories of corruption and counteraction to it. It is puzzling that every ninth RSU graduate and every eighth ROTA graduate cannot define corruption. Whereas the head or the state/municipal employee should clearly know that "corruption is an abuse of official position, giving a bribe, receiving a bribe, abuse of authority, commercial bribery or other illegal use by an individual of his official position contrary to the legitimate interests of society and the state in order to obtain benefits in the form of money, valuables, other property or property-related services, other property rights for oneself or for third parties, or illegal attribution of such benefits to the specified person by other individuals" [1, p. 3].

The situation with the concept of "anti-corruption" is even worse. 24% of RSU respondents and 31% of ROTA have no idea what the legal definition and content of anti-corruption is. The results are presented in diagram 1.

**Diagram 1**

**Results of testing the knowledge of all categories of students in RSU and ROTA on the basic concepts and categories in the field of corruption and counteraction to it (negative and positive results in % of the total number of respondents)**



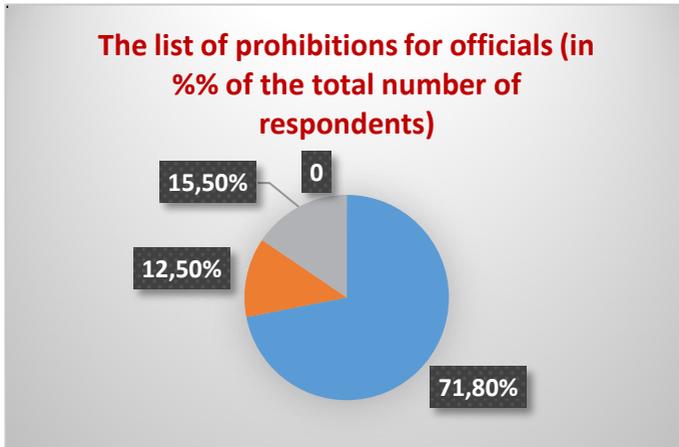
Anti-corruption - "is the activity of the federal government bodies of state power of the constituent entities of the Russian Federation, local governments, civil society institutions, organizations and individuals within their powers: to prevent corruption, including identifying and subsequently eliminating the causes of corruption (corruption prevention ), to minimize and (or) eliminate the consequences of corruption offenses "[1, p. 3].

In the course of the study, special attention was paid to clarification

**Diagram 2**

	Correct answer. It is forbidden to open, have accounts, keep money and valuables in foreign banks
	Correct answer. It is forbidden to own and use foreign financial instruments
	Incorrect answer. It is forbidden to own, use and dispose of real estate in foreign states

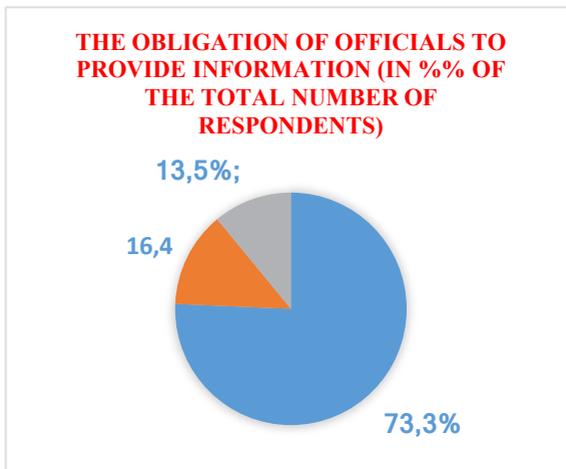
by students of the prohibitions imposed on persons holding federal government posts, positions of constituent entities of the Russian Federation, heads of municipalities, deputies of representative bodies, leaders and specialists of transport, as well as their spouses and minor children. The levels of assimilation of bans are presented in diagram 2.



It can be seen from them that complete and correct answers within 71.8% were presented by the interviewed RSU and ROTA students. 12.5% gave correct, but not complete, answers. And 15.5% showed absolute ignorance of the prohibitions in the study area.

During testing, the level of understanding by students of the duties of officials to provide certain information about incomes was checked (see: diagram 3).

**Diagram 3**



	Correct answer. Obligation to submit information about their income, property and property obligations
	Correct answer. Obligation to provide similar information for their spouses and minor children
	Incorrect answer. Obligation to submit information about their expenses and expenses of their spouses and minor children

As can be seen from the data presented, the correct answers within 73.3% were given by the interviewed respondents from RSU and ROTA regarding the obligation of the relevant officials to provide information about their income, property and property obligations. Significantly fewer were the correct answers (16.4%) regarding the obligation to provide similar information to their spouses and minor children. And 13.5% of RSU and ROTA students gave incorrect answers at all. Which, of course, does not meet the requirements of regulatory documents for future state and municipal employees of SMG bodies and specialists of transport departments.

In the course of research, other shortcomings in the field of university training of graduates were revealed. Proposals for its improvement were substantiated. Unfortunately, the scope of a scientific article does not allow us to fully provide the most general recommendations for humanitarian and technical universities to improve the quality of anti-corruption training of graduates. Therefore, we focused only on unused reserves [4, p. 99-100].

1. Given the negative significance of corruption as a threat to national security, it would be advisable to focus the attention of teachers of the basic part of academic disciplines on combining general theoretical problems with specific issues of forming an anti-corruption worldview of students. A significant role could be played by a criticism of the ideology of corruption ties, the history of their formation, economic wrecking, corrosion of morality, and undermining people's trust in government.

2. The process of mastering the content of special academic disciplines: "Theory of Management", "Fundamentals of SMG", "State and Municipal Service", "Ethics of the State and Municipal Service", "Fundamentals of Personnel Management could be of great importance in the interests of implementing the National Anti-Corruption Plan" " other.

3. It is extremely necessary to focus legal disciplines on the implementation of anti-corruption policies in the Russian Federation. These are “Fundamentals of Law”, “Fundamentals of the Theory of State and Law”, “Constitutional Law”, “Civil Law”, “Administrative Law”, “Municipal Law”, “Labor Law”, etc., each of which contributes to the mastery of students active anti-corruption attitude.

4. Teachers of psychology, sociology, political science, consulting, ethics and other similar disciplines can find their specific approach to the formation of graduates' readiness to resist corruption.

5. A positive role should be played by the transition from a narrative presentation of the material to active and interactive forms of conducting practical exercises: to solving situational and legal problems, a business game, working as part of small groups, “Case” methods and others that contribute to the successful mastery of strong knowledge and skills, the formation of an active life position and readiness to combat corruption.

These and some other recommendations will undoubtedly contribute to increasing the effectiveness of anti-corruption training and education of graduates.

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## ANALYSIS OF THE SEMANTIC GROUP "COLOUR NAMES OF CARS" IN COMPARISON OF TWO LANGUAGES

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**Abstract.** The semantic classes of English object adjectives related to the semantic field "color", functioning in the names of cars, and the Russian correspondences of these adjectives obtained in the course of the analysis of translations of the studied color names of cars are investigated. The structural features of the object color names are established.

**Keywords:** semantic classes, object color designations, adjective colors, car color names

This study is devoted to structural-semantic analysis of the lexical-semantic group of words denoting color, namely, the object color names of cars.

Research Objectives:

- - identify English and Russian object adjectives of various types based on examples of color names for cars in structurally different languages (Russian and English);
- - characterize the obtained color terms: determining the structure and semantics of the analyzed object color names, their frequency parameters and compatibility with the allocation of general and specific;
- - description of the most characteristic ways of translating English color names of cars into Russian, based on the use of lexicographic sources, taking into account the context and language features of the systems of the source and translating languages;
- - establish and characterize the role of color names in shaping the meaning of phraseological units studied in English and Russian, focusing on their similarities and differences.

Subject of research: object color labels, which are special semantic classes and are components of the entire color name field. Their study contributes to the systematic analysis of vocabulary as a whole.

Object of research: semantic classes of English object adjectives related to the semantic field “color”, functioning in the color names of cars, and Russian correspondences of these adjectives, obtained in the analysis of translations of the studied color names into Russian.

In this paper, the semantic class is understood as a set of elements having a common color field value and a particular value, on the basis of which these elements are combined into one class. So, on the basis of concretization of the general invariant value, we can distinguish a class denoting, for example, white color: chalky, milky, ashy, snow-white, paper-white, Chinese white; or class denoting black color: coal, inky, jetty-black, raven-black etc.

In the analysis, a sampling method was used from technical and specialized literature, reference books, media, the Internet, and Russian translations.

Stage 1 of the research:

- 2 classes of color names characteristic of Russian and English are distinguished:
  - 1. White color (chalky, milky, ashy, snow-white, paper-white, Chinese white);
  - 2. Black color (coal, inky, jetty-black, raven-black).

The paper defines adjectives derived from the color names of cars and having a pronounced etymology: olive; silvery; jade-green; leaden; azured; straw-colored (-tinted, -hued); the color of copper.

Stage 2 of the research:

- The analysis of adjective colors in Russian and English by comparing them and studying the features of functioning in the names of cars was carried out.
- It has been established that the English adjective blue is undifferentiated with the Russian language and is reflected in two color terms: синий and голубой. English color codes are different in meaning: sea blue and sea green. In Russian – it’s сине-зелёный or цвет морской волны.
- We have found 10 color codes for cars from the blue-green group according to the Ford Motor catalog: Outrageous Green, Green Gern, Blue Candy, Nitrous Blue, Blue Jeans, Blue Metallic, Lightning Blue, Dark Blue, Deep Impact Blue, Kona Blue. We calculated groups of color adjectives formed from the names of flora (58 units) and precious stones, metals and minerals (39 units), characteristic of English and Russian languages. The rarest color names are gold, silver, orange, sallow, violet, cream and flaxen. Some differ in narrow compatibility: gold, silver,

bronze, copper, russet, cream, snow, violet, lemon, rose. The car colors of jet-black, coal-black, hazel, flaxen, chestnut, sallow, straw-colored are widely compatible.

Thus, the subject of research at this stage was the national-cultural specificity of the English-language color picture of the world, which is reflected in the English object color names, including a wide range of car names.

English color names of cars are divided into the following groups:

- 1. Simple (white, black)
- 2. Derivatives (golden, leaden, rusty, silvery)
- 3. Two-part (grass-green, snow-white-, earth-coloured; golden vermilion, fallow gold)
- 4. Collocations (the colour of cream, the color of old bricks, the colour of pale leather)
- 5. With modifiers (pale sea-green silk, dark gold ringlets, a dusky orange).

Also, 40 color names of Ford Motor vehicles were identified, among them: 11 - the main group, 10 - a group of blue-green names and shades. 180 designations were identified in the AvtoVAZ factory's catalog of car colors, among them more than 70 car color names were borrowed from different languages.

It has been established that car manufacturers are involved in the process of word-formation of the Russian language: "автоколористика", "автоколоризм" is not present in any modern explanatory dictionary. 11 main color names in English are defined: white, black, gray, red, green, yellow, blue, brown, pink, purple, orange.

Thus, the results of our observations indicate that the object color names are grouped around eleven centers represented by the main color adjectives, clarifying the shades of the primary color.

Conclusions:

1. We have established 11 basic color terms in English: white, black, grey, red, green, yellow, blue, brown, pink, purple, orange)

2. The results of our research indicate that object (automotive) color names can be formed into groups represented by the main color adjectives, clarifying the shades of the primary color. So, for cars of the company FORD MOTOR we have established 10 shades of blue-green.

3. The most numerous color designations of cars in English and Russian are groups of color adjectives formed from the names of the flora (58 units) and from the names of precious stones, metals and minerals (39 units).

- 4. Analysis of the reference material made it possible to establish the frequency of use of one or another color designation of cars. Among the color designations we examined, the rarest ones are gold, silver, orange, yellow, violet, cream and flaxen. Objective color adjectives characterized by narrow compatibility include gold, silver, bronze, copper, russet, cream, snow, violet, lemon, rose. The following color designations are widely compatible: jet-black, coal-black, hazel, flaxen, chestnut, yellow, straw-colored.
- 5. English object color names of cars have characteristic structural features and are divided into: simple; derivatives (golden, leaden, rusty, silvery) -, two-part (grass-green, snow-white-, earth-colored; golden vermilion, yellow gold); collocations (the color of cream, the color of old bricks, the color of pale leather) and color codes with modifiers (pale sea-green silk, dark gold ringlets, a dusky orange).

### Conclusion

The color naming system has its own characteristics in different languages. The color systems of different languages are very different from each other. This is due, first of all, to the fact that the coloristic language reflects the color associations of a particular culture, which form under various historical and geographical conditions. Color perception and color understanding include all the main areas of vital activity of an ethnic group. The color picture of the world of the English people has its own specifics. So, the English main adjective of the color blue is undifferentiated in comparison with the Russian language and is reflected in two color terms: синий and голубой. As for the object color names, their meanings are also vague, for example, in English and Russian there is a non-distinction between the "meanings" contained in the English object color terms sea blue and sea green. They are "covered" by one "meaning" - enclosed in the words *сине-зеленый* and *цвет морской волны*.

Object color names included in the color picture of the world of the English language are also widely represented in literary texts, where they acquire the ability to participate in the formation of the artistic meaning of the text whole. Color is the most important means of emotional impact on a person (passenger, driver, pedestrian, reader. Translation of a literary text is a means of international exchange of cultural values. The original is characterized by belonging to one culture, while translation is the result of a comparison of two cultures. When translating color designations, the technique of superimposing "one's own color picture of the world" on the "foreign" is used. As a result, the development of a "foreign" color picture of the world is carried out by means of its conceptual system.

An example of this kind of development can be the English object color designations, which owe their origin to the stable characteristic coloration of the corresponding objects existing in the world around us, for example: lemon-yellow, chocolate-coloured, coal-black, straw {лимонный, шоколадный, угольный, соломенный} etc. A distinctive characteristic of this kind of color designations is that, in contrast to the main adjectives of color, they have a pronounced etymology and imagery.

Object color designations are rich material for comparing the lexical fields of color names in English and Russian, because they are a manifestation of the peculiarities of the national character of the language, reflect the cultural identity of each nation, which distinguishes surrounding reality in its own way, choosing various objects for comparison.

## THE IMAGE OF CHINA AND THE "CHINESE TEXT" IN RUSSIAN LITERATURE OF THE XIX–XXI CENTURIES

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**Abstract.** The paper considers the phenomenon of the depiction of China in Russian literature, which is called the "Chinese text" and reveals the features of its functioning in Russian culture of the XIX – XXI centuries. The "Chinese text" is interpreted as a single "supertext", uniting the image of China, its history and nature, the reproduction of its cultural realities (moral and philosophical ideas, mythologies, motifs and images) and allowing us to pose problems important for the culture of both countries on the Chinese material: correlation "Traditions" and "progress", the path of spiritual development of man and humanity, and many others.

**Keywords:** "Chinese text", the image of China, Russian literature, sinology.

In Russian literary criticism of the 1990–2000s, it became popular to study various versions of "thematic texts" - "Venetian" [12], "St. Petersburg" [16], "Pushkin" [4], "Perm" [1] and etc. "Thematic text" in this case means the union of works of art (in particular, literature) around a certain material - "topos" ("art space" of countries or cities: Italy, Venice, Moscow, St. Petersburg, etc.) - or the personality of an outstanding culture figure (A.S. Pushkin, S.P. Diaghilev).

The concept of "text" in this case is used in the meaning that was used by Yu.M. Lotman [10] and poststructuralists [2]: as a complex structured whole, "text of culture" associated with many texts and contexts that intersect in various ways [6]. In philology, such texts are called *supertexts* expressing the "totality of utterances", limited "temporally and locally", united "meaningfully and situationally", characterized by "integral modal attitude" and "sufficiently definite positions of the addresser and addressee" [9; 215].

Any "supertext" is a system united by a value-semantic community, the presence of "cultural images" associated with it, and numerous non-textual

realities. These features of supertext V.N. Toporov described as follows: "...All "multiple-different", "motley" individual-evaluative is involved in this field, captured by it and, as it were, realized in it into the flesh and spirit of a single text. <...> It is precisely because of this that the "subjectivity" of the whole strikingly provides <...> the "objectivity" of the particular" [16; 261]. The other qualities of "supertext" were indicated by V.V. Abashev: "In a spontaneous and continuous process of symbolic representation of a place, <...> a stable grid of semantic constants is formed. They become the dominant categories <...> and begin <...> to program this process as <...> the matrix of new representations..." [1; 11–12].

Among the various "supertext" created by Russian culture, a special place is occupied by works in which China is described as a *special art space* (the "art world"), as a *collective image* associated with the fate of the characters and determining the development of the plot. The "supertext" created by such works will be hereinafter referred to as the "Chinese text" [8].

*The Chinese text* is combined not only with the image of China, its history and nature, but with the reproduction of cultural realities, an appeal to numerous cultural texts, national religious and philosophical ideas, mythologies, images and plots, separate stylistic and plot-compositional techniques used by Chinese literature. The Chinese text includes numerous descriptions of China and the images of the Chinese in fiction and journalism, memoirs ("travel literature", memoirs of Russian emigrants), as well as works that use separate plots and motifs related to Chinese culture. The study of the Chinese text by Russian literary studies was practically not carried out. A few works are devoted either to individual aspects (for example, political science [11], or the work of famous writers, in whose works China was mentioned.

The formation of a Chinese text in Russian literature began in the 18th century, when Russia joined the pan-European tradition of turning to the "Chinese style" of *chinoiserie*, which influenced architecture, interior design, painting, and women's fashion, which involved the use of symbols and details associated with Chinese art. However, within the framework of the style, the appeal to Chinese culture remained superficial, relating to individual techniques; at the same time, the *essence* of traditions and the philosophical and ethical system behind it, the life of the people remained out of understanding and were not accompanied by an in-depth "enlightening" and "intellectual" love for China.

Interest in China in Russia increased in the last third of the XVIII century (during the reign of Empress Catherine II), when the Russian reader got

the opportunity to read Chinese literature in translations from intermediary languages (French, English, Manchurian). So, for example, it is from French that the writer and diplomat D.I. Fonvizin in 1779 translated the text *Da Da Xue* (The Great Teaching), which is the most important text for Chinese culture. Later, translations made directly from Chinese began to be published. The scientist and diplomat A.L. Leont'ev in the 1780s translated canonical books - *Ijing*, *Da Xue*, *Zhong Yun* [7]. A major role in the formation of ideas about China and the development of the school of translation was played by the activities of the Russian Spiritual Mission in Beijing (which existed since 1715), in which, in addition to A.L. Leontyev, many famous researchers worked - P.I. Kamensky (1765–1845), about. Iakin [N.Ya. Bichurin] (1777–1853), S.V. Lipovtsev (1770–1841), archimandrite Palladium [P.I. Kafarov] (1817–1878), V.P. Vasiliev (1818–1900) and others.

Publications about China and translations of Chinese classical texts formed an interest in the country in the minds of the Russian public and contributed to the emergence of the primary “background” - the “Chinese context”. Significant progress in this direction occurred in the XIX century. The main object of translations from Chinese were *historical* works, which, on the one hand, gave Russian readers an idea of the history of a neighboring country, and, on the other, evoked parallels in their minds with the domestic past.

The interest of Russian literature in China was part of the general attention to the East. Periodic magazines (for example, "Herald of Europe") systematically posted on their pages descriptions of travels in Eastern countries, translations of oriental poetry and prose. Traveling notes about the countries of the East, containing vivid original images and plots, were especially popular with Russian readers.

The isolation of a special “Chinese theme” from the “East theme” occurred in the 1830s (one reason for this was the emergence of a large amount of information about China). For example, in the utopian novel V.F. Odoevsky's “4338th year: Petersburg letters” (1835), Russia and China were interpreted as the two main world centers. In the future, it was a comparison of these countries that formed the basis of the “Chinese text”.

Less often were the works that described the daily customs and mores of the Chinese. In 1832 in the almanac “Northern Flowers”, published by A.S. Pushkin, featured an anonymous translation of a fragment from the XVII Chinese novel “Hao qiu zhuan” (“Happy Marriage”), which tells about the fate of two young people: the learned young man Te Zhunyue and the daughter of the dignitary Shui Binsin. In 1835 Z.F. Leontyevsky created

the novel "The Traveler", using the plot of the classic Chinese drama by the writer Wang Shifu "Xi xiang ji" ("The West Wing"). A fragment of this text was published in 1936 in the "Library for Reading", published by O.I. Senkovsky [5].

Throughout the nineteenth century, Russian literature gradually formed among readers the notion of the history, nature, life, traditions, religion and philosophy of China. Initially (influenced by the French culture popular in Russia), the image of China was largely idealized and exotic; in the future, it gradually changed and became part of a developed, concrete and historically truthful system of ideas about Chinese life and culture. The final work of Russian literature of the first half of the XIX century, in which a realistic image of China is presented, was the "geographical novel" of the I. A. Goncharov "Frigate Pallas", written in 1855–1855 and published in 1858, in which the author described the Chinese national character with sympathy, especially noting among the qualities inherent in the representatives of the people, industriousness, humility, zeal, lack of fanaticism, friendliness, courtesy and honesty, closely related to representations of filial piety and "duty."

The most important feature of the "Chinese text" of literature was revealed in the novel "Frigate Pallas": for Russian writers and readers, "China" was not interesting in itself, not as an exotic, unfamiliar to the Russian reader *scene*, but as a special *diverse world* that on the one hand, is constantly opposed to Russia, and on the other, is in many ways similar to it. The Chinese text allowed us to pose another important problem, both for Russian and Chinese culture, related to the determination of the measure of statics ("stagnation") and dynamics ("progress") in historical development.

Throughout the XIX century. the Chinese text began to occupy a rather large place in Russian culture (and in this regard it turned out to be quite comparable with the "Italian", "Moscow", "Petersburg" or "Pushkin" texts), which can be explained by the enormous significance of the life of the country, Russia's close neighbor – to the understanding of their *own* history and culture. Russia and China are two states, the historical path and cultural paradigms of which, on the one hand, were fundamentally different, and, on the other hand, with all their originality, had features whose comparison helped to understand the essential features of the historical path of Russia and its national character.

The Chinese text helped Russian writers and readers better understand the prospects of Russia and the laws of its development, contributed to understanding the place of the person and the "voice" of the hero in the public

life of a given period. A major role in the creation of the “Chinese text” was played by some, to a lesser extent, by writers such as A.S. Pushkin, I.A. Goncharov, L.N. Tolstoy, F.M. Dostoevsky, A.P. Chekhov, I.A. Bunin, N.S. Gumilyov and many others.

The Chinese text of Russian literature turned out to be organized differently than, for example, the “Italian” text developed in Russian literature. Italy was a country that was well known and often visited not only by Russian writers, artists, musicians, but also a significant part of the nobility and a certain part of the heterogeneous intelligentsia. Italian art, the life of the Italian people were quite well known and close to the Russian reader, and Italian culture, preserving, of course, the status of a “stranger”, in the end turned out to be a “*akin-foreign*” culture. China, which, unlike Italy, was a “culturally unstudied” state and therefore for a long time remained an exotic, “mysterious” country for the Russian reader, in connection with which the problems of *perception* and *interpretation* turned out to be especially important for the Chinese text of Russian literature. A significant part of the information about the country was received by Russian readers from translations of works of Chinese literature.

A qualitatively new stage in the formation and development of the “Chinese text” is associated with the works of Russian Sinologists (A. A. Tata- rinov, M. D. Khrapovitsky, Academician V. P. Vasiliev, and others), which published many scientific articles in the 1850-1880s works on the history and culture of China, Manchuria, Tibet, Mongolia, as well as translations of classical Chinese philosophical texts (including books by Lao Tzu, Confucius, Menzi and other thinkers) and works of Chinese literature and folklore. Their studies and translations, which reproduced the history and current state of China (its nature and culture, life and customs of the local population and surrounding peoples) were known not only to Orientalists, but also to a wide circle of Russian readers, since they had a bright artistic and journalistic form and were published in popular periodicals (the newspapers “Northern bee”, “New time”, “Exchange journal”, “Voice”; the magazines “Contemporary”, “Russian Geographical Society publishing” and other publications) [3].

A huge role in the development of the Chinese text of Russian literature was played by L.N. Tolstoy. China attracted the writer in the 1860s, when the country was subjected to intervention by a number of European states justified by the need to forcefully “to instill the Chinese idea of progress” that has outraged Russian writer [15; 135–136, 139].

Particular interest in the study of Chinese philosophical teachings - Tao-ism and Confucianism - arose in L. Tolstoy as a consequence of the spir-

itual crisis of the 1870-1880s. The result was the emergence of the treatise "Chinese wisdom. Books of Confucius" (1884), in which the writer revealed his own understanding of the Chinese philosophical and ethical system: affirming the value of education and the need to follow high moral principles ("humanity", "universal love", sympathy for the people, attention to the spiritual side of life). L. Tolstoy repeatedly turned to the ideas of Chinese culture (article "So what should we do?", Essay "Siddart, Called Buddha", diaries 1881–1887, book "The Way of Life"); he became the first Russian writer who actively communicated with thinkers of the East, in particular, with Chinese publicists Zhang Qingtong and Gu Hongming [17]. L. Tolstoy was convinced of the spiritual closeness of Russia and China. "I completely agree with you," he wrote in 1905, addressing Zhang Chintong, "that there is an internal, spiritual connection between the two great nations, Russian and Chinese, and they must go hand in hand" [14; 63]. In a letter to Ku Hongming ("Letter to the Chinese", 1906), L. Tolstoy emphasized that the common mission of Russia and China "... is to show the peoples the true path to freedom, for the expression of which ... there is no other word in Chinese, except for Tao, the way, i.e. activities consistent with the eternal fundamental law of human life" [13; 291–292, 295].

The idea of the historical and spiritual closeness of Russia and China, as well as the similarities of the problems facing both countries, formulated in the literature of XIX century, became one of the fundamental for the "Chinese text" of Russian literature of XX century, when, on the one hand, Russia and China really turned out to be in similar political situations, and, on the other hand, a large number of Russian people appeared on the territory of China, which led to both an increase in the "number" of works depicting China and a structural complication of the "Chinese text".

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## ON THE FUNCTIONS OF THE EVENKI LANGUAGE IN THE SAKHA REPUBLIC (YAKUTIA)

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**Abstract.** The article is dedicated to the functioning of the Evenki language in the Sakha Republic (Yakutia). At present, the trend of losing a mother tongue among the Evenks of the republic is continuing. Any language, including Evenki, is multifunctional in nature. This paper gives a brief description of the main functions of the Evenki language - communicative, cognitive, and nominative.

**Keywords:** Evenks, Evenki language, language functions, official language

Language serves as a means of communication; it allows the speaker (individual) to express his/her thoughts, and to the other individual to perceive them and, in turn, react in some manner (take note, agree, object). In this case, the language performs a communicative function. For example: Иду амтылли хавалдыра? Where do your parents work?

Минчи энинми - униечимни магазинду. My mother works as a shop assistant.

Аминми бултадыран. My father is a hunter.

Language is not just a symbolic system that denotes objects and phenomena. Language is also an instrument of human activity in which it performs a number of functions. The main functions of the language include communicative, cognitive, and nominative.

National language, which Evenki is, as the property of the people, exists in several forms. These include: idioms, dialects (territorial), subdialects and literary form. Evenki language is represented in three idioms (northern, southern and eastern), uniting about 15 dialects and about 50 subdialects. In Yakutia, the language is represented by such subdialects as Tommot, Uchur, Tipton and Tokko. The literary form of the language has not yet become supradialectal [Bulatova, 1997, p. 42-53].

To date, the vast majority of Evenks in the republic are bilingual, speaking Evenki and Yakut languages (older generation), Yakut and Russian (middle generation) languages. Some Evenks of the middle generation still speak their native Evenki language, while the younger generation speaks mainly Yakut and Russian.

The oral and written forms of the Evenki language and the features of their functioning are an interesting and complex problem [Struchkov, 2009, p. 54-56]. The results of the study show that the oral form of the Evenki language in the republic is of everyday type and is used more actively, while the written one is used in a limited way and in a passive form.

The main function of the language is communicative, i.e. the main social function. This function is connected with the fact that language is a means of interpersonal communication, which allows one person to express his/her thoughts and transfer them to other person, and the other, in turn, is allowed to understand them and react. In fact, the language appeared specifically for communication, exchange of information. The communicative function is carried out thanks to the language's symbolic nature. Within a communicative function, one can distinguish an emotional function, explaining it by the fact that with the help of the language one can convey feelings, desires, and states. The present-day language situation of the Evenks in the Sakha Republic (Yakutia) can formally be characterized as bilingualism, but the position of the Evenki language does not correspond to the status of a mother tongue. At present, the main means of communication is Russian language, while Evenki language is gradually giving up its positions. Cultural traditions, beliefs, traditional crafts and occupations, national cuisine and national clothes remain the areas of use of the Evenki language. Thus, such performance groups as *Oronchikan*, *Dolbor*, *Girkilen* of Alexey Kulakovsky Center of Peoples' Friendship staged a performance *Аяври Хоктоли* (By the path of love) in the Evenki language. Here is the text fragment as an example:

О!!! Хэгдыкун Айихит Маин

Синэвэ би бутуннэду долдыдям

Би эмэдем синдулэ кэтэмэдук

Бидерил дуннэду

Онкэ минду сада икэнмэ.

Нэнэденэ оорордули?

Тыкин биниду нунанман икадэ

Хутэлдуви эманда !!!

Би долдыдям конкодера чоран

Икэксэдем алатнэ оорови ичэвдытын

*Cognitive* (also called accumulative) function of the language has been created by the means of the language. How is the inner world of a human formed? What is the role of the language in this process? A notion is the main mental “tool” with which a person cognizes the world. It is formed in the course of a person’s practical activity due to the ability of his/her mind to abstract and generalize. A notion is a unit of logical thinking.

However, each nation has some sections of reality that are more detailed than others. It is well known that in the languages of the indigenous peoples of the North, including Evenks, there are dozens of names for different types of snow and ice (although there may not be a generalized name for snow in general). Thus, in the Evenki language, the notion of *snow* in its different subdialects is called *иманна, иман, иманда, эманна, иманра* (Алд. З., Учр., ЧМК., П-Т., С-Б., Брз. и др.), *имани* (Учр. ) and other. Whereas the concept of *hair* in the Evenki language has different names, like, for example, human hair - *нюриктэ*, animal hair – *инүэктэ*, horse hair – *килагасун*, for a Russian person there is no difference in denoting this notion. But in Russian blue and light blue colors are different, whereas for an Evenk person this difference looks insignificant and secondary. Experts believe that every language is right in this, because it has the right to its own "vision of the world." And there are a lot of such words. Obviously, language is a ready-made classifier of objective reality for a person.

Language educates a person and shapes his/her inner world – this is the essence of the cognitive function of language. In accordance with the theory of linguistic relativity, or the Sapir – Whorf hypothesis, a person lives not so much in the world of objective reality as in the world of language...

So, the language can be the cause of various misunderstandings. And therefore, language classifications very often diverge from scientific classifications. For example, we divide the whole living world into animals and plants, but systemologists say that such a division is primitive and wrong, because there are at least fungi and microorganisms that cannot be attributed to either animals or plants. Here is, let’s say, water. Scientifically, this is a natural compound of hydrogen and oxygen atoms with certain physicochemical properties. For an ordinary individual, water is a clear liquid used for drinking, washing, and cooking. The meanings of the words (as they are given in the dictionaries) try to combine scientific concepts with everyday ones, although this is not always possible...

Language not only inhibits the progress of human knowledge. It can, on the contrary, actively contribute to its development. In practice, each means of communication corresponds to the national “world view” and quite sufficiently provides the communicative needs of a given people.

The *nominative* function of the language is extremely important. It is known that a person thinks in categories, and in the process of cognition s/ he denominates new notions and phenomena. Such language function is called nominative. It is closely related to the cognitive one, since everything that is known should have its name. It is also related to the ability of a linguistic sign to denote things. It was this ability that helped a person create a symbolic world. However, there are many words in Evenki language that have no names. In the Evenki language, there are no equivalents to the Russian words *pocket, newspaper, space, fridge*, etc. And, despite the absence of the name, the nominative function is implemented through the description, formation of new words or reconsideration of the old ones, or borrowings from other language. Here we are dealing with the universal phenomenon of lacunarity - the absence of units in the language system [Kalinina E.L., Bykova G.V., Blagoveshchensk, 2011, p. 29-31]. It is typical for all languages. Lexical gaps inconvenience speech practice, so native speakers seek to eliminate them. Linguists believe that the phenomenon of lacunarity preserves the language and makes it alive. Obsolete words (archaisms) disappear from the vocabulary of the language; there appear the new ones – neologisms, the appearance of which is caused by pressing social needs.

Archaisms include words describing the life of the Evenks before the revolution, for example: *убдери* clansman, *этэг* warchief of the clan, *дыливун* tribute paid off in furs, *кота* slaving debt and other. Old words have been reconsidered and neologisms have appeared: *синман* elections, *таңкит* reading room, *авкит* washroom, *халгэн* substraction, *эчивун* application, *гэлэвун* solicitation and other.

That is why many words have been borrowed from the Russian, Yakut, Buryat languages. Borrowings from the Russian language are divided into the old ones and the new ones. The old borrowings include *колобо* bread, *пулат* headscarf, *хакер* sugar, *корида* frying pan, *пурула* grain and other. When Russian language had become the language of interethnic communication, most Evenks became bilingual. New borrowings began reflecting the social realm and new realities: *party, district committee, brigade, sovkhos, book, magazine, TV set, Internet, Space, world*, etc.

Unlike the old borrowings, the new ones are not influenced by Evenki phonetics; they entered the language with the sounds typical for the Russian language.

On the territory of Yakutia there is a mutual influence and interaction of the Yakut and Russian languages. Evenks' ties with the Yakuts began from the time of the Yakuts' resettlement to the Lena-Aldan plateau. Yakut borrowings became ingrained in the language, such as: *алас* meadow, *кэргэн*

family, *эдэр* young, *булта* hunting, *мунняк* assembly, *аргус* migrating, *кузас* red (summer) squirrel, *кута* swamp, and other.

Many borrowings from Buryat language are recorded in the language of the Evenks from Kurumkansky, Severobaikalsky, Bauntovsky, Barguzinsky regions of Buryatia. Such word as *мэндэ*, *мэнду* hello, *хукур* cow, *кэрэму* squirrel, *суглан* assembly came from the Buryat language.

Folklore and fiction exist only thanks to the language; its influence on our behavior and lifestyle is sometimes just as important as that of the real world.

Everything that surrounds us is presented by nominative units – words and set expressions. Language is a picture, “a copy” of the real world. For example, *Он-да гунми*, *деммудук округ-ту этэрэ бувкэнэ*, *донготовконэ*. Whatever you say, you don't die of hunger and cold in the neighborhood.

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the old ones and the new ones. The old borrowings include *колобо* bread, *пулат* headscarf, *хакер* sugar, *корида* frying pan, *пурупа* grain and other. When Russian language had become the language of interethnic communication, most Evenks became bilingual. New borrowings began reflecting the social realm and new realities: *party*, *district committee*, *brigade*, *sovkhoz*, *book*, *magazine*, *TV set*, *Internet*, *Space*, *world*, etc.

Unlike the old borrowings, the new ones are not influenced by Evenki phonetics; they entered the language with the sounds typical for the Russian language.

On the territory of Yakutia there is a mutual influence and interaction of the Yakut and Russian languages. Evenks' ties with the Yakuts began from the time of the Yakuts' resettlement to the Lena-Aldan plateau. Yakut borrowings became ingrained in the language, such as: *алас* meadow, *кэргэн* family, *эдэр* young, *булта* hunting, *мунняк* assembly, *аргис* migrating, *кузас* red (summer) squirrel, *кута* swamp, and other.

Many borrowings from Buryat language are recorded in the language of the Evenks from Kurumkansky, Severobaikalsky, Bauntovsky, Barguzinsky regions of Buryatia. Such word as *мэндэ*, *мэнду* hello, *хукур* cow, *кэрэмун* squirrel, *суглан* assembly came from the Buryat language.

Folklore and fiction exist only thanks to the language; its influence on our behavior and lifestyle is sometimes just as important as that of the real world.

Everything that surrounds us is presented by nominative units – words and set expressions. Language is a picture, “a copy” of the real world. For example, *Он-да гунми*, *деммудук округ-ту этэрэ бувкэнэ*, *донготовконэ*. Whatever you say, you don't die of hunger and cold in the neighborhood.

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**THE CHURCH DIPLOMATS IN THE ORTHODOX EAST IN  
THE MIDDLE OF THE XIX CENTURY: A.N. MURAVYOV,  
ARCHIMANDRITES PORFIKY (USPENSKY) AND ANTONIN  
(KAPUSTIN)<sup>1</sup>**

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***Church-diplomatic relations with the Orthodox East.*** With extensive historiography devoted to the study of the spiritual ties between Russia and the Eastern Patriarchates, there are very few works devoted to the history of the Russian presence in the Holy Land and on Mount Athos in the context of the Eastern question, when these regions became the object of attention of European diplomacy<sup>2</sup>. Studies on the activities of church diplomats in both regions in the middle of the XIX century are practically absent. Meanwhile, in the XIX century, the foreign policy of the great powers in the Middle East was largely church-political in nature, which was due to the activity of European diplomacy within the canonical limits of the Eastern Local Churches, which were under the jurisdiction of the Ottoman Empire.

The London conventions caused a new wave of activity of the Western powers. The intensification of activities in Syria and Palestine by Uniates, Franciscans, Jesuits and Protestants (and, above all, the establishment of the Prussian-Anglican bishopric in 1841) all testified to the fact that the great powers rushed to the Holy Land, this center of Christianity, where the fate of peoples was decided. The penetration of heterodox propaganda, the interests of protecting the rights and property of a growing number of Russian pilgrims forced the Ministry of Foreign Affairs to take measures to better examine the situation in Syria and Palestine. In addition, in the 30s of the XIX century, the active development of mass Orthodox pilgrimage to the holy places of Palestine began. All these facts served as an important incentive

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<sup>1</sup>The study was supported by the Russian Foundation for Basic Research in the framework of the research project No. 19-09-41010.

<sup>2</sup>See more details: Smirnova I.Yu. "Athos" vector of Russian diplomacy in the Orthodox East (1840s - 1870s) // Orthodox Palestinian collection (hereinafter - OPS). Issue. 116. 2019. - P. 127-148.

for the development of inter-church ties of the All-Russian Holy Synod with the throne of Jerusalem.

Without exaggeration, A. N. Muravyov, archimandrites Porfiry (Uspensky) and Antonin (Kapustin) can be considered the key figures of church diplomacy of the XIX century. Largely thanks to their personal initiative, the development of the church presence of Russia in the Orthodox East was carried out. At the same time, it is difficult to name church leaders whose fates were so closely connected with the Christian East - Constantinople, the Holy Land, Athos.

***A.N. Muravyov as a church diplomat.*** A.N. Muravyov's attitude to the Holy Land and Orthodoxy in the East was determined by his deep interest in the fate of Ecumenical Orthodoxy. In the early 30s of the XIX century, after the conclusion of the Adrianople Peace and his first trip to the East, Andrei Nikolaevich initiated the inter-church contacts, and later, oversaw them, being simultaneously an employee of the Russian Foreign Ministry and the Holy Synod. As he wrote in a letter to Patriarch Athanasius of June 6, 1832, "I entrusted myself to the Holy Sepulcher not only for the time of my stay there, but for my whole life, as his zealous servant."

Muravyov was awarded the title of "Epitro" (charge d'affaires) from the Jerusalem, Antioch and Alexandria Patriarchs and represented their interests in Russia, in fact acting as a liaison between the Ministry of Foreign Affairs and the Holy Synod, on the one hand, and with the Eastern High Clergy, on the other. We can say that he was the first of those who had a real idea of the state of Orthodoxy in the East and contributed to arousing interest in the Orthodox East in the ruling circles of Russia and the upper layers of society. In August 1849, setting off on a second journey to the East and the Holy Land, Muravyov made a trip to Athos, which in the middle of the XIX century was not only the center of Orthodox monasticism, but also an important component of the European political system. The fact that on the eve of the Crimean War the peninsula was not isolated from geopolitical processes not only in the Middle East, but also in Europe, is evidenced, in particular, by the letter of Metropolitan of Moscow Filaret of June 14, 1848: "Two parties are visible in France: the bad and the evil. Now on the seats of power is held by the bad; and the evil one is trying to push it. If this fails, time may continue in Europe, no more troublesome than the current; and if it succeeds, the current smoke and stench may turn into a fire, and smut may fall at your traveler's mercy in Constantinople, in Athos, in Greece"<sup>3</sup>.

By the time of the first trip of Muravyov to the Holy Mount Athos, he was in the center of attention of European diplomatic circles. The attention that

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<sup>3</sup>Letters to A.N. M[uraviev]. Kiev, 1869. P. 276-277.

Petersburg began to show towards Holy Mountain in late 1849 - early 1850 could not but alert British diplomats, who saw their main task as preventing the convergence of the Church of Greece from the Patriarchate of Constantinople, and not allowing the growth of the Russian presence on Holy Mountain<sup>4</sup>. Assessing the actions of British diplomacy from a spiritual point of view, Filaret of Moscow wrote: "The poor British do not think that their earthly policy can put heaven against them"<sup>5</sup>. In this regard, the strengthening of the union of Orthodox Churches, the unity of Orthodox monasticism, including on the Holy Mountain, served as a factor of political stability in the Christian East and were a subject of special concern to Russian diplomats.

The result of a trip to Athos A.N. Muravyov was the successful transformation of the Serai cell, which belonged to the Vatopedi Monastery, into the St. Andrew's Monastery, and Andrei Nikolayevich himself received the status of monastery clerk. He did a lot to strengthen the financial position of the monastery, expand its territory and construction, was in constant correspondence with the inhabitants of the monastery and other monasteries. New perspectives were opened for material assistance to Athos monasteries. On Athos, Muravyov could not help but note the shortcomings of Athos monasticism, and above all the intolerance of the monks, based on interethnic differences. Attention was also drawn to the willingness of afonites to see in Russia primarily a source of income<sup>6</sup>. In the spring of 1874 Muravyov made his last trip to Mount Athos, where he was invited on the occasion of the 25th anniversary of the founding of the St. Andrew Monastery. The purpose of the trip was also to put an end to the conflicts between the Russian and Greek inhabitants of the St. Panteleimon Monastery.

Another important purpose of Muravyov's travels to the East was his concern for the preservation of Byzantine traditions in iconography. He tried to draw the attention of spiritual and secular authorities to the Byzantine icon-painting heritage, which was still preserved in the Athos monasteries: "It will be a true service to the Orthodox Church, - he wrote on March 17, 1850 to the Chief Prosecutor of the Holy Synod, Count N. A. Protasov - if, through the sent artists on the Holy Mountain, we will again restore the disconnected connection between the ancient Byzantine and the newest school of our painting"<sup>7</sup>. Muravyov sought to arrange the arrival of Russian icon painters

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<sup>4</sup>See for example: *Smirnova* I. Yu. The trip of the British ambassador to Constantinople Stratford Canning to Mount Athos (1850) in the documents of the Archive of the Foreign Policy of the Russian Empire // National archives. — 2013. — № 4. — P. 53-60.

<sup>5</sup>Letters to A.N. M[uraviev]. P. 315.

<sup>6</sup>*Smirnova* I. Yu. Russian Athos in the correspondence of Metropolitan Filaret and A.N. Muravyov // OPS. Issue. 112. M., 2016. P. 351-386.

<sup>7</sup>*Muravyov* A.N. Note on the iconography of Mount Athos of March 17, 1850 // Andrei

to Athos, who would not only copy the masterpieces of ancient icon painting, but also master the techniques of Greek church painting: "Our artist must certainly write off the right pictures from all the best icons and frescoes before time and ignorance destroys them"<sup>8</sup>. As a result, in 1859-1860, a joint expedition of the Holy Synod and the Imperial Academy of Arts took place under the leadership of P. I. Sevastyanov, which was given tasks that were formulated almost 10 years before by A.N. Muravyov.

The last years of his life, Muravyov lived in Kiev. In his love for Kiev there was something mystical. "This city in his mind always remained " Russian Jerusalem," the mother of Russian cities, the cradle of Orthodoxy"<sup>9</sup>. An important merit of Muravyov to academic science was the donation of his collection to the Moscow and Kiev Theological Academies. Both academies expressed their appreciation to him by electing him an honorary member of the Church History Department of the Academy<sup>10</sup>.

**Archimandrite Porfiry (Uspensky) and his connection with the Orthodox East.** Archimandrite Porfiry (Uspensky) went down in the history of the Russian presence in the Orthodox East primarily as the first head of the Russian Ecclesiastical Mission in Jerusalem, the idea of which belonged to Muravyov. As early as 1838, in connection with the strengthening of Protestant and Catholic proselytism among Orthodox Arabs, Muravyov drafted the first REM in the Holy Land<sup>11</sup>. When, in 1842, the Ministry of Foreign Affairs recognized the expediency of sending a cleric to Jerusalem, the choice fell on Archimandrite Porfiry (Uspensky), which resulted in the establishment in 1847 of the Jerusalem Russian Ecclesiastical Mission. However, its activities in the first period (1848-1854) could not be successful. According to V. N. Khitrovo, the Mission was not only useless, but also harmful<sup>12</sup>. Khitrovo blamed the Ministry of Foreign Affairs, who tied the head of the Mission with impracticable instructions and the meager financing.

Later, in 1857, Vice Chancellor Prince Gorchakov, comparing the Russian Mission with the church missions of the European powers, which had schools, hospitals, hundreds of missionaries supported by diplomats, wrote: "What could the poor Mission do in comparison with them, without any rep-

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Nikolaevich Muravyov and Russian diplomacy in the Orthodox East. Diplomatic notes and correspondence M.: Indrik, 2019. P. 135.

<sup>8</sup>Ibid. P. 134.

<sup>9</sup>*Khokhlova* N.A. «Defender of Orthodoxy "(Activities of A.N. Muravyov in Kiev) // OPS. Issue. 103. P. 134.

<sup>10</sup>*Kazanskiy* P. S. Memory of Andrei Nikolaevich Muravyov. M.1877. P. 22.

<sup>11</sup>*Lisovoy* N. N., *Smirnova* I.Yu. Russia and the Holy Land in the first half of the XIX century. SPb., 2015. P. 487-488.

<sup>12</sup>*Khitrovo* V. N. Collected works and letters. V. 2. M., 2011. P. 147.

representativeness, without excellent service, without hospitals, embassies and other means? <...> The mission was placed very badly, lived poorly; all this taken together was the reason why our opponents grew up in front of us in the East"<sup>13</sup>. Nevertheless, the very fact of the presence of a Russian church institution in Jerusalem was of great importance.

Porfiry managed to establish constructive relations with Patriarch Kirill of Jerusalem, which strengthened the position of the Mission and allowed the implementation of a number of educational programs. The very fact of the existence of the Russian Ecclesiastical Mission in Jerusalem before the Crimean War allowed the Mission to resume its activity after the conclusion of the Paris Peace. Meanwhile, Archimandrite Porfiry, not having the opportunity for any action in Jerusalem, devoted himself to scholarly works and scientific expeditions. As early as 1845, his first trip to Athos took place, where he found more than a dozen letters of honor in the monastery libraries<sup>14</sup>. After the Crimean War, Porfiry, having not received a reappointment to Jerusalem, continued his studies. At this time, he prepared for printing a description of three trips: through Sinai and Egypt, a discussion of mysterious writings on the Sinai cliffs and a statement of the creed, worship and church rules of Egyptian Coptic Christians, several reports on the REM science and art activities in Jerusalem over the past years were written and many others.

The second journey of Porfiry along the Mount Athos took place in February 1858 as part of the expedition of B.P. Mansurov. The decree of the Holy Synod said that he "would collect scientific information about church architecture and painting, make a description of" church utensils, libraries and archives. " On Athos, Porfiry "studied carving, sculpture, architecture, iconography and church singing, and mose of all read old books written on leathers"<sup>15</sup>. He got acquainted with the paintings of the Kareisky Cathedral, with the works of Sevastyanov, who was involved in removing the growths from the frescoes of Panselin in the Protate Cathedral. He studied Porfiry and modern Athos painting.

In 1860, Fr. Porfiry again went to Jerusalem, then to Egypt, and already at the beginning of 1861 to Mount Athos. For five months in Palestine, he studied manuscripts, paintings and Christian art in the patriarchal library in Bethlehem, in the monastery of Sava the Sanctified and in the Cross Monastery. In Egypt, he attempted to renew the alliance of the Egyptian-Ethiopian

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<sup>13</sup>Russia in the Holy Land. Documents and materials.V. 2. P. 110.

<sup>14</sup>Porfiry (*Uspenskiy*), archimandrite. Index of acts stored in the cloisters of St. Mount Athos // ZhMNP. 1847. Part. 55. №7-9. P. 194-197 (see article: Chesnokova N. P. Original letters of appreciation of Russian sovereigns on Mount Athos from the collection of photographs of P. I. Sevastyanov // Kapterevsky Readings-15. M.-Serpukhov 2017. P. 87-91.

<sup>15</sup>Porfiry (*Uspenskiy*), Bishop. The book of my being. V. VII. SPb., 1901. P. 184.

Church with the Orthodox. On Mount Athos he visited monasteries and cells not seen before. "In many of them," says arch. Porfiry - there are small churches, even ancient ones. You will not stay in the loser if you visit these cells. In another they will sell you an old manuscript, even very good and necessary for expanding your exact knowledge; in the other you will see old icons and pictures from wall paintings; in the third you will see how the Athos icon painters write their images"<sup>16</sup>.

Upon his return to Petersburg, Porfiry, in his words, "sat in the cell like a recluse and worked like a silkworm"<sup>17</sup>. Three years later, he was elected to the vicar department of the Kiev diocese. During the "Kiev" period of his life, a large part of his most important and multivolume works on the study of the Christian East, which Porfiry called "his children," was released<sup>18</sup>. Porfiry considered his continuation of scientific studies and publication of works to be his duty to "introduce many, many to the Christian East"<sup>19</sup>. According to the spiritual testament of His Grace Porfiry, his collection of Sinai and Athos icons, as well as various Jerusalem items, were bequeathed to the Archaeological Society at the Kiev Theological Academy.

### ***Archimandrite Antonin (Kapustin) and the Orthodox East***

If for Muravyov and Porfiry, Kiev became the place of their stay at the sunset of life, then for Archimandrite Antonin, on the contrary, Kiev became the place where the beginning of his literary and scientific activities, since his Kiev alma mater became the Kiev Theological Academy. Antonin perceived transfer to the academy as a reward from God, since initially the choice fell on another student, but he fell ill and refused to go to the academy<sup>20</sup>. At the end of the academy, he was left a teacher, tonsured a monk with priesthood ordination. Already in Kiev, the breadth of his interests is manifested, so clearly manifested later in the Christian East. He is interested in painting, music, history, politics, psychology. He is also interested in the peculiarities of divine services - Catholics, Protestants, Jews. In Kiev, his first printed works were published.

The Kiev period, as Father Antonin writes, "was a miracle for me, or at least a *wonder!*", "Gave me a spiritual son", "taught me theologize, made me grow wiser worldly, warmed my heart", "taught me patience, "unrequited labor, caution, vigilance, and much more"<sup>21</sup>. But on February 19, 1850, he

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<sup>16</sup>Ibid. P. 373.

<sup>17</sup>Ibid. V. VIII. SPb., 1902. P. 53.

<sup>18</sup>Ibid. P. 119.

<sup>19</sup>*Porfiry (Uspenskiy), Bishop. The book of my being. V. VIII. SPb., 1902. P. 318.*

<sup>20</sup>Barnabas (Averyanov), Father Superior. The spiritual image of Archimandrite Antonin (Kapustin) based on the materials of his literary heritage. M., 2017. P. 77.

<sup>21</sup>Cit.: Ibid. P. 96.

filed a request for his appointment to Greece, and on April 17 news came of his appointment as rector of the embassy church in Athens. From this time begins the service of Fr. Antonin in the church diplomatic field - henceforth, as Muravyov, Archimandrite Porfiry, and other representatives of the Russian Church abroad, Antonin served in the Ministry of Foreign Affairs.

Service of Antonin (Kapustin) was held in the Christian East in such centers of European politics as Athens, Constantinople, Jerusalem. "So many ... desirable places I saw, felt with my heart, rethought with my mind"<sup>22</sup>. In the person of Antonin, the Russian Church acquired an objective observer and adviser. Knowledge of the Greek language, wide education, sociability and friendliness were those qualities that allowed Father Antonin to organically fit into the Greek environment and establish contacts with the Greek clergy and academia. Thanks to Antonin's reports, first from Athens, then from Constantinople and Jerusalem, the Synod received the latest information on political and church events in Greece and Turkey.

In the summer of 1859, Archimandrite Antonin traveled to the Holy Mountain as part of the expedition of P. I. Sevastyanov. In the Athos cloisters about. Antonin was primarily interested in ancient manuscripts and works of art. Later, the ancient manuscripts, coins, icons, and other antiques collected by him formed the basis of the REM museum in Jerusalem; coin collections and valuable manuscripts were donated by Antonin to theological schools, scientific societies, and researchers. As A. A. Dmitrievsky noted, "the principles that guided Fr. Antonin, acquiring and exploring paleographic rarities, - honesty and respect; [he] was always ready to pay for what was purchased, out of morals he never buy, if he knew that the thing was stolen, he didn't spoil books (he didn't tear out and steal the sheets)"<sup>23</sup>.

In March 1860, Antonin was appointed rector of the embassy church in Constantinople, where, as an official representative of the Russian Orthodox Church, acted as an intermediary between the hierarchy of the Constantinople and Russian Churches and was one of the full participants in the process of developing the concept of church policy in Russia in the Ottoman Empire, under whose authority were the Eastern Churches.

Archimandrite Antonin was very upset by the separation of the Eastern Church and emphasized the need for an alliance with the Greek Eastern Church. "I do not lose the sweet hope that the Orthodox Church recognizes

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<sup>22</sup>Cit.: Barnabas (Averyanov), Father Superior. The spiritual image of Archimandrite Antonin (Kapustin) based on the materials of his literary heritage. M., 2017. P. 103.

<sup>23</sup>*Dmitrievsky* A. A. Our collectors of manuscripts and early printed books, Professor V.N. Grigorovich, Bishop Porfiry (Uspensky) and Archimandrite Antonin (Kapustin) // *Bizantinorussica*. 1994. № 1. P. 183-184.

itself as one family of Christ and ceases to split”<sup>24</sup>. On January 17, 1861, he bitterly wrote to Metropolitan Filaret: “What is the Eastern Church to us? The almost perfect separation of its members ”<sup>25</sup>. Antonin emphasized the need for an alliance with the Greek Eastern Church, believing that Russia should “enter into an open alliance with it both here and in Athens, without fear of anything and no one. We have an undeniable historical, dogmatic, canonical right to this”<sup>26</sup>. In 1865, when relations with the Patriarch Kirill II of Jerusalem became aggravated due to disturbances in the Russian Ecclesiastical Mission, Metropolitan Filaret, appreciating in Antonin the rare gift of “capturing with the love for the Russian Church and for Russia”<sup>27</sup>, approved his candidacy for a trip to Jerusalem, where the creation of Russian Palestine was actively going on since 1860 - Russian Buildings were built - courtyards for the reception of Russian pilgrims.

Interestingly, back in 1850, as soon as he was appointed to Athens, Antonin wrote in his diary: “So, I will definitely be in the East !! in Jerusalem !!”<sup>28</sup> In 1857, after the first visit to Jerusalem, there appeared an essay by archimandrite Antonin “Five days in the Holy Land and in Jerusalem”, published in 1866, as well as a “very important and weighty” report to the Synod of December 28, 1857, in which he wrote about the need to establish in Jerusalem, the Russian consulate to provide diplomatic support to the REM. “We definitely needed our flag in Jerusalem, - said the archimandrite, - who would have covered and defended so many helpless compatriot-travelers who corresponded here from any unforeseen accidents that easily arise in a troubled land”<sup>29</sup>.

Having been appointed to Jerusalem in 1865, Archimandrite Antonin (Kapustin) first acquired a plot of land on Mount of Olives near the Ascension site and began the construction of a monastery with the famous bell tower called the “Russian Candle”; in Beit Jal he founded the “Russian school”; in Ain Karim, an Orthodox women’s Gornensky monastery was formed over time on the site he bought; in Gethsemane, by the efforts of Antonin - on the donations of the Russian Grand Dukes and in memory of Empress Maria Alexandrovna - the church of St. Mary Magdalene. And this is only a small part

<sup>24</sup>Cit.: *Barnabas (Averyanov), Father Superior*. Spiritual image of Archimandrite Antonin (Kapustin) based on the materials of his literary heritage. M., 2017.P. 103.

<sup>25</sup>Letters from clergy and secular persons to Metropolitan of Moscow Filaret (1812-1867). SPb., 1900. P. 473-477.

<sup>26</sup>Ibid.

<sup>27</sup>Collection of opinions and reviews of Filaret, Metropolitan of Moscow and Kolomensky, on educational and church-state issues. SPb., V. IV. 1886. P. 492.

<sup>28</sup>Cit.: *Barnabas (Averyanov), Father Superior*. The spiritual image of Archimandrite Antonin (Kapustin) based on the materials of his literary heritage. M., 2017. P. 129.

<sup>29</sup>RGIA. F. 832. Op. 1. Un. temp. 100. Y. 157ob.-158.

of what was done by the Russian archimandrite. As Father Superior Barnabas (Averyanov) rightly notes, "The Holy Land, with its historical, archaeological and spiritual wealth, became for Fr. Antonina is an inexhaustible fount of discovery"<sup>30</sup>. But church diplomacy in the Orthodox East remained his main mission.

Despite all the differences in the type of activity, in the position in society, in the character traits, the persons examined by us had much in common: all three served in the Ministry of Foreign Affairs, while remaining "unselfish laborers of science"; each enjoyed the grace of the members of the Imperial Family; all of them were often perceived as "troubled", "inconvenient", "very original" people. But at the same time, all three were characterized by such qualities as a broad outlook and multifaceted education, knowledge of several European languages, the ability to diplomatic activity, "the ability to earn the power of attorney of the Eastern hierarchs, and most of all enlightened jealousy and love for such a holy cause, as the *support of Orthodoxy in East*"<sup>31</sup>. The words of the Metropolitan of Kiev Arseny (Moskvin), who rightly characterized A.N. Muravyov as a "defender of Orthodoxy", can be equally attributed to all of them. Both Muravyov and archimandrites Porfiry (Uspensky) and Antonin (Kapustin) left a bright trace in the formation of the Russian presence in the Orthodox East, in the activities to protect and preserve Orthodoxy, in strengthening inter-church ties between the Russian Holy Synod and the Eastern Patriarchates.

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## IMPACT ON THE ENVIRONMENT OF SHEET ROLLING PRODUCTION IN THE METALLURGICAL INDUSTRY

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**Abstract.** The degree of environmental impact of sheet-metal production of the metallurgical industry was studied. Areas of pollution and zones of technogenic transformation of ecosystems and landscapes are shown within and outside the sanitary protection zone of a metallurgical enterprise.

**Keywords:** metallurgy, emissions, discharges, heavy metals, areas of pollution, zones of technogenic transformation

The metallurgical industry plays a huge role in the economy of our country. Over the past year, Russia smelted more than 75 million tons of steel, taking 5th place in the world in terms of production after China, Japan, India and the United States, while Russia takes a 7% share in exports (and third in the world).

Since 2000, the metallurgical industry has been actively working on the construction of new and modernization of existing facilities and production of ferrous metallurgy, the development of high-tech methods of steelmaking, moreover, focused on the most modern world technologies and standards, which can be safely attributed to the best available technological solutions or best practices.

In general, Russian metallurgical companies in the period 2000-2019 invested in the construction of new industries and the modernization of existing more than 5 trillion rubles.

The effectiveness of modernization of ferrous metallurgy over the past 20 years can be estimated by the following technical and economic indicators:

- depreciation of fixed assets decreased from 53.5% to 42%;
- share of open-hearth production in total steel production decreased by less than 3%;

- proportion of steel casting on continuous casting machines increased to 82%;
- steel consumption for the production of one ton of rolled metal decreased by 12.4% (from 1.262 to 1.105 t/t of steel).

Despite the modernization of equipment, being a potentially dangerous facility, metal rolling continues to be one of the most environmentally unsafe production.

Therefore, the important tasks of rolling production are: increasing labor productivity through the creation and implementation of new high-performance equipment, machine systems, comprehensive mechanization and automation of production processes and control systems, improving the quality, reliability and accuracy of sheet-rolled products.

The production of sheet metal is one of the large-scale industries in metallurgy, which other industries are oriented to. But at the same time, this production is a powerful environmental pollutant.

Metallurgical enterprises occupy vast territories of the country. Concentrations of harmful and toxic substances in water bodies and especially in the atmosphere near metallurgical plants are significantly higher than normal. Pollution areas far exceed the boundaries of sanitary protection zones of enterprises. An unfavorable environmental situation is observed in such cities of Russia as Lipetsk, Novokuznetsk, Chelyabinsk, Magnitogorsk, Cherepovets. The main sources of pollution are dust, oxides of nitrogen, sulfur, carbon.

Metallurgy enterprises account for 15-20% of total atmospheric pollution by industry, which is more than 10.3 million tons of harmful substances per year. Emissions and discharges are dominated by pollution by substances of the first and second hazard classes (cobalt, molybdenum, chromium, nickel, lead, etc.).

In the rolling production of dust and gases is formed in smaller quantities than at the enterprises of iron production, foundries, but still their content reaches 2-18 g/t of sheet metal for various types of work. Table 1 shows the metal content in dust during hot and cold rolling.

**Table 1. - The metal content (mg/kg) in the dust during hot and cold rolling**

Element	Ti	V	Cr	Mn	Co	Ni	Cu	Zn	Mo	Pb	W
Cold rolling	800	300	3800	4000	800	6000	1800	1300	300	450	600
Hot rolling	350	150	1300	5500	800	3500	250	300	300	120	150

The sheet-rolling shop widely uses ammonia in the technological process in the cooling system and as a protective gas. Air pollution by ammonia vapors also creates a danger to the environment and leads to environmental damage.

All metallurgical enterprises, including rolling shops, widely use water in the process. Water consumption is 12-15% of total consumption by industrial enterprises of the country. A huge amount of sewage and storm water, which is a source of pollution, is discharged into water bodies from the territories of these plants. So, in the Rybinsk reservoir in the city of Cherepovets, as a result of many years of contaminant intake with industrial and municipal sewage, a pollution zone with a width of 7-15 km was formed.

“Severstal” PJSC enterprises cause dynamic processes in ecosystems and pollute adjacent territories where soil alkalization and accumulation of heavy metals (iron and zinc) are observed. As you move away from the plant, the amount of pollutants decreases. In the sphere of influence of “Severstal”, we can distinguish zones that characterize a different degree of technogenic transformation of landscapes and ecosystems. Data on these zones are shown in table 2.

**Table 2. - Zones of technogenic transformation of ecosystems and landscapes in the territories adjacent to “Severstal”**

<b>Man-made areas and distance from the source of pollution</b>	<b>Atmospheric composition</b>	<b>Soil condition and composition</b>	<b>Transformations of ecosystems and plant species</b>
Heavy Pollution Zone - 2 km	Contaminant content reaches MPC; dust, phenols, hydrogen sulfide - 1-4 MPC; nitrogen oxides, sulfuric anhydride, ammonia, carbon monoxide - 3-4 MPC; MPC amount over 20	Ca, Mg, Fe, Cu, Pb, Ni, Cr, Mn, Cd, and other elements accumulate in the soil. The total gross content - 19; movable forms -35. Carbonization occurred in the soil, pH have increased to 7.6-7.8	In green spaces, growth and size of leaves are reduced by an average of 1.5 times. Unstable species have weak leafiness and early leaf fall; the growth of weeds; the appearance of sites without vegetation.

<b>Man-made areas and distance from the source of pollution</b>	<b>Atmospheric composition</b>	<b>Soil condition and composition</b>	<b>Transformations of ecosystems and plant species</b>
Relatively Heavy Pollution Zone - 5 km	Amount of MPC contamination: 10-19	The total gross content indicator is - 12; moving forms - 19-20	Satisfactory condition of trees and vegetation; decrease in growth by 1.2 times; sprouting of weeds.
Medium Pollution Zone - 15-20 km	Amount of MPC contamination: 5-10	The total gross content indicator is - 5-7; moving forms - 10-18	The annual growth of trees is reduced; degradation of taiga species and mosses; overgrowth of sedge and weeds.
Low Pollution Zone - 45-55 km	Amount of MPC contamination: 1-5	The total gross content is - 2-5; movable forms - 1-9	Slow degradation of forests, but over time, the effect intensifies due to the accumulation of pollutant.
Background Territory – further than 55 km	Contaminant content less than 1 MPC	The total gross content is - 1-2; movable forms - 1	Ecosystems are in ecological balance.

The gas contamination in the production halls also adversely affects the condition and health of workers. Achievement of normal working conditions in the premises of the rolling workshops is possible only under optimal microclimate conditions, the installation of technology and ventilation for projects that meet all the requirements of modern technology, the construction of industrial buildings and ventilation. And in order to preserve the natural environment surrounding metallurgical production, constant modernization of equipment is required, which ensures the efficient purification of gas emissions, wastewater discharges and the disposal of inevitable production wastes.

UDC 616 – 005.755:616.131

**CLINICAL RISK FACTORS AND CAUSES OF VENOUS  
THROMBOEMBOLIC COMPLICATIONS IN THE REPUBLIC OF  
SAKHA (YAKUTIA)**

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**Abstract.** The article describes the causes of progression and the main clinical risk factors for venous thromboembolic complications in the Republic of Sakha (Yakutia). Venous thromboembolic complications (VTEC) are relevant and socially significant clinical problem, because it's are referring to the most common problem and represent a real danger to the lives of patients. The main clinical risk factors for VTEC are stroke or paralysis/paralysis of the lower limbs, severe myocardial contractile dysfunction, severe lung diseases, sepsis, acute infection, malignant neoplasms. It is established that the leading nosological unit of causes of VTEC in the Republic of Sakha (Yakutia) are cancer, trauma of the musculoskeletal system and prolonged immobility (strokes, craniocerebral injuries).

**Keywords:** Venous thromboembolic complications (VTEC); pulmonary embolism (PE); deep vein thrombosis (DVT); ultrasound angioscanning (USAS); computerized tomography (CT).

**Relevance of the problem**

Venous thromboembolic complications are relevant and socially significant clinical problem, because it's are referring to the most common problem and represent a real danger to the lives of patients at the present stage of human evolution [1, 2]. According to statistical reports of the Min-

istry of health of the Russian Federation, about 80000 new cases of this disease are registered in our country every year. In the elderly and senile age, the frequency of deep vein thrombosis increases several times and reaches 200 cases per 100000 people per year. Pulmonary embolism is registered annually with a frequency of 35-40 per 100000 people [1, 2, 3, 4]. According to the national clinical recommendations of phlebologists of the Russian Federation [2] and the European Association of cardiologists, not associated with trauma and surgery main clinical risk factors for VTEC are: stroke or paralysis/paresis of the lower limbs; severe contractile myocardial dysfunction (especially with chronic heart failure III—IV functional classes according to the classification of the New York heart Association – NYHA); severe lung diseases; sepsis; acute infection; malignant neoplasms; hormone therapy, chemotherapy, X-ray therapy cancer patients; compression of veins; age more than 40 years; bed rest (more than 3 days), a long sitting position; the use of estrogen-progestin drugs; the use of selective estrogen receptor modulators; inflammatory diseases of the colon; nephrotic syndrome; myeloproliferative diseases; paroxysmal nocturnal hemoglobinuria; obesity; venous thrombosis and/or pulmonary thromboembolism in history; varicose veins of the lower limbs; catheter in the Central vein; pregnancy and the nearest (up to 6 weeks) postpartum period, thrombophilia [1, 2, 5].

Development of recommendations for a comprehensive examination and identification of major diseases and syndromes that can cause venous thromboembolic complication in the conditions of a large number of patients with suspicion of this disease in the general surgical hospital determined the purpose of our research.

### **Purpose**

Purpose of this work is researching the structure of clinical risk factors leading to venous thromboembolic complications in the Republic of Sakha (Yakutia).

### **Materials and methods**

The research group included 293 patients with VTEC who were treated in the First surgical Department of the Republican hospital №2 - the Center of emergency medical care in the period 2016-2018. To determine the tactics of treatment, for all patients the following researches were conducted, including clinical examination of patients, electrocardiography (ECG), clinical tests, D-dimer, coagulogram, fibrogastroduodenoscopy (FGDS), color duplex scanning of deep veins of the lower limbs, in case of insufficient informativeness of duplex scanning, selective cavography was performed. To confirm the diagnosis of pulmonary embolism (PE) were performed

echocardiography (ECHO-CG), X-ray computed tomography of the thoracic organs (CT TO) and angiopulmonography. To determine of blood flow disorders was performed research of rheological indicators of plasma. Thus, the main disease, which was the cause of VTEC, was detected.

### Results

The main risk factor of VTEC progression as result of our research revealed a cancer – 75 (25.5%) patients, 15 – of them with newly diagnosed cancer, on the background of chemotherapy – 60; trauma of the musculoskeletal system – 55 (18.7%). Long-term immobility (strokes, craniocerebral injuries) – 48 (16.3%), hormone therapy (replacement or contraceptive) – 20 (6.8%) patients. In 30 (10.2%) cases VTEC was complicated by pregnancy. In 26 (8.8%) observations, the reason of VTEC could not be determined. Various forms of coronary heart disease, complicated by chronic heart failure, in the stage of decompensation were revealed in 15 (5.1%) patients; catheter associated jugular vein thrombosis – in 5 (1.7%). Lower limb varicose disease was detected in 19 (6.4%) patients (Diagram 1).

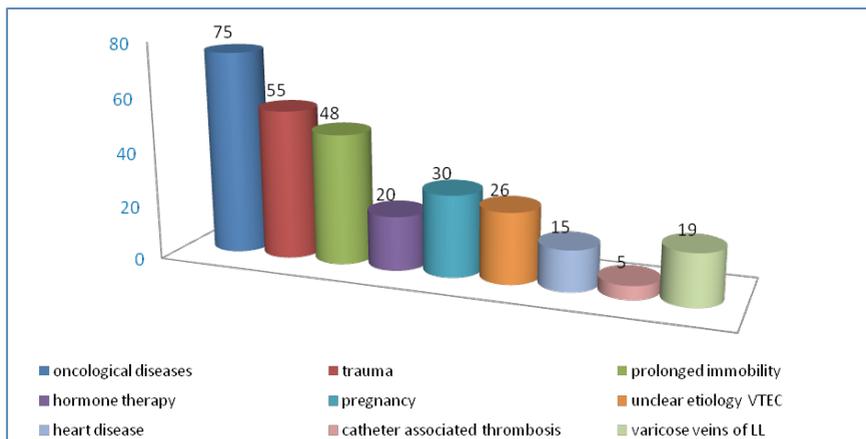


Diagram 1

In the structure of deep vein thrombosis of the lower limbs occlusion most often met in the ileal-femoral segments in 112 (38.2%) patients, moreover, in 11 (3.7%) of them the defeat was bilateral. Thrombotic defeat of the femoral-popliteal segment veins were found in 80 (27.3%) cases, defeat of popliteal tibia segment - in 50 (17.0%) cases, of the internal jugular vein in 5 (1.7%) cases, and thrombosis of the infrarenal inferior vena cava with inferior vena cava syndrome were found in 14 (4.7%) cases. Pulmonary embolism was detected in 21 (7.1%) patients (Diagram 2).

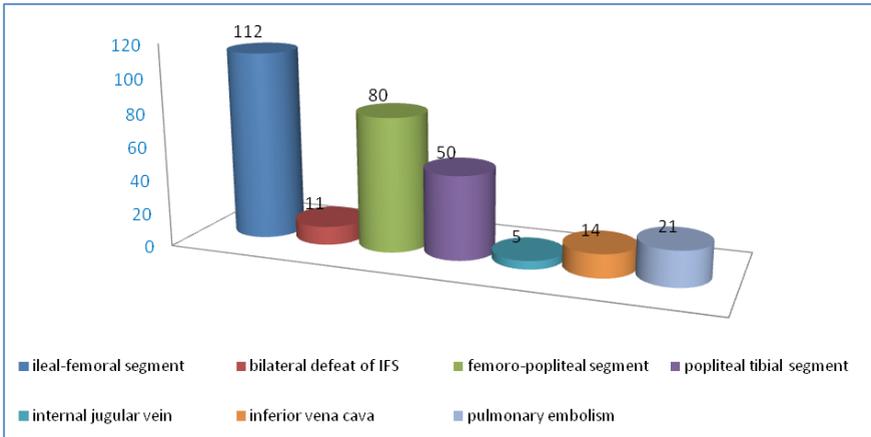


Diagram 2

A retrospective analysis showed that there was a significant increase in patients with VTEC during the research period: in 2016 the number of patients was 87; in 2017 was 99 patients, and in 2018 were registered 107 patients. Hospital mortality from pulmonary embolism in the research group of patients was 5 (1.5%) cases.

### Conclusions

1. In result of analysis of the factors contributing to VTEC was found that main nosological unit reason of VTEC in the Republic of Sakha (Yakutia) are cancers, trauma of the musculoskeletal apparatus is in second place; prolonged immobility (stroke, traumatic brain injury) - in third. Further follow pregnancy, hormone therapy (contraceptive) and various forms of coronary heart disease.

2. Was registered an increase of patient numbers with VTEC for the period 2016- 2018, which may indicate a further progression of VTEC.

3. We can state the lack of prevention of the above listed causes of progression and clinical risk factors for venous thromboembolic complications.

### Recommendations

Strengthen timely prevention of VTEC in cancer patients and in patients with injuries of the musculoskeletal system to reduce venous thromboembolic complications, guided by the Russian clinical guidelines [2].

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**THE DYNAMICS OF THE CIRCADIAN RHYTHM OF BODY TEMPERATURE IN THE ACUTE PERIOD OF SEVERE TRAUMATIC BRAIN INJURY IN CHILDREN**

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**Abstract.** A study of the dynamics of the circadian rhythm of body temperature in the acute period of severe traumatic brain injury in children revealed the peak of a pronounced systemic inflammatory reaction in infants at 5 days. A distinctive feature of groups 2 and 3 of children with STBI in all age groups was a more pronounced systemic inflammatory reaction, which manifested itself by a significant hyperthermic reaction on the 2nd day. The more severe the damage to the brain, the more pronounced is the systemic inflammatory response of the body in groups 2 and 3 of all ages. The duration of hyperthermia can serve as a guide in determining the damaged array of tissue structures of the body and determine the prognosis and degree of neurological disorders after STBI in children.

**Keywords:** circadian rhythm, body temperature, severe traumatic brain injury, childhood

**Relevance.** The body temperature of mammals, including humans, is a very moving indicator of the body's energy. According to research, there are no exact hourly characteristics of the daily rhythm of body temperature. According to one source, the temperature rises to 8 or from 9 to 12 hours. Stabilization occurs at 20 hours. Then it begins to decline and reaches a minimum by 3 to 4 hours, and the 8-hour peak can be shifted to 12 hours, if you change the lighting conditions from 12 to 3 hours. According to other sources, the body temperature of a healthy person is maximum from 15 to 23 hours, with acrophase at 18 hours and minimum at 7 hours. During the day, not only the body temperature changes, but also the intensity of heat dissipation, which decreases in the early morning and rises by 16-18 hours. Daily fluctuations, or circadian rhythm, are regular changes in body temperature over a 24-hour cycle. This phenomenon is very noticeable in humans and can cause a temperature difference between the zenith and the nadir of the cycle, ranging from 0.27 ° C to 0.82 ° C. Body temperature drops at

night, reaching its lowest point by about 3 hours, and then gradually increases to a peak by 17-18 hours. The circadian rhythm is absent in newborns and young children and is established after the second year of life, and it is relatively more noticeable in children than in adults. Thus, the difference between the highest and lowest points of the temperature cycle in children is greater than in adults. In children, this difference can reach 1.4 C [1,2,3]. However, in the literature there is not enough information about changes in body temperature during severe stress reactions of the body, in particular, severe traumatic brain injury, which served as the incentive for this study.

**Purpose.** Study the dynamics of the circadian rhythm of body temperature in the acute period of severe traumatic brain injury in children.

**Material and research methods.** Patients with severe traumatic brain injury (STBI) (100) are presented in three age groups: group 1 - from 9 months to 3 years (30), 2 - 3.1-7 years (31), older than 7.1 to 18 years old (39). Depending on the severity of the condition, which we determined by the duration of intensive care in the ICU, each age group was studied, dividing them into 3 groups: in 1 subgroup, the duration of treatment in ICU was from 5 to 10 days - only 43 children (43%); in the 2nd subgroup included 29 (29%) patients (duration of stay in the ICU - 11-20 days); Subgroup 3 - 28 children (28%). We studied indicators of central and peripheral hemodynamics : body temperature, heart rate (HR), systolic (SBP), diastolic (DBP), mean (Av) blood pressure, minute volume of blood (MVB), and total peripheral vascular resistance (TPVR). All patients were monitored for laboratory and clinical indicators, such as general analysis, biochemical blood parameters, coagulography.

**Results and discussion.** Applied respiratory support was started upon admission in the first hours in 5 children from 12 in group 1 (41% of patients), in group 2 in 8 out of 9 (88%), and in 4 immediately upon admission in A/C mode (IPPV). In group 3, upon admission, all 8 patients by severity of condition immediately upon admission were transferred to artificial lung ventilation (100%). The duration of hardware ventilation in group 1 was  $3.3 \pm 1.6$  days (out of  $5.9 \pm 1.5$  days spent in ICU), in group 2 -  $8.25 \pm 4.6$  days (out of  $14.6 \pm 3, 1$  day). In group 3, the duration of mechanical ventilation was  $21.4 \pm 7.3$  days (out of  $39.8 \pm 15.5$  days). Thus, the severity of the condition and the effectiveness of intensive care corresponded to the duration of mechanical ventilation. So, in group 1, the duration of mechanical ventilation was 55%, in group 2 - 36%, in group 3 - 54% of the total duration of treatment in ICU. However, this problem requires a separate study, since 30% of children had to change ventilation regimes depending on the dynamics of the condition, the need for repeated surgical intervention, and hospital pneumonia.

**Table 1**  
**Dynamics of a mesor of body temperature in the acute period of**  
**severe traumatic brain injury in children**

days	up to 3 years			3.1-7 years			over 7 years old		
	1 gr	2 gr	3 gr	1 gr	2 gr	3 gr	1 gr	2 gr	3 gr
1	37,2±0,1	37,1±0,2	37,1±0,3	37,1±0,1	37,1±0,2	37,1±0,2	37,1±0,1	37,1±0,1	37,1±0,1
2	37,2±0,1	37,5±0,1*	37,2±0,2	37,2±0,1	37,3±0,1	37,5±0,1*	37,2±0,1	37,4±0,1*	37,5±0,1*
3	37,3±0,1	37,4±0,2	37,4±0,2	37,2±0,1	37,3±0,1	37,5±0,1*	37,1±0,02	37,4±0,1*	37,5±0,1**
4	37,0±0,1	37,2±0,1	37,3±0,2	37,0±0,1	37,2±0,1	37,4±0,1	37,2±0,1	37,3±0,1	37,5±0,1*
5	37,0±0,01	37,3±0,1**	37,4±0,1**	37,1±0,1	37,2±0,1	37,7±0,1**	37,2±0,1	37,3±0,1	37,4±0,1*
6	37,0±0,1	37,2±0,1	37,2±0,1	37,1±0,1	37,3±0,1	37,4±0,1**	37,1±0,1	37,3±0,1	37,4±0,1*
7	37,1±0,1	37,1±0,1	37,3±0,1	37,1±0,2	37,2±0,1	37,5±0,1**	37,1±0,1	37,2±0,1	37,3±0,1
8		37,1±0,1	37,3±0,1	36,8±0,1*	37,1±0,1	37,5±0,1**	37,1±0,1	37,3±0,1	37,4±0,1*
9		37,1±0,1	37,3±0,2	36,8±0,1*	37,0±0,1	37,4±0,1**	36,7±0,1*	37,1±0,1**	37,4±0,1**
10		37,1±0,1	37,2±0,1		37,0±0,1	37,5±0,2		37,1±0,1	37,3±0,1
11		37,0±0,1	37,2±0,2		37,1±0,1	37,4±0,1		37,1±0,1	37,2±,1
12		37,1±0,1	37,3±0,1		37,0±0,1	37,3±0,1		36,9±0,1	37,2±0,1
13		37,0±0,1	37,3±0,1		37,1±0,1	37,3±0,1		36,9±0,1	37,2±0,1
14		37,0±0,1	37,2±0,1		37,0±0,1	37,3±0,1		37,0±0,02	37,2±0,1
15		37,0±0,2	36,9±0,1		37,0±0,1	37,3±0,2		36,9±0,1	37,1±0,1
16			37,0±0,1		36,8±0,1	37,3±0,1		36,9±0,02	37,1±0,1
17			37,0±0,1		37,0±0,1	37,4±0,1		36,8±0,1*	37,2±0,1
18			36,9±0,1		36,8±0,1	37,3±0,1		36,8±0,1*	37,2±0,1
19			37,0±0,1		36,9±0,1	37,3±0,1			37,3±0,1
20			36,9±0,1			37,2±0,1			37,2±0,1
21			36,9±0,1			37,3±0,02			37,2±0,1
22			36,7±0,1			37,1±0,1			37,1±0,03
23			36,9±0,1			37,1±0,1			37,1±0,1
24			36,9±0,1			37,1±0,1			37,1±0,1
25			36,7±0,1			37,2±0,1			37,1±0,1
26			36,8±0,1			37,1±0,1			37,3±0,1
27			36,9±0,1			37,3±0,1			37,3±0,1
28			36,7±0,1			37,2±0,1			37,3±0,1
29			37,1±0,1			37,1±0,1			37,2±0,1
30			36,7±0,1			37,3±0,1			37,2±0,1
31						37,3±0,2			37,3±0,1
32						37,1±0,1			37,2±0,1
33						37,3±0,1			37,2±0,1
34						37,5±0,1*			37,1±0,1
35						37,4±0,1			37,0±0,1
36						37,1±0,1			37,0±0,1
37						37,3±0,1			37,0±0,1
38						37,3±0,2			37,2±0,1
39						37,2±0,1			37,2±0,1
40									37,0±0,1
41									37,1±0,1
42									37,3±0,1

\*- significant relative to 1 day

\*\* - significant relative to the data in the first group

As can be seen from the data presented in Table 1, already in the first day after STBI, a tendency to increase the temperature circus rhythm mesor to subfebrile digits was found. A significant increase in the mesor of the circadian temperature rhythm was detected in group 2 up to 3 years on day 2 to  $37.5 \pm 0.1$  ( $p < 0.05$ ) with a tendency to decrease in the following days. On day 5, the indicator remained above the level in group 1 after STBI to  $37.3 \pm 0.1^\circ$  ( $p < 0.05$ ). In group 3, the highest value of the daily average T was also found on the 5th day to  $37.4 \pm 0.1^\circ$  ( $p < 0.05$ ). Thus, the peak of a pronounced systemic inflammatory reaction in infants was found on day 5. At the age of 3.1-7 years in the 1st group, a decrease to the normal level was detected only on 8.9 days to  $36.8 \pm 0.1$  ( $p < 0.05$ ). In the 2nd group, only on the 15th day there were tendencies to normalize the average daily level of temperature reaction at the age of 3.1-7 years. In contrast to the first two groups, the third revealed a significant increase in the mesor of the circadian rhythm of body temperature on days 2–9 to a maximum value on day 5 of  $37.7 \pm 0.1$  ( $p < 0.05$ ) and a tendency to a gradual decrease. However, even on day 34, a hyperthermic reaction was observed up to  $37.5 \pm 0.1$  ( $p < 0.05$ ), which was caused by secondary tissue damage, exacerbation of the systemic inflammatory reaction, whether or not associated (ventilator-associated pneumonia) with the severity of the primary tissue damage brain.

In group 1, in children over 7 years of age, a decrease in the mesor of the circadian rhythm of body temperature to normal values of  $36.7 \pm 0.1^\circ$  ( $p < 0.05$ ) was observed on the 9th day of the acute STBI period. In group 2, on the 2nd, 3rd day, a significant increase was noted to  $37.4 \pm 0.1$  ( $p < 0.05$ ) and a gradual decrease to  $37.1 \pm 0.1$  ( $p < 0.05$ ) on the 9th day (Table. 1).

A distinctive feature of groups 2 and 3 of children with STBI in all age groups is a relatively more pronounced systemic reaction, which manifested itself by a significant hyperthermic reaction on the 2nd day. That is, the more severe the damage to the brain was, the more pronounced was the systemic and inflammatory response of the body in groups 2 and 3 of all ages. Moreover, if in the 2nd group on the 16th day the mesor decreased to a normal level, then in children of the 3rd group the normalization was not fixed even on the 38.42 day STBI. In this regard, it can be assumed that the duration of hyperthermia can serve as a guide in determining the damaged array of brain tissue structures, which determines the prognosis and degree of neurological disorders after STBI in children.

**Table 2**  
**The dynamics of the range of daily fluctuations in body temperature**  
**in the acute period of severe traumatic brain injury**

days	up to 3 years			3.1-7 years			over 7 years old		
	1 gr	2 gr	3 gr	1 gr	2 gr	3 gr	1 gr	2 gr	3 gr
1	0,6	1	1,4	0,7	0,6	1,6	0,6	0,8	0,5
2	0,4	0,7	0,9	0,3	0,6	0,6	0,3	0,4	0,5
3	0,5	0,8	0,9	0,3	0,7	0,7	0,1	0,3	0,8
4	0,3	0,7	0,7	0,5	0,4	0,8	0,3	0,4	0,4
5	0,3	0,6	0,6	0,4	0,3	0,5	0,3	0,3	0,5
6	0,5	0,7	0,7	0,5	0,5	0,9	0,4	0,2	0,4
7	0,7	0,4	0,3	0,9	0,4	0,6	0,3	0,3	0,5
8		0,5	0,9	0,8	0,4	0,3	0,5	0,2	0,5
9		0,7	0,7	0,7	0,4	0,8	0,8	0,3	0,5
10		0,5	0,7		0,3	0,9		0,4	0,4
11		0,5	0,8		0,3	0,5		0,6	0,4
12		0,4	0,5		0,3	0,3		0,3	0,3
13		0,5	0,5		0,5	0,5		0,3	0,2
14		0,3	0,4		0,5	0,4		0,2	0,3
15		0,9	0,3		0,5	0,5		0,4	0,3
16			0,3		0,5	0,7		0,2	0,3
17			0,4		0,4	0,3		0,3	0,3
18			0,5		0,3	0,3		0,3	0,3
19			0,6		0,5	0,4			0,3
20			0,2			0,6			0,3
21			0,6			0,3			0,3
22			0,2			0,3			0,2
23			0,3			0,5			0,3
24			0,4			0,5			0,7
25			0,4			0,4			0,5
26			0,3			0,6			0,4
27			0,5			0,4			0,5
28			0,5			0,3			0,5
29			0,7			0,3			0,5
30			0,5			0,4			0,5
31						0,6			0,6
32						0,3			0,5
33						0,5			0,5
34						0,7			0,6
35						0,5			0,3
36						0,4			0,5
37						0,5			0,6
38						0,8			0,8
39						0,6			0,6
40									0,1
41									0,6
42									0,6

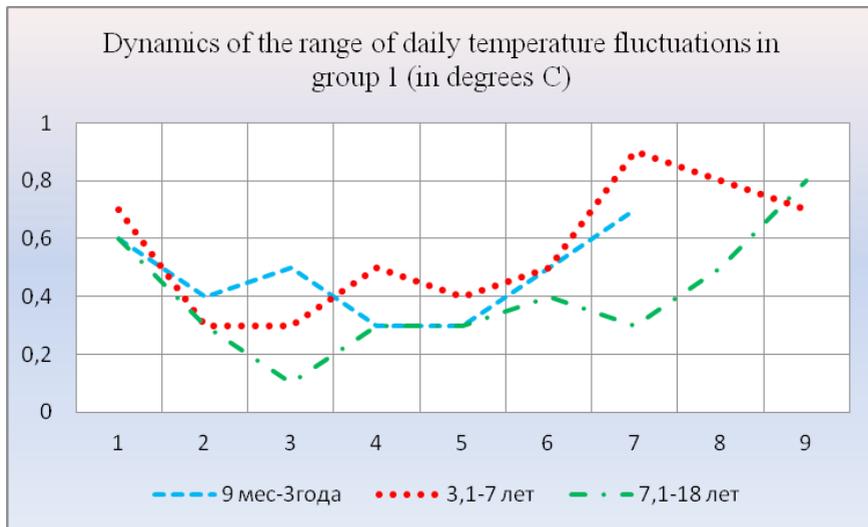


Fig.1

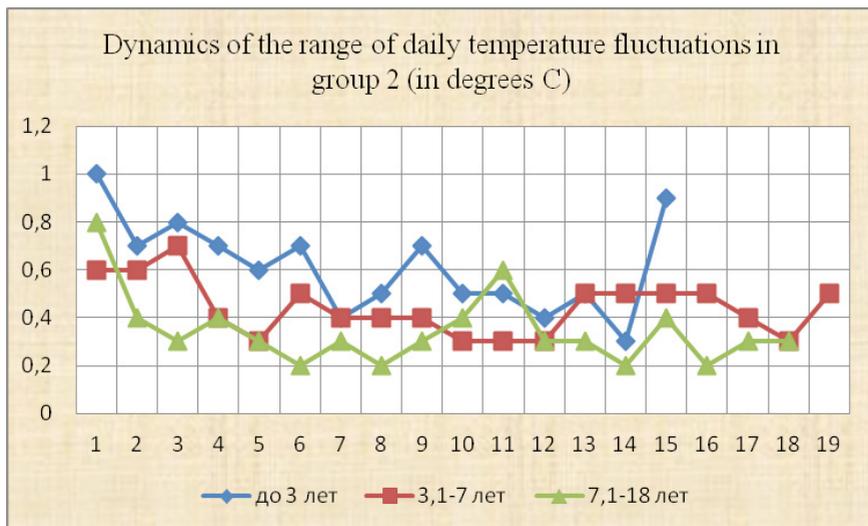
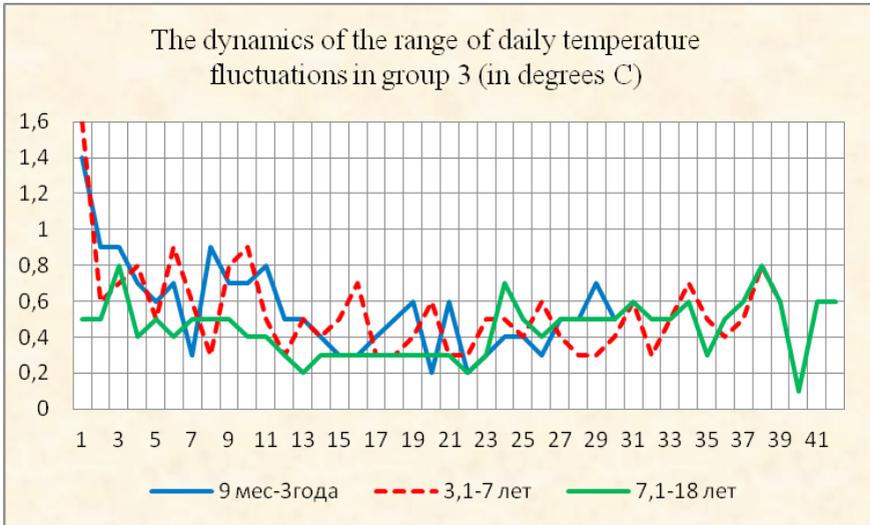


Fig.2



**Fig.3**

Direct correlations between the magnitude and amplitude of diurnal fluctuations in body temperature were revealed. So, under the age of 3 years, in the 1st group, the direct correlation was 0.5866, in the 2nd group, 0.5871, in the 3rd group, 9238. At the age of 3.1-7 years, a direct correlation in the 1st group was 0.7906, in the 2nd group 0.8230, in the 3rd group 0.737. In children with STBI older than 7.1 years, a direct correlation was found between the magnitude and amplitude of daily fluctuations in body temperature in group 1 0.9219, group 2 0.4751, group 3 0.8016. Thus, the strong direct dependence of the magnitude of daily changes and the amplitude of fluctuations in body temperature allows you to navigate about the degree of amplitude deviations, recording data on the maximum and minimum values of body temperature during the day, which does not require time for additional calculations, simplifies monitoring the amplitude of daily changes in body temperature during long-term follow-up in children of group 3 up to 3 years old, in all patients aged 3.1-7 years and patients of groups 1 and 3 aged 7.1-18 years.

As shown in Table 2 and Fig. 1, the most pronounced range of changes in the circadian rhythm of body temperature in group 1 was revealed on the 7th day in children under 3 years old and 3.1-7 years old, on the 9th day in children older than 7.1 years. Thus, a decrease in temperature was accompanied by an increase in the range of temperature fluctuations in the circadian rhythm in group 1. After STBI in group 2, the most pronounced

temperature differences were found at 1 day in all children, at 15 days in children under 3 years of age. Thus, the increase in daily fluctuations in body temperature in the first day corresponded to a greater degree of damage to the cerebral tract during STBI in group 2. On the 15th day in infancy in group 2, an increase in the range of diurnal fluctuations occurred with a decrease in the temperature reaction.

As can be seen from the data presented in Fig. 3, the largest temperature differences were detected on the first day in children aged 9 months to 7 years, corresponding to the severity of brain damage in group 3.

**Table 3**  
**Migration of acrophase, bathyphase in the acute period of STBI in children**

	group 1			group 2			group 3		
	acrophase								
	up to 3 years	3,1-7 years	7,1-18 years	up to 3 years	3,1-7 years	7,1-18 years	up to 3 years	3,1-7 years	7,1-18 years
8-14h	57% (4 out of 7)	44% (4 out of 9)	43% (4 out of 9)	66% (10 out of 15)	57% (11 out of 19)	77% (14 out of 18)	60% (18 out of 30)	61% (24 out of 39)	73% (31 out of 42)
15-23h	14% (1 out of 7)	44% (4 out of 9)	57% (5 out of 9)	26% (4 out of 15)	26% (5 out of 19)	18% (3 out of 18)	30% (9 out of 30)	30% (12 out of 39)	12% (5 out of 42)
24-7h	29% (2 out of 7)	12% (1 out of 9)	0	8% (1 out of 15)	17% (3 out of 19)	5% (1 out of 18)	10% (3 out of 30)	9% (3 out of 39)	15% (6 out of 42)
	bathyphase								
8-14h	71% (5 out of 7)	56% (5 out of 9)	43% (4 out of 9)	33% (5 out of 15)	31% (6 out of 19)	27% (5 out of 18)	43% (13 out of 30)	26% (10 out of 39)	26% (11 out of 42)
15-23h	14,5% (1 out of 7)	22% (2 out of 9)	14% (1 out of 9)	20% (3 out of 15)	42% (8 out of 19)	33% (6 out of 18)	33% (10 out of 30)	43% (17 out of 39)	38% (16 out of 42)
24-7h	14,5% (1 out of 7)	22% (2 out of 9)	43% (4 out of 9)	47% (7 out of 15)	17% (5 out of 19)	40% (7 out of 18)	24% (7 out of 30)	31% (12 out of 39)	36% (15 out of 42)

As can be seen from the data presented in table 3, the normal projection of acrophase in the morning was more likely due not to the severity of the condition, but to the age of the injured child. So, in the 2nd group up to 3 years, the projection of acrophase in the morning was detected for 66%, up to 7 years - 57%, and older than 7.1 years - 77% of the observation duration. The projection of acrophase in group 3 was 60% up to 3 years, 61%

3.1-7 years old, 73% over 7.1 years old. While with STBI in infancy, the projection of acrophase in the morning was observed for 57%, 44%, 43% of the time. But at the same time, inversion of the circadian rhythm by the shift of the bathyphase to the morning hours was revealed over 71-43% of the observation duration, in the 2nd group 47-17-40%, in the 3rd group according to increasing age, respectively, 24%, 31%, 36%. Conducted traditional intensive care for STBI allowed to maintain subfebrile condition throughout the acute period, the maximum value of body temperature prevailed in the first decade and was due to a persistent inflammatory reaction mainly in children of groups 2 and 3.

**Conclusions.** The peak of a pronounced systemic inflammatory reaction in infants was detected on the 5th day. A distinctive feature of groups 2 and 3 of children with STBI in all age groups is a relatively more pronounced systemic inflammatory reaction, which manifested itself by a significant hyperthermic reaction on the 2nd day. The more severe the damage to the brain, the more pronounced is the systemic inflammatory response of the body in groups 2 and 3 of all ages. The duration of hyperthermia can serve as a guide in determining the damaged array of tissue structures of the brain, which determines the prognosis and degree of neurological disorders after STBI in children.

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## FEATURES OF INTRAOPERATIVE PAIN RELIEF IN SEVERE TRAUMATIC BRAIN INJURY IN CHILDREN

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**Abstract.** The authors found that an increase in the duration of endotracheal anesthesia was characterized by an increase in the correlation of hemodynamics, an increase in the effect of mechanical ventilation on the compensatory reactions of the parameters of central and peripheral hemodynamics in STBI in children older than 7 years. With an increase in the duration of anesthesia, a combination of general anesthesia with isoflurane inhalation, local anesthesia significantly reduces the need to increase the introduction of relaxants, intravenous less controlled anesthetics, and hypnotics. 76% of children over 7 years of age who have been operated on in relation to STBI require prolonged mechanical ventilation in the early postoperative period.

**Keywords:** intraoperative pain relief, severe traumatic brain injury, children

**Relevance.** Anesthesiologist encounters problems caused by intracranial hypertension and cerebral edema during anesthetic management in patients with STBI [1-4]. When conducting general anesthesia, anesthesiologists are guided by indicators of systemic hemodynamics, which during craniocerebral operations does not adequately reflect the severity of the condition, the likelihood of complications of hemodynamics, and the respiratory system [5,6,7]. The foregoing served as the basis for the implementation of this study.

**Goal.** Study and identify the features of intraoperative general anesthesia in severe traumatic brain injury in children older than 7 years.

**Material and research methods.** In order to identify the effects of the severity of STBI on hemodynamics, blood pressure, mean AP, stroke volume (SV), minute volume of blood circulation (MVBC), total peripheral vascular resistance (TPVR), myocardial oxygen demand (MOD), heart rate (HR) were studied ) monitoring of the above parameters at the main stages of anesthesia. Evaluation of the studied parameters was carried out at the stages of anesthesia: 1 initial indicator before sedation; 2 - after sedation; 3 - induction (induction anesthesia); 4 after intubation; 5 - traumatic stage of the operation; 6 end of operation; 7 after extubation (without extubation); 8 before transfer to ICU.

Intraoperative control of hemodynamic parameters was carried out in two groups of patients: group 1 with endotracheal anesthesia lasting up to 100 minutes ( $75.8 \pm 20.3$  minutes) 7 children, group 2 with general anesthesia lasting more than 101 minutes ( $188.3 \pm 56.3$  minutes ) 28 patients.

In the 1st group there were children aged  $10.7 \pm 2.2$  with a body weight of  $40 \pm 10$  kg, intraoperative, blood transfusion was performed for 1 patient 139 ml due to 300 ml blood loss, the total intraoperative infusion volume averaged  $721.3 \pm 461.8$  ml, 15% -100 ml mannitol was administered to 4 patients. The volume of infusion in group 1 averaged 18 ml/kg. The average age of children of the 2nd group was  $11.4 \pm 2.2$  years, weight  $43.3 \pm 6.2$  kg. 3 patients were admitted to the clinic on an endotracheal tube, mechanical ventilation bag Ambu. The average BS for mechanical ventilation in children over 7 years old was  $375.6 \pm 101.4$  and MOD  $6402.2 \pm 1235.4$  ml per minute. In group 2, with an anesthesia duration of  $188.3 \pm 56.3$  minutes, the total infusion volume was  $1138.2 \pm 659$  ml (28 ml/kg).

As shown in Table 1, the increase in the duration of endotracheal anesthesia at school age was primarily due to combined with severe traumatic brain injury (liver rupture, hip fracture with displacement, chest injury, collarbone fracture) in 24% of the operated children, removal of intracerebral in 2.7% of children, subdural in 37% of hematomas, resection-decompression trepanation of the skull 33%. The operations of the same name in children of the 2nd group were distinguished by a greater degree of complexity, damage to the structures of bones and brain substance, which led to an increase in the duration and need for deeper anesthesia, combined with local anesthesia. All patients had severe brain contusion, acute axonal insufficiency, as evidenced by acute impairment of consciousness in all injured children before surgery on a GSC scale of  $9.7 \pm 1.5$  (37),  $7.5 \pm 1.9$  points (12 patients)

**Table 1**  
**Operations in the age of over 7 years**

	Operations	1 group-11 (duration of anesthesia 75.8±20.6 minutes at the age of 10.9±2.1 years 11 patients	Group 2 - 38 (the duration of anesthesia is 188.3±56.3 minutes at the age of 11.6±2.2 years). 38 children
1	Intracerebral hematoma removal	0	2,7% (1)
2	Epidural hematoma removal	54% (6)	24% (9)
3	Subdural hematoma removal	36% (4)	37% (14)
4	Resection and decompression trepanation of the skull with the removal of depressed bone fragments, plastic	0	33% (13)
5	Combined with bone fracture, liver damage, chest injury, collarbone fracture with displacement	0	24% (9)

**Results and discussion.** It was not possible to identify a significantly significant dependence of the duration of anesthesia on the initial severity of the condition of children, the type of STBI, and damage to other organs. As shown in table 1, the parameters of hemodynamics before surgery were within the age norm, which can be explained by the effectiveness of the primary correction of hemodynamics in the shock room, the timeliness of the prosthetics of the breath, complex anti-shock therapy. So, the HTN indicator was 100.0±15.7, mm Hg, DBP 65.7±8.6 mm Hg, PBP 34.3±7.1 mm Hg, avg 82.9±12.2 mm Hg, SV 40.7±5.3 ml, MVBC 3.9±0.6 L/min, TPVR 1297.4±89.8 dyn.cm<sup>-5</sup>m, HR 95.3±8.5aud min, MOD 96.5±20.3%, OBT0.8±0.2 units.

Table 3 presents the results of a study of hemodynamic parameters in patients of group 2. So, HTN before sedation was 108.0±8.8 mm. Hg, DBP 63.4 ± 6.6 mm. Hg, PBP 44.6±6.3 mm. Hg, mean BPM 85.7±6.7 mm. Hg., SV 52.3 ± 7 ml, MOQ 5.5 ± 1.3 L/min, TPVR 1089.2±295 d.s.cm<sup>-5</sup>m, HR104.5±19.8 beats. min., PMK112.6±21.1%, OBT1.2±0.3 units.

As can be seen from the data in table. 2, the achieved level close to the age-related standards of hemodynamics before surgery was maintained stably at all stages of general endotracheal anesthesia. 15 patients from 28 (group 2) were admitted to the operating room intubated upon admission to the shock room. Blood transfusion in an amount of 230 ± 8 ml was

performed in 5 patients in connection with a blood loss of  $281 \pm 59$  ml. Out of 28 operated children of the 2nd group, anesthesia was supplemented with local anesthesia performed by 9 patients with lidocaine 10% 2-4 ml + adrenaline 0.18% solution 1 ml + in a solution of sodium chloride 0.9% -100 ml. 29 out of 38 (76%) operated children of the 2nd group were transferred to ICU from the operating room without extubation with prolonged mechanical ventilation.

Thus, the duration of anesthesia did not significantly affect the parameters of the circulatory system with timely adequate infusion therapy, maintaining ventilation parameters taking into account age-related physiological values of BH, DO, MVB, under the control of oxygen saturation indicator.

**Table 2**  
**The state of hemodynamics in children of group 1**

	1 before sedation	2 after sedation	3 introductory anesthesia	4 after intubation	5 traumatic stage	6 end of operation	7 without/ after extubation	8 transfer into ICU
HTN, mm. Hg.	100,0±15,7	99,6±13,9	99,4±15,5	94,3±8,3	104,1±7,8	99,0±6,6	101,0±8,0	106,7±10,0
DBP, mm. Hg.	65,7±8,6	61,6±12,2	63,9±9,0	62,1±6,2	62,1±12,2	65,7±5,9	65,9±6,4	68,3±5,0
PBP, mm. Hg.	34,3±7,1	38,0±5,4	35,6±6,5	32,1±4,5	42,0±9,4	33,3±3,4	35,1±4,2	38,3±7,1
avBP, mm. Hg.	82,9±12,2	80,6±13,1	81,6±12,3	78,2±6,3	83,1±9,2	82,4±5,5	83,4±7,1	87,5±7,5
SV, ml	40,7±5,3	48,1±9,3	43,4±4,2	41,3±6,6	52,0±15,1	40,6±3,8	42,3±4,9	43,6±5,5
MVBC, l/min	3,9±0,6	5,2±1,5	4,1±0,4	4,0±0,6	5,0±1,3	4,2±0,6	4,4±0,9	4,9±1,1
TPVR, d.s.cm <sup>-5</sup> m	1297,4±89,8	1064,1±267,4	1211±172,1	1219±200,6	1124,6±283,9	1237,7±202	1214,2±205,4	1126,8±184
MOD, %	96,5±20,3	105,0±11,5	95,1±16,8	91,6±12,2	104,0±15,0	101,2±14,3	103,9±15,9	120,2±21,3
OVT, cu	0,8±0,2	1,0±0,2	0,8±0,2	0,8±0,1	1,0±0,2	0,9±0,1	0,9±0,2	1,1±0,3
HR bpm	95,3±8,5	105,6±11,5	95,6±6,9	96,7±9,4	99,6±9,8	101,6±10,4	102,0±10,3	111,8±9,8

**Table 3**  
**The state of hemodynamics in children of group 2**

research stages	1 before sedation	2 after sedation	3 introductory anesthesia	4 after intubation	5 traumatic stage	6 end of operation	7 without/ after extubation	8 transfer into ICU
HTN, mm. Hg.	108,0±8,8	108,0±10,2	106,2±10,2	104,0±10,1	101,1±13	103,1±11,8	103,0±11,4	106,4±10,1
DBP, mm. Hg.	63,4±6,6	64,0±8,5	62,9±8,3	61,9±9,3	62,2±10	63,1±11,1	63,9±9,8	67,4±6,7
PBP, mm. Hg.	44,6±6,3	44,0±5,1	43,3±4,8	42,1±5,8	39,0±6,5	40,0±7,1	39,1±6,9	39,0±5,4
avBP, mm. Hg.	85,7±6,7	86,0±8,7	84,6±8,7	83,0±9	81,7±11	83,1±10,9	83,4±10	86,9±7,8
SV, ml	52,3±7	51,9±7,7	51,9±7,4	51,6±8,5	48,3±8,4	49,6±10,3	48,0±9,8	45,1±6,8
MVBC, l/min	5,5±1,3	5,5±1,4	5,5±1,4	5,2±1,4	4,8±1,1	5,1±1,5	5,0±1,3	4,8±1
TPVR, d.s.cm <sup>-5</sup> m	1089,2±295	1098,0±289,3	1068,4±255,7	1119,5±314,4	1136,0±288	1182,9±403,	1198,9±392	1175,2±239,3
MOD,%	112,6±21,1	113,2±23	110,2±20,4	103,4±18,8	100,6±21,7	107,0±19,9	107,4±19,2	114,1±21,1
OVT, cu	1,2±0,3	1,2±0,3	1,1±0,3	1,1±0,2	1,0±0,2	1,0±0,3	1,0±0,3	1,0±0,2
HR bpm	104,5±19,8	104,4±17,7	103,6±15,6	99,9±16,4	99,5±15,1	103,7±16,1	104,2±14,9	106,9±15,

The oxygen saturation index of  $99.1 \pm 0.4\%$  testified to the effectiveness of lung ventilation parameters at all stages of anesthesia. There were no significant differences in the parameters of ventilation in the groups. So, in group 1, BS was  $363.3 \pm 91.1$  ml, MVB  $6516.7 \pm 1350.0$  ml per minute, in group 2 - BS -  $375.6 \pm 101.4$  ml, MVB  $6365.2 \pm 1188, 7$  ml per minute.

The revealed differences in the consumption of narcotic drugs in groups 1 and 2 concerned fentanyl, to a lesser extent arduan. In connection with the increase in the duration of surgery in patients of group 2, the duration of the inhalation component of the general anesthesia of isoflurane increased from 1.5-1% for the entire traumatic period of the operation despite additional local anesthesia with lidocaine. On the other hand, it was the use of an inhalation anesthetic that significantly limited the less controlled intravenous prophylaxis, relaxant arduan. As can be seen from the table 4, the amount of intraoperative drug consumption in group 2 did not significantly exceed the number of children used in group 1. Ketamine is used primarily for induction of anesthesia in children with unstable hemodynamics and a high risk of arterial hypotension.

**Table 4**  
**Doses of drugs for STBI in children older than 7 years**

	<b>Ketamine, mg</b>	<b>Profol, mg</b>	<b>Fentanyl, mg</b>	<b>Arduan, mg</b>
group 1	166,7±44,4	266,7±88,9	0,2±0,05	4,4±1,3
group 2	178±20	133,3±66,6	0,31±0,12	4,6±1,25

Anesthesia was maintained by inhalation anesthetic isoflurane 1-1.5 vol% from the start of surgery, during the traumatic period BS of the end of the operation, followed by switching to ventilation with oxygen, an oxygen-air mixture with the above ventilation parameters.

As can be seen from the results of the study, the correlation between HTN and PBP (0.7696 and 0.7597, respectively), HTN and cf AP (0.9230 and 0.911), HTN and MOD (0.8618 and 0.8948) turned out to be significant. HTN and OBT (0.8559 and 0.9133). In the 2nd group, the direct connections of HTN and MVBC (0.6987), HTN and HR (0.6377), HTN and MVB (0.7279) became significant. With prolonged anesthesia, a direct dependence of the level of HTN on minute ventilation of the lung, on the minute circulatory volume and HR. The latter indicates the need for monitoring adequate infusion therapy to stabilize HTN.

In the 1st group, during endotracheal anesthesia, a direct relationship between DBP and avBP (0.8035) was found. While in the 2nd group there

were found direct links not only to DBP with avBP (0.7691), but there was also a direct dependence on the level of DBP and MOD (0.7129), DBP and HR (0.8434), and a negative correlation changes in DBP and SV (-0.711), DBP and BH (-0.8646), DBP and BS (-0.8011). From the obtained results it follows that in children of the 2nd group, in contrast to the data of 1, the DBP level began to depend on BH and BS, that is, a decrease in BH and BS caused an increase in DBP (i.e., a decrease in lung ventilation caused peripheral vasospasm). Moreover, the increase in DBP had a cardiodepressive effect on cardiac output (decrease in SV).

Due to the insufficient knowledge of the informative significance of such hemodynamic parameters PBP and avBP, and the information available in the literature is ambiguous, we set the task to study and evaluate the information content of these indicators in conditions of endotracheal anesthesia. In group 1, there was a direct correlation between PBP and SV (0.9117), PBP and MVBC (0.8661), PBP and OBT (0.8609), and feedback between PBP and TPVR (-0.7383). The revealed results indicate that in group 1 the value of PBP changes in parallel with the change in SV and MVBC and the degree of activity of the sympathetic nervous system. That is, an increase in PBP during anesthesia in group 1 characterizes an increase in SV, MVBC, a decrease in TPVR (-0.7388) under conditions of increased sympathoadrenal regulation of hemodynamics.

In group 2, these correlations remained unchanged at PBP and SV (0.8882), PBP and MVBC 0.998), PBP and OVT (0.9355), and PBP and TPVR (-0.8602). In group 1, a direct relationship was found between cf AP and HR (0.6336), avBP and OBT (0.6673), cf AP and MOD (0.8448). While, with an increase in the duration of anesthesia, the existing correlations of avBP and HR (0.8495), cf AP and OBT (0.7111), cf AP and MOD (0.9684), additional avBP and MVB correlations (0, 7044), inverse relationship between cp AP and BS (-0.6434). That is, with prolongation of endotracheal analgesia with STBI, there is an increase in the influence of mechanical ventilation parameters on hemodynamics, in particular, a decrease in avBP with an increase in BS. It should be noted that the level of avBP is directly dependent on the state of vegetative tone, heart rate and a direct relationship between the oxygen demand of the myocardium and the level of avBP. That is, the more avBP, the higher the consumption of myocardial oxygen.

In the 1st group, a direct dependence of SV on OBT (0.6797), SV and MVBC (0.8295), and inverse SV and TPVR (-0.7845) were observed. These correlations characterize the physiological level of the hemodynamic stress response during short anesthesia. An increase in the duration

of endotracheal analgesia in group 2 was characterized by an increase in the correlation of hemodynamics. Moreover, in the 1st group of direct correlation between SV and MVBC (0.9024), SV and OVT (0.7061), SV and TPVR (-0.7875), new ones were added - SV and BH (0.7207), SV and body temperature (-0.7264). That is, in the 2nd group, mechanisms of the intraoperative cardiodepressive mechanism arose, when a decrease in the respiratory rate or an increase in body temperature contribute to a decrease in cardiac output through a decrease in SV.

In group 1, a direct relationship was found between MVBC and OBT (0.9351), MVBC and HR (0.7115), MVBC and MOD (0.7154), MVBC and MVB (0.6726). That is, the minute volume of blood circulation directly depended on the activity of sympathetic regulation, heart rate, and minute ventilation of the lungs, causing an increase in oxygen consumption by the myocardium. While in group 2, only the direct dependence of MVBC on OBT (0.9259) and the inverse of TPVR (-0.7524) remained. That is, the compensatory significance of the change in MVBC decreased slightly with an increase in the duration of anesthesia. The latter may be associated with more pronounced external influences against the background of a more severe STBI, the general condition of the body of children of group 2.

In the 1st group, an inverse correlation between TPVR and OBT (-0.8198) was observed, which remained in the 2nd group (-0.7211). What characterized a compensatory decrease in peripheral vascular resistance in response to the hypersympathotonic reaction of the body in all operated patients. But in group 2, the inverse dependence of TPVR on HR (-0.8198) observed in group 1, the compensatory increase in heart rate in response to a decrease in peripheral vascular tone, disappeared. This compensatory hemodynamic reaction is physiological at the onset of hypovolemia. With an increase in the duration of anesthesia, the compensatory reaction of increased heart rate in response to a decrease in vascular tone disappeared.

In group 1, there was a direct dependence of myocardial oxygen consumption on vegetative tone (0.8953), and HR (0.9368), which was also found in group 2 MOD and (0.7183), MOD and HR (0.9121). They were joined by a direct relationship between MOD and MVBC (0.7354). A well-known fact is an increase in myocardial oxygen consumption with increased heart rate and a hypersympathotonic reaction. But in group 2, a direct dependence of MOD on MVB (0.7354) arose additionally.

It was found that an increase in the duration of endotracheal anesthesia is naturally accompanied by an increase in the effect of mechanical ventilation on the compensatory reactions of the parameters of central and peripheral hemodynamics.

Group 1 revealed a direct correlation characterizing the dependence of HR on OBT (0.8156), BS (0.7011), MVB (0.7012), the inverse of BH (-0.7012). That is, a decrease in BH during mechanical ventilation causes tachycardia, which is most likely caused by tissue hypoxia. In the 2nd group, there appeared a direct correlation between OHT from MVB (0.6343), HR from MVB (0.6374), and inverse correlation links HR from BS (-0.8014), body temperature from BH (-0.9835), and temperatures from tidal volume (-0.6630).

**Conclusion.** An increase in the duration of endotracheal analgesia was characterized by an increase in the correlation of hemodynamics, an increase in the effect of mechanical ventilation on the compensatory reactions of the parameters of central and peripheral hemodynamics in STBI in children older than 7 years. With an increase in the duration of anesthesia, a combination of general anesthesia with isoflurane inhalation, local anesthesia significantly reduces the need to increase the introduction of relaxants, intravenous less controlled anesthetics, and hypnotics. 76% of children older than 7 years operated in connection with STBI need prolonged mechanical ventilation in the early postoperative period.

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UDC 611.061:619:639.1.021

## ANATOMICAL AND TOPOGRAPHIC FEATURES OF THE PANCREAS OF THE EUROPEAN BADGER

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**Abstract.** The pancreas of the European badger is located retroperitoneally at the level of 2-3 lumbar vertebrae. Gland, by the type of structure, occupies an intermediate version, has the form of a plate bent at an angle, pale pink in color, has soft, delicate texture. It has two excretory ducts independently opening in the area of the bend of the duodenum.

**Keywords:** badger, topography, pancreas, type of structure, ducts.

**Introduction.** Pancreas — is the largest and most important gland of the digestive system, and, at the same time, the most important gland of internal secretion, which takes part in the regulation of carbohydrate metabolism. Its endocrine function is the secretion of hormones insulin, glucagon, gastrin, somatostatin, pancreatic polypeptide, amylin into the blood. Moreover, insulin produced only in this organ is essential for life due to its role in ensuring normal metabolism. On the other hand, the pancreas performs an exocrine function - it produces secretion necessary in the digestive tract [4]. Pancreatic enzymes break down basic nutrients into small molecules, later they are cleaved by intestinal membrane enzymes into individual molecules and partially diffuse through the mucous membrane of the intestinal wall (monoglycerides and dipeptides). Pancreatic juice rich in bicarbonates provides the reaction of the medium necessary for the initiation of enzymes and the creation of an optimal environment for the manifestation of their activity [10].

The pancreas in mammals is located in the abdominal cavity. Animals of various species and ecological niches have anatomical and topographic and functional features of the pancreas, in particular, predators lack adap-

tive reactions of its enzyme spectrum in response to a change in diet [5]. The shape of the pancreas of animals is extremely diverse. Scientists distinguish several types of structure: compact, scattered or mesenteric and intermediate, combining both options [12]. According to the microstructure of the pancreas of animals, it belongs to the number of tubular-acinous, i.e. to glands with a branched system of excretory ducts and spherical or egg-shaped secretory end sections [3]. Despite the wide range of studies of the pancreas in different species of mammals [1, 2, 6, 7], its topography, shape, type in wild game animals is not well understood, which makes it difficult to assess the state of the organ and digestive system when animals are kept in artificially created conditions of Zoos, circuses, nurseries and fur farms. In this regard, the study of the anatomical and functional features of the pancreas of wild game animals is of particular relevance.

**The purpose of this study was** study of the topography, form and anatomical features of the European badger's pancreas (*Meles meles*, L.).

**Materials and research methods.** The study was performed at the Department of Obstetrics, Surgery and Non-communicable Animal Diseases of the FSBEI of Higher Education, the Ivanovo State Agricultural Academy in 2019.

The object of the study was adult badgers. The choice of the object is determined by the commercial value of the animals, their fat is used in alternative medicine, razor shaving brushes are made from the badger's hard hair, as well as paint brushes, its meat is edible [8, 9, 11].

The subject of the study is the pancreas, taken after the death of animals, due to injuries incompatible with life, not related to the pathology of the endocrine system and gastrointestinal tract, in compliance with ethical standards "Directive 2010/63/EU of the European Parliament and of the Council of September 22, 2010 on protection of animals used for scientific purposes."

Topographic and anatomical studies of the pancreas were performed directly at the opening of the abdominal cavity of the studied animals. Methods of layered and thin preparation determined the shape, weight and linear dimensions of the gland.

The digital material of macrometric measurements was subjected to statistical processing using the standard Microsoft Excel software package. The names of the anatomical formations are given in accordance with the international nomenclature *Nomina Anatomica Veterinaria* (2005).

**Results of the study.** The badger's pancreas is located retroperitoneally at the level of 2-3 lumbar vertebrae behind the liver in the mesentery of the duodenum. This is a large, elongated flat diffuse organ, grayish-

pink in color, of inconsistent shape, with an uneven edge, not having a pronounced connective tissue capsule. A thin layer of loose connective tissue covers the pancreas and divides it with partitions into lobules. The pancreas has a very delicate texture.

The absolute weight of the gland in an adult badger was  $36.33 \pm 1.98$  g and varied from 34.0 g to 38.0 g. The body of the pancreas (*corpus pancreatis*) is almost completely surrounded by the duodenum and bends steeply near the pylorus. In form, the pancreas in the form of a plate bent at an angle resembles the letter “V”; by the type of structure it occupies an intermediate version (Fig. 1). Anatomically, the pancreas is divided into three parts: the right and left lobes, and the head. The right part, the pyloric, or the body of the gland, is located along the duodenum and reaches almost the right kidney, its length is 17.5-20.0 cm, the width in different areas varies from 1.4 to 2.7 cm, height - from 0.3 to 1.1 cm. The tail of the right lobe lies freely, separated from the mesentery tissue. The left part, the gastrosplenic, lies along the greater curvature of the stomach and reaches the spleen and left kidney. This proportion has a shorter length - 13.0-17.0 cm, width and height vary from 0.9 to 2.1 cm and 0.4 to 0.7 cm, respectively. The head or duodenal part (*caput pancreatis*) is completely covered by the duodenum and opens into it with two ducts (table). The main, Wirsung duct, combines with the common bile duct and opens with a common large papilla of the duodenum (*papilla duodeni major*) through the sphincter of Oddi. The accessory duct or Santorinius duct (*ductus pancreaticus accessorius*) opens into the duodenal cavity with a small duodenal papilla (*papilla duodeni minor*), somewhat cranial than the first (Fig. 2).

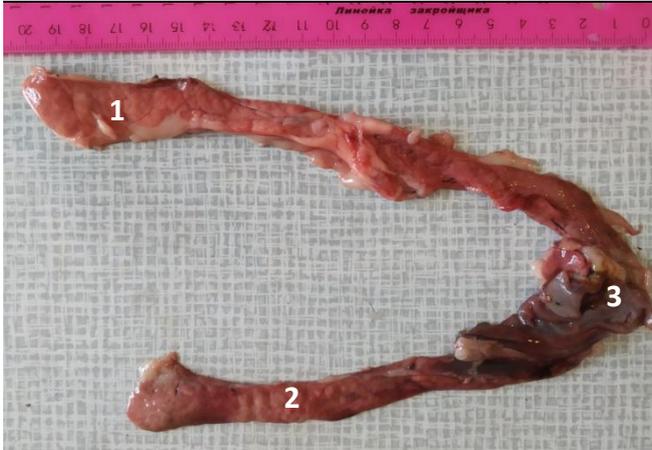
**Table - Morphometric indicators of the European badger's pancreas, M $\pm$ m, cm**

Indicator	Length	Width	Height
Right part	18,86 $\pm$ 2,43	2,05 $\pm$ 0,63	0,72 $\pm$ 0,19
Left side	14,83 $\pm$ 2,28	1,75 $\pm$ 0,36	0,06 $\pm$ 0,03
Head	3,14 $\pm$ 0,22	2,34 $\pm$ 0,09	0,87 $\pm$ 0,16

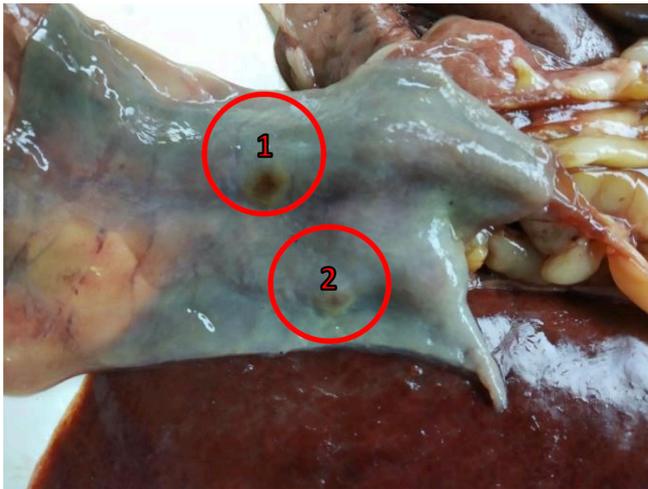
The blood supply to the badger's pancreas is, like that of other mammals, the gastro-duodenal arteries (*arteriae pancreaticoduodenales*) and the branches of the splenic artery (*arteria lienalis*). Venous outflow occurs through the veins of the same name into the portal vein system.

The lymphatic vat is up to 6 cm long and 3-4 cm wide, pink-gray in color, has a conical shape, consists of loose fibrous tissue, is located in the mesentery, drains the liver, pancreas, duodenum, skinny and ileum (Fig. 3-4 )

The gland has a sympathetic, parasympathetic and autonomous innervation. The sympathetic bodies of nerve cells are located in the mesenteric and celiac ganglia, the parasympathetic part is located through the branches of the vagus nerve, and the autonomic nervous system is distributed throughout the gland in the connective tissue septa and parenchyma [13].



**Fig. 1. Badger Pancreas:**  
1 - left lobe; 2 - right lobe; 3 - body



**Fig. 2. Duodenum: ducts of the pancreas:**  
1 - *papilla duodeni major*;  
2 - *papilla duodeni minor*



**Fig.3. Lymphatic vat**



**Fig. 4. Lymphatic vat in section**

**Conclusion.** The absolute weight of the European badger's pancreas is 34-38 g, it has the shape of a plate bent at an angle and occupies an intermediate version according to the type of structure. The gland is covered with a thin layer of loose connective tissue, localized in the mesentery of the duodenum, consists of three parts, different in size, the tail of the right part lies freely, separated from the mesentery tissue. It is opened by two ducts into the duodenum, the main duct is combined with the common bile duct, the additional one is located somewhat more cranial than the first. The lymphatic vat is located in the mesentery of the duodenum, removes lymph from regional organs and lymph nodes.

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## METHODS FOR THE SYNTHESIS OF POLYETHERETHERKETONES AND POLYETHERETHERKETONES

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**Abstract.** Aromatic polyetherketones in recent years occupied a prominent position among other thermoplastic polymers. This is because they possess a unique combination of toughness, thermo-oxidative stability, resistance to solvents, mechanical strength, fire resistance, and maintain their physicochemical properties at high temperatures.

Aromatic polyetherketones currently successfully synthesized using the Friedel-Crafts reaction. Important advantages of the synthesis of aromatic polyethers by the reaction of the Friedel-Crafts over the other are relatively mild polycondensation conditions (temperature, typically up to 100 °C) and the possibility of using inexpensive starting materials.

There are two ways of synthesis of aromatic polyetherketones: electrophilic and nucleophilic, each of which has its own advantages and disadvantages.

The article provides a comparative analysis of the advantages and disadvantages of electrophilic and nucleophilic methods for the synthesis of polyetherketones and polyetheretherketones.

**Keywords:** polyetherketone, polyetheretherketone, electrophilic method, nucleophilic method, solubility.

Prospects for modern technological development show that synthetic polymers, which include aromatic polyetherketones, will occupy one of the leading places in the future in terms of production volume due to a number of their high physical, mechanical and thermophysical characteristics [1-7, 23]. These unique polymers have appeared on the market relatively recently and have found great application in various branches of engineering and industry from automotive to space. Most of them are produced in England, China, USA, Japan [8-10].

Among thermoplastics, polyetheretherketones have one of the highest melting points (330-360 °C). Moreover, their chemical structure, which consists of phenylene rings connected by oxygen atoms or by oxygen at-

oms and carbonyl groups, provides high strength and flexibility of macromolecules. To date, there is the necessary amount of information that makes it possible to represent the relationship of the structure and properties of polyetheretherketones. [11].

The synthesis of aromatic polyetherketones is based on the Friedel-Crafts reaction. In addition, they can be obtained by the mechanisms of synchronous bimolecular nucleophilic substitution of halogen atoms in aryl halides with various active metal bisphenolates [12-13].

The electrophilic substitution reactions underlying the preparation of aromatic polyethers by the Friedel-Crafts method are currently fully investigated. In such processes, diaryl sulfochlorides are used in the synthesis of polysulfones [14], and in the case of polyetherketones, tere-, isophthaloyl chlorohydrides, etc. are used. They usually interact with diphenyl oxide and its derivatives, naphthalene, diphenyl sulfide, etc. [15].

Polycondensation reactions in the synthesis of aromatic polyethers are carried out, as a rule, in such solvents as N, N-dimethylacetamide, N, N-dimethylformamide, trifluoromethanesulfonic acid, polyphosphoric acid, as well as in the presence of catalysts - acids and Lewis bases such as tetrabutylammonium bromide, tetrabutylammonium fluoride boron, aluminum chloride, etc. Most often, polyarylene ether ketones are obtained in this way [16-20].

Due to the low solubility in solvents, polyetherketones precipitate; no increase in molecular weight occurs [21-23]. It was proposed to use hydrofluoric acid as a solvent in such reactions [24]. If the latter is combined with boron fluoride [25], it is possible to obtain high molecular weight polyarylene ether ketones.

The disadvantages of the electrophilic method for the synthesis of PEKs are: the isolation of a low-molecular-weight by-product, hydrogen chloride, the tendency to contaminate the polymer with metal salts that impair the useful properties of polyethers, and the use of expensive reagents (for example, acid halides).

During the preparation of aromatic or fatty aromatic polyethers by the nucleophilic method, an ether linkage is formed during the polycondensation reaction of diphenol bisphenolates with the corresponding dihalogen derivatives. This reaction, depending on the structure of the activated dihalogenated derivative, proceeds by the mechanism of nucleophilic aromatic substitution or nucleophilic substitution at a saturated carbon atom.

The optimal conditions for the synthesis of polymers by this method are determined by a number of similar factors: the chemical nature of the functional groups, the chemical structure of the nucleophilic reagent, the

nature of the solvent, the concentration and ratio of reacting substances, the nature of adverse reactions, the nature of the additives, catalyst, and temperature.

The most significant advantage of the method for producing polyarylene ether ketones by nucleophilic substitution reaction is the use of different diphenols, which make it possible to synthesize compounds of different molecular designs and at the same time change the properties of the final products in the desired directions. This also has its drawbacks, which include the limited solubility of polyethers, especially crystalline structure, in the most affordable low-cost solvents, the difficult removal of side halides of alkali and alkaline earth metals from polymers. But with all this, the purification of polyetherketones from low molecular weight products in these processes is easier to carry out than with electrophilic synthesis.

The most widely used method for the synthesis of polyetherketones was the reaction of diphenols with 4,4'-dichlorobenzophenone and 4,4'-difluorobenzophenone [26–28]. Using voluminous monomers, as well as introducing substituents of various nature into the aromatic ring, polyethers with improved solubility and high molecular weights can be synthesized [29–31].

Dipolar organic solvents such as dimethyl sulfoxide, dimethylacetamide, dimethylformamide, dimethyl sulfone, methylpyrrolidone are used as a reaction medium in the synthesis of polyetherketones and polyetheretherketones by nucleophilic polycondensation. As catalysts, as a rule, carefully dried carbonates, bicarbonates, hydroxides, hydrides, and active metal fluorides are used. Polyethers are obtained in a medium of gaseous nitrogen or argon with a stepwise increase in temperature from 100 to 400 °C. It was proposed to use [32] monohydric phenols of various structures as regulators of polymer chain growth.

Under relatively mild conditions, polyetherketones and polyetheretherketones are obtained [33–34]. Using this method, aromatic polyetherketone-sulfones capable of forming three-dimensional structures from diphenyl ether or 4,4'-diphenoxyphenyl sulfone and butadiene-1,3 dichloride, tere and isophthaloyl dichlorohydrides in the presence of Lewis acids were obtained.

The polycondensation reaction of aromatic esters and thioethers with carboxylic acid halides yielded aromatic polyetherketones and their thio derivatives at temperatures of  $-10 \div + 100^{\circ}\text{C}$ . The role of the catalysts is performed by bases and Lewis acids.

Using aluminum chloride as a catalyst, the synthesis of aromatic polyetherketones by the Friedel-Crafts reaction from diphenyl oxide, diphenyl

sulfide and electrophilic compounds such as dichloride, diphenyloxycarboxylic acid, 4-phenoxybenzoyl chloride, carbonic acid dichloride, dichlorohydride is carried out. The reaction is carried out in solvents such as 1,2-dichloroethane, methylene chloride, nitrobenzene. The temperature range is from -70 to +40 °C.

Polyetherketones are synthesized by the polycondensation reaction [35] also in the melt. In this way, a polyether is obtained at temperatures of 220-280 °C from trimethylsiloxane esters of various bisphenols and 4,4'-difluorodiphenylketone using cesium fluoride as a catalyst. If you carry out the specified reaction without a catalyst, even at higher temperatures, oligomers, and especially polymers are not formed. Polyetherketones obtained in the presence of a catalyst have melting points of 240-422 °C, glass transition temperatures of 150-185 °C, and temperatures of 10% weight loss are 420-550 °C.

With increased solubility and mechanical properties, polyetherketones and polyetheretherketones are obtained [36] by sulfonation with sulfur oxide (VI) of the corresponding polymers in dichloroethane. Polyethers sulfonated in this way give solid film samples from the solution.

By the interaction of hydroxythiophenols and other sulfur-containing difunctional compounds with dihalogenobenzophenones, [37] polythioetherketones in organic polar solvents were obtained. The reaction is carried out in an inert medium (nitrogen or argon) at temperatures of 320-410 °C using catalysts - hydroxides, bicarbonates or carbonates of the elements of the main subgroup I of the group of the periodic system.

From the foregoing, we can conclude: to date, the synthesis of numerous polyetherketones and polyetheretherketones with unique performance characteristics has been carried out, although work in this direction needs substantial improvement, especially in matters of reproducibility of the synthesis results.

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*Scientific publication*

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

Birmingham, United Kingdom  
(Novotel Birmingham Centre, January 16, 2020)

Signed in print 22.01.2020 г. 60x84/16.  
Ord. No. 82. Circulation of 500 copies.  
Scientific publishing house Infinity, 2020.