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THE LATENCY OF DOMESTIC VIOLENCE IN RUSSIA

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Abstract. The article examines domestic violence as a legal phenomenon of social reality. The author reveals theoretical - conceptual approaches in understanding the category of "latent crime", identifies objective and subjective factors of the latency of domestic violence.

Keywords: physical and psychological violence, family and domestic violence, crime.

Introduction. The problem of domestic violence since the beginning of the pandemic has increased dramatically in Russia. Human rights activists and human rights ombudsman in the Russian Federation T. Moskalkova note that since 2020 the number of registered cases of domestic violence has more than doubled (from 6,054 in March 2020 to 13,000 in April 2020) [1]. Official statistics published by the Ministry of Internal Affairs of the Russian Federation record a decrease in cases of domestic violence officially registered in the Russian Federation by 9% compared to April last year. Domestic violence offenses are latent, due to a number of factors. The article attempts to understand the latent nature of domestic violence in the Russian Federation and to find out the reasons for this negative phenomenon. In particular, the police recorded 14.6% fewer facts of deliberate infliction of grievous bodily harm, 17.1% - moderate harm, 3.3% - minor harm to health.

Purpose of the study – to establish the nature and causes of the latency of "domestic violence in Russia, to outline ways of solving this problem.

Materials and methods. To study the problem of latency of domestic violence, the following methods were used: systemic, analysis and synthesis, formally legal, as well as statistical materials from publicly available sources. A theoretical analysis of the concepts and categories of "latency in domestic violence" was carried out.

Results. In the legal literature, the category of "violence" is considered as a physical or moral coercive influence on the object of criminal acts. In criminal

law, "violence" is most often viewed as physical harm to health. Family and domestic crime harms society and the victim, not only material, but moral and psychological, and the possibility of the culprit to evade responsibility does not in any way reduce his unlawful acts. The scale of latent crime in the family household sphere has not been determined.

In legal science, there are two directions in the study of the latency of crimes. The first direction, the term "latency" is considered as an opportunity to study every existing real crime, which for various reasons remained hidden, was not included in official reports, that is, not documented. This point of view is shared by M. M. Chernousov, V. I. Avdiyskiy, A. G. Filippov, this approach can be called statistical, since the concepts of these authors are based on digital data on offenses that are not registered in the official bodies [6, p.31].

I.V. Bobovkin, I.V. Aleksandrov latent criminality is considered as directly, from the moment of disclosure of the crime, bringing the perpetrator to responsibility of the criminal type. Latency defines such quality of crime as concealment from official bodies and incompleteness of official registration. IV Bobovkin, analyzing the problem of ensuring criminal liability for domestic violence, notes that the norms providing for criminal punishment for this type of act are not fixed. Latent crime has signs. When characterizing latent crime, one should take into account two fundamental factors that distinguish it from the identified and recorded legal crime statistics. The first of them lies in the unknown latent crimes that are not recorded by the official bodies of criminal justice, therefore, they are not taken into account in statistics.

The concept of "domestic violence", reflecting the criminal acts of the perpetrator of a crime against family members or relatives, is characterized by social danger, wrongfulness, guilt, it can be expressed in action or inaction with the use of any type of violence associated with violation of the rights and freedoms of family members. N. Yu. Volosova. considering latency in the family and everyday life, he comes to the conclusion that domestic violence in the world has begun to acquire a massive and threatening character [3, p.311]. However, law enforcement officers often refuse to register the facts of domestic violence, believing that this is a family matter.

Violence in corner law is a sign of the objective side of the offense, it is characterized by illegality, social danger, the subject's awareness of his criminal acts with the aim of causing harm to the victim, violation of the rights and freedoms of family members. Currently, there is no legal definition of domestic violence in the legislation. Consequently, the category "violence" has a relatively legal character and therefore there is no common point of view on this issue in the scientific literature. In 2016, a draft law on domestic violence was drafted and brought up for discussion. In the draft law, family and domestic violence was disclosed as a deliberate act (action or inaction) of one person against another (other) persons, committed in the field of family and domestic relations [4, p. 130].

An action or inaction that violates the rights and freedoms of a person, and (or) causes him physical pain, and (or) harms his health, and (or) causes moral suffering, and (or) causes him property harm will be qualified as domestic violence. - the household sphere [9]. This law was not adopted, as there were heated discussions on the definition of "domestic violence", its prevention and law enforcement.

Latency determines such a quality of crime as concealment from official bodies, incomplete official registration. Latent criminality has signs. The first sign is social danger, as a result of crimes against family members are repeated. The second sign of latent family and domestic crime is a specific structure, which consists in the need to identify the consequences of harm to health from the victim, as well as to collect evidence of the criminal acts of the offender. The third sign is a spatial-temporal parameter in which a crime is committed, if a criminal case is initiated within ten days, then the crime becomes official, if not, then it remains latent.No detection and neglect of crimes in the family and everyday life is also a specific sign of this type of offense. Since the crime is committed in the family, spatial identity can also be considered a specific black latent family - domestic crime.

Latent family crime has negative consequences, it is the possibility of a recurrence of this type of crime, a negative image of law enforcement agencies is formed in public consciousness. Victims of domestic violence develop a sense of insecurity and hopelessness, which makes it difficult to fight this negative phenomenon.

Results and discussion. Consequently, the category of latent family - domestic crime has no legal expression, in the scientific literature there is no unambiguous understanding of this problem. The latency in family and domestic offenses is characterized by: the absence of statistical recording of these offenses, there are no clear reasons for its formation and development. It is characterized by: social danger, temporal and spatial boundaries, incomplete disclosure of crimes by the investigating authorities. Modern society does not have real knowledge of the current situation in the country, therefore, it does not have the ability to take appropriate measures.

N. A. Tunina notes that: "The consequences of domestic violence are in some way "delayed "death", since pregnant women and children are often subjected to violence [p. 83]. The objective factors of the latency of "domestic crime" are the environment, the environment in which the criminal act is committed, as a rule, it affects "family - marriage relations". The offender and the victim are close people

who have joint property, common household and common children. That is why, as a rule, some of the applications filed by victims are taken by the victims. The offense was committed, but it is not recorded in the official statistics, since the statement withdraws its complaint. The subjective factors of domestic violence include the fear of the victim in the police, which prevents him from turning to the official bodies, so after filing an application his whole life can change.

Conclusion. In scientific research, there is not a single point of view on the problem of latent crime in the family and everyday life, which in most cases is hidden. In the legal system, there is a gap in the definition and consolidation of this type of offenses. State statistics on these offenses does not reflect an objective picture of offenses.

It is necessary to develop state-legal measures to identify latent domestic crime:

1. Define the legal concept of "domestic violence" and consolidate in the normative - legal acts.

2. Develop a unified program of assistance to victims of domestic violence at the federal level and allocate funds to help victims of domestic violence.

3. To bring this type of offense in the statistics of the Ministry of Internal Affairs of the Russian Federation into a separate type of offense.

4. To oblige the police to record all cases of treatment by victims on the facts of domestic violence, regardless of whether the application was withdrawn from the victim or not.

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COMPARATIVE ANALYSIS OF PUNISHMENT FOR FRAUD IN THE GRAND DUKE OF FINLAND, THE RUSSIAN EMPIRE, IN MODERN FINLAND AND IN EUROPEAN COUNTRIES

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Abstract. A comparative study of criminal liability for fraud in the Grand Duchy of Finland, the Russian Empire, the Republic of Finland and in European countries, as well as the study of court practice materials using the provisions of the article for fraud, indicates a relatively low maximum sentence for the aggregate crimes in modern Finland. Grave crimes are deliberate acts, for the commission of which the punishment is from four months to four years in prison. Aggravating signs of a grave crime are recognized, including causing damage on an especially large scale and committing a crime using the confidence placed in the perpetrator by virtue of his official position. A person who has committed a crime for the first time or has not been convicted within the last three years in Finland is released on parole after serving half of the sentence imposed by the court. Finnish legislation also does not provide for a period of deprivation of the right of convicted fraudsters to hold certain positions or engage in certain activities. Damages to states from fraud have increased significantly during the coronavirus pandemic and require amendments and additions to the article of the Criminal Code for fraud.

Keywords: Fraud, judicial practice, serious crimes, aggravating signs of a crime.

The penalties for serious crimes provided for by the criminal legislation of European countries are lower than those established by the Finnish Penal Code. Also, the system of imposing a fine in Finland since 1921 is the lowest and cannot exceed 120 daily rates of net income, and in the case of several offenses, no more than 240 in total.

For example, in the largest money-laundering case in Finland's history of 135 million euros, the prosecution demanded a sentence of imprisonment for 5 years and 5 months. On 19 October 2019, the Helsinki County Court issued an acquittal

to both of the accused. Hearings in the Helsinki Court of Appeal are scheduled for 26.8 - 3.9.2021¹.

The maximum punishment for cumulative crimes by partial addition of punishments for serious crimes in Finland is 6 years.

For example, Hannu Kailajärvi, founder of the largest pyramid scheme in Finland's history, WinCapita, with a turnover of about 100 million euros and a promise of 400% yield to 10,000 investors, was sentenced to 4 years in prison in 2011 on charges of gross large-scale fraud and illegal collection. of money. The Court of Appeal changed the county court's decision and sentenced Hannu Kailajärvi to 5 years in prison. The convict was released on parole after 2.5 years.

In Finland, a person who has committed a crime for the first time or has not been convicted within the last three years is released on parole after serving half of the sentence imposed by the court. A person who has committed a crime under the age of 21 is released on parole after serving one third of the sentence. For a conditionally convicted person, the court establishes a probationary period from 1 to 3 years.

The modern school of Finnish criminal law, which originated in the General Code of Finland in 1784², was based on the principle of unlawfulness (nullum crimen sine leges) and linked the degree of just punitive influence primarily with the objective properties and method of the offense, the amount of damage and harmful consequences for the protected interests³.

The principle of administering justice only by the court originates in the Russian Empire in the Judicial Reform of 1864, approved by Emperor Alexander II, as the establishment of a "speedy, just, merciful and equal court for all"⁴.

In 1889, the Finnish Seimas approved the Criminal Code of the Grand Duchy of Finland on 19.12.1889⁵. The Criminal Code came into force by the Decree of Alexander III, signed on April 2/14, 1894⁶.

According to the Criminal Code of 1889, temporary confinement in a prison, temporary confinement in a fortress, as well as in a correctional prison department, presupposed the deprivation of all special rights and advantages, personally and

¹The author of the article took part in the preliminary investigation of the case in 2014 and in the preparation of the consideration of the case in the county and appellate courts in 2019 and 2021.

²General Code of Finland in 1784 in three volumes. Compiled by N.N. Korevo. Chairman of the Imperially established Commission for the systematization of Finnish laws. St. Petersburg. State Printing House. 1912. Fund of the Library of the President of Finland.

³Seimas charter of the Grand Duchy of Finland, imperially approved on July 20, 1906. St. Petersburg. State Printing House. 1913.

⁴The judicial statutes on November 20, 1864, with a statement of the reasoning on which they are based, were published by the State Chancellery. Part two. St. Petersburg.

⁵Suomen Suuriruhtinaanmaan Rikoslaki. Annettu Helsingissä, 19 p:nä Joulukuuta 1889.

⁶Suomen Suuriruhtinanmaan asetus-kokoelma. 1894. n:o 17. Hatsinassa 2/14 p:nä Huhtikuuta 1894.

according to state and rank conferred on the convict⁷. In addition to general punishment and penalties for crimes, a person dismissed from service was deprived of the right to be appointed again to any public service, to participate in elections and to be elected to office by appointment of the nobility, cities and villages. If the price of what was taken, embezzled or wasted by an official or an official in the service exceeded three hundred rubles, the Code provided for the deprivation of all rights and benefits and transfer to correctional detention units from 5 to 6 years⁸.

Strengthening the punishment is provided, including if the crime was committed in collusion with several persons and when the guilty person by rank or by special relationship to the deceived instilled special confidence in himself (Art. 1671).

The Penal Code currently in force in Finland⁹ begins with the words "We, Alexander the Third, by God's advancing mercy, the Emperor and Autocrat of All Russia...", formally remains in force as amended in 1991 and amended in 2004. The system of punishments enshrined in the Criminal Code includes punishments for crimes and serious crimes. Grave crimes are deliberate acts, for the commission of which a penalty of four months to four years in prison is prescribed (§ 36). Aggravating signs of a serious crime are recognized, including causing damage on an especially large scale.

The exact limit of damage or the amount of "significant benefits" in a serious crime is not defined by law. For example, according to the determination of the Finnish Supreme Court in 2019, an amount of less than 14,500 euros is not a significant benefit and a sign of a serious crime of fraud¹⁰.

The same amount of damage caused in the amount of EUR 14,570.89 (FM 86,633) was declared insignificant by the Supreme Court in 2007¹¹.

In Germany, for example, the Criminal Code (Strafgesetzbuch) for the commission of especially grave crimes provides for a punishment of imprisonment for a term of 6 months to 10 years, if the loss of property is caused on a large scale, the crime was committed as part of a group or for abuse of the powers or position of an official or a European official (§263).

Also, as in Finland, in Germany the amount of property damage caused on a large scale is not defined by law and is highly controversial. In accordance with the law enforcement practice of the Federal Supreme Court and the highest Land Courts of Germany, this amount is from 50000 euros.

Article § 266 (1) of Strafgesetzbuch provides for a penalty of imprisonment for

⁷Code of Practice for Catch and Correctional Punishments. Published in 1885. Volume Fifteenth, Chapter Two. About punishment. p.30.

⁸Ibid. Article "On Fraud" (Division Four. Article 1665) to the Fifth Article of the Code of the fifth degree of Article 31.

⁹Rikoslaki 19.12.1889/39.

¹⁰Decision of the Supreme Court R2018 /488 of 24.10.2019. KKO 2019:93.

¹¹Decision of the Supreme Court R2006/657 of 27.12.2007. KKO 2007:102.

up to 5 years or a monetary fine that cannot exceed 360 full daily rates for breach of trust and abuse of a statutory mandate from a public authority. The daily rate is set at a minimum of one euro and a maximum of thirty thousand euros. A person sentenced to a term of imprisonment for at least one year loses the ability to hold public office and exercise the rights obtained as a result of participation in elections for a term of 5 years.

The general punishment in Germany is formed by increasing the size of the imposed capital punishment (except for life imprisonment) for punishment of various types - by increasing the most serious type of punishment, but in the case of imprisonment for a certain period of 15 years, and in the case of a monetary fine - not over 720 daily rates. When imposing a term of imprisonment for at least one year, the court may deprive the convicted person of the right to hold positions in the civil service, in local self-government bodies, or to engage in certain professional or other activities.

In Germany, a court decides on parole from a sentence of imprisonment imposed for a certain period and imposes a probationary period if two-thirds of the sentence imposed has been served, but not less than two months, and if this seems to be permissible taking into account the interests of public safety.

In the UK, fraud by abuse of office is punishable by up to 10 years in prison¹². The maximum terms of punishment in the form of imprisonment for a specified period may not exceed 25 years.

In France, fraud is punishable by up to 7 years in prison and a fine of 750000 euros if the crime is committed by a person with public authority or charged with a public service mission and in the performance of his duties. If the fraud is committed by a criminal community, the punishment is up to 10 years in prison and a fine of 1000000 euros¹³.

In Belgium, which uses the French model of criminal legislation, with a prison sentence of 10 years or more, convicts are subject to deprivation of academic degrees, titles, state powers and other public positions, as well as to be elected and perform the duties of a legal adviser¹⁴.

In Switzerland, fraud is punishable by up to ten years 'imprisonment or a monetary fine of at least 90 days' rate.

In Spain, fraud is punished by imprisonment from 4 to 8 years if the amount of damage caused exceeds 50000 euros, committed in a group or through the use of personal relationships and official or professional position¹⁵.

¹²Fraud Act 2006. Fraud by abuse of position (Section 4) The Fraud Act 2006 (the Act) came into force on 15 January 2007 and applies in England, Wales and Northern Ireland.

¹³Code pénal. Dernière modification: 2021-05-27. Article 313-2.

¹⁴Code pénal. Chapitre II. – Des Fraudes.URL: https://codes.droit.org/PDF/Code%20p%c3%a9nal. pdf.

¹⁵Código Penal. Capítulo VI. De las defraudaciones. Sección 1.ª De las estafas.

According to the analysis carried out in Finland, the maximum terms of imprisonment for cumulative crimes are much lower than those provided for by the legislation of European countries. Thus, in a case of large-scale fraud and abuse of office under aggravated circumstances, the former head of the Helsinki Department of Education received an illegal benefit of 8.445.863,40 euros in the period 2006-2016¹⁶. On May 12, 2020, the prosecutor demanded that a final sentence of 5 years in prison be imposed on the cumulative crimes by partial addition of sentences.

From the description of the criminal act in the court decision, it follows that Hannu Suoniemi committed acts falling under the elements of a crime provided for in the articles for fraud on an especially large scale¹⁷ and abuse of office under aggravated circumstances with obtaining an illegal benefit on an especially large scale¹⁸. The court found that, through deception and abuse of trust, Suoniemi had ordered computer equipment and electronics items, submitting invoices for payment to the Helsinki Department of Education. The convicted person transferred the goods obtained by criminal means for the purpose of further sale or for personal use.

On March 8, 2021, the defense of the accused Suoniemi held negotiations with the prosecutor and came to an agreement on the full admission of the prosecution and the consent of the Helsinki Education Department to conclude a procedural agreement in the form of a plea deal and the amount of damage caused, with a criminal case being considered by the court in conciliation proceedings of the shortened trial.

The former head of the Education Department of the City of Helsinki announced his consent to be heard in the plea process in accordance with Chapter 5b of the Criminal Procedure Act and Chapter 3 and §10 of the Preliminary Investigation Act (805/2011) when the case was heard in the County Court.

After pleading guilty to the accused in compliance with the principles of legality, judicial protection of human and civil rights and freedoms and other fundamentals of criminal proceedings in Finland, the prosecutor demanded that Hannu Kalevi Suoniemi be punished in the form of 3 years and 3 months in prison.

The court found that the crime was committed for a long time with direct intent aimed at stealing someone else's property or acquiring the right to someone else's property, committed by deception or abuse of trust and official position in order to obtain illegal property benefits. When determining the proportionality of the punishment to the crime committed, depending on the gravity of the offense, the degree of guilt, the size and nature of the damage caused, the court determined the final punishment for Suoniemi in the form of 3 years and 3 months in prison.

¹⁶Helsinki County Court decision dated 8 March 2021.

¹⁷Rikoslaki 36 luku 2 § 1.

¹⁸Rikoslaki 40 luku 8 §.

According to an earlier court decision on May 16, 2018, Hannu Suoniemi's property was seized for a maximum amount of 1000000 euros and remains in effect until the amount of damage is paid.

As the first perpetrator of a crime, Hannu Suoniemi was released on parole after a year and a half, having served part of his sentence in an open-type correctional institution, taking into account the imprisonment during the preliminary investigation.

Hannu Suoniemi was dismissed from his position and retired for health reasons as disabled. Within the framework of the initiated enforcement proceedings, bailiffs-executors will not be able to recover from the convicted person even the amount of damages agreed and approved by the court. The foreclosure in criminal cases from the debtor is possible only in the amount of net income of 925.80 euros per month¹⁹. From income in excess of this amount, bailiffs-executors can collect only 1/3 of the net income for no more than 10 years.

A convicted person in Finland has the right to be transferred to one of 11 open correctional institutions with payment for work performed and tax-free at the rate of 4.7-5 euros per hour, an additional 1.60 euros per day is paid²⁰.

For example, in the open-type prison Suomenlinnan vankila, the payment is up to 1,300 euros per month with a 7.5 hour working day, and convicts also move freely around the territory of the most famous sight of the island of Helsinki.

It should be especially noted that the presence of a criminal record in Finland is not an obstacle to further legal practice or to appointment to public office. There are many examples of convicted politicians and high-ranking officials in the history of Finland, but still, one of the striking examples is Aarre Simonen. Formerly Minister of the Interior (1948-1950), Minister of Trade and Industry (1954-1956) and Minister of Finance (1956-1957), Aarre Simonen was appointed Minister of Justice (1966-1970) following a criminal conviction in 1961 by the State Court²¹.

In 1993, the Supreme Court sentenced former Minister of Trade and Industry (1991–1992) and MP Kauko Juhantalo to one year suspended imprisonment for accepting a bribe. This did not prevent Kauko Juhantalo from being elected to Parliament again in 1995. In 2003, Juhantalo was elected chairman of the parliamentary defense committee, and in the 2015 elections he received a parliamentary mandate and was elected chairman of the employment and economic development section of the parliamentary finance committee, and in April 2017 Kauko Juhantalo led the delegation of the Finnish Parliament during a meeting with deputies of the Legislative Assembly of the Leningrad Region²².

²²Ibid. P. 189.

¹⁹Non-taxable income of a debtor based on the norms for 1.1.2021, who has one family member. ²⁰Data as of 12.2.2020 from the Finnish Penitentiary Service.

²¹V.A. Zhilkin. Corruption in Finland as a threat to political stability and national economy. Russian Journal of Legal Research.2017 № 2. P.186-191.

In the last elections on June 13, 2021, a total of 268 criminal convictions were handed down to candidates for parliamentary elections in Finland during the period 2016-2021.

In the previous municipal elections in 2017 in Finland, candidates for parliament were found guilty in 301 criminal cases during the period 2012-2017. 99 politicians were sentenced to prison terms or suspended sentences. The degree of intoxication of 2.5 ppm of alcohol or more was recorded in seven politicians, and the maximum alcohol level of 3.25 ppm was recorded in the Finnish politician in 2017.

According to information provided by the Finnish Ministry of Justice to the Finnish Parliament, 125 out of 2,468 candidates have been convicted of various crimes over the past eight years. Between 2012 and 2019, candidates already had 173 criminal convictions for 74 different crimes, including fraud (8) for sexual acts against minors $(2)^{23}$.

A person serving a sentence in Finland has the right to study. Correctional institutions in Finland provide a wide range of opportunities for convicts to receive education services, including higher education in the form of distance learning. Graduation diplomas are issued to convicted persons by educational institutions without specifying that they have passed exams while serving their sentence in a correctional institution.

For example, the former co-owner of Interbank (after the sale with his brother in 1993 of the bank's shares for 74 million fin marks, the money was transferred to offshores) was sentenced in 1999 by the county court to 4 years in prison for economic crimes on an especially large scale (134 million rubles). Finnish marks or more than 22.5 million euros). During the appeal against the judgment of the county court in 2001, he completed his doctorate at the University of Helsinki. On 30 March 2001, the Court of Appeal changed the verdict of the county court and sentenced him to imprisonment for a term of 6 years. During three years of serving his sentence in a closed prison in Helsinki, the convict wrote a doctoral dissertation on the European Court of Human Rights, which he successfully defended at the University of Helsinki in June 2004 after his parole and continues to practice law.

The correction of a criminal in Finland is considered the main purpose of punishment. The main means of correction was to attract convicts to work, as well as to provide them with education. The gradual release of convicts to freedom under controlled conditions through open institutions with the serving of the final period of their sentence at large under supervision is one of the fundamental ideas of

²³V.A. Zhilkin. International law and legal basis for elections in Finland. Participation in elections of candidates for deputies who had a criminal record for committing crimes as a violation of the basic constitutional right of citizens. IV International Scientific and Practical Conference "Greater Eurasia: National and Civilizational Aspects of Development and Cooperation". October 6-7, 2021.

Finnish legislation. At the same time, the state costs for the maintenance of each prisoner amount to more than 62,000 euros per year, in addition, the state covers the damage caused in case of evasion of payments by the convicted person, and also pays court costs in the absence of income from the convict.

Of particular note, the number of crimes and damage caused by fraud to EU states has grown significantly during the coronavirus pandemic. According to the head of the European Anti-Fraud Bureau (OLAF) Ville Itälä, over a year and a half more than 1,000 companies have been identified as suspected of illegally producing sanitary products, fake masks and test kits. The Office investigated over 200 cases and secured the return of \in 293 million in public funds. In the spring of 2021, organized crime offered Finland and 11 other EU countries a shipment of a non-existent coronavirus worth 14 billion euros²⁴.

A comparative analysis of the norms of criminal legislation, regulations and judicial practice in European countries and in Finland indicates the need to make additions to the classification of crimes in Finland for especially grave crimes and to increase the punishment limit to 10 years in prison.

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COMPETENCE-BASED APPROACH: IMPLEMENTATION PROBLEMS IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

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Abstract. The key goal of modern education in the context of the implementation of the concept of sustainable development is the process of forming a holistic worldview based on the general picture of the world on the basis of a competenceoriented approach. This ensures the formation of the personality of a specialist who is able not only to independently determine the trajectory of professional growth, but also to self-development throughout life, subject to the mastery of competencies. It is education that is a necessary condition determining the possibility of successfully achieving sustainable development goals.

The article outlines the problem of lack of unity in approaches to the formulation of the concepts of "competency" and "competence". The analysis of the interpretations of the concepts presented in scientific publications confirmed the insufficient degree of knowledge of the process for the formation and development of the competency of subject teachers.

Keywords: sustainable development, education system, competency, competence, competence approach, polycompetence.

Introduction

The key state-significant goal of the activities of universities, including pedagogical ones, is to create effective conditions for the development and full use of the intellectual potential of the nation. This creates a prospect for the formation of a creatively thinking young generation, focused on the research, creative activity of specialists with the skills of self-organization, self-education, as well as social responsibility, capable of forecasting and ready to promptly respond to new challenges of a dynamically developing society [10, 17].

In the Strategy for the Socio-Economic Development of the Russian Federa-

tion until 2030, a special place is occupied by the development of the knowledge economy, i.e. the sphere of vocational education. According to this document, one of the national projects of the state program of the Russian Federation "Development of Education" for 2018–2025 is "Training of highly qualified specialists and workers, taking into account modern standards and advanced technologies." Russian pedagogical universities are one of the priority platforms for the implementation of this strategy, and they train specialists - future subject teachers who can take the vanguard place in the implementation of this project of the state program, which will ensure an increase in the country's competitiveness in the world market.

Despite the steady and even growing interest in the problems of professional training of highly qualified specialists (in the context of the content of the research - competence of specialists), there is still, firstly, no common approach to the interpretation of the concepts of "competency" and "competence". Secondly, there is no common understanding of the ratio of the volumes of these concepts. Thirdly, there is no clear understanding of the essence and procedural specifics of the implementation of the competence approach of learning. In this regard, the problem of research is the need to study and analyze the available scientific publications covering these issues.

The purpose of the study is to examine the theoretical foundations of studying the competence approach in the context of sustainable development in the preparation of a polycompetence specialist (subject teacher) in the education system.

To study scientific works and publications on the theoretical foundations of the study of "competency", "competence" and "competence-approach", the author used methods of analysis and synthesis, the method of a systematic approach, systematization of scientific research, methodological literature on the problem of research.

Scientific novelty lies in the disclosure of the relationship between the concepts of "competency", "competence approach" and "competence" in teacher education; substantiation of the possibility of using the term "polycompetence of a specialist".

Research results

At all levels of the modern education system (ES), large-scale changes are taking place, which are accompanied by structural, functional, organizational and managerial, professional and methodological, criterion-evaluative transformations. Thus, the structure of ES is constantly becoming more complex as a result of the opening of specialized educational organizations, including for adult education in order to ensure the continuity of the educational process. The network of methodological associations, professional communities, including network ones, is expanding.

The constant acceleration of the processes of development of society nullifies attempts to predict the development of the economy and professional characteristics in accordance with the requirements of employers. In this connection, the main feature of the modern education system (and most likely the future) is its applied nature. That makes its own adjustments to the functions of the education system and leads to a significant revision of priorities. One of the leading functions of the education system is the process of forming students' needs for lifelong education, creating opportunities for the development of skills and abilities of self-education [14, p. 23]. The transition to the competence of the learning model is explained by the transformation of functions.

The need to implement the competence of the learning model requires a revision of the content of the main basic document - the Federal State Educational Standard (FSES), which is guided by the development of curricula, exemplary work programs as elements of the organizational and managerial component of the education system. So, on May 31, 2021, the federal state educational standard for basic general education (FSES) was approved, approved by Order of the Ministry of Education of the Russian Federation №287. Training under this federal state educational standard is planned to be carried out from 01.09.

Professional and methodological transformations lead to a rethinking of the expediency of mastering and applying educational technologies and methods of a productive nature in the learning process, and, of course, a revision of the content of approximate work programs of basic general education, curricula of basic professional educational programs, etc.

The criterion-evaluative transformations in order to achieve compliance of the learning outcomes with international criteria led to the introduction of all-Russian testing, the final state certification in the MSE and USE format in the context of the implementation of basic general education. In the context of secondary vocational education, the format of the demonstration exam is increasingly used. In the context of higher education, the result is the process of training the competence of a specialist who owns the competence ysstem. But, in our opinion, it is more appropriate to talk about the polycompetence of a modern specialist (subject teacher).

Russia has accumulated significant experience in training personnel for different levels of education based on the competence approach. Here are just some examples of the published results of research on this issue (Adolph V.A. [1, 13], Gheorghe I.V. [4], Gladilina I.P. and Koroleva G.M. [5], Zimnyaya I. A. [7], Ilyina N.F. [9], Karavaeva E.V. [11], Savchuk A.N. [1], Sergeeva M.G. [12], Stepanova I.Yu. [13], Tamozhnyaya E.A., Belovolova E.A., Dronov V.P., Lopatnikov D.L. [15], Tarkhanova I.Yu. [8], Khutorskoy A.V. [16], Shkerina L.V.[18], etc.).

The analysis of scientific and scientific-methodical publications, dissertation research confirmed, firstly, the wide application of such concepts as "compe-

tence", "competency" and "competence approach"; secondly, the presence of a large number of interpretations of these concepts; thirdly, the need to systematize and identify the nature of the relationship between these concepts on the basis of a synergistic approach.

There are different approaches to formulating the concepts of "competency" and "competence". So, the first approach, in which researchers consider these concepts as synonyms (i.e., identify) (see V.A. Bolotov, V.S. Lednev, M.V. Ryzhakov, V.V. Serikov). Supporters of the second approach consider these concepts as independent, but at the same time define "competence" as the primary category (see I.A. Zimnyaya, A.V. Khutorskoy, S.E. Shishov) [2, 6, 7, 16].

"Competency" represents the ability to act as a personality trait and the basis for competence. "Competence" is more often understood as a manifestation of activity that reflects the level of ownership of competency, while competency is a complex or integrated system. The composition of competency will change over time in accordance with the transformation of requirements for a specialist and the education system. Therefore, "competence" is a system of competency that is or can be applied by a specialist.

The analysis of approaches to understanding the competence approach in education makes it possible to assert about its evolution and gradual transition from a key consideration of the content of education to competency and, as a result, consideration of the competence approach as a complex system that has its own interrelated components [2, 3, 19].

The introduction of the competence of the learning model is due to a number of objective factors, which include the implementation of general globalization, the integration of Russia into the world economy, and participation in the Bologna process. This led to the universalization of requirements for specialists, in the preparation of which the main reference point for educational institutions is the system of universal, general professional and professional competencies, presented in the curricula of the main professional educational programs.

The competency level of the graduate / specialist reflects his competence. Provided that the graduate / specialist owns the entire competency system at a high level, then the concepts of "competency" and "competence" become identical. However, it is very difficult to achieve this in life, especially in connection with the high speed of development of society, economy, and hence the system of requirements for a graduate / specialist - the competency system will be constantly updated. This requires regular implementation in a short time of "personnel reset" in the education system [10], where schools, colleges, universities, as well as social and professional communities of teachers act as inseparable links of lifelong education.

The key element of the modern system of higher pedagogical education is the

problem of training a subject teacher who has competency in the field of sustainable development and is able to educate a "thinking" graduate as a representative of the country, a zealous user, custodian and creator of socio-cultural values and traditions of their homeland [10].

Thus, the following conclusions can be formulated:

1) today, in the context of the implementation of the concept of sustainable development in the education system, cardinal changes are taking place, which are accompanied by structural, functional, organizational and managerial, professional and methodological, criterion-evaluative transformations;

2) there is a transition from knowledge-based to competence learning model as a result of the transformation of the functions of the education system;

3) analysis of scientific publications devoted to the formation of competency, confirmed the insufficient degree of knowledge of approaches to the process of formation and development of competency of specialists, in particular, subject teachers;

4) a key element of the modern system of higher pedagogical education is the process of preparing a subject teacher who has a system of competency in the context of the implementation of the concept of sustainable development, i.e. polycompetent specialist.

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CHALLENGES TO THE DEVELOPMENT OF THE ACADEMIC WRITING SKILL IN A 2019/2020 VS. A 2020/2021 COURSE IN ENGLISH FOR MEDICAL PURPOSES: A COMPARISON

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Abstract. The research presented in this paper aims to compare the results of the effort to develop the academic writing skills of 10 groups of medical students who attended the English for Medical Purposes (EMP) course during the first semester of the 2019/2020 academic year at the Medical University Prof. Dr. Paraskev Stoyanov – Varna with the results of the effort for development of the academic writing skills of 7 groups of medical students who attended the English for Medical Purposes (EMP) course during the first semester of the 2020/2021 academic year at the Medical University Prof. Dr. Paraskev Stoyanov – Varna.

In both courses, the students were required to submit a portfolio of 3 written tasks completed as homework assignments.

In the 2019/2020 EMP course, the students were given the opportunity to submit an academic essay or an academic summary, and they were presented with a number of suitable essay topics and texts for summaries for selection. They also had the opportunity to select an essay or research summary topic of their own interest. All written tasks were required to amount to 200-300 words, and they had to be relevant to the scientific field of Medicine.

In the 2020/2021 EMP course, the students were given the same writing genre opportunities with the addition of the opportunity to submit a medical referral letter for a patient as one of their writing tasks.

In the 2019/2020 course, the lecturer encountered 2 main challenges: the great total number of written tasks to edit and assess, and the problem of plagiarism resulting from the unsupervised and digitally unrestricted environment of homework task fulfilment. These challenges led the lecturer to a revision of 3 main teaching methodology components that were presented in a paper authored by the lecturer and published in 2020 (Vateva, Tsvetelina (2020). Challenges to the Development of the Academic Writing Skill in a 2019-2020 Course in English for Medical Purposes, Globalization: Business, Finance and Education, Ed. P. Stoynov, ISSN 1314-4618, Vol. 10, pp. 3-12, Perun-Sprint Ltd.): the setting of conditions for fulfilment of the writing tasks; the focus of the lecturer's feedback; and the achievement of the purpose to develop the students' academic writing skills. As a conclusion to her 2020 paper, the lecturer suggested an alternative teaching model aiming to address the encountered challenges and improve the teaching model applied in the 2019/2020 course.

In the 2020/2021 EMP course, the lecturer tried to apply the alternative teaching model suggested in her 2020 paper to the best possible extent under the circumstances (considering the course was conducted entirely online due to the COVID-19 pandemic and there was no opportunity for setting and fulfilment of the writing tasks outside the same unsupervised and digitally unrestricted environment of the students' homes and personal computers as in the 2019/2020 course.)

Nevertheless, some of the improvements suggested by the lecturer in her 2020 paper were introduced and tested in practice successfully in the 2020/2021 EMP course.

The current comparative paper aims to outline these successfully introduced teaching methodology improvements, to present the 2020/2021 results from these introduced improvements and to compare them with the achieved results in the previous 2019/2020 EMP course.

Keywords: writing skill, challenges, improvements, results, comparison

Introduction

In her paper entitled "Challenges to the Development of the Academic Writing Skill in a 2019/2020 Course in English for Medical Purposes", which was published in 2020, the author Tsvetelina Vateva identifies and discusses the following 2 main challenges encountered in her effort to develop the academic writing skills of 10 groups of medical students who attended the English for Medical Purposes (EMP) course during the first semester of the 2019/2020 academic year at the Medical University Prof. Dr. Paraskev Stoyanov – Varna: the great total number of written tasks to edit and assess (as all 120+ medical students from these 10 groups were required to submit 3 written tasks each) and the problem of plagia-rism resulting from the unsupervised and digitally unrestricted environment of homework task fulfilment (as the 3 written tasks for assessment were completed as homework assignments by each student).

Two main questions are answered by the author's 2020 paper entitled "Challenges to the Development of the Academic Writing Skill in a 2019/2020 Course in English for Medical Purposes" on the basis of the author's practical observations and presented feedback examples: whether the required number of 3 written tasks for assessment is sufficiently adequate and efficient for both the students and the lecturer to achieve the set learning goal and whether the check and penalty for plagiarism in the digitally unrestricted circumstances of homework task fulfilment would have been a more effective feedback focus than focusing the lecturer's feedback more on the linguistic and grammatical correction of the submitted texts.

In order to arrive at the answers to these questions, the author analyzes 3 components of the teaching methodology applied in the discussed 2019/2020 EMP course: the setting of conditions for fulfilment of the writing tasks; the focus of the lecturer's feedback; and the level of achievement of the set tasks' purpose. Based on the author's observations and presented data, the answers to both questions come out to be negative, as due to the "great workload of 360+ written tasks for editing and assessment, which comes in addition to the workload of their required weekly teaching hours, the lecturer may not be left with the necessary available working hours to check and penalize all of the written tasks for both plagiarism and linguistic errors" (Vateva, 2020), while "even if the lecturer attempts to proofread and penalize all the written tasks for plagiarism, they may not be lucky enough to find the sources of all plagiarized texts despite their best efforts, or even despite the use of plagiarism detection software (as the relevant original texts may fall out of its scope)" (Vateva, 2020). The author further points out that under the homework task fulfilment conditions, besides the created opportunity for plagiarism, there is also a "created opportunity for re-assignment of the tasks to other people for fulfilment, which significantly lowers the usefulness of the written homework assignments as a teaching strategy unless the lecturer manages to provide the most appropriate feedback that achieves the objective of developing the students' writing skills at least to a satisfactory extent under the set circumstances" (Vateva, 2020).

The author defines the teaching methodology for developing the skill of academic writing applied in the 2019/2020 EMP course as following the "individual trial-individual error-individual penalty" teaching model, since the students were assigned to submit their 3 written tasks fulfilled as homework without a preliminary detailed classroom discussion of the guidelines for writing academic essays and summaries (available as part of their main textbook – Dokova, A., Trendafilova, S., Angelova, V. (2009). *English for Medicine*, Varna, STENO Publishing House.) and without being provided with excellent essay and summary samples for reference or an opportunity to fulfil an ungraded writing task and receive feedback on their own writing prior to fulfilling their tasks for assessment.

Therefore, as a conclusion to her 2020 paper, the author suggests an alternative teaching model aiming to improve the teaching model applied in the 2019/2020 course by introducing the aforementioned elements of a preliminary classroom discussion of the guidelines for writing and some excellent writing samples, as well as an ungraded homework task fulfilment for feedback, while reducing the students' final graded writing to a single writing task fulfilled in class.

The author's intention was to try to apply this alternative teaching model as presented in her 2020 paper in the next EMP course that she taught to 7 groups of medical students during the first semester of the 2020/2021 academic year at the Medical University Prof. Dr. Paraskev Stoyanov – Varna. Unfortunately, the CO-VID-19 pandemic necessitated all courses taught during the first semester of the 2020/2021 academic year at the Medical University Prof. Dr. Paraskev Stoyanov – Varna to be conducted entirely online, and this impeded the author's intention to restrict the final graded task fulfilment environment to the physical classroom. The intention for reduction of the final number of graded tasks to a single graded task was also impeded, as the department head insisted on continuing to require 3 written homework tasks for assessment from each of the students.

Thus, in the 2020/2021 EMP course, the author had the opportunity to introduce only the following improvements to the teaching model applied in the 2019/2020 course:

• a preliminary detailed online-classroom discussion of the guidelines for writing academic essays, academic summaries and medical referral letters for patients;

• a preliminary detailed online-classroom discussion of excellent samples of academic essays, academic summaries and medical referral letters for patients and provision of the discussed samples to the students for reference;

• a provision of detailed instructions for fulfilment of each individual assignment;

• a provision of detailed feedback on both linguistic (grammatical, lexical and stylistic) corrections and established plagiarism (including examples of the successful application of some of the preliminarily discussed strategies for avoiding plagiarism).

The particular improvements listed above and the results from their application in the 7 groups of medical students who attended the English for Medical Purposes (EMP) course with the author Tsvetelina Vateva as their lecturer during the first semester of the 2020/2021 academic year at the Medical University Prof. Dr. Paraskev Stoyanov – Varna are presented and discussed in detail in the following sections.

Purpose of the study

This paper aims to draw a comparison to the results achieved in the EMP course taught by the same lecturer during the 2019/2020 academic year and to confirm or refute the lecturer's conclusion about the potential advantages of the improved teaching model suggested in her 2020 paper "Challenges to the Development of the Academic Writing Skill in a 2019/2020 Course in English for Medical Purposes".

Methodology

The applied methodology for development of the academic writing skills of the 10 groups of students in the 2019/2020 EMP course included the following

activities: assignment of the 3 written tasks to the students for fulfilment by presenting the students with a number of suitable essay topics and texts for summaries for selection, as well as with the opportunity to select an essay or research summary topic of their own interest; pointing the students to read the guidelines for writing academic essays and summaries (available as part of their main textbook -Dokova, A., Trendafilova, S., Angelova, V. (2009). English for Medicine, Varna, STENO Publishing House.) on their own and encouraging them to ask the lecturer questions (should any questions related to these guidelines arise); collecting, editing and assessing the students' portfolios of 3 fulfilled written tasks; providing feedback that contained comments on the necessary linguistic (grammatical, lexical and stylistic) corrections, as well as comments on the plagiarism issues (if detected), to each student regarding each of their 3 submitted written tasks for assessment. In the 2019/2020 EMP course, the check for plagiarism was performed only manually by the lecturer to the best extent possible under the circumstances, and the lecturer performed this check using either just the help of the most popular internet search engines, or by comparing the students' texts with the original source texts used (when the lecturer had those texts at their disposal to perform a manual comparison).

The applied methodology for development of the academic writing skills of the 7 groups of students in the 2020/2021 EMP course included the following activities: assignment of the 3 written tasks to the students for fulfilment by presenting the students with a number of suitable essay topics and texts for summaries for selection, as well as with the opportunity to select an essay or research summary topic of their own interest and the opportunity to submit one of their texts for assessment in the additional writing genre of a medical referral letter for a patient; devoting 3 teaching hours for preliminary detailed online-classroom discussions of the guidelines for successful writing (available as part of the students' main textbook - Dokova, A., Trendafilova, S., Angelova, V. (2009). English for Medicine, Varna, STENO Publishing House.) for each of the required genres of academic essays, academic summaries and medical referral letters for patients and preliminary detailed online-classroom discussions of excellent samples of academic essays, academic summaries and medical referral letters for patients before setting the deadlines for submission of each particular task; provision of the discussed excellent writing samples at the students' disposal for reference; provision of detailed instructions for fulfilment of each individual assignment, which were also at the students' disposal at all times; collecting, editing and assessing the students' portfolios of 3 fulfilled written tasks; provision of detailed feedback on both the necessary linguistic (grammatical, lexical and stylistic) corrections and detected plagiarism issues (including examples of the successful application of some of the preliminarily discussed strategies for avoiding plagiarism) to each student

regarding each of their 3 submitted written tasks for assessment. In the 2020/2021 EMP course, the check for plagiarism was performed automatically by relying on the SafeAssign plagiarism checking tool that is integrated in the online teaching platform used by the university, as well as manually by the lecturer when it was necessary and when the lecturer had the relevant original texts at their disposal to perform an additional manual comparison.

The introduced differences in the 2020/2021 EMP course succeeded in improving the teaching methodology for academic writing applied in the 2019/2020 EMP course for the following reasons:

• the preliminary detailed online-classroom discussions of both the guidelines for successful writing and some excellent samples of academic writing (that were subsequently left at the students' disposal for reference) ensured that all the students were acquainted with the guidelines at least once and that all the students' attention was directed towards the examples of the successful practical application of these guidelines at least once during class before they were assigned to write their own writing tasks for assessment; otherwise, as it had become evident from the 2019/2020 EMP course, if the students are only left to read the guidelines on their own, the lecturer can never be sure that all of them would actually read the guidelines and few students would be prompted to turn to the lecturer with questions about these guidelines even when they have read them;

• the use of an automatic plagiarism checking tool definitely sped up and improved the plagiarism checking process for the lecturer; however, the results from its application also practically proved that automatic plagiarism checking tools do not identify all instances of committed plagiarism (as there can always be original texts that fall out of their scope) and there will always be cases when the lecturer's manual plagiarism check could establish plagiarism where the automatic tool has registered a 0% result, as well as cases when neither the plagiarism checking tool, nor the lecturer would be able to establish a case of plagiarism (if, for example, the homework task has been re-assigned for fulfilment to another person who has not published their submitted text anywhere previously);

• in the cases of detected plagiarism, the low grades and the provided detailed feedback informing the students that plagiarism was detected in their assignments and containing examples of the successful application of some of the preliminarily discussed strategies for avoiding plagiarism managed to guide nearly half of the students away from resorting to plagiarism again in their next tasks; however, the remaining half of the students were not prevented from trying to resort to plagiarism again (which re-confirmed the previously established need for a supervised physical classroom environment for the fulfilment of writing tasks for assessment).

The practical results presented in the following section illustrate and come as evidence of the improvements and drawbacks outlined above.

Results and discussion

The 7 groups of medical students who attended the English for Medical Purposes (EMP) course with the author Tsvetelina Vateva as their lecturer during the first semester of the 2020/2021 academic year at the Medical University Prof. Dr. Paraskev Stoyanov – Varna included a total number of 85 students. Each of these 85 students was required to submit 3 written tasks for assessment. Therefore, the total number of written tasks that were submitted for editing and assessment to the lecturer in the 2020/2021 EMP course equaled 255 written tasks.

Out of this total number of 255 written tasks edited and assessed by the lecturer, there were 78 written tasks (equaling about one third of the total number of 255 written tasks), in which plagiarism was detected either by the SafeAssign plagiarism checking tool, or manually by the lecturer.

The 78 written tasks with detected plagiarism were submitted by a total number of 48 students (more than half of all 85 students attending the course), and the plagiarism issues were distributed among them in the following way: there were 25 students with detected plagiarism in 1 of their 3 written tasks and there were 23 students with detected plagiarism in 2 or 3 of their 3 written tasks.

These results indicate unambiguously that the lecturer's detailed feedback informing the students that plagiarism was detected in their assignments and containing examples of the successful application of some of the preliminarily discussed strategies for avoiding plagiarism managed to guide nearly half of the students with detected plagiarism away from resorting to plagiarism again for their second and third tasks. However, also nearly half of these students were not prevented from resorting to plagiarism again for their second and third tasks and they ended up submitting 2 or 3 of their 3 required tasks with detected plagiarism after having received the lecturer's warning feedback at least once.

These results provide an indisputable – and certainly alarming – indicator, which once again confirms the need for the fulfilment of such writing tasks for assessment in the supervised environment of the physical classroom (when the circumstances allow the teaching process to be conducted in the physical classroom), since in the physical classroom environment, it would be possible to ensure a 100% freedom from plagiarism a priori by design.

Another indicator revealed by the discussed 2020/2021 results also relates to the application of an automatic plagiarism checking tool as an aid for the lecturer. This indicator once again confirms that the use of automatic plagiarism checking tools cannot ensure a 100% plagiarism detection on its own and the lecturer still needs to resort to a manual plagiarism check in some cases (e.g. when the plagiarism checking tool has registered a 0% result and the lecturer's manual check still establishes plagiarism), while in other cases it remains highly possible that neither the plagiarism checking tool, nor the lecturer would be able to establish a case of

plagiarism (e.g. if the homework task has been re-assigned for fulfilment to another person who has not published their submitted text anywhere previously). In precise figures, this indicator was revealed as follows: out of the total number of 78 written tasks with detected plagiarism, there were 28 written tasks with plagiarism detected manually by the lecturer after the SafeAssign plagiarism checking tool had registered them with a 0% result.

Conclusion

As the presented and discussed results in the previous section indicate, the first conclusion to be drawn from the research presented in this paper is that it once again confirms that the homework environment of writing task fulfilment has become inefficient for both the students and the lecturer because a significant number of students continue their attempts at plagiarism in this environment even after being warned about it and even after knowing that a plagiarism checking tool is being utilized by the lecturer.

The second main conclusion that stands out is that the presented and discussed results also once again confirm that it is inefficient and wasteful for the lecturer to invest so much time and efforts in providing feedback after feedback stating that plagiarism has been detected and warning the students to avoid this practice in their future tasks instead of focusing their time and efforts on avoiding the plagiarism issues altogether by simply requiring the students to fulfil their writing tasks for assessment in person in the physical classroom where the supervised environment would ensure the submission of 100% plagiarism-free written tasks.

A third important conclusion to be drawn from the results of both the 2019/2020 and the 2020/2021 EMP courses is that the inefficiency of the lecturer's efforts to assess homework writing tasks is even further boosted by the number of 3 required written tasks from each student in a course of around 100 (+/-20) students. It is simply pointless to require 3 written tasks completed as homework assignments from each student of such a great number of students, many of whom will provenly continue their attempts at plagiarism even after being warned about this practice and getting a low grade on their first assignment. It is also as much pointless to give these students the same feedback 2 or 3 times over instead of placing them in the supervised environment of the physical classroom where they will have no other choice but to write in their own words and receive a more useful feedback and a more real assessment of their actual academic writing skills.

Finally, the homework environment also entails the created possibility for reassignment of the writing tasks to other people for fulfilment, which is a prerequisite for potentially numerous cases of plagiarism that would be virtually untraceable and unprovable for both the lecturer and any automatic plagiarism checking tool.

Therefore, we can only be hopeful that the COVID-19 pandemic will at last retreat soon and give us the opportunity to return to our physical classrooms because the online classrooms and the homework environment for written assignments can never provide us with the necessary face-to-face contact and supervision to ensure 100% plagiarism-free students' written production.

Just as Jude Carroll and Carl-Mikael Zetterling have put it forward in their book entitled "Guiding students away from plagiarism": "the students need to know what the teachers expect them to do" (Carroll, Zetterling, 2009) before they actually do it, while the teachers "should not set assignments that require the students to use skills before they have been taught to use them" (Carroll, Zetterling, 2009).

And in order for this teacher-student interaction to be as efficient as possible, as the results presented in this paper indicate and confirm, the supervised environment of the physical classroom and the teacher-student face-to-face contact seem to remain the best possible environment to conduct the teacher-student interaction successfully.

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MERITS OF ON-SITE ORAL TRANSLATION AS AN ESP TEACHING STRATEGY APPLIED IN 2 SUCCESSIVE ESP COURSES FOR STUDENTS OF MEDICAL OPTICS WITH AN A2/B1 ENTRY LEVEL OF GENERAL ENGLISH (2019/2020; 2020/2021)

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Abstract. The research presented in this paper was carried out based on the observed results from the application of on-site or altranslation as a teaching strategy in both the facultative and the obligatory courses of English for Specific Purposes of a total of 6 groups of Medical Optics students at the Medical University Prof. Dr. Paraskev Stoyanov – Varna during the 2019/2020 and 2020/2021 academic years.

Both the facultative and the obligatory ESP courses for Medical Optics students during the 2019/2020 and 2020/2021 academic years were designed with the aim to develop the students' 4 basic receptive and productive language skills of reading, listening, speaking and writing in English, while introducing them to specialized optics and ophthalmology topics related to their future profession.

In all 6 discussed groups of Medical Optics students, the main challenge encountered by the lecturer was the fact that most students' entry level of proficiency in General English did not exceed the A2/B1 level according to the CEFR. This fact inevitably created an obstacle for these students' proper comprehension and interpretation of the specialized reading and listening ESP course materials. Therefore, the lecturer had to adapt her reading and listening teaching strategies, so as to ensure that all students comprehended the specialized course materials properly.

The most appropriate teaching strategical methods for achieving this purpose proved to include the practice of each student reading out loud and translating (with increasingly less needed help from the lecturer as the courses progressed) parts of the provided specialized materials for reading, as well as the practice of the students attempting to formulate their own answers to specific questions compiled by the lecturer in relation to the provided specialized materials for listening and reading.
The current paper, however, is focused and aims to outline and draw conclusions about the established merits and the success of the applied reading-out-loud-andtranslation teaching strategy for improving the reading comprehension skills of ESP students whose entry level of proficiency in General English did not exceed the A2/B1 level according to the CEFR.

Keywords: translation, ESP teaching strategy, merits, practical results, Medical Optics students

Introduction

For quite a long time since the Grammar Translation language teaching method was deemed to be inefficient for developing the students' speaking and communicative skills around the mid-20th century, the use of translation in the language teaching classrooms had come to be regarded as "uncommunicative, boring, pointless, difficult and irrelevant" (Duff, 1994), and translation had, therefore, been practically abandoned as a language teaching strategy.

More recent research, however, has restored the interest in translation as a language teaching strategy, as recent theorists and researchers have proven repeatedly that translation has a value as a language teaching strategy "if used pertinently and efficiently, and if (the translation exercises are) prepared with specific goals in mind" (Chirobocea, 2018).

Multiple recent case studies (Kavaliauskiene and Kaminskiene, 2007; Rushwan, 2017; Chirobocea, 2018; Mazeikiene, 2019; etc.) have confirmed that translation as a language teaching strategy helps to develop the following 3 essential qualities of language learning: "accuracy, clarity and flexibility" (Duff, 1994), and that the "translation-based activities are useful for ESP learners and that translation is an efficient ESP teaching and learning method if the amount of translation done is well-balanced, the activities are well-planned and the learner profile and needs in each specific course are well-analyzed" (Mazeikiene, 2019). Therefore, these recent case studies have come to prove that "translation can serve as a tool for improving language skills" (Kavaliauskiene and Kaminskiene, 2007), and they have managed to reestablish translation as a valid language teaching strategy for both the General English FLT and the ESP classrooms.

Purpose of the study

The current case study of the application of on-site oral translation as a teaching strategy in the ESP classes of the 6 groups of Medical Optics students presented in this article aims to confirm or refute the cited researchers' findings about the usefulness and suitability of translation as a language teaching strategy for the ESP classroom and to present some established merits of the applied on-site oral translation teaching strategy.

Methodology

The applied methodology for development of the Medical Optics students' reading comprehension skill under discussion in this article involved the following components: selection of reading materials related to the fields of Medical Optics and Ophthalmology that were also suitable to build on the students' entry A2/B1 level of General English; compiling detailed English-Bulgarian glossaries containing the most essential specialized and non-specialized vocabulary from the selected reading materials; asking each student from the 6 groups to read out loud passages from the selected reading materials; correcting each student's detected mispronunciations while reading out loud their respective passage; asking each student to perform an on-site oral translation of the passage they had read out loud with the help of the respective glossary; correcting each student's suggested translation version for their respective passage and clarifying why the corrections were needed; asking if there was anything unclear left after the performed oral translation exercise.

The aims of employing each of these methodological components are indicated below:

• the selection of reading materials related to the fields of Medical Optics and Ophthalmology that are also suitable to build on the students' entry A2/B1 level of General English aims to consolidate the need to build on the students' particular entry level of General English with the need to also introduce them to specialized optics and ophthalmology topics related to their future profession;

• the compilation of detailed English-Bulgarian glossaries containing the most essential specialized and non-specialized vocabulary from the selected reading materials aims to provide the students with a useful teaching aid to assist them for the proper comprehension of the selected reading materials;

• the strategy to ask each student from the 6 groups to read out loud passages from the selected reading materials and correct each student's detected mispronunciations while reading out loud their respective passage aims to allow the lecturer to detect some individual pronunciation weaknesses for each student and address these weaknesses by teaching the students how to pronounce their problematic words correctly;

• the strategy to ask each student to perform an on-site oral translation of the passage they had read out loud with the help of the respective glossary and then correct each student's suggested translation version for their respective passage aims to allow the lecturer to identify some individual comprehension problems for each student on site and address these problems by correcting the students' translation versions and clarifying why each correction is needed, thereby ensuring the students' ultimate proper comprehension of the selected reading materials;

• the final strategy of the lecturer to ask the students if there is anything unclear left after the performed oral translation exercise aims to ensure that at end of their

ESP seminar, the students have acquired everything properly and if there is still something unclear left, the students may ask the lecturer to clarify this problematic issue, as well.

The observed results from the application of the presented methodology, as well as its established merits, are presented in the following sections.

Results and discussion

The results from the application of the discussed on-site oral translation methodology are presented in the form of the students' grades on the final exam in each of the two courses they were taught by the author Tsvetelina Vateva as their lecturer during the 2019/2020 and the 2020/2021 academic years at the Medical University Prof. Dr. Paraskev Stoyanov – Varna.

The final exam for the facultative course was conducted in the form of a written test consisting of the following components: Listening Comprehension Exercise, Reading Comprehension Exercise, Gap-Filling Exercise, Term-Definition Matching Exercise and 2 Grammar Exercises (as most of the students started their facultative course with the A2/B1 entry level of General English and it was necessary for the course to include some teaching of General Grammar in addition to the discussion of the Optics and Ophthalmology-related specialized topics).

The final exam for the obligatory course was also conducted in the form of a written test consisting of the following components: Listening Comprehension Exercise, Reading Comprehension Exercise, Gap-Filling Exercise, Term-Definition Matching Exercise and Filling-In Missing Lines in a Dialogue Exercise (as the obligatory course is taught after the students have taken the facultative course and it aims to build on the students' achieved results in the facultative course).

Tables 1,2, 3 and 4 that are presented below contain the summarized final exam results of the 6 groups of Medical Optics students in the facultative and the obligatory ESP courses, respectively. These results come to reflect the fact that the on-site oral translation methodology applied in class definitely improved the students' reading and listening comprehension skills to an extent that was sufficient to achieve the mostly excellent results on the respective tasks in their final exams.

Table 1

2019/2020 Medical Optics Students' Facultative Course Final Exam Results – Groups 1 and 2

Total Number of Students (Groups 1 and 2)	Total Number of Excellent Grades	Total Number of Very Good Grades	Total Number of Good Grades	Total Number of Average Grades	Total Number of Poor Grades
17	16	0	1	0	0

Table 2

2019/2020 Medical Optics Students' Facultative Course Final Exam Results – Groups 3 and 4

Total Number	Total	Total	Total	Total	Total
of Students	Number of	Number of	Number	Number	Number
(Groups 3	Excellent	Very Good	of Good	of Average	of Poor
and 4)	Grades	Grades	Grades	Grades	Grades
17	13	3	1	0	

Table 3

2020/2021 Medical Optics Students' Obligatory Course Final Exam Results – Groups 3 and 4

Total Number	Total	Total	Total	Total	Total
of Students	Number of	Number of	Number	Number	Number
(Groups 3	Excellent	Very Good	of Good	of Average	of Poor
and 4)	Grades	Grades	Grades	Grades	Grades
17	14	2	0	1	0

Table 4

2020/2021 Medical Optics Students' Facultative Course Final Exam Results – Groups 5 and 6

Total Number	Total	Total	Total	Total	Total
of Students	Number of	Number of	Number	Number	Number
(Groups 5	Excellent	Very Good	of Good	of Average	of Poor
and 6)	Grades	Grades	Grades	Grades	Grades
15	11	4	0	0	0

Conclusion

The mostly excellent final exam results presented in the 4 tables above confirm the other herein-cited researchers' general findings about the usefulness and suitability of translation as a language teaching strategy for the ESP classroom, while they also reveal the following merits of the specific type of on-site oral translation applied as a teaching strategy in the discussed ESP courses:

• as a teaching strategy applied in the ESP classroom, on-site oral translation allows the lecturer to identify and get a real idea about each student's English language strengths, weaknesses and problems; this merit provides the lecturer with an opportunity to address these problems instantly, as opposed to the lack of this opportunity if, for example, the translation task is assigned as a written homework task, in which some individual students' problems may remain unresolved even if the students have translated their homework correctly (because of the numerous online free-access sources of information at the students' disposal in the homework environment);

• another merit of the on-site oral translation strategy is that once the lecturer identifies certain students' language weaknesses and problems, they may continue to address them, if needed, and check occasionally if the problems have been resolved;

• by applying the on-site oral translation strategy, the lecturer has the chance to pay attention to the non-literal meanings of certain phrasal verbs and collocational expressions that may otherwise remain improperly learned by the students;

• the students' overall text comprehension is improved, as by the end of the courses, the lecturer noticed significant improvement and progress in all students' reading comprehension skills – there was a decreased need for help with the translations from the lecturer as the courses progressed;

• finally, the application of the on-site oral translation teaching strategy by the lecturer achieves a consolidation between the students' reading, listening, writing and speaking skills development in the following ways: the students' reading, listening and speaking skills development is consolidated through the out-loud reading by 1 student while the others and the lecturer listen, and the other way around – while the lecturer corrects the students' mispronunciations and incorrect information comprehension; then, the students' writing skills development is also improved when the lecturer pays attention to the correct spelling of certain words.

In conclusion, as the researcher Yolanda Sanchez de Mateo has pointed out in her article entitled "English for Optics: A Challenge or an Impossible Dream?", there is a general "need to be up-to-date in teaching trends, which entails including what new technologies offer us, and the need to find texts and teaching aids for English for Optical Sciences" (Sanchez Mateo, Y., 1994). The current research presented above adds to this statement the conclusion that besides the needs outlined by Yolanda Sanchez de Mateo, there is also a constant need to find suitable and efficient teaching approaches for the students of Medical Optics, who attend courses in ESP, since in many cases, they would start these ESP courses with a comparatively low entry level of General English that also needs to be built on simultaneously. The results from the application of the on-site oral translation teaching strategy presented above suggest that this is one such suitable teaching approach for the students of Medical Optics, who start their courses in ESP with an entry level of General English as low as A2/B1 according to the CEFR.

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GOGOL'S TRADITIONS IN THE WORKS OF M. E. SALTYKOV-SHCHEDRIN

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Annotation. The article is devoted to the work of Saltykov-Shchedrin – a bright follower of Gogol's tradition of satirical laughter. Shchedrin, then still a young satirical writer – was not going to imitate Gogol, write in his manner. However, the power of Gogol's sly-ironic intonation was so strong that it appeared as if "by itself", "in addition" to the will of the writer. Shchedrin, like Gogol, was endowed with an amazing, rare talent, had the gift of capturing life's comedy in its most diverse manifestations, instantly grasped the inner comicality of what looked solid, significant, noble.

Keywords: traditions, Gogol, Saltykov-Shchedrin, genius, creativity, weapons of satire

Satire is a vast and extremely diverse field of art that has given humanity many aesthetic masterpieces, executing with its merciless laughter the evil of life in its most harmful, socially dangerous manifestations. One of the most valuable examples of world satire are the works of M. E. Saltykov - Shchedrin. It is even more admirable that his work as a satirist was strikingly versatile, multi-colored. Like all great masters of the word, Shchedrin was a hard worker in literature, for whom writing was a daily work. He considered himself "an active writer, a hard worker, obliged to hold a pen in his hand every minute..." [8, p. 6].

Saltykov-Shchedrin continued and revolutionarily deepened the traditions of Gogol's satire [3, p. 63]. It is not without reason that Gogol is considered the closest predecessor of Shchedrin, who created a satirical and philosophical picture of the modern world. In his satirical activity, Shchedrin, without a doubt, not only relied on the traditions of Gogol, but also developed them. In his writings, a similar creative task has acquired greater purposefulness and greater scope. However, Shchedrin is also infinitely far from him, since he set himself a fundamentally different task – to track down, expose and destroy. The world of his ugly heroes and masks is the severely realistic world of contemporary Russian reality, more

gloomy and oppressive than the world of "pig snouts" that tormented Gogol. The Decembrist writer Mikhail Lunin claimed that "the scourge of sarcasm is whipped in the same way as the executioner's axe"[8, p.7].

From the very early childhood, the desire for the ideal was awakened in the future writer Saltykov, there was a desire to change and rebuild this life, which can and should be different. Acquaintance with the advanced Russian literature, first of all with the works of Gogol and Belinsky's articles, awakened in the future writer an aspiration to the high human ideals of freedom, equality, justice. The young Shchedrin was among those in whom the desire for an independent identity did not fade away, who did not succumb to oppression, but opposed it. After returning from exile, the writer is inspired by the satirical tradition of Gogol [3, p. 68], turns to satire. And this right, like other satirists, he was forced to defend, because he, like Gogol, was reproached for writing about negative, bad things, that it was time for him to portray the bright, gratifying things that exist in life.

Saltykov was worried about the question of an oppressed, "lost" person, crushed by the oppression of circumstances. He advocated "a restored human image, enlightened and cleansed from those shames that centuries of prison captivity have layered on it" [5, p.86]. Gogol, for example, actually set himself a similar task, choosing his own aspect of its creative solution, which he defined as the image of the vulgarity of a vulgar person. If Gogol particularly focused, first of all, on the socio-psychological and moral aspects of the problem, then Saltykova occupies along with them its socio-political aspect, which becomes the main determining factor for all the others. Therefore, the subject of Shchedrin's satirical research is no longer the "vulgarity of a vulgar person", but the dehumanization of people who are in the power of ghosts [5, pp. 86-87].

Shchedrin, like Gogol, was endowed with an amazing, rare talent, had the gift [4:6] to sensitively catch the comic life in its most diverse manifestations, instantly grasped the inner comicality of what looked solid, significant, noble. He was able to turn this "solid" and "noble" (or nightmarish, terrible) in such a way that his inner inconsistency, his worthlessness was immediately revealed. On closer examination, the "solid" turned out to be empty, the "noble" - base, and the nightmarish and terrible-pathetic and ridiculous.

If Gogol was outraged by "dead souls", then Saltykov is outraged, in addition ,by "dead forms of life". In all his works, the writer paints a society confused by these "deadening forms", numb, rotting [5, p. 57]. But even in this gloomy, heavy atmosphere, Saltykov continued to maintain optimism and hope. The writer saw the triumph of dark forces striving to stop life, to strangle all living things.

In the XX century, we began to really realize what a colossal phenomenon this is-Shchedrin's satirical laughter. According to N. G. Chernyshevsky, "laughter is a comic beginning, inseparable from satire, awakening in us a sense of self - esteem"

[7, p. 3]. "This is not Gogol's laughter [3, p. 65], but something much more deafeningly truthful, deeper and more powerful" [1, p. 109]. His sharp, penetrating mind never stopped at the surface of life, he penetrated into the phenomena, into their innermost essence. In an atmosphere of violence, fear, and darkness, Saltykov stood on the side of truth, life, and light; in defense of the sleeping, destitute, and oppressed. The writer decided to debunk the gloomy, hostile world that prevailed around him. He realized that it was necessary to fight this nightmarish world with the weapon of laughter - satire." Saltykov stressed many times that "laughter was never an end in itself for him, it was a form of discovering the truth, a means of distinguishing truth from lies" [5, p. 263]. When one of Saltykov's acquaintances got into an absurd, ridiculous situation, the writer said: "Everyone is mocking him, and it is unlikely that he will rise again. The funny is the scariest of all" [1, p. 112]. These words brilliantly characterize the incomparable effectiveness, the effectiveness of laughter, which performs a traditionally cleansing, cathartic function [1:2]. Only laughter can dispel fears, help get rid of fright. Only laughter is stronger than fear, more terrible than fear. Shchedrin's laughter is born of the tragic situation of a person in a terrible world of violence, lies, arbitrariness and disenfranchisement.

Gogol's great merit in the development of Russian satire was that he abandoned the plot conflict, in which negative heroes were necessarily opposed to positive ones, and replaced it with another type of conflict based on the collision of negative heroes with negative ones. This replacement was natural and necessary and expressed a significant shift in the poetics of satire, which rose in Gogol's work to a new stage of its historical movement.

In the "Inspector", the main "clash" takes place between Khlestakov and city officials led by Draughty-Dmukhanovsky. As a result, both city officials and Khlestakov are exposed. The plot conflict of "Dead Souls" is based on the same principle. Chichikov, the hero who embodies the nascent acquisition, enters into negotiations and transactions with various landowners, pillars of the existing order. Although" formally " the victory is won in one case by Khlestakov, and in the other by Chichikov (because they leave the city on time), in fact both sides are defeated, since both are exposed.

Gogol himself, unfortunately, could not continue his fruitful searches in the field of poetics of conflict and plot. Moreover, in the 40s (after a change in his worldview), he goes back in this regard and tries to contrast the "ideal" land-owner and the "ideal" tax collector with negative, satirical characters in the second volume of "Dead Spirits". It should be noted that in Shchedrin's work, the plot conflict, in which negative characters face negative ones, has acquired a special sharpness and many varieties.

Saltykov-Shchedrin, following the Gogol tradition in the poetics of conflict and plot, refused to depict a "positive" hero, allegedly successfully fighting evil. In his works we will not find either virtuous landowners or ideal officials. The writer draws numerous and diverse manifestations of the activities of negative, satirical characters. These characters can have conversations, or deceive each other, or do something together, or fight for something together. In all cases, however, they self-expose or expose each other, and their "exploits" and "deeds" appear to us as a "comedy of empty talk and empty bravado", as a "painstaking transfusion from empty to empty", as "business idleness" [5, p.185].

In the cycle "Pompadours and Pompadours", the writer brilliantly demonstrated that the struggle between the young pompadours-liberals and their conservative predecessors is pure fiction, that in the main, essential they do not actually differ from each other. The satirist paints this kind of "struggle" as a comic, empty struggle. Pompadours are ignorant, limited dummies who are endowed with power, put at the head of cities, provinces, territories. There is something of Khlestakov in them. Especially in young pompadours. They are just as frivolous and uneducated. In their heads, like Gogol's hero, "the lightness of thoughts is extraordinary". They are always ready to brag, fanfaronit, hang around. The plot of a number of stories in the cycle is really based on the very "points" of Pompadour activity, situations that are not at all funny in themselves, but completely"serious". It is their writer who turns them in such a way that the reader can see their immense, inner comedy [3, p. 63].

If Khlestakov was a "fityulka" who was mistaken for a "statesman", then the pompadours are empty people who are actually "statesmen", they are in power, they control the destinies of many thousands of people. However, it is probably not worth calling them such. Shchedrin himself called such figures "state babies" [5, p.124]. Very interesting is "The Story of how one peasant fed two generals", which clearly bears traces of the influence of "The Story of how Ivan Ivanovich quarreled with Ivan Nikiforovich" and at the same time differs significantly from it (the similarity of these two works is obvious. Shchedrin did not even think of obscuring the creative connection of his "The Story..." with Gogol's, but, on the contrary, emphasized it by the very title of the work).

In "The Story..." Gogol's main characters are two landowners; in Shchedrin's "Story..." there are two generals (civilians). The plot conflict of "The Story..." Gogol consists in a quarrel and the subsequent "war" of the heroes. In the plot of Shchedrin's "Novella..." there is also a motive for the quarrel of the heroes; however, it is only a certain moment in the development of the action and is of a secondary nature. The main thing becomes another conflict – not between the generals among themselves, but between the generals and the peasant; or rather, not even a conflict, but a collision, because there is no conflict between the generals and the peasant: the latter obediently does everything that the generals tell him.

If in the 30s and 40s of the XIX century the main task of satire was to show

the internal insolvency of landowners and officials (and this task was brilliantly solved by Gogol), then in the 60s, after the abolition of serfdom, another question arose with no less acuteness-about the passivity of the peasantry, which turned out to be incapable of active, purposeful actions, about the remnants of serfdom in the minds of the broad masses. Shchedrin put both of these problems in "The Story of How One peasant fed two generals". Having based his satirical work on the collision between generals and a peasant, the writer managed to simultaneously show both the parasitism and parasitism of representatives of the ruling class who live at the expense of the labor of the broad masses of the people, and the passivity, downtroddenness of these masses, obediently bearing the usual yoke instead of being outraged and throwing it off.

Thus, the two types of plot conflict characteristic of Shchedrin's satire are combined here, and the one that expresses the main social contradiction of the era – between the ruling class and the exploited people-comes to the fore. It is very curious, by the way, that the peasant in Shchedrin's "The Story..." is opposed not by landowners (which seemed to be much more logical), but by generals.

Saltykov-Shchedrin was a true master of the satirical plot. He instantly grasped those comic situations that he encountered in life, and was able to purposefully sharpen them, subordinating them to the solution of certain creative tasks. Moreover, he was an unsurpassed inventor of comic scenes and comic plots. His imagination, starting from certain facts of reality, immediately began to work actively, generating new and new funny episodes that clearly revealed the inner comicality [2, p. 66], the absurdity of the displayed life collisions.

In all the satirical works of N. V. Gogol, the plot is based on an anecdote, an incident. In "Marriage" - this is a household joke, in "The Inspector" – an administrative one, in "Dead Souls" – a social one. This is a completely plausible anecdote, as in "The Carriage", or grotesquely fantastic, as in "The Nose", thanks to which Gogol's plots have a clearly expressed comic character [3, p.63] and very clearly reveal certain comic contradictions of reality. Saltykov-Shchedrin's anecdotes are of a slightly different nature. They are not only funny, but also dramatic, tragic [2, p. 69].

If N. V. Gogol took some one anecdotal story and, putting it as the basis of the plot, sought to extract all its potential possibilities for the sake of a more complete identification of characters, Shchedrin in each of the mentioned stories presents several such stories at once. These stories are generally of the same type, they follow one after another, as if strung on some invisible rod. This core is extortion, bribery, the utter arbitrariness of the authorities.

Mikhail Yevgrafovich uses anecdotal stories differently from Gogol. We are struck by the main scenes, which can hardly be called comic. They are rather dramatic, even tragic, since almost in every chapter of the novel someone dies. Throughout the novel, Shchedrin draws scenes in which the dramatic and even tragic are organically merged with the comic [1, p.109]. Satirical ridicule can be carried out in such forms as: humor, sarcasm, irony, wit [2, p. 66]. A. N. Plesh-cheev in one of the letters noticed that Shchedrin "has his own special humor [3, p.68] ... which involuntarily makes you laugh". "In my literary works, the humor-ous element is predominant," Mikhail Yevgrafovich once remarked, and these words quite correctly formulated the main direction of his artistic searches [5, p. 260].

Saltykov-Shchedrin's style was bright and very individual. The satirist was immediately recognized by readers. They were recognized by the style, by the manner, even in cases when another work was published under some new pseudonym. "He writes well", Lev Tolstoy said about Saltykov – "and what an original syllable he developed", "a magnificent, purely folk, apt syllable" [5, p. 386].

On many pages of the "Provincial Essays", the influence of Gogol's manner of narration, Gogol's style, Gogol's ironic intonation was clearly felt, which was so brilliantly manifested in "The Story of how Ivan Ivanovich quarreled with Ivan Nikiforovich" and in "Dead Souls". And only at the end of the last of the above phrases, something else breaks into the familiar Gogol intonation – more sharp, more sarcastic ("And you feel that your respect for Porfiry Petrovich increases to frenzy") [5, p.266]. Of course, Shchedrin-then still a young satirical writer – was not going to imitate Gogol, write in his manner. However, the power of Gogol's sly-ironic intonation was so strong that it appeared as if "by itself", "in addition" to the will of the writer. It sounded like a "tuning fork" somewhere in the depths of consciousness, and, tuning his satirical lyre on this tuning fork, the author often fell into stylistic imitation.

It is very important to emphasize that already in the "Provincial essays", Shchedrin finds his own voice, develops his own manner of ridicule, different from Gogol's. There is also irony in the intonation, in the manner of narration. But this is an irony [3, p. 63] of a different type, not the same as that of Gogol. It is more "dry" and "businesslike". There are no notes of that touching admiration and unrestrained pathos of praise that are characteristic of Gogol's style. At the same time, it is more prickly, more sarcastic, more evil.

In one of the articles, Saltykov wrote about "that energetic, merciless wit" possessed by D. I. Fonvizin and N. V. Gogol. These words can be attributed to Shchedrin himself. After all, it was him who was called by Lunacharsky "the most witty writer of the Russian land" [4]. In wit, more than in irony or humor [3, p.68], the author's subjectivity, his desire to "impress", brand, ridicule the depicted are visible. He was a master of all shades of funny. In his works, humor and irony [3, p. 63] are interspersed or combined with wit, caustic sarcasm. Both of these forms of ridicule turned out to be the closest to Saltykov, who is inclined to express his

attitude to the surrounding outrages sharply and uncompromisingly. In them, the activity of his mind was most clearly and clearly manifested, boldly analyzing the contradictions of life, exposing them from all those veils with which they are covered.

Another important feature of Shchedrin's poetics is the much broader use of such artistic forms and techniques as hyperbole, fantasy, and grotesque, which have reached an even sharper and more distinct expression than Gogol's [5, p.82]. Saltykov-Shchedrin turns to sharp satirical exaggeration much more often than his predecessors in Russian literature. The personality of the satirical writer Shchedrin at the same time manifests itself especially actively, vividly – in all the brilliance of his mind, resourcefulness, erudition. No matter which work of the writer we turn to, everywhere we are struck by the sniper accuracy of comparisons, metaphors, laconic verbal formulas that instantly expose the most various comic contradictions of reality.

Gogol in "Dead Souls" compares the guests at the governor's ball with flies flocking to sugar. Shchedrin in the "Provincial essays" compares officials with fish. Shchedrin says through the mouth of his character that there are "sturgeon officials, ... piscary officials and another special kind-a pike official who swallows piscaries during the zhor..." [5, p. 275]. Just as Gogol compares Ivan Ivanovich and Ivan Nikiforovich, Shchedrin similarly compares the state councillors of the Rack and the Boa Constrictor ("Abroad"). Lunacharsky V. A. believes that " the highest form of Shchedrin's art is his idea in a mask. It was the fact that he was able to masterfully dress his most subtle and poisonous analysis of the Russian public and the state in funny masks that saved him from censorship and made him a virtuoso of the artistic and satirical form [5, p.298]. It is also characteristic that Shchedrin was opposed by Gogol, who, they say, ridiculed "no less deep ulcers of Russian reality", and "did not resort to" aesopism"," parables", "slave "language" [5, p.336]. It should be noted that this kind of opposition is completely illegal.

Firstly, the thesis according to which Gogol allegedly has no "aesopism" at all is not quite correct. It is there. It is enough to recall at least the parable about Kief Mokievich and Mokiya Kifovich, included by the writer in "Dead Souls". And the name itself is "Dead Souls"? After all, it has long been clear that it has not only a literal, direct meaning (denoting those audit dead souls that Chichikov buys), but also another, allegorical (referring to the landowners depicted).

Secondly, there are images in Gogol's works that, although they are not allegorical by their very nature, at the same time grow into broad, capacious symbols (Mirgorod as the embodiment of vulgar existence, Nevsky Prospekt as the personification of false, soulless St. Petersburg...).

Thirdly, Shchedrin's poetics was born of a new stage in the development of Russian satire. And to present Gogol's style as a "model" for the writer means not

to understand either the general shifts that occurred in Russian literature in the middle and second half of the XIX century, or the ideological and artistic originality of Shchedrin's work.

The most important difference between Shchedrin's satire and Gogol's satire, as already mentioned, is that it has acquired a clearly expressed political character, that the writer's focus was on life constrained by existing state and social forms. The so-called "Aesopian manner" and "Aesopian language" became organic, necessary components of his poetics and his style.

From the very beginning to the end, the novel "Dead Souls" is full of numerous arguments on a variety of, sometimes very topical topics. Some of these arguments are given on behalf of the narrator, they have long been called "lyrical digressions". Others are attributed to Chichikov, although in fact, of course, they also belong to the author. This Gogol tradition [3, p.68] was picked up by Saltykov-Shchedrin. And not just continued, but also developed, raised to a new level. In his work, the combination of an artistic representation of reality with sharp journalistic reasoning has become an important, constantly operating creative principle.

The writers of subsequent generations have constantly turned to the artistic experience of the great satirist. His traditions at different stages of the development of our literature were inherited and continued by M. Gorky and V. Mayakovsky, E. Zamyatin and M. Bulgakov, A. Platonov and M. Zoshchenko, etc. Modern satirists also rely on them: S. Mikhalkov, F. Iskander, A. Zhukov... They learn from Shchedrin not only the depth of comprehension of life and ideological uncompromising, but also the ability to master a variety of poetic forms and means-from careful everyday life, scrupulous psychological analysis to outright fiction. Shchedrin's satire has a global ideological, aesthetic and educational significance, because humanity still continues to fight against ghosts.

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POETRY OF FOLK WISDOM – PROVERBS AND SAYINGS IN THE FABLES OF I. A. KRYLOV

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Annotation. Many lines from Krylov's fables have turned into folk proverbs and sayings that introduce us to the world of universal values. Krylov's language is very close to the folk speech, as the writer inserted proverbs and sayings into his fables that completely merged with the general tone of the fable. V. I. Dal in his collection "Proverbs of the Russian People" highlighted the relationship of the proverb and the fable. The proverb is like a condensed formula of folk wisdom. Krylov's memorable own poems have themselves become proverbs that have entered the national speech.

Keywords: fable, proverbs and sayings, Krylov, folk wisdom, humor of the Russian people, satire.

Many poets and writers turned to the oldest genre of art – the fable, with its deep historical roots. The German playwright Lessing wrote that in no form of a poem did he focus his attention more than on a fable. According to him, "a fable is not a toy, but a deep philosophical reflection, the work of the mind and consciousness" is an invaluable treasury that has preserved the folk wisdom of proverbs and sayings, the richness and beauty of Russian speech. "Fable - poetry of the mind", "special poetry" [11, p. 57].

A valuable source that formed the identity of the Russian fable is considered a favorable soil of oral folk art. Without folklore, we cannot have an idea about the genesis of the fable and its artistic originality. A. A. Potebnya distinguished the genetic relationship of fables with proverbs and sayings [9, p.155].

The famous collector of proverbs AND. Snigirev noted that "many parables and fables have been reduced to proverbs... so the latter are equally developed in fables and parables" [10]. Also, V. I. Dal in his collection "Proverbs of the Russian People" highlighted the relationship of the proverb and the fable. The proverb is like a condensed formula of folk wisdom [2, p. 64]. A. Potebnya generally considered the proverb to be an "abbreviated fable" [11, p.31].

The fable reached its highest heyday in the work of Ivan Andreevich Krylov, who has come a long way to find his vocation as a writer-fabulist. It was in this small epic genre that his talent unfolded, about which Belinsky wrote that "fable, like satire, was and will always be an excellent kind of poetry, as long as people with talent and intelligence appear in this field" [3, p.16]. Krylov's fable comes to life precisely in reading. This is an amazing art of oral speech. It should be listened to [11, p. 64]. Krylov explained his choice of the fable genre by the fact that this "genus is understandable to everyone, it is read by both servants and children" [11, p.18].

Krylov's fables, which perfectly express the people's view of life, turned out to be close to folk tales, sayings, since many lines of fables turned into folk proverbs that have firmly entered our memory.

Pushkin was the first to call Krylov "a truly folk poet who surpassed all fabulists. Representatives of the spirit of both peoples called it La Fontaine and Krylov, who forever will remain the darlings of their denosumab" [11, 20].

V. G. Belinsky wrote that in our time, "the nation became the first dignity of literature and of the highest merit of a poet" [3, p. 1]. "Wings pave and other Russian poets of the road to the nation," [11, p. 104]. The nationality of his fables was reflected in the fact that fable images, apt phrases became folk proverbs and sayings.

Gogol wrote about Krylov that he chose the form of a fable, which was neglected as an old thing. It was in it that he managed to become a folk poet, "this national heritage is the book of wisdom of the people themselves" [8, p. 1095]. He managed to give the fable a high meaning and satirical sharpness, relevance and ambiguity. And Krylov, as a man of genius, instinctively guessed the aesthetic laws of the fable [3, p. 16].

For him, the fable is the most popular, intelligible and ancient genre, understandable to everyone, very close to folk poetry, which had a strong tradition in Russian literature. The simplicity and clarity of the images, the connection with folk proverbs and sayings, folk wisdom [2, p.67], its morals – all this made the fable especially beloved by the people. V. A. Arkhipov called the fable "the fruit of great observations and deep reflections on life" [1, p. 78].

The sharp and accurate humor of Krylov's fables originates from folk sources. He drew many of his thoughts and plots from the folk language, from the wisdom of Russian proverbs and sayings [2, p. 64], which occupy a special place in the rich and expressive language of his fables, thanks to which he ridicules human vices. Folk speech is used in Krylov's fables not only by people, but also by fabled animals.

Krylov took both positive and negative moral results from reality. His words: "For the strong, the powerless is always to blame," is a bitter moral conclusion, but

sanctified by the historical experience of the people [7, p. 19]. Equally, the result is a positive conclusion: "It's a misfortune if a shoemaker starts baking pies, and a pirozhnik makes boots" [7, p. 49].

The fabulist returns to the people their own morality, as if purifying them from all impurities in the form of proverbs and sayings. When they returned to the people's environment, they were accepted by the people as their own. This is the proof of Krylov's greatest merits as a master fabulist.

Krylov's fables embodied the modern world, as well as the personality of the poet himself was most fully reflected. He managed, using the achievements of his predecessors, giving it a Russian national character [2, p. 64], to make the fable a diverse literary genre. Gogol emphasized that in Krylov's fables "Russia is everywhere and smells of Russia" [11, p. 24].

In our everyday speech, not always realizing the authorship, we use expressions from Krylov's fables, which have long become winged expressions, proverbs and sayings. According to Belinsky, they can "end the dispute and prove your idea better than any theoretical arguments" [3]. It is not for nothing that the critic wrote about Krylov that he is "more than a writer and a poet" [3, p. 33]. Almost all of his fables, "as in a mirror, reflect some human shortcomings, unfair relations between people" [5, p. 403]. Through his fables, conflict situations, the morality contained in them, we see that he condemned, warned against, encouraged, supported, as well as how he treated his time, Russian customs, everyday life, literature, the whole way of modern reality. He was not afraid of the truth of life, did not embellish anything, did not smooth it out.

According to A. S. Pushkin, Krylov, "having enriched the Russian language with winged, witty figurative expressions, comparisons, managed to surpass all the famous fabulists" [3]. In them, he showed that the main thing in life – hard work, modesty, diligence, honesty, intelligence and courage will be higher than ignorance and cowardice.

The language of Ivan Andreevich is very close to the folk speech [2, p. 64], since the writer inserted proverbs and sayings into his fables that completely merged with the general tone of the fable. It is also remarkable that Krylov's own poems, which are easily remembered, have themselves become proverbs that have entered the popular speech.

All his life Krylov used the" Aesopian " language, he was not afraid that the people would not understand him. He spoke the language of the people, who themselves express the truth with a proverb, a saying, a hint. Eg: "Grabbing a sash and a hat in an armful" ("Demyanova's ear") [7, p.118], "What thieves get away with, thieves are beaten for it" (" Raven") [7, p.58], "You are to blame for the fact that I want to eat" ("Wolf and Lamb") [7, p.20], "And you, friends, no matter how you sit down, all are not fit for musicians!" ("Quartet") [7, p.93], as well as well-

known proverbs were included in his works "What you sow, then reap" ("Wolf and Cat"), "There is no animal stronger than a cat" ("Mouse and Rat") [7, p.119], "Let's look for a ford better than we go to the bridge" ("Liar") [7, p. 47], "A pity that you are not familiar with our rooster" ("Donkey and Nightingale") [7, p. 60], "Let the donkey's hooves know" ("The Fox and the Donkey"), "God save us from such judges!" ("The Donkey and the Nightingale") [7, p. 60], "It's better to drink, but understand the matter" ("Musicians") [7, p. 6].

Krylov disguised himself not only in his literary work, but also in life. He himself spread jokes about his laziness and carelessness. "Surprising with his laziness, he was able to surprise with his activity." Zhukovsky wrote about Krylov that he could be counted among the "skilled translators", which earned him the name of an original poet. The syllable of his fables is very light, clean and always pleasant [6, p. 411].

Krylov tells very freely and with simplicity, his flexible syllable touches us, describing a tender feeling, and also amuses us with some funny expression or turn. "His speech, submissive and obedient to thought, according to Gogol, flies like a fly ... and betrays its inexpressible spirituality" [8, p. 1097].

For so many years, the Krylov language has not become obsolete. It is still understandable to us and continues to surprise us with the accuracy [2, p. 64] of images, its metaphorical nature and brightness. The poet N. Aseev pointed out that "any fable of Krylov can reveal an outwardly imperceptible, extraordinary sound grace of speech, which combines the charm of sound with its expediency" [11, p. 95].

Each actor in the fable has a corresponding image and character. It seems that the reader is mentally present at this action described by the author [6, p. 411].

The language of Krylov's fables as "semantic staples" (V. V. Vinogradov's expression) includes numerous proverbs, sayings, formulas of folk phraseology that give the fable speech a sense of its true nationality: "The family is not without a freak" ("An elephant in the voivodeship") [7, p. 59], "Though he sees an eye, but he does not have a tooth" ("A Fox and Grapes") "Out of the fire and into the fire" ("A Mistress and two Maids").... [11, p. 99-100].

The proverb became the source for many of Krylov's fables, the structural beginning, in which the fable plot is contained in the potency, not to mention the richness of humor, verbal colors that have passed into the fable from the proverbs [11, p.32]. For example: "Don't spit in the well – it will be useful to drink water" [11] echoes the plot and the moral of the fable "The Lion and the Mouse". The fable "The Moth and the Swallow" originated from the proverb "One swallow does not make spring" [11], the fable "The Shepherd" - from the proverb "Glory to the wolf, but Savva steals sheep" [11]. We will also point out the close connection of such fables as "The Poor Rich Man", "The Miser", with folk proverbs about

avarice, which prompted Krylov to choose a fable plot.

In Krylov's works, the naked truth of life triumphs, his poetry carries so much in itself. She is highly intelligent, insightful, and all-seeing [1, p. 14].

Krylov opened access to the literature of the Russian folk speech, there was a merger of the literary language with the folk language. As a result, the literary language was liberated and further developed. Many phrases from his fables have entered the Russian language on the rights of sayings: ("And the casket just opened..." ("Casket") [7, p. 8], "But only the cart is still there..." ("Swan, pike and crab") [7, p. 97], "Ah, Moska! She is strong enough to know that she barks at an Elephant" ("An elephant and a Pug") [7, p.66], "And Vaska listens and eats" ("A Cat and a Cook") [7, p.71], "I didn't notice an elephant" ("Curious") [7, p.110], "An obliging fool is more dangerous than an enemy" ("A Hermit and a Bear") [7, p.105], "It's not better to work for yourself, kuma, turn around" ("The Mirror and the Monkey") [11].

As a classicist, Krylov believed that the vices of humanity should be eradicated with laughter, so greed, ignorance, stupidity are ridiculed in his works. "It is not easy to find a Russian person in whom there would not be a property to laugh at something" [2 p. 65]. Krylov expressed very broadly and fully only one side of the Russian spirit [2, p. 68], its common, practical sense, its experienced worldly wisdom, its simple-minded and evil irony [11, p.23]. Irony is the main satirical weapon of the fabulist. A. Nikitenko wrote: "This calm, sly and at the same time good-natured irony [2, p.65] resulted in the form of the national spirit [11, p. 82-83]. The works of I. A. Krylov are not just fables – "this is a story, a comedy, a humorous essay, an evil satire" [3].

The proverbs show very fully and vividly the humor of the Russian people, their idea of life, moral sense, the maximum expressiveness and semantic generalization is achieved, which makes them very close to the fable. Gogol, considering "our proverbs are more significant than the proverbs of all other peoples" [2, p.64], wrote that Krylov "traces his origin from Russian proverbs" [11, p. 31].

Belinsky V. G. argued that it is not even worth "talking about the great importance of Krylov's fables for the upbringing of children" [3]. It seems that the images and winged lines of his fables, " without growing old and without losing their satirical sharpness, accompany us, somehow imprinted in our consciousness. His intelligent animals with their completely human thoughts, actions, judgments, which have entered into our life by themselves, have retained all their meaning of colorful folk formulas, they help to express a thought briefly and clearly" [11, p.111].

Krylov's fables are a world of living ideas and images, the richness of their content is inexhaustible. In them, "Russian common sense triumphs – it is nothing but the high intelligence of the people" [1, p. 11]. In Krylov, the "Russian mind"

was personified and expressed in his creations [2, p.64]. No wonder Gogol wrote about Krylov that this is "the same mind that is akin to the mind of our proverbs" [8, p.1095]. Grot Ya. K. added that the fable is meaningful not as a fable, but as a creation in which the mind and experienced wisdom of an entire people were artistically embodied" [10, p. 87].

Krylov managed to reflect the correct tact of the Russian mind [2, p. 64], to express the true essence of every matter without offending anyone, a tact that we lost among our secular education [8, p. 1104]. Behind the fabled images of Krylov was the collective wisdom, the centuries-old accumulated experience that express the views of the people. This was reflected both in the very nature of the fable's morality, in the folk wisdom [2, p. 65] that underlies the fable, and in their artistic originality, in the "picturesque way" of expression [11].

Belinsky V. G. believed that "a genuine work of art cannot be retold, since it cannot be retold, like Krylov's fables, because these are works of art in the highest sense of the word" [1, p.33].

Krylov remained at the "height of his satirical vocation" [1, p. 43]. His fables, which have not lost their relevance even today, help us to overcome the shortcomings of people: envy, ignorance, ingratitude, betrayal, laziness, hypocrisy, teach us to be honest, modest, hardworking. It does not seem strange to us his early passion for literature, which never burned in him, but always burned with a quiet and even flame [3, p.19]. And it is not for nothing that Gogol noted that " the poet and the sage merged together in him. None of the poets has managed to make his thought so tangible and express himself so accessible to everyone as Krylov" [11, p. 1096].

Many people in Krylov want to see a fabulist, unlike them, we see something more in him [3, p. 9]. And if Krylov had appeared in our time, he would have been "the creator of Russian comedy" [11]. Probably, Krylov would not have been a great folk writer if he had stopped there. Ivan Krylov went his own way, paving the way for others. His fables, imaginative and at the same time simple in form and language, have an impact on the emotional sphere of children, they are very easily perceived by them. By the power of the artistic word, they are brought up with high moral qualities, have a great educational value on them, and therefore they have acquired such a huge success and world significance. In fact, he was a great worker" [3, p. 19].

We are surprised by the brevity and imagery of a very easy, memorable language that is impossible to forget. The language of his fables became an example for A. S. Pushkin, A. S. Griboyedov, N. V. Gogol, N. A. Nekrasov, as well as the great satirist Saltykov - Shchedrin, who in his satire preserved the traditions of Krylov, resurrecting his fabled heroes in his "fairy tales" [11, p.110].

Krylov's fables are still alive today, they did not die with him. The verses of his

fables, which have become proverbs, still help us today in all life situations. V. G. Belinsky's words that Krylov would be read by "the whole Russian people" turned out to be prophetic, therefore, we are not surprised at the number of his readers, which is constantly increasing [11, p. 5].

Today, he is known far and beyond the borders of the country. His fables, translated into many European languages during the writer's lifetime, are heard in more than fifty languages of the world. Krylov died, having fully justified his vocation, having enjoyed the deserved glory. Death for him was not a misfortune, but a calm, perhaps long-desired... [3, p. 30].

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EPIC FORMULA AND FORMULIC LANGUAGE AND STYLE¹

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Abstract. The present study examines the formula and formal style in the oral tradition of Kazakh heroic singers of the 15th-18th centuries, notes the productivity of Perry-Lord's oral theory.

The main goal of the article is to reveal the significance of the Parry-Lord oral theory for scientific developments by young scientists of Kazakhstan in the field of epic studies and folklore studies, linguistics and literary studies, etc.

Keywords: formula, Perry-Lord's oral theory, formula style, zhyr.

When we ask ourselves what oral theory or oral tradition is, we inevitably turn to folklore, to oral folk art and, of course, to the epic, the greatest of the poetic arts. The Kazakh, Nogai, Crimean Tatar, Kumyk ancient epic tradition is based on two types of art – musical and verbal, which have been dominant among other types of art for hundreds of centuries.

There are five main types of mastering aesthetic reality by a person, from which national and universal culture grow. These are: auditory - the culture of hearing, oral-the culture of speech, visual-the culture of visual perception, tactilethe culture of doing, working with a thing, meditative-the culture of contemplation. Visual culture most of all characterizes the folk traditions of Europe, known

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for their sculpture, architecture, painting, etc. The meditative culture most of all characterizes the Eastern classical traditions, known for rich spiritual teachings and the arts of contemplation and imitation of nature. Kazakh and Turkic steppe culture in general is represented mainly by auditory-oral art, despite the fact that visual and tactile traditions are developed quite highly in it. Such a high art is considered the art of ornament, the art of decorating the Kazakh yurt, jewelry works of steppe masters, etc. The high art of nomad architecture is confirmed by the Memorial Complex in honor of the ancient Turkic kagan and commander Kul-tegin. Thus, the oral-auditory type was the predominant type of aesthetic development of the nomads ' reality. It presupposes the dominance of musical and verbal art over all other types of arts, the tradition of transmission and continuity of Steppe knowledge by oral and musical means. This is the oral tradition, or Oral Tradicion, as it was characterized by M. Parry and A. B. Lord, the authors of the oral theory. The outstanding orientalist G. N. Potanin, describing this type of culture of the Kazakh nomads, admiringly noted: "The whole steppe sings!". We are talking about the ubiquitous and most irreplaceable musical and verbal art for nomads, about the epic, or as Auezkhan Kodar designated it, total oral discourse. Oral theory, or Oral Tradicion is a term used to study the specific mechanisms of oral transmission of traditional Steppe knowledge, from the point of view of linguistics, cultural conditions and literary genre, an important part of this Steppe knowledge is the epic.

But the epic itself (zhyr) – the world, a representation structured in a special way from artistic images and cultural and linguistic phenomena - is a consequence of a centuries-old oral tradition. For example, the researcher of the ancient Turkic epic I. V. Stebleva convincingly connects the Orkhon poems with the Kyrgyz warrior epic, and the Yenisei monuments with the folklore – song and ritual tradition, that is, the methods of performing, memorizing, recreating, and continuity of the text. The epic itself acts as a hyperformula of poetic art, consisting of traditional images, permanent (stable) means of artistic expression and depiction, stylistically homogeneous structures, different types of repetitions, etc. All this makes up the so-called formula style of an oral work, or the singer's oral-style technique. The authors of this oral theory were M. Parry and A. B. Lord, who derived the epic style from the poetic technique of an oral work and who "did not doubt the mythological origin of the content of epic formulas" (E. M. Meletinsky). They show that the unit of an epic oral text is always a formula that carries special ideas ("themes") of a mythological, sacred order.

As applied to the Turkic (Kazakh) oral tradition, the formula is a word, or a stable combination of words, a combination of the same linguistic phenomena in the rigid structure of zhyr, a poetic epic meter of 7-8 syllables:

1	3	3
Jel,	jel eser,	jel eser
Or,	Or ,	Or qoian
Men,	men edim,	men edim

or:

2	2	3
Asqar,	asqar,	asqar tau
Sere,	sere,	Sere qar

This syllable structure is very easy to remember and reproduce. Researchers Z. Akhmetov and M. O. Auezov write about this. Such a structure – zhyr – is very convenient for expressing any concept, idea. This is the basis of every Turkic epic formula and epic work. All the Turkic (Kazakh) epics known to us consist of zhyr-this poetic size, therefore the poems themselves are called zhyrs, and the singers who perform them are called zhyrau. In the performance of these zhyrs, the singers are helped by a special oral-stylistic technique, or formularity. As a linguistic universal and as a phenomenon of the oral-poetic language, it is of particular interest to researchers, it is characteristic of all genres of oral creativity, for many multilingual epic monuments.

Following M. Parry and A. Lord, such outstanding scientists as E. M. Meletinsky, V. M. Zhirmunsky, B. N. Putilov, P. A. Grinzer, I. Stahl, etc. turned to the study of formularity in the epic text.

The theory of the formularity of the epic text is well covered in the works of B. Sh.Abylkasimov, Zh. Zh. Bekturov, Sh. Ibraev. In Turkology, V. V. Radlov, M. O. Auezov, A. H. Margulan and I. V. Stebleva first spoke about the formula and about the formularity. The author of the oral theory himself, M. Parry, defined the formula as "a group of words regularly used in the same metric conditions to express some necessary concept". The formula, in his opinion, is the main structural unit of the text, and "oral poetry as a whole has a formulaic character".

Each oral tradition known to us (akyns, zhyrau, saly, sary, bucks) and each oral genre have their own strictly defined, clearly characterizing, limited set of formulas.

The method of comparative analysis of formulas of oral-poetic texts reveals: traditional schemes of formulas, their variants, the degree of their "density" and prevalence among different authors and in multilingual epics, "flexibility", the variability of the formula depending on the peculiarities of the language, national tradition, the manner of performing the singer's text.

When comparing oral and poetic works of different peoples, the functional purpose and stylistic role of formulas, the commonality and difference of stylistic techniques of epic works are revealed. This, in turn, makes it possible to more fully represent the national identity of multi-ethnic folklore monuments.

After a comprehensive study of the oral-stylistic technique in the poetry of Zhyrau of the XV-XVIII centuries, the question naturally arises: is it possible to apply the terms "formula", "formula style", "formula grammar" to the ancient Turkic runic monuments? Is it possible for the structure of runic poems to identify those verbal expressions, the use of which would be associated with their rhythmic organization? Indicative in this respect are the location of numerals, adjectives that make up epithet blocks (members, binomials, trinomials in the epic line of zhyrau.

Kazakh scientists have also been influenced by the oral theory of Parry-Lord. The researcher B. Sh. Abylkasimov spoke about the formula and the formula style in the poetry of Zhyrau for the first time, who still did not differentiate the oral genres, as well as various carriers of the Kazakh poetic culture, which is of fundamental importance for understanding the original nature of the masters of epic art and solving the problems of authorship, around which discussions do not cease.

M. O. Auezov and O. A. Nurmagambetova were among the first to mention the formula in the epic, about the connection of the epic with the poetic form and folklore genres.

Deep knowledge of the theory of Parry-Lord is demonstrated by Zh. Zh. Bekturov, who studied the problems of semantics of the oral individual culture of the Kazakh people and the lexical and figurative-semantic fund of monuments of Kazakh poetry of the XV-XVIII centuries.

Of particular importance for the study of the Turkic (Kazakh) book epic are the works of Sh. Ibraev, who for the first time studied the formulaic language and style of the oldest Turkic monuments.

In the field of Turkology, it is necessary to note the works of I. V. Stebleva, who discovered the folklore connections of the ancient Turkic runic monuments with the druzhin epic and with the folk tradition. Of course, we also see real practical benefits from the formula theory in various fields of research: in Turkology and dialectology, pedagogy and psychology. At one time, E. M. Meletinsky conducted an analytical analysis of the most famous schools in Europe in the aspect of the theory of the origin of the epic: mythological (A. Kuhn, M. Muller), neo-mythological (Sh. Otran, E. Miro, R. Kerpenter), ritual and mythological (F. Raglan, Jan de Vries, J. Dumezil, G. R. Levy), the theory of oral-stylistic technique (M. Parry, A. B. Lord), psychoanalytic (J. Vedier, K. Jung, Z. Freud, S. Baudouin) and historical (K. and M. Chadwicki, Baura, K. Weiss). Today, the theory of oral-stylistic technique has justified itself in the field of poetic translation and the genesis of genres.

A formula is a combination or synthesis of a number of specific cultural cliches (stable words or word combinations) and more universal narrative forms or archetypes. An epic anaphoric formula is a formula that exactly repeats the previous scheme Margaska-Makhambet, Yeset bi-Makhambet, etc:

Jel, jel eser, jel eser.	Jel, jel eser, jel eser.
Jel astynda qarasam	Jel astynda qarasam
Shalkiyiz, XVI.	Zhiyembet, XVII.
Ket-Bugadaı bılerden	Ket-Bugadaı bılerden
Keńes surar kún gaida	Keńes surar kún gaıda
Dospambet XVI	Makhambet, XIX.
Kúmbir, kúmbir kisinetip	Kúmbir, kúmbir kisinetip
Kúreńdi miner kún gaida	Kúreńdi miner kún galda
Dospambet, XVI.	Akhtamberdy, XVII.
Asqar, asqar, asqar taý,	Asqar, asqar, asqar taý,
Asqar taýdyń so búrkit	Asqar taýdyń so búrkit
Yldıdyń ańyn shalar ma?	Yldıdyń ańyn shalar ma?
Shalkiyiz, XVI.	Makhambet, XIX.

Formality refers to the universal properties of the poetic language of folklore. Formality is a linguistic universal. Formality as a phenomenon of oral and poetic language is of considerable interest, since it is characteristic of all genres of folklore, for many multilingual epic monuments. TV channels: "Alpamys batyr":

Keshegi ótken zamanda			
Qaraqypshaq			
Qoblandy			
Atasy munyń Toqtarbaı–			
Halyqtyń asqan boldy			
baı			

The theory of the formularity of the epic text was developed by the American scientist M. Parry, whose teaching was developed by Prof. Albert Lord of Harvard University. The merit of M. Parry is primarily that they gave the definition of a formula as "a group of words regularly used in the same metric conditions to express some necessary concept". The formula is the main structural unit of the text, and oral poetry as a whole has a formula character: kyzyl til, asyl tas, askar tau, asyl soz, sary bal. For example, each epic tradition has its own strictly defined,

limited set of formulas. Therefore, when analyzing the linguistic phenomena of folklore, we will inevitably face the problem of typological universals: Compare the texts of Asan Kaiga and the texts of Birzhan-sala, the texts of Bukhara and the texts of Akhan-seri.

A comparative analysis of the formulas of oral-poetic works will reveal the traditional schemes of formulas, their variants, the degree of prevalence in multilingual epics, will allow us to consider the variability of the formula depending on the peculiarities of the language, national tradition, the manner of performance of the text by the narrator. When comparing oral and poetic works of different peoples, the functional purpose and stylistic role of formulas, the commonality and difference of stylistic techniques of epic works are revealed. This, in turn, makes it possible to more fully represent the national identity

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ALANS DURING THE PERIOD OF THE GOLDEN HORDE OF THE XIII-XIV CENTURIES

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Abstract. The article is devoted to the region of the North-West and Central Caucasus during the period of the arrival of the Mongols in the Caucasus and the finding of the Alans under the leadership of the Golden Horde of the XIII-XIV centuries. A number of Mongolian, Arab-Persian and Russian sources are analyzed. It is emphasized that some of the Alans did not submit to the Mongols, which forced the Mongols to pay special attention to them. An assumption is made about the presence of a Mongol-speaking ethnic element in Alania, which later assimilated into the Alan environment.

Keywords: Alans, Caucasus, Golden Horde, Mongols, springs, sledges.

Northwestern and Central Caucasus in the XIII-XIV centuries were a mosaic in ethnographic terms, the peoples living here were at different levels of development of socio-ecological relations. The most numerous of them were the Iranianspeaking Alans, they are also "Aesir" or "Asu" in Chinese sources of the Mongol era, "YAesir" of Arab and European chronicles, who by this time had created early state formations in the mountains and foothills of the region.

The Mongol warriors Jebe and Subedei, having overcome the Main Caucasian ridge, invaded the Alanian borders. As evidenced by Muslim - Arab-Persian sources and the Chinese dynastic history of "Yuan-shi" [1. p. 132.]. It is known that some of the aces who did not submit to the Mongols, when the next wave of the Mongol invasion swept over, ending with the capture of Kiev, namely, 3 thousand families, together with 40 thousand Polovtsians of Khan Kotyan, retreated to Hungary, where they began to serve the Hungarian kings and became known as the Yaesir, which retained their language until the XVIII century and are now an ethnographic group of the Hungarian people. Some of the Alans acted differently, as evidenced by the biography of Asatachi, who served the Mongols, placed in the "Yuan-shi", whose father Kanguz (Hanhus in Chinese. -Auth.), The head of one of the state formations of the Aesir during the Mongol invasion voluntarily transferred to Mongol citizenship, for which the great Khan Ogedei left him the owner of his lands, awarded him the honorary title Badur (bogatyr, batyr, hero. - Auth.) and paitsza - the state symbol of the Mongol Empire, confirming his authority. Kanguz formed a thousand aces warriors to participate in the Mongol campaigns and put his son Atachi at the head of them [2. p. 177.] Famous at the court of the great Mongol khans was the family of Asa Yuvashi, whose father Yanbadur (Elibadur in Chinese. - Auth.) Submitted to the Mongols together with the ruler of the Aesir Kanguz. [1. p. 275.] Aesir who lived in China during the Yuan era - the period of Mongol rule, were mainly soldiers of the imperial guard of the great Mongol khans - emperors of the Yuan Empire - the Mongol state in East Asia. [3. p. 144.] In 1335, the Aesir secured the ascension to the throne of the last Mongol emperor in China, Togon-Temur, suppressing the conspiracy of the Kipchak (Turkic) units of the imperial guard. In 1336 Toghon Temur sent a representative Yuan embassy to Western Europe, arriving in May 1338 in the city of Avignon in France. It is interesting that among the main officials of this mission were As Tohai and Western Europeans André Frank, William Nassio, who served the Mongols in China, and there was not a single Mongol or Chinese. [5. p. 155.]

The Arab chronicler Al-Omari, the author of the first half of the XIV century, points to the "appearance of Islam" among the Circassians and Alan Aesir. In turn, Russian authors report: "It is known that these peoples have their residence in the Caucasus mountains and are divided into many possessions under different names. Bravery, contempt for death, military exploits and the acquisition of self-interest by force of arms impute to themselves an honor and are not subject to any strong to the sovereign... Their dwellings are located in inaccessible places, and their characteristic courage protected them from conquest by alien peoples... "[4, p. 145.] G. de Rubruck noted: "Having left... from Saray... and heading south, we got... to the Alans mountains... Alans on these mountains are still not conquered, so that out of every ten people of Sartakh (son of Batu Khan and heir to the throne of the Golden Horde. - Auth.) Two were to guard the mountain gorges so that these Alans would not leave the mountains to abduct their herds on the plain that stretches between the possessions of Sartakh, Alans and the Iron Gates (Derbent. - Auth.)... so that the Tatars who lived at the foot Alans mountains, it was necessary to give us 20 people to accompany us..."[7. p. 128.]

From which it follows that due to the attack of the Alans on the nearby Golden Horde possessions, the Mongols had to set up guards. This information, which reflects the situation in Alania in the middle of the XIII century, when the Mongol garrisons were stationed in fortresses at the exits from the mountains, are amazingly accurately reproduced in the folklore of the descendants of the Aesir-Alans - the Ossetian epic "Narts". It turned out that the names of the rulers of the Golden Horde were deposited in the "Nartiada" - the khans of Sainag-aldar (that is, Sainkhan, the "glorious khan", Batu-khan, Batu of the ancient Russian chronicles), Berke, the brother of Batu-khan, who deprived his nephew of the throne Sartakh, and Temnik Nogai [8. p. 104.]

According to the epic, the enemy of the Narts, Balga-Berke, sits at the exit from the mountain gorges with his numerous troops and watches over the Nart youths who make sorties with the aim of driving herds into the mountains. Alans especially suffered from Berke, who "settled in Ossetia," when large masses of them were transported across the Main Caucasian ridge and entered the service of Khan Hulag, the ruler of the Mongol state in Iran, with whom the Golden Horde waged long wars. The epic "Narta" reflects the historical situation in the North-West and Central Caucasus of the era of the Mongol conquests, where anti-Mongol motives are clearly visible. In this respect, the figure of Khanzargas (Genghis Khan) - the enemy of the Narts, the rapist, the kidnapper of girls, is very indicative. [8. p. 106.] Probably, the Alans and Circassian communities of the North-West Caucasus felt quite autonomously and after the Mongol invasion, the power of the Mongol Empire, and then the Golden Horde in their region, apparently, was not strong, as evidenced by their way of life. Although the peoples of the Northwest became famous not only in the military field, but also as farmers and cattle breeders. According to Al-Omari, the Circassians and Yaesir are "residents of well-equipped, crowded cities, but wooded, fertile mountains. They have sown bread, flowing udders (i.e., livestock), rivers flowing and fruits are obtained..." [6. p. 303.]

Thus, some tribes of Alans and Circassians, who lived in the mountainous regions, inaccessible for the Mongolian troops, remained independent from the Dzhuchiev Ulus.

And in the second half of the XIII century, the Golden Horde khans continued to fight with them. If the North Caucasian steppes were completely in the power of the Golden Horde, then this cannot be said even about the foothills of the North-Western and Central Caucasus. It should be borne in mind that the North-West and Central Caucasus since the time of Batu Khan became part of the personal domain of the Golden Horde khans, and therefore the rulers of the Dzhuchiev Ulus had a special interest in pacifying the region. The duration of this struggle, which did not allow the Golden Horde to extend its power deep into the foothills, is evidenced by the campaign of the Golden Horde Khan Mengu-Timur in 1277 against the Yaesir (Alans), when their main city, Dedyakov, was taken and burned.

The campaign became known thanks to the participation in it of the ancient Russian princes, subject to the Golden Horde, **noted in the annals**. The Russian regi-

ments marched together with the darkness of Mengu-Timur. As a result, on February 8, 1277, Dedyakov fell, and the allies - the Horde and the Russians "were full of great self-interest" [9. p. 165.]

The situation of constant war in the North-West and Central Caucasus was caused not only by the constant raids of independent Alan and Circassian tribes from the mountainous regions and the uprisings of their fellow tribesmen, subject to the Golden Horde, but also by the fact that this region was bordering on the Ilkhans empire of the Hulaguids - a Mongol state with a center in Tabriz on the lands of Azerbaijan and which included Persia, Mesopotamia, Syria, part of Asia Minor and Afghanistan, with which Ulus Jochiyev waged continuous wars after the collapse of the world Mongolian state, directly affecting the North-Western and Central Caucasus, although the hostilities were conducted in the possessions Hulaguids - on the lands of Georgia and Azerbaijan. The Alans and Circassians could become allies of the Hulaguids operating in the rear of the Golden Horde troops, taking advantage of their withdrawal to the Transcaucasus, which aroused the fears of the authorities of the Dzhuchiev Ulus.

As for the degree of economic development of Alan society, it was sedentary, and there was a tendency for the evolution of their settlements into cities, as mentioned above by Al-Omari. Evidence of the rudiments of urban culture among the Alans and Circassians is the existence of a large number of their settled settlements in the North-Western and Central Caucasus in the XI-XII centuries, the life of most of which was interrupted by the Mongol invasion, preventing them from turning into developed cities. In the Golden Horde era, small but numerous settlements were replaced by several rapidly developing large cities, which quickly became prominent craft and trade centers.

In general, the North-West and Central Caucasus represented one of the important economic regions of the Golden Horde and the scale of its participation in international trade at that time is a clear evidence of this.

But natives of the North-West and Central Caucasus in the Golden Horde era lived not only in their homeland, as already mentioned above. Involved in the Mongol conquests, of which they both involuntarily became victims and participants, many of them ended up in different countries conquered by the Mongols - from Hungary to China. In China alone, at different times in the XIII-XIV centuries, 10 thousand Aesir served in the elite units of the guard for the great Mongol khans, not counting their family members. Aesir made up the personal guard of the Mongol rulers there [9. p. 199.] The Aesir took an active part in the Mongol campaigns against China, where they suffered heavy losses in battles. The Aesir-Alans also served and lived in the Juchi Ulus outside their native mountains, where they are mentioned among 62 main tribes and peoples, in the overwhelming majority of Mongolian and Turkic origin, who constituted the main military forces and support

of the Golden Horde throughout its history. [10. p. 361.] Although Al-Omari notes that "the emergence of Islam in these peoples", not only among the Aesir, but also among the Circassians. It is known about the Alanian communities in the subservient of Ulus Jochi Crimea, in particular in the city of Stary Krym - Solkhat. [11. p. 194.]

During the wars of the Golden Horde with Timur, which were mainly fought on the lands subject to it, the North-West and Central Caucasus experienced an invasion of his troops. Timur's warriors under the command of Mirza Mohammed Sultan, Mirza Miranshah and Emir Jehan Shah moved from Azak (Azov – Auth.) to the Kuban. The Circassians resorted to the "scorched earth" tactics, "burned the meadows between Azak and Kuban," depriving Timur's army of food, since the herds of cattle accompanying him fell from lack of food. However, despite the hardships and losses, Timur's warriors "robbed the Circassian ulus, seized a lot of booty... returning safely..." [13. p. 105.]

During the campaign, his soldiers cleared the forest and paved a road that allowed him to climb Elbrus. It is interesting to note that Timur was the first to use such a method as deforestation for tactical purposes in the war with the Caucasian mountaineers in order to deprive the highlanders of their natural habitat. "In the mountain fortifications and defended gorges, he had many clashes with the enemies of the faith and in all matters (his) army... won a victory, many of those infidels (Aesir-Auth.), Betraying them to the sword..., ravaged their fortresses, and by the grace of fate for the victorious army there was a countless booty from the property of the infidels. Returning victoriously from there... with countless booty, (Timur) stopped in the highest horde... "[12. p. 142.].

After the inclusion of the Northwestern and Central Caucasus, the Black Sea steppe region into the Jochiev Ulus, greater political stability is noted on its lands than in previous eras. In addition, the absence of spatial barriers and borders within this vast Eurasian empire, which existed for about three centuries, over the course of the life of five to six generations, made it possible to bring together the peoples who fell under the rule of the Golden Horde. The cultures of the Caucasian peoples for a long time were formed and developed in a single system of ties with the civilizations of other peoples of the Golden Horde, both steppe - Mongols, Turks, and sedentary - Eastern Slavs, Finno-Ugrians, Iranians, Greeks, Italians, which brought them closer and led to unification into united multinational states like the Golden Horde. Moreover, in the history of the peoples of the North-West and Central Caucasus, this was the first experience in their history of a centuries-old hostel as a part of the world empire, and, in contrast to subsequent times, during all the wars with the Mongols and their Golden Horde successors, it did not put these peoples on the edge of extermination and existence as ethnic groups in their historical lands. But this does not exhaust the consequences of the Golden Horde era for the peoples of the North-West and Central Caucasus.

Thus, the long-term and intensive historical contacts of the peoples of the North-West and Central Caucasus with the Mongolian and Turkic steppe tribes, both in this region and beyond, objectively created conditions for cultural mutual influences. For example, they can be judged by the data of the descendants of the Ases-Alans - Ossetians, in whose vocabulary there is a noticeable amount of borrowings from the Mongolian language, in particular in vocabulary, toponymy and family nomenclature, which makes us assume that there is a Mongol-speaking ethnic element in Alania, which may have assimilated into the Alanian environment. The contacts of the Alans and the steppe conquerors in the Mongol era found a relief reflection in the content and structure of the Ossetian Nart epic.

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ABOUT THE FORMATION OF KAZAKH-TURKISH CULTURAL COOPERATION AT THE TURN OF THE CENTURY

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Abstract. This article is devoted to the formation of cooperation between Kazakhstan and Turkey in the field of culture. It is noted that the beginning of cooperation was laid in the 1990s and continues to the present. It is emphasized that the types of cooperation are of a different nature: from festivals, exhibitions, book editions to joint study of the historical and cultural heritage of the Turkic world.

Keywords: Turkey, Kazakhstan, culture, cooperation, creativity.

As you know, the development of bilateral relations between Turkey and Kazakhstan began from the moment Kazakhstan declared its independence. Over the past years of cooperation between the two states, bilateral agreements have been signed, primarily in the spheres of trade, economics and politics. Significant progress has been made in the implementation of these agreements. It is obvious that for closer cooperation - and especially between the two fraternal peoples only trade and political contacts are not enough. It is necessary to develop and strengthen based on the dialogue of cultures, the dialogue of literature and art [1]. Relations between Turkey and Kazakhstan in the field of culture are based on a number of international legal documents. In the spring of 1992, the Prime Minister of the Republic of Turkey (RT) Suleiman Demirel paid a visit to Kazakhstan, and an Agreement on cooperation in the field of culture, science, education and sports was signed between the governments of the two states. The parties agreed to promote the development of relations in the field of theater, music, opera, ballet and other arts, as well as the establishment of joint activities in these areas and the organization of mutual visits. [2] In the Treaty of Friendship and Cooperation between the Republic of Kazakhstan (RK) and the Republic of Turkey dated October 17, 1994 in Art. 7 indicated that the parties will promote direct cooperation in the field of art and culture and provide the necessary assistance in the opening of cultural centers of the two countries. [3. p. 46.] The protocol on cultural cooperation between the Ministry of Cultures of the Republic of Kazakhstan and the Ministry of Culture of the Republic of Turkey was signed in Istanbul on September 22, 1996. In it, the parties confirmed their intentions to create favorable conditions for strengthening cultural ties, as well as for protecting objects of historical and cultural heritage, amateur performances of folk art, folk art and other cultural activities. An important step of the Turkish Republic was the publication of a joint Turkish-Kazakh newspaper. It began to be published in Kazakhstan in January 1992. Its publication aimed at comprehensive coverage of the life of the two countries, and was aimed at strengthening business and cultural cooperation, expanding information exchange between the Republic of Turkey and Kazakhstan [4]. In April 1992, Ankara began regularly broadcasting TV programs to Azerbaijan and Central Asia. All expenses for the organization of broadcasting and communication were borne by the Republic of Turkey. The state pays great attention to public cultural organizations. Turkey and Kazakhstan took and actively participated in the work of the International Organization for Turkic Culture and Art - "TURK-SOY". The beginning of its activity was laid in the spring of 1992 in Istanbul, when the first meeting of the ministers of culture of the Turkic-speaking countries was held. The highest governing body is the Council of Ministers of Culture of the Turkic-speaking countries. The purpose of creating "TURKSOY" is the creation of a new cultural space within the Turkic world, based on the idea of the real and the parity of related cultures of the Turkic-speaking peoples. Setting the task to be a kind of support for the spiritual rapprochement of the Turkic-speaking peoples. "TURKSOY" sets the tasks: to promote the protection and study of the cultural values of the Turkic peoples; to carry out regional leadership in the development of cultural ties between the Turkic-speaking countries in the field of culture and art; to provide all members of the Commonwealth with equal rights in the field of cultural cooperation, regardless of the political orientation of their state structures. [5]

The activity of this organization testifies to its desire to play a unifying role for the Turkic-speaking regions. "TURKSOY" has become an organization capable of bringing peoples closer together through cultural cooperation. The agreement on the fundamentals and principles of "TURKSOY" activity was signed in Almaty on July 12, 1993. The Republic of Kazakhstan, the Azerbaijan Republic, the Kyrgyz Republic, the Republic of Turkmenistan, the Republic of Uzbekistan and the Turkish Republic became the participants of this organization. This document reflects the desire to unite the Turkic states: the parties, "striving for mutual understanding between the peoples of Turkic origin and speaking Turkic languages, taking into account the need for the development and prosperity of the culture and art of the Turkic peoples..." [6].
Turkey has a special role to play in case of equality of participants. In particular, the Executive Body-General Directorate "TURKSOY" (headquarters) in Ankara. Art. 7 stipulated that "funding for the activities of" TURKSOY "was carried out from the fund created by the Council of Ministers of Culture, and is formed from the contributions of the participating countries" [7] Since the establishment of the organization, a number of meetings were held at the level of the leaders of the Turkic-speaking states, a number of meetings of the Permanent Council of Ministers of Culture, during which issues of strengthening political, trade, economic, cultural and humanitarian relations between the countries were considered. In 1999, a group of Kazakh scientists, writers and public figures took part in the 4th Kurultai of friendship and cooperation of the Turkic-speaking states. Along with this, a scientific-practical conference "Study of the heritage of Korkyt-ata" was held, where the President of Turkey presented the well-known figures of the Turkic states with a certificate of the members of the Ataturk International Cultural Center. In Kazakhstan, such a certificate was received by the Kazakh poet Mukhtar Shakhanov [8. p. 137.].

Thanks to the support of "TURKSOY", large international events were also held, in which cultural and artistic figures of the Turkic-speaking states took part: music and theater festivals, exhibitions of fine and applied arts, competitions and anniversary celebrations dedicated to significant dates, publication of books and calendars. "TURKSOI" contributed to the holding of the congress of writers of the Turkic world, which took place in June 1993 in Ankara. It was attended by writers from Turkey and Kazakhstan. In the same year, with the support of "TURKSOY", an exhibition of folk applied art of the Turkic-speaking states was organized, which was held in Almaty with the participation of the Ministry of Culture of the Republic of Kazakhstan.

At the 1994 summit of the Turkic-speaking states, the proposal of the President of the Republic of Kazakhstan N.A.Nazarbayev on joint celebration of major anniversaries of outstanding figures of the Turkic world in the field of culture, sciences and art was accepted. The practical implementation of this proposal was the celebration of the 150th anniversary of Abay in Turkey. For this purpose, a commission was created, headed by the Ambassador of Kazakhstan K. Saudabayev and adviser to the President of Turkey K. Zeybek [9]. The events were quite largescale. As part of the week of Abai, collections of poems were published in Kazakh and Turkish languages. Lessons dedicated to Abay were held in Turkish schools. Meetings were held, programs dedicated to Abai were shown on television. And in order to emphasize the special significance of the creative heritage of the Kazakh poet, the Turkish side decided to name the school in Ankara after Abai.

"TURKSOY" continued to promote celebrations timed to the birthdays of Kazakh poets, organized in the Kazakh capital. Following Abay, in August 1996, celebrations were held in honor of the 150th anniversary of the birth of the Kazakh poet Zhambyl Zhabayev. A collection of the poet's poems was published specially for this date. Busts of Abai and Magzhan Zhumabaev appeared in the parks of Ankara [10]. Also, the works of Kazakh writers were translated into Turkish. In particular, Abai, Zhambyl, Magzhan Zhumabaev, and others. Turkey's attention to the joint celebration of memorable dates timed to coincide with the birthdays of Kazakhstani poets was a demonstration of Turkish interest in the culture of the young republic. These actions were intended to create a positive image of the Turkish Republic not only in the eyes of the Kazakh leadership, but also in the eyes of ordinary citizens of Kazakhstan. Among the works of Kazakh writers and poets translated into Turkish are the poems of the founders of Kazakh literature - Abai, his famous novel "Abai Zholy", Mukhtar Auezov and Zhambyl Zhabayev. M. Shakhanov "The Delusion of Civilization" - published by TDAV; O. Suleimenov "The Language of Writing"; A. Kekilbayuly "Pleiades"; M. Shakhanov "The cry of a hunter over the abyss".

The Days of Culture and Art of Turkey are held. During these events, it was emphasized that "only culture can become the basis of political stability, economic well-being and spiritual prosperity of any country" [11]. The visits of creative teams, held on a reciprocal basis, are aimed at strengthening friendship between peoples. Turkey, a country famous for its folklore, dance and music festivals, regularly invited Kazakhstani creative teams to take part in them. It is obvious that organizing such events is the best way to develop cultural ties. In accordance with the agreements reached between the Republic of Kazakhstan and Republic of Turkey, the Turkish government agreed to allocate 100 places in cultural educational institutions in specialties related to the cultural component of the state.

An important event in the Turkish-Kazakh relations was the work on the restoration of the historical and architectural complex: the mosque and the mausoleum of Khoja Akhmet Yassavi. This monument was erected at the end of the XIV century at the burial place of the great scientist, thinker, philosopher and leader of the Sufi order. Since that time, the mausoleum has become a national pantheon; great Kazakhstani khans, religious leaders and representatives of the nobility are buried in it. In addition, it is also a place of worship for Muslims all over the world, where many pilgrims come. The restoration project of the mausoleum began to be actively implemented after the arrival in December 1992. During a meeting at the Ministry of Culture, its head E. Rakhmadiev, the president of the firm E. Onal, and general director S. Polat signed an Agreement on the conservation, restoration and restoration of the greatest monuments of Muslim architecture in Kazakhstan - the mausoleum of H. A Yassavi. The Turkish National Assembly has allocated 54 million dollars for this purpose [12]. But on the way to the implementation of the project, certain difficulties arose. The restoration of this monument turned out to be a very difficult matter, during which the performers faced such problems as the lack of building materials, design principles and measurements of old architects, which were completely different from modern ones. The master restorers had to recreate the grandiose scale, magnificent forms and elegance of the interior decoration. Despite all the above points, the restoration work continued to be carried out. At the 27th session of UNESCO, the mausoleum of Khoja Ahmed Yassavi was included in the list of World Cultural Heritage, which undoubtedly emphasized the importance of the implementation of this project, both for Kazakhstan and for Turkey.

The opening of the monument in 2000 as part of the celebration of the 1500th anniversary of Turkestan. These days, the official visit of RT President A.N. Sezer to Kazakhstan. The presidents planted trees and took part in a scientific conference dedicated to H.A. Yassawi. Today, the Turkish Cultural Center has become an influential institution that helps the development of Turkish culture in Kazakhstan. A library has been opened, and Turkish language courses are in operation. Also here you could get all the information about Turkey and its tradition [13]. With the support of the Turkish side, the works of more than 35 Kazakhstanis have been translated into Turkish, including the works of N.A. Nazarbayev, Abay, Zhambyl, M. Zhumabaev, M. Auezov, O. Suleimenov, A. Kekilbaev, M. Shakhanov and others, in turn, the outstanding political figure N.K. Zeybek translated the book "Yassavi's Way" into the Kazakh language. The Kazakh Turkologist F. Ali, with the help of the Turkish Agency for Strengthening International Cooperation, published in a separate edition a book written by a Turkish scientist under the title "Foundations of Turkism". One of the last ones was the translation into Turkish of the book of the President of the Republic of Kazakhstan Nursultan Nazarbayev "In the Heart of Eurasia".

The "Weeks of Kazakhstan in Turkey" are held in Ankara, the Day of the Republic of Kazakhstan is celebrated. There are a photo exhibition, ethnographic expositions illustrated with books, film screenings, etc.

Thus, the holding of such permanent and large-scale events indicates that both Nur-Sultan and Ankara realized the need to maintain ties in this area at a certain level, since such contacts were able not only to maintain mutual interest between the peoples of the two countries, but further strengthen the developing economic and political relations between the two states.

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CSTO POTENTIAL IN THE CONTEXT OF RUSSIAN-KAZAKH RELATIONSHIPS

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Abstract. The article examines cooperation between Russia and Kazakhstan in the context of security, taking into account the existing potential of the CSTO. It is emphasized that both sides have a common point of view on key issues related to maintaining stability and peace. Emphasis is placed on the absence of disagreements between Russia and Kazakhstan in matters of regional and international security.

Keywords: Russian Federation, Republic of Kazakhstan, foreign policy, cooperation, CSTO

Since the establishment of diplomatic relations on October 22, 1992, Kazakhstan and Russia have been linked by long-term good-neighborly relations based on mutual understanding and mutually beneficial cooperation in all areas. Today, about 4,000 treaties and agreements are in force, which formed the basis of bilateral allied relations and integration ties. The fundamental documents are the Treaty of Friendship, Cooperation and Mutual Assistance (05.25.1992) [1], the Declaration of Eternal Friendship and Alliance, oriented to the XXI century (06.06.1998) [2] and the Treaty of Good Neighborliness and Alliance in XXI century (11.11.2013) [3]. Russia and Kazakhstan are successfully cooperating within the CIS, SCO, CICA, EAEU. Strong partnership relations between the two countries allow them to act as a united front in resolving various regional and global problems. In the scientific literature, many historical moments associated with the 1990s, the period of the formation of bilateral relations, have been investigated [4]. Scientific analysis of Kazakh-Russian relations in the field of security in the 2000s is interesting from the point of view of forecasting the prospects for bilateral relations. In this regard, the topic of the article is being updated.

In addition to the main interstate treaties, the Concept of the foreign policy of both countries formed the basis of the Kazakh-Russian cooperation in the field of

regional security. In the "Foreign Policy Concept of the Russian Federation", approved by the President of Russia V.V. Putin on November 30, 2016, along with the country's desire to ensure its security, participate in the preservation of peace, etc., speaks of the formation of a belt of good-neighborliness along the perimeter of the Russian borders [5]. Kazakhstan is just part of this perimeter, with a total length of 7591 km of common borders [6]. Continuous in the Kazakh-Russian relations is not only the border, but also friendly relations between the peoples of both countries. The common historical past, together the hardships and achievements experienced together give confidence that no obstacles, internal or external, are capable of destroying trust between the peoples of the Russian Federation.

The Russian Federation is one of the world powers, on whose foreign policy regional and global security depends. Realizing this, the Concept states that "Russia is fully aware of its special responsibility for maintaining security in the world both at the global and regional levels and is aimed at joint actions with all interested states in the interests of solving common problems" [5]. In a separate chapter of the Concept "Strengthening International Security", the goals of Russia on the consistent strengthening of international security and stability at the strategic and regional levels are shown. Regional priorities of the foreign policy of the Russian Federation consist in the development of bilateral and multilateral cooperation with the member states of the Commonwealth of Independent States (CIS) and further strengthening of the integration structures operating in the CIS space with Russian participation [5].

President K.K. Tokayev approved by his decree the Concept of Security of Kazakhstan on March 6, 2020 in the fifth chapter: Trends and vision of the development of foreign policy ", the priorities in the field of maintaining international peace and security are highlighted. The Foreign Policy Concept of the Republic of Kazakhstan calls the further development of allied relations with the Russian Federation as one of the main priorities in the field of regional and multilateral diplomacy; development of bilateral and multilateral interaction with the member states of the Commonwealth of Independent States in order to strengthen multilateral dialogue in the political, trade, economic and humanitarian fields, as well as in the field of security and countering new challenges and threats; activation of mutually beneficial relations with the leading European states outside the EU. Continuation of the course to expand cooperation with multilateral organizations in the field of politics and security in Europe and Eurasia - the Collective Security Treaty Organization, [7]. The foreign policy concepts of both countries once again prove that Russia and Kazakhstan occupy a priority place in each other's foreign policies.

The 1994 Military Cooperation Treaty, along with other treaties, coordinates

cooperation between Russia and Kazakhstan in ensuring national and regional security. In particular, Article 2 of the Agreement "On Military Cooperation" states the following: "In the event of a situation that threatens the security, independence or territorial integrity of one of the Parties, the Russian Federation and the Republic of Kazakhstan immediately hold consultations and take concrete actions to provide each other with the necessary assistance, including military, in accordance with international law, the bilateral Treaty of Friendship, Cooperation and Mutual Assistance of May 25, 1992 and the Collective Security Treaty of May 15, 1992" [8]. In general, both countries understand their responsible role in such a complex matter as confronting the threats and challenges of the modern world. Trust between countries is tested when actions are agreed to reduce threats to national security. In matters of security, there are no fundamental contradictions between Russia and Kazakhstan. Both countries understand that their national security is linked to regional security, which can only be achieved through joint efforts and on the basis of high confidence.

The XXI century has called into question the traditional security models associated with the bipolar system of international relations. Now mankind is faced with modern threats, which were the result of the transition of mankind to the informational stage of its development. The struggle for energy resources is escalating, separatist tendencies, religious extremism are escalating, and international terrorism is strengthening its positions. Understanding the complexity of resolving these threats and challenges, Kazakhstan and Russia call the security sphere one of the key areas in bilateral relations. "And now, after the activation of the Taliban movement (banned in Russia), it is worth paying close attention to this region again in order to find a way of a political settlement of the Afghan problem" [9.p.2083].

From the point of view of the national security of the Russian Federation and the Republic of Kazakhstan, stabilization of the situation in the post-Soviet space is of great importance. Kazakhstan and Russia are large states in the post-Soviet space and play a significant role in the activities of the CIS. Instability in the post-Soviet space, especially in the Central Asian region, forces the Russian Federation and the Republic of Kazakhstan to strengthen not only their national security, but also to unite to resolve the security problems of the rest of the CIS members. The relevance of considering cooperation between Russia and Kazakhstan in the field of regional security is dictated by the fact that in the XXI century it is no longer possible to confront one by one the new challenges that destabilize the situation in the Eurasian space. An important area of cooperation between Kazakhstan and Russia in the field of security is military-political cooperation, which became possible due to their similar views on national security problems and the leading role of both states in ensuring regional security. Therefore, it is natural to integrate the two states in the military-political sphere, which at one time led to the creation of the Collective Security Treaty Organization within the framework of the Commonwealth of Independent States. Nobody disputes the leading role of Russia and Kazakhstan in this organization.

CSTO plays a significant role in ensuring peace and security, in countering the threats of terrorism, extremism and separatism, in the fight against illegal production and drug trafficking in the post-Soviet states. The Russian Foreign Policy Concept writes about the role of CSTO in ensuring security: "Russia regards the Collective Security Treaty Organization (CSTO) as one of the most important elements of a modern security system in the post-Soviet space. Russia stands for the qualitative development of CSTO, its transformation into an authoritative multifunctional international organization capable of confronting modern challenges and threats in the context of the increasing impact of diverse global and regional factors in the CSTO area of responsibility and adjacent regions" [5]. CSTO begins its history with the Collective Security Treaty signed in 1992. In addition to the Russian Federation and the Republic of Kazakhstan, it was signed by Kyrgyzstan, Uzbekistan, Tajikistan, Armenia. A year later, Belarus, Azerbaijan and Georgia joined the Treaty. According to V.A. Chernov "The accession of Azerbaijan, Georgia and Belarus not only territorially expanded the zone of responsibility of the Treaty, but also gave the emerging structure new geopolitical dimensions. Three main directions of CST interests were identified - the western one, represented by the union of Belarus and Russia, the Caucasian and Central Asian"[10]. At the beginning of the XXI century, the question of the fight against international terrorism arose. The current situation in Afghanistan requires close attention of the CSTO to the Central Asian region.

As you know, the Treaty was expanded into the Collective Security Treaty Organization back in 2002. This transformation indicated that the CSTO is now positioning itself as an independent mechanism of international security without being tied to the CIS. At the moment, 6 out of 9 members remained in CSTO, since Azerbaijan, Georgia and Uzbekistan left it in 1999. Uzbekistan returned to the Organization in 2006, but withdrew again in 2012. In 2001, the Collective Security Council (CSC), as the supreme body of the CSTO, decided to create the Collective Rapid Deployment Forces (CRDF), and in 2009, as a result of deeper military-political integration, the Collective Rapid Reaction Forces (CRRF) were formed. As a result, military cooperation intensified - joint exercises and operations against crime began to be held annually. The CRRF also sets itself the task of combating drug trafficking, transnational organized crime, as well as conducting operations to eliminate the consequences of natural and man-made emergencies. November 28, 2019 President of Kazakhstan K-Zh. Tokayev at the session of the CSTO Collective Security Council in Bishkek, speaking about the position of the Republic of Kazakhstan on topical issues of the organization's activities,

said the following: "We intend to develop political cooperation within the CSTO, strengthen the organization's military potential and counter modern challenges and threats." K-Zh. Tokayev believes that the organization should be more bold to speak out with a more active position, "linking Europe and Asia into a single Eurasian security platform" and for this "proposed to work on the international reputation of CSTO." "We are not opposed to anyone, but on the contrary, we are ready for a mutually beneficial dialogue. It is important to promote this principle", said the President of Kazakhstan [11].

On March 11, 2020, CSTO Secretary General S. Zas met with V.V. Putin and reported on the plans of the CSTO. In particular, the organization plans to: expand the foreign policy activities of the CSTO and strengthen cooperation with international organizations; to carry out work on the practical inclusion of units of the CSTO Peacekeeping Forces in UN peacekeeping operations (for this, create a Base Center for the Training of Peacekeeping Units in accordance with UN standards); expand political cooperation with the countries of the world through inter-parliamentary ties (to date, such ties have been established with Serbia and Afghanistan); early approval of the Plan for the Development of Military Cooperation of the CSTO Member States for 2021-2025 and the Draft Anti-Drug Strategy of the CSTO Member States for 2021-2025 [12]. In our opinion, the successful implementation of promising measures will expand the powers of the CSTO in the fight against modern threats and give confidence to the CSTO member countries in the area of important points of national security. So, CSTO has a solid potential that can be used in the fight against both traditional external (international terrorism, illegal migration, drug trafficking) and new threats (inciting information wars, cyber attacks, threats to energy supplies, proliferation of weapons of mass destruction). Coordinated actions with regional and international integration associations will strengthen the position of the CSTO and lead to an increase in its practical importance in the field of security.

Interstate integration is viewed as a social institution that meets the collective needs of states and takes various organizational forms, in particular, meeting the needs of the Eurasian states of the post-Soviet space to pursue an independent policy and ensure their own security, which implies the expansion of ties within such structures as the CSTO and the SCO. The main threats to security in the Central Asian region remain: activities of extremist organizations aimed at destabilizing the situation in the countries of the region; the creation and operation of illegal armed groups; distribution and transportation of drugs, the growing influence of the drug mafia; illegal circulation of weapons, ammunition, explosives, etc.; socio-political instability in the countries of the region; the presence of hotbeds of military conflicts near the borders; the spread of the influence of international terrorist organizations, the strengthening of the position of religious extremism [12].

Thus, at the moment, the urgent tasks facing the CSTO are related to activities aimed at expanding the demand for the organization in maintaining stability and security in the CAR and around the world. In general, cooperation between Kazakhstan and Russia in the field of security, especially within the framework of the Collective Security Treaty Organization, will contribute to the joint struggle against modern threats and challenges.

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FEATURES OF THE ISMAILI COMMUNITY OF THE PAMIRS

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Abstract. This article is devoted to the formation of the Ismaili community in the Pamirs. It is noted that representatives of various confessions moved to the territory of the Pamirs in the course of the historical process. The importance of interaction of the Ismailis of Tajikistan with the Ismaili communities of neighboring Afghanistan is emphasized. Attention is drawn to the fact that it is necessary to rely on historical experience to resolve the current acute problems in the Central Asian region.

Keywords: Pamir, Central Asia, Ismailis, community, beliefs.

Currently, the Ismailis make up 80% of the population of the Gorno-Badakhshan Autonomous Region of Tajikistan [1. p. 74]. Their place of residence is a significant part of Afghan Badakhshan, such districts as Shugnan, Wakhan, Zebak, Yumgan, Jurm, Rushan, Kiran-Munjan and Darvaz. [11. p. 24]. At the moment, the Pamir is the only place where the Ismailis live compactly, and Tajikistan is the only country where the Ismailis make up the majority in the largest administrative entity. [12. p. 14]. The history of the development of Ismailism in the Pamirs is full of significant and turning events, as a result of which the unique characteristics of the Pamir community were formed, which differed in many respects from the inhabitants of the valley. [8. p. 91].

It should be noted that for a long time, up to the XI century, representatives of various faiths found shelter in the Pamirs: pagan, Zoroastrian, and Buddhist [3. p. 102]. The Pamir adjoins Central Asia through which the Silk Road passed and, accordingly, trade, as well as the interaction of cultures. In connection with the events taking place today, it is worth remembering that "the destinies of Afghanistan and Central Asia, the origins of the relationship of which originate in the depths of the centuries, are closely intertwined to this day". And, in this regard, the experience of the historical development of Afghanistan, both positive and negative, is very important for the peoples of Central Asia, which consists in avoiding

its fate and not becoming an arena of military confrontation and a clash of external forces with all the ensuing consequences... [9. p. 2083].

At the same time, the Pamir is the "roof of the world" where representatives of religious minorities who are hiding from persecution have found refuge. So, as a result, in the Middle Ages, more than 15 ethno-linguistic groups lived in the Pamirs, for whose interethnic communication Farsi was. The spread of Ismailism in the Pamirs began, in all likelihood, at the turn of the X-XI centuries and is mainly associated with Ismaili preachers called "**dai**" The main function of the dai was to explain the ideas of Ismailism to the local population. : during the reign of Emir Nasr II Samanid (914-943), the Ismailis achieved a prominent position at the court [7. p. 92].

Modern Ismailis associate the origin of Ismailism in the Pamirs with the name of the famous philosopher, scientist and writer Nasir Khusraw (1004-1070). In scientific circles, this belief is supported, although there is precise evidence that it is Nasir Khusraw who is considered the founder of the Ismaili tradition in Badakhshan, [6. p. 181.]. And today there are legends where his personality is given sacred meaning. So, until 1995, the main prayer of the Pamir Ismailis was called "Pir-i-Sho" (literally "Lord of the Lords") [7. p. 29]. Its authorship is attributed to Nasir Khusraw, and his name is mentioned along with the Imam. Significant geographical objects were also named after Nasir Khusrav, for example, the springs "Piri Shonosir Chakhma" (Shonosir - Shah Nasir). Stories about Nasir Khusraw are passed down from generation to generation, and in different villages his biography is supplemented with various myths and details [3. p. 5]. Much has survived from Nasir Khusraw in the traditional ritual of the Ismailis, for example, the traditional recitation of sacred verses in the house of one of the community members - "Maddohoni". The Pamir Ismailis maintained political autonomy until the XIX century. By 1841, the largest concentration of Ismailis around the world was in these areas: between the Hindu Kush and Pamir ranges. In the Tajik Pamir alone, by the beginning of the XX century, more than 14 thousand Ismailis lived in 97 villages [8. p. 91.].

From the second half of the XIX century, the Sunnis began to expand into the Pamirs, and two world powers appeared on the political arena: the British and Russian empires. In the 1890s, Russia occupied the Pamirs up to the Hindu Kush Range, and the possessions of the British crown expanded north of India. Both powers were interested in the Pamirs, as it is a strategic region bordering the key Asian civilizations of India, Western Asia (Iran and the Arab countries) and China, and is the intersection of trade and military routes. The "Great Game", which continued in the Pamirs during the entire second half of the XIX century, was formally completed with the signing in 1895 of the Treaty on the Division of Spheres of Influence in the Pamirs. The border between Russia and Afghanistan, which was in the sphere of interests of England, was the Panj River: the territories on the right bank retreated to Russia, and the lands on the left side became part of Afghanistan. From the point of view of political boundaries, the division according to a natural geographic feature (river or mountain ridge) seems to be strategically convenient. When dividing the Pamirs, however, the ethnocultural features of the region were completely ignored, since after the creation of state borders, such territories as Wakhan, Ishkashim, Goron, Shugnan and Roshan were literally "split" in half.

The Pyanj River did not become an obstacle for the Pamiris. Many families, having a house and arable land on the right bank, drove their livestock to the left. In addition, mutual trade operations took place jointly on one or the other side. The division into two states immediately affected the community: firstly, agriculture was hit; secondly, the formal closure of the border gave rise to and flourishing of smuggling and illegal trade operations, which continue to this day, and on a frightening scale [3. p. 14]. The illegal nature of trade exchanges in the Pamirs inevitably led to a sharp jump in prices even for essential goods, traditionally purchased from one side and the other: salt, rice, metals for the manufacture of agricultural products and dishes [13. p. 81]. All products bought by the Pamiris became difficult to access, since the Russian-Afghan border was officially considered closed. Here it is worth mentioning that trade contacts, although in a closed form, continued to be carried out: Russian and Afghan border guards in most cases ignored the facts of illegal border crossing for the purpose of peaceful trade [5. p. 76]. Yet, despite the partial preservation of trade and cultural ties, in 1895 the Ismailis of the Pamirs, representing a single ethno-confessional space, were divided into two different administrative units. The first became part of the Russian Empire, then Tajikistan, the other became part of Afghanistan. Nevertheless, the Ismailis of Tajikistan and Afghanistan continued to live side by side with each other, and the unity of historical destinies runs through the entire XX century.

The annexation of the territories on the right hand of Pyanj to the Russian Empire, despite the obvious negative aspects described above, still had certain positive consequences. Russia, taking the Pamir Ismailis under direct subordination, freed them from the oppression of the Sunni rulers of Bukhara and Afghanistan, who were constantly replacing each other [2. p. 82]. In 1905, the Pamir was removed from the general Turkestan rule and became a separate district, which was henceforth directly subordinate to the head of the Pamir detachment. The Ismailis were able to freely send zakat (religious tax) to Imam Aga Khan III in Bombay. In addition, the Russian authorities, given the strategic importance of the region, invested large sums in the development of the region's infrastructure, building and erecting roads and canals, the largest of which was the Pamir Highway, which still plays the role of the main transport artery of the Pamirs [14. p. 78].

The October Revolution and the coming of the Bolsheviks to power initially did not affect Badakhshan in any way. Having established Soviet power in Tajikistan, the local branches of the AUCP(b) party proclaimed freedom of religion in the Pamirs: "The beliefs and customs of Muslims, their national and cultural institutions are inviolable. Their rights are free and unhindered to build their lives". [6. p. 32]. Perhaps the freedom given to the Ismailis was due to the fact that the first leaders of Soviet Tajikistan were immigrants from the Pamirs. Another possible reason is the political loyalty of the Pamiris to the Russian government. Thus, the Central Executive Committee of the Turkestan Autonomous Soviet Socialist Republic declared in 1922 that the Ismailis "gravitate toward the Russians," and there is no need to talk about the danger of the separatist activities of the Badakhshans [11, p. 33.]. Having come to power in the Pamirs, the Soviet leadership, first of all, sought to solve the socio-economic problems of the region: the growing population faced the problem of land shortages: out of 57,000 sq. km. territories of only 9000 hectares were suitable for agriculture, and for the 40-thousand population of Gorno-Badakhshan this was extremely small [4. p. 11-13.]. The Pamirs became one of the subsidized regions, which further burdened the country's budget during the period of reconstruction after the Civil War. In 1930, the Union of Militant Atheists was created, the purpose of which was to discredit Ismailism as a religion: "The customs and beliefs propagated by the leaders of Ismailism fully coincided with the predatory measures that were carried out in the economic and political spheres by the tsarism and exploiters in Tajikistan before the revolution" [11. p. 63.] This kind of propaganda statements did not give results, and the statistical successes of the Union of Atheists, which eloquently indicated that every fourth Pamiri is an active member of the organization, do not inspire confidence.

The struggle against religious leaders was conducted more actively and successfully: in 1928 alone, 554 religious leaders were deprived of their civil rights, in 1929 331 people were added to the list, and in the period 1936-1940 another 509 people were subjected to repression. The most frequent accusation was espionage for the British imperialists, who were fully supported by the Aga Khan III [4. p. 75.] An atmosphere of fear reigned in the Pamirs, and eyewitnesses of those events point to the general atmosphere in the Pamirs at that time. One of the Pamir elders recalls: "[My father] ordered that the family bake cakes for him every day, and he slept dressed and shod: he was afraid of a sudden arrest". [7. p. 75].

Despite harsh government measures and the physical annihilation of religious authority figures and clerics, Ismaili ties with the Aga Khan continued. The turning point was 1936, when, in order to preserve state security, a decision was made to completely close the Soviet-Afghan border.From that moment, the ties of the Tajik Ismailis with the imam were actually interrupted. Work on anti-religious propaganda did not stop in the 50s and 60s, when any inscription on the Arabic script was the reason for accusations of espionage against the state.

The Soviet period in the Tajik part of the Pamir remained difficult. On the one hand, foreign researchers note the successes achieved by the Soviet leadership in the Pamirs: the population of Badakhshan quadrupled and by 1991 reached 200000 people, hundreds of educational and cultural institutions were commissioned and opened in the Pamirs [13. p. 74]. However, the efforts made by the Soviet leadership aimed at the development of agriculture, energy and industry in GBAR were still not able to fully meet the internal needs of the region, about 80% of food was imported from other republics of the USSR. Many infrastructure projects were never implemented, for example, the project of the "Kulyab-Nulvand-Kalai-Khumb" highway, which allows year-round communication between Dushanbe and Khorog, was never implemented.

The situation is even more difficult for the Ismaili community in Afghanistan. Officially recognized as part of Afghan territory, the local community has come under pressure from the Sunni majority. The uprising of the Afghan Ismailis of 1925 against the arbitrariness of the Afghan government failed. The rebels who fled to the Tajik SSR were extradited to Kabul and severely punished [14. p. 78]. at present, "after the activation of the Taliban movement (banned in Russia), it is worth paying close attention to this region again" [9.2083.].

Thus, at the turn of the century, the Ismailis of the Pamirs found themselves in a difficult situation: in Tajikistan, communities were oppressed by the atheistic Soviet government. In addition, economic problems in the region were growing and the infrastructure of the region was left far behind a century ago. On the other hand, the disgraced position of the Ismailis in the Pamirs played a cementing role in their self-awareness and self-identification: most Ismailis remained true to their faith, and the Ismaili communities themselves continued to function, despite severe restrictions.

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RUSSIAN GOVERNANCE IN THE CONTEXT OF THE INFLUENCE OF POLITICAL MYTHOLOGY

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Abstract. This article examines the process of the formation and influence of political myths on public administration in the Russian Federation.

Keywords: political myths, politics, society, culture, media, Russia, political leaders

At the present stage of development of Russian society, the political process is impossible without the participation of the media. This is due, on the one hand, to the growth of political transparency, and on the other, to the diversity of the media themselves (quantitative and qualitative composition). The political side of public life becomes dependent on the need for constant presence on the information agenda. At the same time, the role of the media is growing as a non-political factor expressing political ideas, views and values. The media are one of the main mechanisms of political socialization and function at all levels of relationships between a person and the political system. In today's information society, even the younger generation receives the first information about politics through the media and discusses these messages in the family.

One of the main substantive features of publications in the media of the last decade has been a systematic appeal to facts and the most prominent personalities of the Soviet period, the desire to re-understand and re-evaluate what was happening in Russia in those years. Not all Russians are satisfied with the results of reforms and the situation in the country. This usually leads to the fact that in society there is a need to interpret the present against the background of the past and to look in the past for situational and behavioral models that can provide such an interpretation. The political myth, that is, "political consciousness that misinterprets the real political system," is one of the most effective ways to form new ideas about the past and its assessments. As noted in the research literature, political myths "are usually perceived by society not as fiction, but as a natural state of affairs." Unlike the classical myth, which is a phenomenon of artistic thought and one of the components of the cultural space, the political myth is always social, that is, associated with the pressing problems of society. At the same time, turning to old political myths and constructing new ones helps the state and authorities to form collective thinking, corresponding to the implementation of the paths of development of the country and society outlined by the state.¹

With the help of school, university and other educational programs, thematic exhibitions, monuments, speeches by politicians and works of art, political myths are being introduced into the mass consciousness. The media and the Internet play a critical role in the transmission and dissemination of political myths.

The construction of new political myths, as well as the refutation of those that existed before, is carried out through the use of elements of two semiotic series: non-verbal and verbal.

Non-verbal means primarily include new facts and new plots, new details reported about the object of the mythologized, as well as details:

a) object details - details of appearance, clothing, etc.;

b) behavior. G.G. Pocheptsov (2004: 188), including detailing in the toolkit of imageology, emphasizes "we always believe in details more than in abstraction." A detail of an object, a thing in separate "conceptualized areas" can "semantically combine" with a word and be associated with certain abstract concepts that create an idea of the preferences, character of the mythologized person, as well as the ideology of the era.

The verbal embodiment of the myth is those lexical and phraseological units that make up the general meaning of the content, their associative-semantic and evaluative connections, as well as the compositional and syntactic features of the organization of narrative and stylistic techniques that are most characteristic for the construction of a myth. In most cases, the scientific study of this - actually linguistic - side of political myths simply complements the general analysis of the compositional and substantive features of the myth and the possibilities of its impact on the mass consciousness. Only a few works have been devoted to the linguistic properties of political myths. Meanwhile, linguistic and stylistic means sometimes play a primary role in the emergence of a new political myth, in the reconstruction or refutation of an old myth.²

 $^{^{1}}$ Vershinin M.S. Political communication in the information society: promising areas of research // Actual problems of communication theory. Collection of scientific papers. SPb, 2004.

²Gololobova V.N.Political mythology: theoretical foundations and practical significance in the political life of society. Novosibirsk, 2004.

It is quite obvious that the study of the linguistic and stylistic features of modern political mythology is very relevant and requires special attention. The new political reality of Russia: pluralism of opinions and the right to freedom of expression, which, thanks to the diversity and multidirectionality of the media and the Internet, which almost every Russian now owns, generates not only new myths, but also new forms of their embodiment.

As the researchers note, the activation of political mythology is characteristic of periods of instability and crises, when the lost past is idealized, and the forgotten leaders of the past are seen as figures, in comparison with which the actions of the leaders of the present do not look so effective and correct.

An evaluative interpretation of a political myth is usually a one-way street: the person being mythologized is placed either in a positive zone (re-glorification) or in a negative zone (demonization) on an axiological scale. At the same time, in discourse, two interpretations of the same historical, political event or the same person, opposite in terms of evaluative assessment, can coexist.³

One of the central myths characterizing the political culture of Russia is the myth of the Russian people. For the most part, other myths come from him, be it the myth of the exclusivity of the Russian people or the myth of autocracy.

One of the elements of the human myth is human nature. In it, the Russian person is characterized by contradictory hypertrophic qualities, which in some way Russians have. He can be both infinitely patient and as impatient as possible. He can be given the characteristics of both a statesman and an anarchist nation. Another element is the attitude of people to such a phenomenon as power. Again, in the context of this myth, people can be loyal servants of the state and vice versa - try to resist it. The modern attitude of people to power, and indeed a large part of Russian political culture, was formed largely under the influence of mythology, which gave an idea of I.V. Stalin, whose "culture of personality", in turn, was shaped by myths from a strong defender of the tsar. Stalin's personality culture is a classic example of political mythology, like many others, is the legalization of power. The peculiarity of this mythology is that we can tell when the ups and downs began, and, moreover, we can say that this mythology partially exists today.

Echoes of the mythology of that time played a role in the formation of modern political culture and leadership style in Russia - V.V. Putin is similar to the Stalinist style, and the use of the mythology of the state and its strong sovereign is only a continuation of the same mythology used by the creators of the image of Stalin. It can even be said that in some respects the image of Putin in Russian political

³Demidov, A. Ideology as a tool of political communication and power // Power. - 1998.- № 8-9. - P. 44.

culture takes on the same paternal aura of the "father of the nation" that was once associated with Stalin.

The myth has now become a convenient tool of manipulation used by politicians and structures that want to direct society in the direction that will bring maximum benefit. In particular, using the example of our country, we can say that political mythology is one of the most important methods of manipulation used throughout the modern history of the country and during the Soviet Union. Taking into account the events taking place both in the country and around it, we can say that they most successfully fit into the "plot" of modern myths, which were created mainly in the interests of both the population of the Russian Federation and its allies and opponents in the fact that Russia is a great power, the population of which has rallied around a strong leader and is ready to repulse all the forces of the enemy.

The political myth has always been associated with the culture that gave birth to it, "it is a projection of social values on the world as a whole." These types of myths have the most archaic component in comparison with other myths. G. Po-cheptsov writes: "Myths are a database from which all serious ideas and goals are taken. Even if we do not recognize the existence of certain archetypes, we must agree that a certain set of plots has a high degree of repetition, and a new plot is created on the basis of their existence".

The mythological view of politics is characterized by the idea that a single law prevailing in the world determines the principles of the existence and management of society. The myth suggests that parts of the cosmos and society are not only interconnected, but also interdependent, can reproduce the quality of the whole in each particle and are sensitive to external influences. Reliance on such ideas in public life leads to strict regulation of the behavior of participants in political and social relations.⁴

Society and the current political system work according to the once established mythological scenario with the division of the roles of all members. Each action is legalized, directed towards a closed macrocosm and guarantees its safety. The role of the political system as the guiding principle and the ruler as the center becomes especially important. Focusing on past examples leads to a culturally closed society, a constant reproduction of the existing social model, a slow pace of continuous change and a small amount of foreign cultural borrowings.

Every dominant political force, regardless of what form and type of government it adheres to, what ideas and principles, first of all seeks to retain power as long as possible. It is for this reason that today the creation and dissemination of political myths for the state is as important as maintaining a sufficient level of pro-

 $^{^4 \}mbox{Grachev}$ M.N. Political communication: theoretical concepts, models, vectors of development. M., 2004.

tection of society. A number of studies have already been carried out in Russian science highlighting the direct influence of the media on election results.

Media and PR technologies, which collect, process, interpret and disseminate information, are able to determine public attitudes and ideas, impose ideals and set norms of behavior. In addition, what was not included in the channels of mass communications practically does not affect the development of modern society. Since the media are the main tool for shaping public opinion, they are assigned a leading role in the development and implementation of political myths in the mass consciousness by deliberately distorting facts and events. Political myths disseminated in the media are the main means of justifying and, as a rule, praising the existing political regime and social conditions of life, as well as justifying the legitimacy of the current government. In this regard, one cannot but agree with the opinion of the researcher N.I. Shestov, who asserts that "the information content of the political tradition is a certain set of stereotyped judgments and ideas, motives of activity, which are repeated many times in political practice. The myth begins to correlate with a certain constructive sequence of rituals of political action". Thus, the myth becomes the main state ideology that supports the political elite, which may not meet the real needs of society. As L. Mutovkin notes, "manipulating the human mind is a means of enslaving it, one of the ways in which the ruling elite tries to subordinate the masses to their goals".

Let's highlight the main mechanisms often used by the media to ensure "favorable conditions" for broadcasting and consolidating political myths in the mass consciousness - the dissemination of a large amount of information occurs haphazardly, fragmentarily, preventing the creation of logical chains between interconnected messages. Thus, the audience is deprived of a holistic perception of the events and facts covered;

- broadcast messages containing immorality and obscenity, oversaturation of the agenda with "zero" information, overwhelming the public, preventing them from analyzing the news for its meaning;

- continuous and rapid dissemination of messages that do not allow the public to determine the degree of importance and relevance of the information provided. Such information overload does not allow the information to be perceived meaningfully or completely alienates the public from watching the news. As a result, we get an audience that cannot analyze, compare, has lost touch with the past, lives only in the present - here and now, and therefore easily lends itself to all sorts of manipulations. Therefore, the meaning of political myths often boils down to transferring a socio-political problem to the mythical sphere, finding an explanation there and presenting it to society. And if earlier the reason for the origin of myths was the lack of knowledge, then in the modern world this is a reluctance to logically explain many processes. In addition, an unconditional belief in myths is associated with a person's desire to regain his former "painless perception of the world around him". That is, the myth makes it possible to replace the complex and truthful image of reality in the minds of the masses with a symbolic image that allows one to live in harmony with the world.⁵

Most of the current political myths circulated in the media are technical or short-lived. Such myths temporarily divert public attention from real global problems or crises. Modern political myth, like ancient myths, also consists of symbols and images. But at the same time, today's myth differs from the archaic one in that it contains much more text, or rather, a group of messages containing subtextual information and evoking certain emotions and feelings in the audience. They sympathize with the myth when the content of the text matches or "complements" the existing worldview created by the political myth, and also when the myth has an emotional basis. Thus, the construction of a political myth is an integral part of the activities of political elites: myths rooted in the public consciousness make it possible to legitimize the actions of the ruling structure and maintain balance in society.

In addition, the modern myth is genetically linked to the processes taking place in the mass media - the media is assigned the main role in the creation and dissemination of political myths.

For the mythological legitimization of President Putin, the ideology of a "national leader" was imposed on the mass consciousness - the head of the supranational level of power, standing above the conceptually dependent residents who maintain the continuity of the previously chosen political course. The continuity of the embodiment of the heroic figure of Putin was actually achieved thanks to the election victory of United Russia, which, as a rule, achieved its sacred and charismatic status through a complex system of bureaucratic rituals.

The logic of the political myth lies in the transfer of a certain causal connection, contested due to the social crisis, into the sphere of mythical images, where a new causal connection can be found and then transferred to political reality. Thus, the political myth carries a kind of search logic that works due to the lack of completeness of the initial data.⁶

In the culture of early civilizations, the king, as a necessary part of the social space, is not even localized as a person. Thus, the possible possibility of dividing a single cultural space and the emergence of contradictions is overcome in advance. Opposition to the myth is completely impossible, because it violates the integrity of the world, in which everything is coordinated. The story popular in myths about dualism - gods, demons, people - does not actually create elements of opposition,

⁵Gololobova V.N.Political mythology: theoretical foundations and practical significance in the political life of society. Novosibirsk, 2004.

 $^{^6}Vershinin$ M.S. Political communication in the information society: promising areas of research // Actual problems of communication theory. Collection of scientific papers. SPb, 2004.

they are just different parts of the same system of things. The sacred principle, concentrated in the king as a figure and in the government as a necessary process of correcting society, unites all aspects of mythological reality and even justifies the possible mistakes of those in power.

The lack of individuality of the ruler can be traced in the images, plastics and descriptions in the text. All of them fit into the portrait of an ideal ruler, clearly archaic in nature. This also applies to personal life and the performance of state functions. It is believed that a ruler who obeys the sacred nature of his social status is present at every point of the public space. Everything that is important for the existence of society can be connected with it. At the same time, the head of state is ethically ambivalent; he cannot be judged in terms of good and bad. It is clear that the one who rules is who has a certain territory with clear boundaries, where manifestations of disorder / chaos are unacceptable, and only in this way the exercise of power is possible.

Since the ordering mechanism affects the cosmos, assumes that it is poorly formed, it is necessary to periodically revive the existing order, as well as recognize the presence of an incorrect / disordered element in the main figures of social space. The chthonic component is reflected in the peculiarities of the image of the ruler as the center of the political myth, referring to both traditional political myths and modern ones. The monarch is a figure standing on the border of Being and Nonexistence, Cosmos and Chaos, it is the center and periphery, a concentrated expression of what a person is used to considering sacred since the time of the archaic.

However, one should not speak of the original models as fully describing the contours of all systems of political mythology. Archaic images exist as interwoven into the fabric of culture, realized only within its limits and subordinate to the logic of cultural development.

Despite the fact that the initial basis of the myth is formative, it strongly depends on the cultural and historical context, as well as on the trends in the development of human culture as a whole. Over time, mythologies that have arisen as a result of an initially defined way of perceiving the world undergo significant changes in terms of a number of factors of cultural development.

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FEATURES OF THE CIRCADIAN RHYTHM OF AUTONOMIC TONE IN CONCOMITANT SEVERE TRAUMATIC BRAIN INJURY DEPENDING ON AGE

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Abstract. On the first day after injury, the most pronounced sympathotonic reaction (by 90%) was observed in group 1, while in group 2, SVT was increased by 40%, in group 3 - by 50%. during the acute period of CSTBI in group 1, the severity of hypersympathotonia increased even more. Regardless of daytime and nighttime during the day, the SVT indicator in group 1 was significantly higher than in groups 2 and 3 by 50-60%. The hypersympathotonic response was invariably accompanied by a significant increase in MVP in all age groups. The most vulnerable group in terms of the adequacy of the sympathotonic response, compensatory restructuring of the circulatory system in the acute period of CSTBI were traumatized patients over 61 years of age.

Keywords: circadian rhythm, autonomic tone, combined severe traumatic brain injury.

Relevance

Acute brain damage in the initial stage is accompanied by hyperactivation of the sympathetic system, which leads to tachycardia and hypertension. On the one hand, an increase in cardiac output is aimed at a significant increase in the brain's need for oxygen, on the other, a significantly increased functional activity of the components of the cardiovascular system under these conditions requires a significantly increased need for cells and tissues for oxygen under conditions of a hypersympatotonic reaction to a combined severe traumatic brain injury [1-3]. However, there is insufficient information in the literature on the age-related characteristics of the autonomic reaction of hemodynamics in the acute period of concomitant severe traumatic brain injury (CSTBI).

Purpose of the work

To study the features of the circadian rhythm of the autonomic tone in concomitant severe traumatic brain injury, depending on age.

Material and research methods

The indicators of a comprehensive examination of 30 patients with concomitant severe traumatic brain(CSTBI) who were admitted to the ICU of the neurosurgical department of RSCEMA in the first hours after an accident - 28, catatrauma of 2 patients were studied. According to the indications, 29 patients underwent invasive mechanical respiratory support (MRS) on admission. Monitoring was carried out by complex hourly recording of hemodynamic parameters: stroke volume of blood (SVB), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean blood pressure (MBP), pulse blood pressure (PBP), cardiac output (CO), general peripheral vascular resistance (GPVR), estimation of autonomic tone (EAT), the need of myocardium in oxygen (TNMO). Mechanical respiratory support was started with artificial lung ventilation (ALV) for a short time followed by switching to SIMV. The assessment of the severity of the condition was carried out by scoring methods according to the scales for assessing the severity of combined injuries - the CRAMS scale, the assessment of the severity of injuries according to the ISS scale. On admission, impaired consciousness in 29 injured patients was assessed on the Glasgow Coma Scale (GS) 8 points or less. Patients were considered in three age groups: group 1 - 19-40 years old (13), group 2 - 41-60 years old (9), 3 - 61-84 years old (8 patients). In 28 patients, the clinic was dominated by the diencephalic and mesencephalo-bulbar forms, which, due to a critical disorder of the vital systems (respiratory and cardiovascular), required urgent intensive therapy, and sometimes resuscitation. Complex intensive therapy consisted in identifying and timely correction of deviations: MRS, after removing from shock anesthetic, anti-inflammatory, antibacterial, infusion therapy, correction of protein and water-electrolyte balance disorders, surgical early correction to the extent possible, stress-protective therapy.

Result and discussion

As shown in table 1, on the first day after injury, the most pronounced sympathotonic response (by 90%) was observed in group 1, while in group 2, SVT was increased by 40%, in 3 - by 50%. It should be noted that during the acute period of CSTBI in group 1, the severity of hypersympathotonia increased even more by 6 (by 50%), by 8 days (by 40%), by 9 - by 50%, by 10 - by 60%, 11 - by 40%, by 12 - 60% (p <0.05, respectively).

Table 1

	<i>v v</i>	0	2 0		
Days	Group 1	Group 2	Group 3		
1	1.9±0.2	1.4±0.2*	1.5±0.3		
2	1.9±0.1	1.4±0.1*	1.3±0.1*		
3	2.1±0.1	1.4±0.1*	1.4±0.1*		
4	2.2±0.1	1.4±0.1*	1.3±0.1*		
5	2.1±0.1	1.5±0.1*	1.4±0.1*		
6	2.4±0.1‴	1.6±0.1*	1.4±0.1*		
7	2.3±0.2	1.6±0.1*	1.4±0.1*		
8	2.3±0.1‴	1.5±0.1*	1.4±0.1*		
9	2.4±0.1‴	1.5±0.1*	1.4±0.1*		
10	2.5±0.1‴	1.4±0.1*	1.3±0.2*		
11	2.3±0.1‴	1.6±0.1*	1.3±0.1*		
12	2.5±0.2‴	1.4±0.1*	1.5±0.1*		
13	2.0±0.2	1.5±0.1*	1.2±0.1*		
14	1.9±0.1	1.4±0.1*	1.4±0.1*		
15	1.9±0.1	1.4±0.1*	1.4±0.1*		
16	1.9±0.1	1.4±0.1*	1.4±0.1*		
17	1.7±0.1	1.5±0.1	1.4±0.1*		
18	1.7±0.1	1.6±0.1	1.3±0.1*		
19	1.6±0.1	1.6±0.1	1.3±0.1*		
20	1.7±0.1	1.5±0.1	1.2±0.1*		
21	1.9±0.1	1.8±0.1	1.3±0.1*		
22	2.0±0.2	1.6±0.2	1.3±0.2*		
23	2.0±0.1	1.6±0.1	1.4±0.1*		
24	1.9±0.1	1.7±0.1	1.4±0.1*		
25	1.8±0.2	1.8±0.2	1.6±0.2		

Dynamics of the mesor of the circadian rhythm of vegetative tone

*- reliably relative to the indicator of group 1

" - reliably relative to the indicator on the first day

In the following days, the degree of tension in the function of the sympathoadrenal system was restored to the level of 1 day after injury. In group 2, during the first 25 days, a steadily increased SVT was noted at the level of the indicator on the first day. It is noteworthy that in patients of group 2, SVT remained significantly less than the indicator in group 1 during the first 12 days by 50-70%. In group 3, the level of activity of the sympathetic nervous system remained unchanged on average. Thus, the SVT circadian rhythm mesor in group 3 was increased by an average of 40-20% throughout the observation period. However, the indicator was significantly less than in group 1 by 50-60% (p < 0.05, respectively).

The hourly assessment of the average circadian rhythm of SVT depending on age made it possible to state that, regardless of daytime and nighttime, during the day, the SVT indicator was significantly higher than in groups 2 and 3 by 50-60% (fig. 1).





The greatest amplitude of the SVT circadian rhythm was detected per day, amounting to 0.6 units in group 1, 0.76 units in group 2, and 1.2 units in group 3. That is, on the first day, the most pronounced instability of the stress response of the sympathetic nervous system was found in patients over 61 years of age. Low-amplitude daily fluctuations of SVT on days 2-12 were replaced by an increase in the indicator in group 1 to 0.6 units, in group 2 to 0.8 (on day 21), remaining at the initial level (0.3 units) in group 3 (fig. 2).





Dynamics of the SVT circadian rhythm amplitude, units

Fig.2

Dynamics of the diurnal range of SVT changes



Fig.3

Fig. 3 shows the dynamics of the maximum diurnal SVT changes. The greatest changes in the SVT mesor were observed on day 1 in all patients, the most significant were in patients of group 3 (1.5 units), and the smallest (1 unit) in group 1. After a 9-day period of minimal SVT fluctuations (within 0.3 units), an increase in daily SVT instability was noted on the following days, with a more pronounced tendency to increase in patients of groups 2 and 1.

Correlations between SVT and hemodynamic parameters in the first 25 days of the acute period of CSTBI



As can be seen from the data in fig. 4, in the acute period of CSTBI (25 days) in group 1, there was a strong direct correlation between SVT and SBP, MBP, MVP (0.7; 0.7; 0.8) and inverse with GPVR (-0.3). That is, at the age of up to 40 years, the hypersympatotonic reaction was accompanied by a hyperdynamic type of hemodynamics, a tendency to increase SBP, PBP with an increase in myocardial oxygen demand. In group 2, in contrast to the first, the negative correlation of SVT and GPVR (-0.5) and SVT and SBP (0.7), SVT and PBP, SVT and CO increased. That is, the hyperdynamic type of hemodynamics was manifested by an increase in cardiac output with a compensatory tendency towards a decrease in GPVR.

In group 3, the age difference was manifested by the fact that a significant tendency towards the formation of correlations was revealed under conditions of the sympatotonic reaction of SVT and MBP and MVP to traumatic stress. That is, even vasoactive drug support was not observed adequate restructuring of the func-

tion of central and peripheral hemodynamics, aimed at maintaining the necessary intracranial capillary perfusion under CSTBI conditions.

	1 - 8 days			9-17 days			18-25 days		
	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
SVT/ MVP	0.9	0.7	0.8	0.9	0.8	0.4	0.9	0.7	0.2
SVT/ GPVR	-0.7	-0.7	-0.4	-0.4	-0.8	0	-0.9	-0.5	-0.6
SVT/ CO	0.8	0.9	0.9	0.5	0.9	0.8	1	0.8	0.6
SVT/ SVT	0.7	0.2	0.6	0.8	0.4	0.6	0.3	0.4	-0.3
SVT/ SBP	0.5	0.6	0.8	0.9	0.6	0.7	0.8	0.5	-0.2
SVT/ DBP	0.7	-0.3	0.4	0.7	0	0.4	-0.2	0	-0.4
SVT/ PBP	0.3	0.5	0.7	0.6	0.9	0.6	0.9	1	0.3
SVT/ SV	-0.1	0.7	0.4	-0.2	0.6	0.6	0.9	0.8	0.5

Correlations of SVT in the dynamics of the acute period of CSTBI

Table 2

In the first 8 days, patients of group 1 showed a strong direct correlation between SVT and MVP (0.9), CO (0.8), average BP (0.7), DBP (0.7). In the second week of treatment, the direct correlation with CO (0.5) and inverse with GPVR (-0.4) decreased, and the direct correlation with SBP significantly increased (0.9). In the next 8-25 days in group 1, the tendency to form a hyperdynamic type of hemodynamics increased. Throughout the acute period of CSTBI, the direct correlation of sympatotonic response with myocardial oxygen demand (MVP) at the level of 0.9 remained stably significant. Thus, at the age of up to 40 years after CSTBI, the hyperdynamic type of blood circulation somewhat weakened in the second week, but on days 18-25 it intensified again with the appearance of a strong direct relationship between SVT and SV (0.9).

In group 2, in the first week, the hyperdynamic type of hemodynamic reaction to sympathotonic stress reaction was manifested by a direct strong correlation of SVT with CO (0.9) and SV (0.7) and inverse with GPVR (-0.7), remaining at this level for a quick and third week of observation.

In group 3, in the first week, a strong direct correlation was found between SVT and CO, SBP, PBP. In the next 9-17 days, the treatment decreased slightly. But in the third week, a significant weakening of correlations was found. A decrease in the correlation between SVT and MVP at later periods of CSTBI (9-25 days) is most likely due to the failure of the mitochondrial system to adequately respond, to increase the intensity of oxidative phosphorylation at the mitochondrial level. At the age of over 61, unstable correlations aimed at the hyperdynamic type of blood circulation, which is of a compensatory nature, practically disappeared on the 18-25th day of the acute period of CSTBI. Thus, the most vulnerable group in terms of the adequacy of the sympathotonic response, as well as compensatory restructuring of the circulatory system in the acute period of CSTBI, were traumatized patients over 61 years of age.



Duration of SVT circadian rhythm acrophase shifts

As shown in fig. 5, in all age groups, a moderate shift in acrophase prevailed, the most prolonged in group 3 (68%).

Conclusion. On the first day after injury, the most pronounced sympathotonic reaction (by 90%) was observed in group 1, while in group 2, SVT was increased by 40%, in group 3 - by 50%. during the acute period of CSTBI in group 1, the severity of hypersympathotonia increased even more. Regardless of daytime and nighttime during the day, the SVT indicator in group 1 was significantly higher

than in groups 2 and 3 by 50-60%. The hypersympathotonic response was invariably accompanied by a significant increase in MVP in all age groups. The most vulnerable group in terms of the adequacy of the sympathotonic response, compensatory restructuring of the circulatory system in the acute period of CSTBI were traumatized patients over 61 years of age.

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AGE FEATURES OF THE CIRCADIAN RHYTHM OF MYOCARDIAL OXYGEN DEMAND IN CONCOMITANT SEVERE TRAUMATIC BRAIN INJURY

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Abstract. Only those injured under the age of 40 (group 1) showed normal values of the mesor of the circadian rhythm TNMO on day 1, while in groups 2 and 3 there was a tendency to increase. During the first 25 days in group 1, there was an increase in TNMO on days 3-15 with a tendency to normalization of the indicator on the following days of intensive therapy. The highest values of the amplitude of the circadian rhythm TNMO were revealed on day 1, amounting to 20% in group 1, 55% in group 2, and 65% in group 3. Such abrupt changes in myocardial metabolism on the first day significantly increased the risk of complications from heart function, which suggests that it is advisable to start the earliest (in the first hours) active coronary artery disease and metabolite therapy, especially in patients over 41 years of age. Compensatory mobilization of blood circulation in favor of maintaining intracranial capillary perfusion in patients over the age of 41 is fraught with aggravation of the existing coronary insufficiency.

Keywords: circadian rhythm, myocardial oxygen demand, combined severe traumatic brain injury

Relevance. In the structure of mortality, multiple injuries in combination with

TBI account for 48%. According to the literature, vasospasm may be one of the factors determining the outcome of TBI. P. Macpherson and D. Graham found vasospasm on angiograms in 41% of patients who died due to TBI. Cerebral ischemia was detected in 51% of patients with vasospasm and only 32% of cases were without vasospasm. It has been established that changes in myocardial trophism remain for 3-4 weeks after the elimination of the manifestations of diencephalic syndrome [1,2,3]. Due to the lack of information on the state of myocardial oxygen demand (TNMO), one of the leading causes of possible complications from heart function, we made an attempt to study the features of TNMO changes in the acute period of CSTBI.

Purpose of the work. To study the circadian rhythm of myocardial oxygen demand in concomitant severe traumatic brain injury.

Material and research methods. The indicators of a comprehensive examination of 30 patients with concomitant severe craniocerebral trauma (CSTBI) who were admitted to the ICU of the neurosurgical department of RSCEMA in the first hours after an accident - 28, catatrauma of 2 patients were studied. According to indications, 29 patients were started on admission to invasive mechanical respiratory support (MRS). Monitoring was carried out by complex hourly registration of hemodynamic parameters: stroke volume of blood (SVB), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean blood pressure (MBP), pulse pressure (PP), cardiac output (CO), general peripheral vascular resistance (GPVR), estimation of autonomic tone (EAT), the need of myocardium in oxygen (TNMO). Mechanical respiratory support was initiated with artificial lung ventilation (ALV) for a short time followed by switching to SIMV. The severity of the condition was assessed by scoring methods according to the scales for assessing the severity of combined injuries - the CRAMS scale, the assessment of the severity of injuries according to the ISS scale. On admission, impaired consciousness in 29 injured patients was assessed on the Glasgow Coma Scale (GS) 8 points or less. Patients were considered in three age groups: group 1 - 19-40 years old (13), group 2 - 41-60 years old (9), 3 - 61-84 years old (8 patients). In 28 patients, the clinic was dominated by the diencephalic and mesencephalo-bulbar forms, which, due to a critical disorder of the vital systems (respiratory and cardiovascular), required urgent intensive therapy, and sometimes resuscitation. Complex intensive therapy consisted in identifying and timely correction of deviations: MRS, after removing from shock anesthetic, anti-inflammatory, antibacterial, infusion therapy, correction of protein and water-electrolyte balance disorders, surgical early correction to the extent possible, stress-protective therapy.
Result and discussion.

1

2

3

5

6

7

8

Group 1 Group 2 Group 3 Days 99±6 117±20 112±16 96±6 94±3 113±4 $105\pm5*$ 99 ± 4 107±6 111±3* 4 107±6 104 ± 3 111±3* 115±8 108±6 117±5* 116±4 104±4 114±6* 119±4 98±4‴ 115±4* 113±4 100±7‴ 9 117±3* 113±6 100±5‴ 122±7* 10 110 ± 3 102±6‴ 117±4* 118±6 11 103±7‴ 124±4* 107±4‴ 12 105±5‴ 13 117±5* 111±5 92±4‴ 14 114±5* 106±6 104±7 15 115±6* 108 ± 4 $104 \pm$ 16 110±7 104±5 107±5 105±5 106±6 88±6 17 18 105±6 123±7 93±5 19 100±5 118±6 96±7 98±5 20 102±4 113±6 21 108±6 119±8 100±6 22 116±6 121±12 95±8 23 106±7 115±5 95±6 24 108±6 121±4 102±7 25 106 ± 8 127±12 113±8

Dynamics of the mesor of the circadian rhythm of myocardial oxygen demand

* - reliable relative to the indicator in 1 day

" - reliable relative to the indicator in group 1

Table 1

As presented in tab. 1, on day 1 only the injured group 1 showed normal values of the mesor of the circadian rhythm TNMO, while in groups 2 and 3 there was a tendency to increase. During the first 25 days in group 1, an increase in TNMO was noted, starting from the third day to 15 days, inclusive, with a tendency towards normalization of the indicator on the following days of intensive therapy. In group 2, TNMO on day 12 turned out to be less than in group 1. In traumatized patients of the 3rd group, on the 7th - 13th day, the mesor of the circadian rhythm TNMO was significantly less than in the 1st group, which was most likely due to the more active coronary artery therapy in patients over 61 years of age due to concomitant cardiovascular diseases (hypertension, coronary heart disease). There were no statistically significant changes in the 25-day average hourly TNMO indices in the circadian rhythm in the acute period of CSTBI (fig. 1).





Fig.1



Dynamics of the amplitude of the TNMO circadian rhythm, in%

As shown in fig. 2, the highest values of the amplitude of the TNMO circadian rhythm were detected on day 1, amounting to 20% in group 1, 55% in group 2, and 65% in group 3. Changes in the amplitude of the TNMO circadian rhythm in the acute period were low-amplitude fluctuations with a tendency to increase up to 45% in patients of group 2 on the 22nd day.



The maximum values of changes in the circadian rhythm of TNMO were also detected on day 1, which amounted to 35% in group 1, 88% in group 2, and 90% in group 3. It is quite understandable that such abrupt changes in myocardial metabolism in the first day significantly increased the risk of complications from heart function, such as, for example, acute tachy- or brady arrhythmia. This suggests that it is advisable to start the earliest (in the first hours) active coronary and metabolic therapy aimed at maintaining myocardial metabolism in extremely unfavorable conditions of changes in systemic hemodynamics, especially in patients over 41 years of age. Moreover, in order to maintain perfusion blood flow in the injured brain, to maintain the delivery of the required minimum of oxygen to preventative irreversible secondary changes in the brain, the load on the heart increases 7-10 times.



In the first 8 days, the average daily TNMO level in group 3 ($102\pm3\%$) was the closest to the standard values. In group 1, TNMO was increased relative to the norm by 8%, in group 2 by 13%, and significantly higher than in group 3 in group 1 by 5% and in group 2 by 12% (p<0.05, respectively).

Figure 5 shows the circadian rhythms of TNMO from 9 to 17 days, when in group 1 the mesor of the circadian rhythm TNMO was the highest in patients of group 3, amounting to $120\pm3\%$, in group 1 - $116\pm2\%$, in group 2 - $109\pm2\%$. Age differences in the TNMO circadian rhythm mesor indicator were significant. The highest level of the indicator in group 3 indicated an extremely unfavorable state of myocardial trophism due to an increase in the tendency to oxygen starvation against the background of prolonged intensive therapy.

As shown in fig. 6, from the 18th to the 25th day of treatment, on average per day, TNMO was found to be the closest to the normative values in group 3, averaging $99\pm2\%$. At the same time, the TNMO indicator in group 3 turned out to be significantly less relative to groups 1 and 2 by 6% and 17% (p<0.05, respectively).







Correlation relationships of myocardial oxygen demand for 25 days

Significant correlations (fig. 7) of the mesors of the circadian rhythms TNMO and CO (0.8) were found only in group 1, and TNMO with MBP in group 2 (0.7) during 25 days of the acute period of SCTBI. In the first week (fig. 8) in group 1, with a strong direct correlation between the mesor of the circadian rhythm TNMO with the mesors of CO (0.7), MBP (0.8), a direct relationship with DBP (0.8) was also reliable. In group 2 from 1 to 8 days negative correlation with GPVR (-0.8), and positive with CO (0.8). And in group 3 with MBP (0.9), SBP (0.9) and DBP (0.8).

In the second week (fig. 9), patients of group 1 showed strong direct correlations of TNMO with MBP (0.8), with SBP (0.8), with DBP (0.7), with PP (0.8). In group 2, only a direct correlation was found with the MBP indicator (0.8). In group 3, connections with MBP, SBP and DBP were completely broken and practically disappeared.



Correlation links TNMO from 1 to 8 days of the acute period

On the third week, from 18 to 25 days in group 1, a negative correlation was formed between TNMO and GPVR (-0.7), direct correlation with CO (0.9), with MBP (0.7), with SBP (0.9), with PP (0.8) and SV (0.7). From the results obtained, it can be imagined that in order to reduce myocardial oxygen demand on days 18-25 in group 1, it is necessary to maintain GPVR at the level of 1342 ± 71 , a decrease in TNMO less than $106\pm3.2\%$ can lead to a decrease in CO less than 5 ± 0.3 l/min, decrease in SBP less than 121 ± 3.9 mmHg, decrease in PP to 50 ± 2.5 mmHg and SV of the heart to 57 ± 2.5 ml with an average level of the mesor of the circadian rhythm PP $106\pm3.2\%$.

In group 2, from 18 to 25 days (fig. 10), a strong direct relationship was found between the mesor of the circadian rhythm TNMO at the TNMO level ($120\pm3.2\%$) with MBP (0.9) and DBP (0.7). That is, an increase in MBP above 95 ± 2.4 mmHg, DBP above 77 ± 2.3 mmHg will be accompanied by an increase in TNMO of more than 120%. In group 3, a direct correlation was observed between the PP and CO mesor (0.7) and SBP (0.7). That is, an increase in the mesor of the circadian rhythm of CO above 5 ± 0.2 l/min and an increase in SBP above 125 ± 3.6 mmHg will be accompanied by an increase in TNMO of more than $99\pm4.5\%$. Thus, the most vulnerable in terms of the likelihood of increased coronary hypoxia was the 2nd age group, in which, in the third week of intensive complex therapy, myocardial oxygen demand remained increased by 20%. From this we can conclude. That compensatory mobilization of blood circulation in favor of maintaining intracranial capillary perfusion in patients aged 41 to 60 years is fraught with aggravation of the existing coronary insufficiency with the ensuing consequences and complications.



Fig.9



Correlation links TNMO from 18 to 25 days

Duration of TNMO acrophase displacement in the acute period of CSTBI



During the acute period of CSTBI, a moderate shift in the acrophase peak prevailed over 75% in group 3, 45% in group 2, and 42% in group 1 during intensive care in the ICU (fig. 11).

Conclusions. Only those injured under the age of 40 (group 1) showed normal values of the mesor of the circadian rhythm TNMO on day 1, while in groups 2 and 3 there was a tendency to increase. During the first 25 days in group 1, there was an increase in TNMO on days 3-15 with a tendency to normalize the indicator on the following days of intensive therapy. The highest values of the amplitude of the TNMO circadian rhythm were revealed on day 1, amounting to 20% in group 1, 55% in group 2, and 65% in group 3. Such abrupt changes in myocardial metabolism on the first day significantly increased the risk of complications from the heart function, which suggests that it is advisable to start the earliest (in the first hours) active coronary and metabolic therapy, especially in patients over 41 years of age.

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CIRCADIAN RHYTHM OF OXYGEN SATURATION IN THE ACUTE PERIOD OF CONCOMITANT SEVERE TRAUMATIC BRAIN INJURY

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Abstract. Mechanical respiratory support (MRS) provided fluctuations in the mesor of the circadian rhythm of the oxygen saturation indicator within the normal range. The tendency to an increase in the amplitude of fluctuations in the third week of the acute period in injured people over 61 years old testified to the instability of blood oxygenation. During the acute period of CSTBI, the longest inversion — pathological migration of the peak of oxygen saturation acrophase at night (within 14 days) was found in group 3 and the smallest (4 days) in group 1.

Keywords: circadian rhythm of oxygen saturation, combined severe traumatic brain injury.

Relevance. The starting pathophysiological mechanism in acute cerebral insufficiency, as the final link, is the formation of tissue hypoxia caused by mitochondrial dysfunction. It has now been established that impaired perfusion of the brain leads to an acute deficiency of macroergs, massive release of excitatory amino acids (glutamate "excitotoxicity"), impaired permeability of cell membranes with the penetration of calcium ions into the cell, and the development of lactic acidosis in ischemic tissue. These processes are triggered even with short-term episodes of a drop in cerebral perfusion pressure, develop immediately from the moment of injury and, in general, fade away by the end of the first day of ischemia. Further damage to the nervous tissue occurs by the mechanism of an increase in oxidative stress and local inflammation (from 2-3 hours after pathological exposure with a maximum by 12-36 hours) and the progression of apoptosis.

Combined severe traumatic brain injury (CSTBI) is always accompanied by disturbances in the function of external respiration due to impaired central regulation, as well as obstruction of the upper respiratory tract with mucus, blood, gastric contents, retraction of the root of the tongue and lower jaw, which are the reasons for the aggravation of primary brain hypoxia and the development of intracranial hypertension [1-4].

The multifaceted mechanisms of secondary brain damage (SBD) have been studied, however, there is insufficient information on the age-related characteristics of the circadian rhythm of the oxygen saturation indicator in the acute period of CSTBI.

Purpose. To study the circadian rhythm of oxygen saturation in the acute period of concomitant severe traumatic brain injury

Material and research methods. We studied the indicators of a comprehensive examination of 30 patients with concomitant severe traumatic brain injuries (CSTBI) who were admitted to the ICU of the RSCEMA neurosurgical department in the first hours after an accident - 28, catatrauma of 2 patients. Mechanical respiratory support (MRS), the duration of treatment in the ICU, the duration of hospital treatment (DHT) were studied. Continuous hourly monitoring of following indicators is presented: saturation of oxygen (SO), stroke volume of blood (SVB), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean blood pressure (MBP), pulse pressure (PP), cardiac output (CO), general peripheral vascular resistance (GPVR), estimation of autonomic tone (EAT), the need of myocardium in oxygen (TNMO). Mechanical Respiratory Support (MRS) was started with artificial lung ventilation (ALV) for a short time followed by a switch to SIMV. ALV was performed in the mode of normoventilation or moderate hyperventilation (pCO2- 30-35 mmHg) with an air - oxygen mixture of 30-50%. At low pO2 in arterial blood, ALV was performed with constant positive pressure. However, the end-expiratory pressure did not exceed 5-7 cm aq., since higher pressure could impede the outflow of blood from the brain and increase ICP.

The assessment of the severity of the condition was carried out using scoring methods according to the scales for assessing the severity of combined injuries - the CRAMS scale, the assessment of the severity of injuries according to the ISS scale. On admission, impaired consciousness in 29 injured patients was assessed on the Glasgow Coma Scale (GS) 8 points or less. Patients were considered in three age groups: group 1 - 19-40 years old (13), group 2 - 41-60 years old (9), 3 - 61-84 years old (8 patients). Complex intensive care consisted in identifying and timely correction of deviations: MRS, after removing from shock anesthetic, decongestant, anti-inflammatory, antibacterial, infusion therapy, correction of pro-

tein and water-electrolyte balance disorders, surgical early correction to the extent possible, stress-protective therapy.

Results and discussion. As shown in fig. 1, there was a strong direct correlation between the duration of MRS and the duration of intensive care in the ICU, the total duration of inpatient treatment, and only in group 3, the direct relationship between ALV and body weight was (0.6).



Fig. 1 Correlation links of mechanical respiratory support

Table 1.

Dynamics of the mesor of the circadian rhythm of oxygen saturation depending on age, in%

Days	Group 1	Group 2	Group 3
1	97,9±0,9	98,0±1,2	95,4±3,7
2	98,9±0,3	98,2±0,3	97,9±0,2
3	98,4±0,7	98,6±0,4	98,1±0,3
4	99,0±0,2	97,6±0,5	97,1±0,5
5	98,6±0,2	97,7±0,7	97,4±0,5
6	98,8±0,1	98,1±0,3	97,2±0,4
7	98,6±0,3	98,3±0,4	97,8±0,6
8	98,9±0,2	98,6±0,4	97,7±0,4
9	98,6±0,3	98,0±0,3	98,4±0,3
10	98,0±0,2	97,8±0,3	98,2±0,4
11	98,5±0,3	98,1±0,4	97,7±0,6

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12	98,6±0,2	98,2±0,3	98,2±0,3
13	98,5±0,3	97,8±0,3	98,4±0,3
14	98,6±0,2	98,1±0,3	97,9±0,5
15	98,4±0,2	97,8±0,3	98,0±0,3
16	98,0±0,4	98,0±0,4	97,4±0,6
17	98,1±0,4	98,5±0,3	97,5±0,3
18	99,1±0,1	98,0±0,3	97,0±0,6
19	98,5±0,3	98,2±0,3	96,7±0,5
20	98,5±0,2	98,0±0,4	96,7±0,5
21	98,2±0,3	98,0±0,4	97,2±1,0
22	98,4±0,3	98,2±0,5	97,6±0,6
23	98,1±0,5	97,4±0,6	97,7±0,4
24	98,1±0,4	97,5±0,7	97,2±1,1
25	98,3±0,4	97,6±0,5	97,3±0,9

MRS was generally quite effective in maintaining the target oxygen saturation rate above 94%. There were no significant deviations from the norm and changes depending on the age of the mesor of the circadian rhythm in the oxygen saturation index in the acute period of CSTBI (tab. 1).



Fig. 2. Amplitude of daily fluctuations in oxygen saturation, in%

The greatest values of the amplitude of daily fluctuations of the circadian rhythm of oxygen saturation were found in group 3, which amounted to 3.4% in 1 day, 18 - 1.8%, 22 - 2.4%. Daily fluctuations in the indicator occurred within acceptable values, since oxygen saturation remained above 92%. However, the tendency to an increase in the amplitude of fluctuations in the third week of the acute period in the injured over 61 years of age testified to the instability of blood oxygenation, despite MRS (fig. 2).



Fig. 3 The range of maximum daily oxygen saturation values

The maximum differences in the values of the oxygen saturation index were also found in patients of group 3 on day 1 - 23% and on day 24 - 12%, while in groups 1 and 2 the indicator remained stable at a level above 96% (fig. 3). Thus, the most pronounced tendency to a decrease in oxygen saturation in the blood was found in group 3.



Fig. 4. Average hourly oxygen saturation data in the circadian rhythm for 25 days of the acute period of CSTBI, in%

The study of hourly values of the indicator of the circadian rhythm of oxygen saturation made it possible to designate group 3, patients, as the most unfavorable in terms of the effectiveness of MRS in the acute period of CSTBI. Fig. 4 shows that stable oxygen saturation was 98-98.5%, that is, the most effective MRS during the day and in the daytime and at night was performed in patients of groups 1 and 2. While in group 3, the tendency to decrease to 96.2% was revealed at 13 o'clock in the afternoon with a slight tendency to increase in the evening and night hours. Probably, the tendency to a deterioration of oxygen binding at the level of the alveolar-capillary system of the lungs was due to an increase in the hydrophilicity of the pulmonary parenchyma in connection with infusion therapy, mainly performed in the morning-afternoon hours against the background of a relatively stable MRS regimen.



Fig. 5. Hourly dynamics of oxygen saturation in the circadian rhythm in 1-8 days in%

An attempt to identify the peculiarities of oxygen saturation depending on the time of day on the 1st - 8th day made it possible to state the most unfavorable tendency to decrease the indicator at 13 and 20 hours by 3% and 2%, respectively. While in groups 1 and 2, infusion therapy performed in the same volume did not affect the level of hemoglobin oxygenation (fig. 5).



Fig. 6. Hourly dynamics of oxygen saturation in the circadian rhythm on days 9-17 in%

On the second week (9-17 days), the oxygen saturation indicator was represented by low-amplitude fluctuations in all patients at the level of 98.3% (fig. 6).



Fig. 7 Hourly dynamics of oxygen saturation in a circadian rhythm on days 17 - 25 in%.

In the third week (17-25 days), slightly lower oxygen saturation indicators were found with a decrease in oxygen saturation to 95.7% at 13 o'clock in the afternoon in group 3. In groups 1 and 2, the indicator remained stable during the light and dark hours of the day at higher values (fig. 7).



Fig. 8 Correlation of oxygen saturation with hemodynamic parameters

During the acute period of CSTBI (25 days), a direct correlation was found between the oxygen saturation index with MBP (0.26), DBP (0.26), GPVR (0.2), which reflects a certain stimulating effect of the growth of hemoglobin oxygenation on the tone of peripheral vessels under MRS conditions (fig. 8). While in groups 2 and 3, inverse correlations of oxygen saturation CO, MBP, PP, characterize a weak tendency of the stimulating effect of a decrease in blood oxygenation on hemodynamic parameters, sympathetic activity, and an increase in myocardial oxygen demand.



Fig. 9 The duration of the shifts of the acrophase of the circadian rhythm of oxygen saturation

During the acute period of CSTBI, the longest inversion — pathological migration of the peak of oxygen saturation acrophase at night (within 14 days) was found in group 3 and the smallest (4 days) in group 1 (fig. 9). One of the leading causes of the inversion of the circadian rhythm of the oxygen saturation index in group 3, possibly, is chronic heart failure, which significantly reduced the adaptive capabilities of the myocardium in the conditions of intensive therapy of the acute period of CSTBI.

Conclusions. Mechanical respiratory support (MRS) provided fluctuations in the mesor of the circadian rhythm of the oxygen saturation indicator within the normal range. The tendency to an increase in the amplitude of fluctuations in the third week of the acute period in injured people over 61 years old testified to the instability of blood oxygenation. During the acute period of CSTBI, the longest inversion — pathological migration of the peak of oxygen saturation acrophase at night (within 14 days) was found in group 3 and the smallest (4 days) in group 1.

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HETEROGENEITY OF THE CAESIUM-137 DISTRIBUTION IN THE PEAT SOIL UPPER PART

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Abstract. For the upper part of the peat soil profile of the Sodrinskoye upland swamp, which is the part of Mshinsky Swamp reserve, a high variability of the specific activity of caesium-137 in 28.6% was established. The specific activity of peat soil varies from 357 ± 28 Bq/kg to 668 ± 41 Bq/kg. To determine the accumulation coefficients of fungi and berries, it is recommended to select peat soil directly at the sample collection site, rather than using specific activity values averaged over large areas.

Keywords: caesium-137, upland bog, sphagnum, peat soil, distribution.

Introduction

According to the Ramsar Convention, the Mshinskoe Swamp Nature Reserve of federal significance, located on the territory of Leningrad Oblast, belongs to wetlands of international importance. On the map of radioactive contagination of the Leningrad Oblast, the areas of contamination with cesium-137 are marked in the reserve.

This isotope is absorbed by plants and fungi and enters the food chain. Its source in ecosystems is the fission products of nuclear fuel released into the environment as a result of the accident at the Chernobyl nuclear power plant, which occurred on 26.04.1986.

To protect of the population health, the activity of caesium-137 in wild raw materials of fungal and plants origin is monitored [1]. An important characteristic of the body's ability to accumulate caesium-137 is the accumulation coefficient, which shows the ratio of the radionuclide specific activity in the raw material to its activity in the soil.

The main type of soil in the upper bogs is peat soil, formed as a result of the sphagnum moss development. To determine the coefficient of caesium-137 accumulation by fungi and berries, we use the part of the soil profile in which the

maximum number of woody plants and shrubs roots is detected. Usually, they are located at a depth of 5-10 cm in the upper part of the peat horizon. The reasons for this are that their distribution is limited lower down the profile by excessive moisture content, a reduction in the amount of available oxygen and an increase in the concentration of carbon dioxide.

To determine the coefficients of caesium-137 accumulation in fungi and plants, the specific activity of caesium-137 was measured in the upper part of peat soil and in the oches of sphagnum moss. As a result of the work carried out, it was found that the distribution of caesium-137 in the sphagnum moss and peat horizon is heterogeneous and varies in a wide range from permissible values of 356 ± 37 Bq/kg, to values exceeding the valid value of 400 Bq/kg, such as 815 ± 62 Bq/kg [2] and 853 ± 41 Bq/kg [3].

Purpose of the study – to study the variation of the caesium-137 specific activity $\$ in the peat soil of the upper bog for samples collected on the territory of one hectare.

Materials and methods

The territory of the Sodrinsky swamp was chosen as a model object, where studies of cesium-137 accumulation in the producers and reducers of the upper swamp ecosystem are carried out [1].

The samples were taken in wet depressions located at the vertices of a square with a side of 100 m (Points 1-4), the fifth sample was taken at the intersection of the diagonals (Point 5). The coordinates of the sampling sites were determined by the etrex GPS navigator:

Роіпт № 1. (N 59°08.350', Е030°22.008', Н 65 м).

Point № 2. (N 59°08.345', E030°21.900', H 62 м).

Point № 3. (N 59°08.293', E030°21.901', H 62 м).

Point № 4. (N 59°08.295', E030°22.014', H 62 м).

Роіпт № 5. (N 59°08.321', Е030°21.959', Н 63 м).

The upper part of the sample is from 0 to 5 cm deep – alive shoots of sphagnum (oches). The second part of the soil sample from a depth of 5 to 10 cm is the upper part of the peat horizon. The selected samples were dried in an air stream with a temperature of 40 °C to an air-dry weight. The radionuclide composition of the sample was determined by gamma-ray spectrometry. The specific activity of caesium-137 (Bq/kg) was measured by beta radiation radiometry.

Results and discussion

The table shows the results of measuring the specific activity $({\rm Bq/kg})$ in the studied samples of peat soil.

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Point	1	2	3	4	5	
Depth 0-5 см	439±19	357±28	553±29	353±25	668±41	
Depth 5-10 см	256±25	301±24	322±16	245±22	547±35	

Table – Specific activity* of caesium-137 in the upper part of peat soil

* – the calculation of the confidence interval of the average activity was carried out at the significance level p<0.05

The variation coefficient of specific activity in the upper part of the soil profile (Table) is 28.6 %, which characterizes the detected variability as significant, and the distribution of caesium-137 as heterogeneous

At the same time, at each selection point, a decrease in specific activity is observed with increasing depth (table), which is characteristic of the regressive-accumulative type of distribution. At the same time, the variation in the values of specific activity becomes more significant and reaches a value of 36.8 %.

The sampling of peat soil was carried out in wet depressions in order to compare the results obtained with the data of the Ozernoye swamp study, also part of Mshinskoe Swamp Reserve. When determining the specific activity of samples taken in the Ozernoye swamp, sampling was also carried out in wet depressions, but along a route whose length was 2 km [3]. Six samples were selected, the specific activity of which varied in the range from 356±37 Bq/kg to 853±41 Bq/kg [4]. The coefficient of variation of gorge activity was 29.2%, which is comparable with the results obtained in this study.

Thus, the obtained results demonstrate the spatial mosaic of the caesium-137 distribution in the upper layer of the peat soil of the surveyed swamps, characterized by high variability. For the preliminary characterization of the studied swamps, this approach justifies itself. At the same time, it is not necessary to use the averaged data to determine the accumulation coefficient of caesium-137 by wild fungi and berries. If a high variation in specific activity is detected, it is recommended to select the soil directly at the place where fungi or berries are collected.

The sampling method used in this work is suitable for the analysis of those objects where the soil conditions are homogeneous, for example, in fields. In the case of swamp ecosystems, the method used is suitable for preliminary characterization of the caesium-137 distribution. In further studies, the results obtained should be detailed taking into account the collection of those organisms, the accumulation of caesium-137 in which it is planned to study.

Special attention should be paid to the upper part of the soil profile when studying the distribution of caesium-137, since it is the place of the maximum concentration of the isotope. A regressive-accumulative type of distribution was

established for peat soils of upland bogs in the study area, in which the specific activity of caesium-137 in the soil profile naturally decreases with depth.

One of the properties of peat soil and live sphagnum shoots is the acidification of the medium to pH values of 3.5-4.0. These are favorable conditions for the migration of the alkali metal caesium-137. The concentration of caesium-137 occurs as a result of assimilation processes occurring in growing sphagnum shoots. An additional resource for the migration of caesium-137 up the soil profile is the capillary properties of sphagnum stems. The evaporation of moisture by living cells of the tops of moss shoots leads to the flow of moisture from deeper layers of peat to the surface.

Conclusion

It was found that the variability of the caesium-137 distribution in the upper part of the peat soil profile is 28.6 %. In this regard, to calculate the coefficients of caesium-137 accumulation in producers and reducers of swamp ecosystems, it is necessary to detail the activity of the radionuclide at the collection site of the studied sample, for example, the fungus fruit body or berries, and not to use averaged values, for example, per hectare or per square kilometer.

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ECO-FIBER CONCRETE - AN INNOVATIVE MATERIAL IN TANK CONSTRUCTION

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Abstract. The history of the development of reinforced concrete is briefly outlined. Now the fourth stage of reinforced concrete development is underway and a new material is being born in it - "eco-concrete" - a domestic development of reinforced concrete, patented in 1992. "Eco-concrete" - ultra-high pressure concreting in a water-aerosol environment using inflatable formwork. The use of composite reinforcement (basalt fiber, polypropylene, glass fiber, metal fiber) in the "eco-concrete" technology gives rise to an almost new building material -"eco-fiber concrete", which has unique properties - high strength, durability, fire resistance, impact and fatigue strength, low-temperature strength, non-shrinkage, high crack resistance, reducing the cost and construction time. "Eco-fiber concrete" has great prospects in the construction of storage equipment of various shapes for the storage of explosive, toxic and low-temperature media.

Keywords: A brief history of reinforced concrete, "eco-fiber concrete" ultra-high pressure concreting in a water-aerosol environment, concrete with composite reinforcement with fibers from various materials (metal, basalt, plastic, propylene). Capacitive equipment - vertical cylindrical, spherical tanks. Stored products - explosive, toxic, liquid, gaseous. According to historians of technology, the invention of reinforced concrete, in terms of its influence on the development of world civilization, can be put on a par with the discovery of electricity, the appearance of a car or aviation. The first inventors of reinforced concrete appeared in France (Lambo, 1850; Cunier, 1854; Monier, 1867 - 1880), in England (Wilkinson, 1854), and in the USA (Gnutt, 1855-1877).

And the history of reinforced concrete begins in 1848 with Jean Louis Lambo's boat made of a new material - a metal mesh made of interconnected wires and rods and covered with cement. Although Russian craftsmen back in 1802 used reinforced concrete in the coatings of the Tsarskoye Selo Palace. However, they did not consider it a new material and did not patent it.

In 1887 G. Weiss and M. Kenen proposed to place the reinforcement in the tensile zone of the structure. From that moment on, reinforced concrete became an independent new building material, which is the first stage in the development of reinforced concrete. At the same time, the method of calculating concrete structures by permissible stress, based on the laws of resistance of elastic materials, came into practice.

In 1917, E. Freyssinet proposed compaction of concrete by vibrocompression, and then, in 1928, prestressing of reinforced concrete elements. Although for the first time the idea of prestressing tensile elements was put forward and implemented in 1861 by the Russian artillery engineer A.V. Gadolin.

In the early 30s of the XX century A.F. Lawleyt, A.A. Gvozdev, E. Freisinet created a theory for calculating reinforced concrete based on destructive forces. This refers to the second stage in the development of reinforced concrete. And the method of calculation by limiting states that appeared in our country in the 50s (NS Streletsky, VM Keldysh, AA Gvozdev, etc.) marked the third stage in the development of reinforced concrete.

Doctor of Technical Sciences A.I. Zvezdov (President of the Reinforced Concrete Association, Deputy General Director for Research of the Research Center "Construction") formulated the concept of sustainable development of concrete and reinforced concrete.

1. Minimal consumption of irreplaceable natural resources. 1 ton of concrete takes 6-7 tons of natural resources, 1 ton of steel is almost 3 times more (\sim 20 tons).

2. Durability. It is highly recyclable and reusable.

3. Compatibility with other materials.

Today, concrete is not produced in the world without all sorts of chemical additives. Modified concrete is more effective than conventional concrete, while modifiers of complex action are mainly used, which improve several properties and characteristics of concrete at once.

Usually 4 fractions are used, which are separately introduced into the concrete mixture. For this, it is necessary to have special equipment for the preparation, drying, fractionation, storage and supply of aggregates. Russian factories have one or, at best, two factions.

We currently have material with the following advantages and disadvantages.

The main advantages of reinforced concrete:

- fire resistance and incombustibility;

- strength and durability;

- corrosion, weather and frost resistance;

- resistance to seismic and dynamic influences;

- constructions of structures of any shape;

- minimum operating costs;

- hygiene, ability to protect against radioactive radiation;

- prevalence and availability of source materials;

- low production energy costs.

Disadvantages:

- large dead weight of the structure;

- high sound and thermal conductivity;

- the complexity of alterations and reinforcements;

- long-term holding of the structure in the formwork (28 days) until the concrete acquires the required strength;

- the appearance of shrinkage and force cracks.

Complete or partial elimination of these drawbacks is carried out through the use of concretes on porous aggregates, special processing (steaming, evacuation, etc.), prestressing. Thus, reinforced concrete - the youngest of building materials (wood, stone, metal), continues to develop, fighting its shortcomings and multiplying its advantages.

The next stage in the development of reinforced concrete, in our opinion, is the emergence of the patented innovative technology "eco-concrete" - concreting under ultra-high pressure in a water-aerosol environment using inflatable formwork developed by CJSC NPPSO "GrantStroy" and design solutions of "Spetsstroypro-ekt" LLC [1, 2].

Consider the application of this virtually new material in tank construction - the most material-intensive area of construction.

All of the listed advantages of "eco-concrete" very successfully meet the requirements for the construction of tanks for the storage of explosive, toxic, with a higher specific gravity, higher or lower storage temperature. Such requirements are imposed by such products as oil, oil products, acids, alkalis, liquefied gases.

The technology of concreting under ultrahigh pressure in 2007 was recognized as a world discovery of a scientific idea and a domestic copyright certificate [3]

and a US patent [4] "On the force inertial compaction of particles of continuous media" were issued. The basic principles of this technology are aimed at achieving a high density concrete structure with increased physical and mechanical properties and increased isotropy of properties.

When creating the "eco-concrete" technology in 1992, CJSC NPPSO "Grant-Stroy" invented a fundamentally new mechanized complex for the preparation of concrete mixture in a hermetically sealed chamber high-speed concrete mixer (fig. 1, 2), providing transportation under high pressure 1.4 MPa at a speed 120-200 m/s and concreting in a water-aerosol environment in a hermetically sealed system (fig. 3), which absolutely excludes dust release and rebounds in order to achieve ecological cleanliness of the environment.

The ultra-high density of concrete and reinforced concrete structures is achieved by compaction and displacement of water and air from the concrete mixture to the peripheral surface of the concreting. It provides the strength of a homogeneous single-layer concrete mix at an early stage of concreting up to 40%.

The use of "eco-fiber concrete" with composite reinforcement in the "eco-concrete" technology has an advantage over traditional reinforced concrete due to its higher physical and mechanical properties:

- significant reduction in the cost and construction time;
- an increase in the productivity of concrete works and concreting by 10 times;

• tensile and shear strength - 4 times higher than conventional reinforced concrete;

- flexural and compressive strength 20% higher;
- high resistance to cracking;
- impact and fatigue strength 3-5 times higher;
- strength at destruction from water hammer 3-5 times higher;
- modulus of elasticity 20% higher;
- increased fire resistance;
- frost resistance minus 120°C
- the work of destruction is 3-5 times higher;

• equality of indications of thermal expansion of composite reinforcement and fiber-reinforced concrete;

• elimination of shrinkage of the concrete mixture;

• increased surface resistance to abrasion and its higher resistance to weathering and weathering;

· construction in hard-to-reach places and confined conditions;

• 25 years of experience in extreme conditions shows a high degree of water tightness and resistance to cavitation and abrasion.

All of the listed qualities of "eco-concrete", with varying fibers having different properties (heat resistance, alkali and corrosion resistance) (tab. 1), can expand the

field of application of this actually new material "eco-fiber concrete" by using it for the construction of vertical tanks for storage of oil, petroleum products, chemically active substances (including ground-based), ball tanks for storing products under pressure, as well as isothermal tanks for storing low-temperature liquefied gases. These qualities include the following properties: increased strength, leading to a decrease in weight (the main disadvantage of reinforced concrete) of the structure; due to the lack of moisture and air in the body of concrete, the reasons for the occurrence of shrinkage disappear; a quick set of the required strength significantly reduces construction; the minimum construction area makes it possible to carry out work in cramped, inaccessible and remote areas. The increased impact strength will be in demand in the protective walls of oil terminals, as well as in the outer shells of vertical isothermal tanks of complete containment of the combined design. Significant reduction in the magnitude of stress concentrators at the joints of the wall with the bottom and with the coating due to the "eco-fiber concrete" application method.

We would like to point out the prospects of using "eco-fiber concrete" in the outer shells of isothermal tanks at temperatures up to -104°C (ethylene) even without metal cladding of the inner surfaces. At the same time, the shell thickness can be reduced by 2 times, as well as in spherical tanks, especially in large volumes (>3000 m³). The use of inflatable formwork in combination with the property of "eco-fiber concrete" to quickly gain 40% strength within a short time increases its advantages in the construction of structures of complex shapes (fig. 4).

"Eco-concrete" technology is widely used and has successfully proven its unique capabilities in the construction of buildings and structures of the most complex shapes and structures for various purposes. They have been tested by time and natural disasters. Unfortunately, these unique construction and operational capabilities have not yet found their application in the construction of storage tanks for oil, oil products, toxic products, and liquefied gases, although all the prerequisites for this exist. It is necessary to carry out in-depth comprehensive laboratory tests, select the optimal concrete mixtures, chemical additives and plasticizers, the material and shape of the fiber, the density of reinforcement, and build prototypes of storage facilities of various configurations and designs.

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Fig. 1, 2 – Mechanized complexes in the "eco-concrete" system



Fig. 3 – Concreting technology "eco-concrete"



Fig. 4 – Civilian structure

N S											
Table M. teristics of different fiber	Steel (metal) fiber	Carbon steel wire		600 - 1500	$0.5 - 1.2 \ \mu m$	30 - 50 mm	190	3 – 4	1550	Low	7.80
Comparative chara	Fiberglass fiber	Fiberglass		1500 - 3500	13 – 15 μm	4.5 - 18 mm	75	4.5	860	Alkali resistant fiber only	2.60
	Polypropylene fiber	Polypropylene		150 - 600	10 – 25 μm	6 - 18 mm	35	20 - 150	160	High	0.91
	Basalt fiber	Basalt		3500	13 – 17 μm	3.2 – 15.7 mm	Not less than 75	3.2	1450	High	2.60
	Indicator	Material	Structure	Tensile strength, MPa	Fiber diameter	Fiber length	Elastic modulus GPa	Elongation coefficient,%	Melting point, °C	Resistance to alkalis and corrosion	Density, g/cm ³
140	0	International scientific conference									

"Science and innovations 2021: development directions and priorities"

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THE HYBRID UNLIMITED EDUCATION MODEL. REVIEW

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Abstract. This paper addresses the problem of the modern education process. Can the remote education replace the traditional offline classes? Enrollments in higher Australian education dropped by 5 per cent. Postgraduate research enrollments and commencements decreased by 1% and 18% respectively, while other postgraduate commencements also decreased by 28% on 2019 figures. Bachelor degree commencement dropped 14% over the same period. We sure this is the time for developing a new global education market. Colleges and classical Universities should change their education model.

Keywords: education process; web technology; dualingo; tandem; hybrid education model.

1. Introduction

The globalization of the job market in the context of a pandemic has opened up remote work opportunities for many professions which were previously available only to representatives of the IT sector. Working on the beach with a laptop - this attractive image has long been a kind of business card of many trainings and courses teaching professions of the future. Nowadays, a cook, teacher, and an hire-specialist can work remotely as well. We will not consider the inevitability of automation of many professions, instead of that we will pay attention to modern approaches to training.

Remote learning today is a given that should be accepted. It hides both excellent opportunities and obvious shortcomings.

The Covid-19 pandemic has unveiled the importance of establishing proper channels of remote learning. While distance learning was primarily used by students who lived in remote areas or couldn't access in-person classrooms, it's now necessary for anyone enrolled in an academic institution. Corporations and educational institutes that rely on distance learning find that they cut costs substantially. Most online learning degrees are also cheaper than in-person learning, since students don't have to commute to class. Many universities also offer cheaper remote instruction since students enrolled in these programs don't need to use on-campus resources [1].

On the other hand, remote education is a tool of globalization. A new high-tech cross-border education market is being created right before our eyes. After all, what can prevent a student from Russia from enrolling and studying remotely at an university in Australia, given the enough quality?

This means that all the advanced educational organisation of the world will certainly have to join the fight for such students. The situation is similar with teachers and researchers. Opportunities to teach a large number of students, to apply their own author's methods in different countries - this also means a struggle for teachers. After all, now nothing will prevent a teacher who is in the United States from conducting classes and entire courses, for example, in Australia and vice versa .

It is obvious that the main working tool of such globalization is the English language. Students should own it, as well as teachers.

According to the statistics for 2018, the share of foreign students studying remotely at universities in Australia was 3% [2]. In 2020, there were 882,482 enrolments generated by 686,104 full-fee paying international students in Australia on a student visa. This represents a 7% decrease in enrolments on 2019 compared with an average annual enrolments growth rate of 7% per year over the preceding five years. Commencements decreased by 22% on 2019. This compares with the average annual commencements growth rate of 1% per year over the preceding five years [3].

2. Hybrid unlimited education model.

There are many learning models [4]. It is obvious that our own human life is a kind of school, and we learn every day. If we combine all these concepts into one, what do we get? Remote education, English, continuous learning-this means that a modern person should have the opportunity to learn technically throughout his life. If you have completed English language courses, this does not mean that the training is over. If you graduated from the university, it does not mean that your professional training ended there. It must continue.

Consider the popular platforms for learning English:

2.1 Dualingo.

Duolingo uses the method of unconscious learning for the steady assimilation of material and strengthening communication skills in a foreign language. The Duolingo courses comply with the CEFR (Pan-European System of Foreign Language Proficiency Levels), which is an international standard [5]. Duolingo is a commercial languageteaching platform that offers free courses on mobile apps and on the web. This study reports the ACTFL listening and reading proficiency levels of adult Duolingo learners who had completed the first seven units of course content in Spanish or French (from the English user interface). The participants

(n=340) were learners who had little to no prior proficiency in the target language and used Duolingo as their only learning tool. The participants of the study reached Intermediate Mid/High in reading and Intermediate Low in listening on the ACTFL scale. Their reading and listening scores were comparable with those of university students at the end of the fifth semester of study as reported in Tschirner (2016). The median amount of time learners spent on completing the first seven units was 203 hours. The findings of the study suggest that Duolingo can be an effective tool for foreign language learning at an intermediate level, especially in developing reading and listening skills [6]. This means The proficiency scores of Duolingo learners were comparable with the proficiency outcomes of students at the end of their fifth semester in upperdivision USbased university language programs. In conducting this study, we hope to have shed light on the potential effectiveness and comparability of Duolingo, as measured through standardized tests, to more traditional settings. Future studies will continue to build on our findings at other levels of study, in other linguistic domains, and in other target languages. And Beginning-level courses equivalent to four university semesters [7].

It would be a marketing, but the author of this work has been using this app for two year and this approach works.



Figure 1: Screenshots of the Dualigo application in the author's user account

It is noteworthy that the application constantly keeps statistics on the frequency of repetition of words, sends reminders and generates quick lessons to interest the user who has abandoned the training.

2.2. Tandem Language Exchange App. I

This is a language learning app where you can find a conversation partners. It makes so-called language exchange process, the process of joining forces with someone, known as your language exchange partner, who is ideally a native speaker of the language you want to learn. Through a two-way process of direct communication and conversation, both learners are given the opportunity to improve their target language skills and proficiency while simultaneously fostering intercultural competence [8]. Moreover they introduced Tandem languages certificate. It helps members verify their English language level. The Tandem Tests have been carefully designed to correspond with the levels in the Common European Framework of Reference (CEFR), an internationally recognized system for learning languages established by the Council of Europe. Tandem currently offers four tests to examine English level proficiency: A2 (Beginner), B1 (Intermediate), B2 (Advanced), and C1 (Fluent) [9].



Figure 2: Screenshots of the Tandem application

Besides, the application offers to hire a paid tutor for individual classes from among certified users. Nowadays, the app gives their user an opportunity to improve their language skill using language exchange partners and professional tutors as well.

2.3. SkyEng.

Lessons with a teacher in the Skyeng online school can be called a classic learning model based on a modern web platform. The largest online school in Europe [10].

They suggest:
- online classes with teachers;
- interactive tasks;
- video-collection with subtitles;
- speaking clubs;
- testing and individual plans of education.

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Figure 3: Screenshots of the SkyEng web application

Trainings for IELTS, TOEFEL, a job interview. The teacher is paired with a smart platform to monitor your progress and adjust the training plan.

2.4. AMES Australia.

For seven decades the organisation has been supporting newly arrived refugees and migrant settle in Australia, helping to build our marvelous multicultural society [11]. AMES Australia has played a significant role in successfully settling hundreds of thousands of new arrivals with our broad range of settlement, English language and employment services. In fact, this organization aids improve English as well as find job for immigrants.

It is not for nothing that we have given these examples of organizations that

are engaged in teaching English for their main purpose. After all, if we combine all this, we will get the modern cross-border hybrid continuous learning model that should be adopted by any professional higher education institution. It does not matter whether he is studying English or some professional specialty. The model includes:

- a modern digital platform that will help students learn using modern practices of gamification, task adaptation and personalization;

- intelligent homework system;

- a modern communication platform between students, professionals, colleagues and teachers;

- qualified teaching staff around the world;
- modern teaching methods, including author's ones;
- certification according to the standards;
- professional development;
- employment and career opportunities.

3. Intelligence system of home works. Math aspects.

Such a system will allow students to receive individual tasks depending on the mistakes made and the time spent on each task, and it will also be possible to choose the direction and training in accordance with the needs, skills and knowledge of the student. After completing the homework, the system determines based on the analysis which task will be offered to the student next. After each completed task, the system updates the student's data and makes a report on completed homework. When all the homework is completed, the teacher or the platform as a whole can give the student admission to the test to move to the next level.

Let's imagine that each task is a training exercise based on a separate miniapplication of a certain type. Each such mini-application has its own set of parameters, for example, the number of examples, the number of digits in the examples, a mathematical operation (multiplication, division), etc. Each parameter can have several levels (values) that configure the exercise and thus affect its complexity. For example, the parameter "Number of examples" can have levels: 2, 4, 6, 8, 10, 12.

Also, the teacher or manager sets a Zero standard – passing values according to the criteria for evaluating the solution of this type of exercise when choosing the standard level of parameters (default parameters). The criteria are:

- the time of solving the exercise, sec.;
- the percentage of correctness, %;
- number of attempts.

Each level other than the standard one has coefficients of influence on deviations of the zero standard when choosing this level. Thus, if the standard level of the parameter "Number of examples" is six, therefore, the value of the zero standard reflects the minimum indicators according to the criteria, when the student reaches the task will be counted as completed. If the teacher changes the level of the parameter "Number of examples" and sets it to twelve, it is expected that the values of the zero standard should be adjusted in the appropriate dependence. This is what the coefficients of the level's influence on the value for each criterion of the zero standard allow us to do.

It means, if the exercise has 5 parameters, respectively, the teacher chooses 5 levels. Each such level has 3 coefficients (for each criterion). Then these coefficients are multiplied to find the total coefficient for the value of the zero standard according to the corresponding criterion. Thus, the system receives an adjusted standard for this particular exercise with certain levels of parameters, according to which the student's performance of the exercise will be evaluated.

The formula for calculating the total coefficient for each criterion is as follows:

$$G_k = \prod_{p=1}^n I_{P_j'}$$

where G_k – is the coefficient of change of the zero standard for a certain criterion; I_{p_i} – is the coefficient of the parameter level.

The changed standard for each criterion is found according to the formula 2:

$$\boldsymbol{N}_{\boldsymbol{k}} = \boldsymbol{N}_{\boldsymbol{k}_{\boldsymbol{0}}} * \boldsymbol{G}_{\boldsymbol{k}'} \tag{1}$$

where N_k – the value of the standard for a certain criterion, based on the entered parameters; N_{k_0} – the value of the zero standard for a certain criterion.

The formula for calculating the deviation of the obtained data for the criteria from the standard:

$$\boldsymbol{O}_{\boldsymbol{k}} = \mathbf{1} - \frac{N_{\boldsymbol{k}}}{N_{\boldsymbol{k}\boldsymbol{z}}},\tag{2}$$

where O_k – deviation of the received data from the standard; N_{kz} – the value for a certain criterion formed after completing the homework.

After calculating the standard, the system processes the student's answers and compares them with the calculated standard. If the standard is not passed, the system finds a deviation of the student's results from the standard, forms training tasks according to the level of this deviation and automatically sets new levels of parameters for them. At the same time, the deviation level helps the system to most accurately set the parameters of the exercise so that the student can cope with it and be brought to the solution of tasks of the initial level of complexity.

Let's take an example for the English language. The parameters of the exercise are: the number of examples, the type of action (choose the correct answer, enter the correct answer, dictate the correct answer). Criteria: the speed of execution, the

percentage of correct execution and the number of attempts. To issue the next task, the deviation from the standard for the criteria "speed of execution" and "number of attempts" must be less than or equal to 0, and for the criterion "percentage of correctness of execution" must be greater than 0. In case of a different result, a training task is issued.

The zero standard for the criteria:

1) execution speed – 60 seconds;

2) the percentage of correct execution -95%;

3) number of attempts -1.

Starting parameters:

1) number of examples -6;

2) action - choose the correct answer.

The teacher set the following parameters:

1) number of examples – 12;

2) operation-dictate the answer.

Table 1 shows the formed coefficients based on the entered parameters..

Criteria Parameters	Execution speed	Percentage of correct execution	Number of attempts
Number of examples	2	1	2
Choose the correct answer	1,1	0,96	1

Table 1: Coefficients for the selected parameters

Using formula 1, we calculate the coefficient of change for each criterion:

$$G_{kc} = 2 * 1, 1 = 2, 2.$$

 $G_{kB} = 1 * 0, 96 = 0, 96.$
 $G_{km} = 2 * 1 = 2.$

Next, we will find the value of the standard for each criterion according to the formula 2:

$$N_{kc} = 60 * 4 = 132 \text{ sec.}$$

 $N_{kB} = 95 * 0.96 = 91.2\%$
 $N_{k\pi} = 1 * 2 = 2$

For example, a student completed the exercises in 185 seconds, the percentage of correctness is 80%, and all this in one attempt. We calculate the deviation of the obtained data from the standard for each criterion according to the formula 3.

$$O_{kc} = 1 - \frac{132}{185} = 0,28.$$

$$O_{kE} = 1 - \frac{75}{80} = 0,06.$$

$$O_{kII} = 1 - \frac{2}{2} = 0.$$

Based on the data obtained, the student should be given a training task due to the fact that he spent too much time on homework. These calculations show an approximate mathematical model of the operation of such an algorithm.

4. Results and discussion

The hybrid model will obviously help the educational institution to make its brand recognizable, to spread its teaching methods almost infinitely. An intelligent adaptive model for those who want and can study independently based on the materials and experience of the college, a remote model of working with students around the world. The opportunity to provide post-training to former students: training should not end after receiving a diploma/certificate/certificate. The hybrid model is an opportunity for a person to improve their knowledge by steps and throughout their life.

Students who have completed their training can continue training in the app. Get information about new training programs, teach yourself and form your own individual educational track.

Graduates who were currently employed were asked about how they had found out about their job [12]. The main avenue identified by respondents was through job advertisements or approaching employers directly. Overall, 44 per cent of graduates first found out about their job through an advertisement or by approaching employers. More specifically, advertisements on the internet were the most common way graduates had found their job (26%). The second most common way for finding employment was through personal networks, with 26 per cent of graduates finding their job either through friends of family or with the assistance of work contacts or networks. For graduates who were living in country on their passport, personal networks were more commonly utilised with 29 per cent of graduates using their personal networks to find their job compared with 23 per cent of graduates living in Australia.

Employees that were in part-time employment were also more likely to have used personal networks to find their role (36%) and also graduates who were not in their preferred industry were more likely to have used personal networks to find their employment (35%). This suggests that personal networks are more frequently helping graduates find temporary employment.

A focus on employment with a 'career' orientation was identified by graduates as the most important factors when selecting their current employer. Opportunities for personal or professional development (26%) and career opportunities (17%) were the two most common factors when selecting their current employer, while the profession (12%) was also a popular answer. Only nine per cent of graduates rated salary as the most important factor in selecting their employer.

Can an employer be interested in an inexpensive but qualified and promising employee who does not yet know the language? How can an employer or investor find out about a candidate if he does not enter the labor market of his country? And what if a person who has made a decision to enter the international labor market for himself has started studying a foreign language, but still has one or two years left, if such a specialist will fall into the field of visibility of potential employers. Then it will be a potential opportunity for the employer to find out about an interesting candidate a few years before he comes to the international labor market himself. It is also an opportunity to learn about scientists, talented young people even before they start publishing in English.

5. Conclusion

Computerization, border closure and globalization are opening up the global distance education market for educational institutions. Modern technologies and standards dictate their own rules. Any educational institution that has entered this race for world markets can become a new leader and gain popularity along with all recognized classical universities. The proposed hybrid learning model is based on the author's personal and teaching experience. On the other hand, as an active web developer, the author sees the possibility of applying the practical experience of several successful educational platforms based on one educational institution.

Further research is proposed to focus on the development of the concept of the connection of the learning process with potential employers.

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SIMULATION MODELING OF PRIMARY OIL TREATMENT FACILITIES

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Abstract. Mathematical modeling is widely used in the oil and gas industry, because allows to carry out research of objects and processes without carrying out field experiments. Due to the complexity, explosion and fire hazard of such processes as primary oil preparation, as well as the lack of information on technological parameters, the use of analytical methods for their study is difficult. Therefore, the optimal, and often the only possible way to study them is the construction of simulation models (SM). Simulation modeling of objects of the process under consideration is a complex task, the success of which depends on the methodology used. The article discusses the methodology for constructing an SM multiply connected system using the example of one of the components of the primary oil treatment unit - a furnace for heating the borehole fluid.

Keywords: mathematical modeling, simulation model, difference equations, hierarchy analysis method, oil heating furnace

Introduction

In the oil and gas industry, almost all objects and technological processes are fire and explosive, therefore it is not possible to conduct any research directly on them. For these purposes, various mathematical models are used, in particular, simulation modeling (SM), since the use of analytical methods most often turns out to be difficult or impossible due to the high degree of complexity of these systems in terms of structure, functioning, choice of behavior and development.

A system of simulation modeling (SIM) is understood as a set of software tools for creating a simulation model and its simulation (imitation) [1]. Today, there are

a large number of different simulation programs with their own unique languages (DYNAMO, GPSS, SLAM, SIMULA, SIMSCRIPT, Petri nets, etc.), which have significant differences only in the area of the graphical interface.

Regardless of the approach chosen, the most important factors in the development of simulation models are the correct task, the correctness of the initial data and the adequacy of the model, which largely depends on the identification method used to determine the parameters of the model based on experimental data.

Purpose of the study – development of a methodology for constructing a hierarchical simulation model of a multiply connected system using the example of individual blocks of a primary oil treatment plant (furnace for heating crude oil), which can later be used in a training simulator.

Materials and methods

The concept of a mathematical model does not have a strict formal definition [2]. In particular, in [3], a mathematical model is understood as any operator A, which allows setting the output values of the parameters Y of the simulation object based on the corresponding values of the input parameters X. The main requirement for any model is the most adequate reflection of the properties of the modeled object and its relationship with the outside world.

A mathematical model, like any other model, is always only a copy of an object and describes it approximately.

Compared to a natural experiment, the mathematical model (MM) has a number of advantages, in particular, the ability to implement modes that are dangerous or difficult to reproduce in reality, changing the time scale and making forecasts based on multifaceted analysis and identifying general patterns [4]. Also, without MM, it is impossible to implement predictive analytics, the importance of which is constantly growing in the industry.

The development of a simulation model consists in the sequential compilation of models of four levels: conceptual, topological, structural and parametric (fig. 1), each of which solves its own problem.

A conceptual or meaningful model is a description of the object of modeling in verbal form, which provides information about the nature and parameters (characteristics) of elementary phenomena of the object under study, about the type and degree of interaction between them, about the place and meaning of each elementary phenomenon in the overall process of functioning of the object. The conceptual model must be stratified, i.e. divided into separate parts that interact with each other and thus ensure the integrity of the entire object.



This interconnection of individual parts is described at the next, topological level. It is at this topological level that causal relationships between input and output parameters are determined. The model is a directed graph, where the vertices correspond to the input and output parameters, and the arcs correspond to the connections between them.

At the structural level, the relationships between input and output parameters are described in the form of mathematical expressions using algebraic operators. A typical structural model is a system of equations that describe either electrical, thermal, mechanical processes, or information transformation processes.

At the last, fourth level, parametric modeling is carried out, during which various options for the functioning of the object are simulated, depending on the specified parameters of the model elements and the relationships between these parameters.

To determine the parameters of models on the basis of experimental data, a large number of identification methods have been developed [5]. From the point of view of the purpose of this study, of interest are methods that are not demanding on RAM and that allow to analyze data on-line, as well as using difference equations, which are most easily implemented on most industrial microprocessor controllers, as well as in software packages of mathematical modeling.

In this study, it is proposed to use the method of analysis of hierarchies (MAH) at the parametric level, which is one of the rather formalized and classical methods of system analysis used to solve the problem of decision making in conditions of multicriteria [6].

The method is implemented in the following sequence: first, a hierarchical decomposition of the problem into separate tasks is carried out in such a way as to make it easier for a person (an expert) to make decisions for individual tasks based on paired, rather than multi-criteria comparisons, and then priorities are synthesized by mathematical methods.

When choosing the values of the model parameters, the developer faces a similar problem, which consists in obtaining a balanced set of parameters by multiple comparisons of the available parameter values in different modes. The technology underlying the hierarchy analysis method will allow replacing the need for simultaneous comparison of multiple parameters with pairwise comparisons.

To build a simulation model according to the described method, a crude oil heating furnace was used as an example, which is one of the main elements of a primary oil treatment unit in the field.

The technology of primary oil separation consists in heating it to a predetermined temperature in a furnace (fig. 2) and then separating it into three fractions in a separator: oil, gas and water.

Heating of the initial oil and gas mixture, which is supplied through pipeline 5

from an automated group metering unit (AGMU), is carried out in furnace 1 due to the heat of burners 3, in which gaseous fuel mixed with air is burned, supplied through the corresponding pipelines 2 and 4 [7].



Fig. 2. Oil heating process

Results and discussion

The block diagram of the P-1 furnace as an object of research can be represented as shown in fig. 3.



Fig. 3. Conditional representation of the furnace as an object of research

The letters in fig. 3 denote the so-called concepts - input and output quantities, which the created model must in a certain way relate to each other: T_1 - inlet oil temperature in P-1; T_2 - oil temperature after heating in P-1; T_3 - flue gas pass temperature in P-1; S_1 - operation of the first blower; S_2 - second blower operation; F_1 - oil flow rate at the inlet in P-1; F_2 - gas flow rate on burners in P-1; P_1 - gas pressure on burners in P-1; V_1 - position of the gas supply valve to the burners in P-1.

Then the conceptual model of the furnace primitive will have the form shown in fig. 4.



Fig. 4. Conceptual model of the furnace

At the next level, a topological model of the furnace is drawn up. At the topological level, causal relationships between input and output parameters are determined. Such a model is a directed graph (fig. 5), in which the vertices correspond to the input and output parameters, and the arcs correspond to the connections between them.

At the structural level, connections between input and output parameters are described in the form of mathematical expressions using algebraic operators:

$$T2_i = T1_i - W1 * F1_i + W2 * F2_i * (S1_i + S2_i),$$
(1)

where W1 and W2 are aperiodic links of the first order.



Fig. 5. Topological model of the furnace

After conversion to the difference form, we get the recurrent formula:

$$T2_{i-1} = T1_i - \frac{k2}{\frac{T_1}{dT} + 1} * F1_i + \frac{T1}{dT * (\frac{T_1}{dT} + 1)} * T2_{i-1} + \frac{k3}{\frac{T^2}{dT} + 1} * F2_i + \frac{T2}{dT * (\frac{T^2}{dT} + 1)} * T2_{i-1} * \frac{S1_i + S2_i}{2}.$$
(2)

To use the method of analyzing hierarchies, it is necessary to transform the expression by introducing new variables

$$a1 = \frac{k2}{\frac{T_1}{dT}+1}; \ a2 = \frac{T_1}{dT*(\frac{T_1}{dT}+1)}; \ a3 = \frac{k3}{\frac{T_2}{dT}+1}; \ a4 = \frac{T_2}{dT*(\frac{T_2}{dT}+1)}.$$

Expression (2) takes the form

$$T2_{i-1} = T1_i - a1 * F1_i + a2 * T2_{i-1} + a3 * F2_i + a4 * T2_{i-1} * \frac{S1_i + S2_i}{2}.$$
 (3)

To determine the expression coefficients for $T2_{i-1}$ an $n \ge n$ matrix is compiled (n = 4 - is the number of inputs that affect $T2_i$). Each row and column of the matrix corresponds to the parameters $F1_i$, $T2_{i-1}$, $F2_i$ and $f1=(S1_i + S2_i)/2$.

The matrix of weights (fig. 6) is filled in random order according to the rule: if a row element is more important than a column element, then the number $r \in [1; 9]$ is put in the corresponding cell (the value determines the degree of importance of one element relative to another), otherwise the number r^{-1} is put.

Then the sum of the weights is determined:

$$S_{v} = \alpha_{1} + \alpha_{2} + \alpha_{3} + \alpha_{4} = 5,13 + 1,57 + 0,56 + 0,22 = 7,48$$

The nominal values of the parameters are taken equal: F1 = 200 t/h; $T2_{i-1} = 60^{\circ}\text{C}$; F2 = 0.5 t/h; f1=0,75; $T2_i = 78^{\circ}\text{C}$. Then the values of the coefficients are:

$$k_{1} = \frac{\alpha_{1} * T2_{i}}{S_{v} * F1} = \frac{5,13 * 78}{7,48 * 200} = 2,68,$$

$$k_{2} = \frac{\alpha_{2} * T2_{i}}{S_{v} * T2_{i-1}} = \frac{5,13 * 78}{7,48 * 60} = 0,89,$$

$$k_{3} = \frac{\alpha_{3} * T2_{i}}{S_{v} * F2} = \frac{5,13 * 78}{7,48 * 0,5} = 106,99,$$

$$k_{4} = \frac{\alpha_{4} * T2_{i}}{S_{v} * f1} = \frac{5,13 * 78}{7,48 * 0,75} = 71,33.$$

	F1	T2 _{i-1}	F2	fl	П	$\sqrt[3]{\Pi_i} = \alpha$
F1	1	9	5	3	135	5,13
T2 _{i-1}	1/9	1	7	5	3,89	1,57
F2	1/5	1/7	1	6	1,71	0,56
fl	1/3	1/5	1/6	1	0,01	0,22

Fig. 6. Matrix of weights

To check the adequacy of the model, data from regime sheets obtained from production were used. When simulating a disturbance in the form of an increase in the mass flow rate of oil to 220 t/h at the 25th minute with a constant fuel consumption on the burners, the model showed a decrease in the outlet temperature to 68°C (fig. 7), which practically coincided with the data of the regime sheets (70.5 °C).



Fig. 7. *The graph of the change in the temperature of raw materials at the outlet of the furnace*

Conclusion

When developing simulation models, the level of parameterization is of great importance, at which the parameters of the model are determined from experimental data. When choosing a particular method, the purpose of the simulation must be taken into account. In the present study, SM was compiled for further implementation as part of a training simulator for studying the primary oil treatment, therefore, the main requirement for the identification method was the possibility of prompt input of initial data and the possibility of using difference equations as a mathematical apparatus, therefore, the hierarchy analysis method was chosen. The assessment of the adequacy of the constructed model, carried out by comparing the calculation results with the data of a specific production, showed the convergence of the results at the level of 3.5 - 5%, which can be considered a completely satisfactory result.

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ABOUT METHODS AND MEANS OF EXTINGUISHING LANDSCAPE FIRES WITH ATMOSPHERIC NITROGEN

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Abstract. This article discusses the problems of extinguishing forest, steppe and peat fires, as well as ways to prevent them and reduce losses. The existing ground-based methods of extinguishing and preventing the fire of peat bogs are analyzed. It is proposed to use a nitrogen membrane station to perform the task. The methods of extinguishing forest and steppe fires with the help of aircraft are considered. Based on the analysis of the disadvantages of all the described methods, it is proposed to use a nitrogen membrane station based on a helicopter or airship. The results are a reduction in the cost of extinguishing farmland fires, steppe, forest and peat fires and damage from them, and the implementation of regular monitoring of steppe and forest areas.

Keywords: fire protection, thermomagnetic air separation, membrane separators, fire helicopters, fire airship, peat nitriding.

Introduction

Currently, monitoring of farmland, forests and steppe massifs is carried out with the help of helicopters, airplanes, satellites and even a simple bypass of fields with measuring devices.

At the same time, the" human factor " and climatic anomalies are the main causes of fires on farmland and in forests. The real scale of forest fires both abroad and in Russia, as well as the extent of the damage caused by fire, have not been reliably established to date, since regular monitoring of forest fires is carried out only in the zone of active forest protection, due to limited material and human resources [1].

The post-war statistics of forest fires in the USSR (Fig.1, 2) shows that every year in the country there were from 20 to 30 thousand forest fires on an area of 0.5 to 2.5 million hectares, and today only in the forests of Siberia there are up to 27 thousand fires that cover an area of 3.5 to 18 million hectares [1, 2].



Figure 1 - Dynamics of the number of forest fires on the territory of the USSR in 1947-1996



Figure 2 - Dynamics of the area of forest fires on the territory of the USSR in 1947-1996

Statistics also show that the scale of forest fires is increasing every year, causing significant harm to the health of the population due to the release of a dangerous carcinogen - benzopyrene.

Purpose of the study

The purpose of the study is to ensure fire and environmental safety of the biosphere and resource conservation of farmlands, peatlands and forests, which are renewable natural resources.

Materials and methods

Many countries, such as the USA, Canada, Australia, France, for which the problem of forest fires is relevant, have special aviation fire formations, and Russia is no exception, since fire equipment based on aircraft has been used in Russia for almost 90 years [3].

Each type of equipment has its own advantages and disadvantages. For example, unlike airplanes, MI-8, Ka-32 and MI-26 helicopters with spillway devices, the speed of transporting water containers is significantly lower and in case of fires in small territories or in mountainous areas, this is a fundamental advantage, since when draining at high speeds, at altitudes exceeding 40-50 m from the ground surface, the discharged liquid as a result of the incoming air flow breaks up to the state of aerosols and most of it evaporates before reaching the fire [4]. A common disadvantage of existing methods and devices is the high cost of both the equipment itself and its operation. As a result, it can only be used centrally on a national scale or in large regions of Russia. At the same time, extinguishing forest and steppe fires with water with the help of aviation is not only unprofitable, but also not effective, since planes and helicopters constantly have to refuel with water, fly up to the fire site, pour out the water and fly to the refueling station, during which the fire flares up with a new force [5].

Protection of peat from spontaneous combustion and prevention of peat fires is of extremely important social and economic importance both in our country and abroad [6, 7].

However, it is during the drainage of peat that there is a danger of its spontaneous combustion due to the products of the vital activity of microorganisms that warm up its mass to 70 degrees Celsius. The resulting destruction processes cause a further increase in temperature, which turns the peat into a semi-coke, which, in the presence of oxygen, self-ignites. Such self-heating and self-ignition also occur during the storage of extracted peat [7, 8].

Despite the fact that the uselessness of extinguishing peat fires with water was proved at the end of the last century, many modern developments in the field of extinguishing peat fires use water methods. Special means are also being created for this, despite the fact that filling the peat bog with water makes it impossible to extract and use it [9-11].

There are also other methods of extinguishing fires on peat bogs, including waterless ones, one of which, for example, is to create a barrier along the contour of the most fire-hazardous areas before the occurrence of spontaneous combustion or during fires. When the fire spreads to the barrier, the special mineral material decomposes with the release of carbon dioxide, which reduces the oxygen content in the air. Magnesium and calcium oxides begin to interact with various additives to form a porous barrier resistant to high temperatures, which prevents the spread of fire. The disadvantage of the method is, firstly, the destruction of peat by fire, secondly, high one-time and operational costs for its implementation, and thirdly, the inability to locate and prevent spontaneous combustion of peat [10].

There are gas methods of extinguishing forests and peatlands: "bombs" with liquid nitrogen, "briquettes" with carbon dioxide granules, etc., but they have "surface efficiency", and the spontaneous combustion of peat and the development of fire occurs in the depth of the peat, where they cannot get [11].

Results and discussion

The authors have developed a method of nitriding peat, which consists in the fact that with the help of an air separation unit (membrane or thermomagnetic), oxygen is separated from the surrounding atmosphere, and nitrogen is introduced into the peat self-heating zone with the help of gas-peat fire barrel with thermal probe (GPFBTP). This zone is determined by three GPFBTP, by thermal location of the "self-heating hearth", which allows to prevent spontaneous combustion and ensure safe extraction and storage of peat [10, 11].

A model of an automated complex was developed that eliminates the disadvantages of installing the nitriding method and expands its capabilities as follows [12]:

- the use of a highly passable serial mobile nitrogen station TGA 5/10 with a capacity of 300 hp with a capacity of 5 Nm³/min. and a pressure of 10 atm., with a nitrogen purity of 98-99% with overall dimensions of $6.0 \times 2.5 \times 3.6$ m. and a mass of 11.5 tons, which makes it possible to extinguish fires and prevent fires even on hard-to-reach peat bogs

- the use of gas-peat fire barrel with thermoelectric probes (GPFBTEP). using the method of electric sounding, which allows determining the profiles of the peat birthplace.

Thus, the use of the method and a mobile automated complex based on TGA-5/10 for detecting, preventing and extinguishing peat fires allows solving the problems of fire and environmental safety of peat bogs, as well as peat extraction and storage [13]. In the problem of extinguishing forest and steppe fires with the help of aviation, a promising direction is the replacement of the fire extinguishing composition (water) with atmospheric nitrogen produced using a nitrogen membrane station. At the same time, the most suitable aircraft for this method are airships and helicopters with high lifting capacity, for example, the MI-26.

Airships are mobile and reliable aircraft, with a sufficiently large autonomy, have a high load capacity and weight return, universal application and low total cost, including the cost of manufacturing -10 times lower than helicopters, and operating costs - 100 times lower. Therefore, there is an idea to equip an airship with the necessary fire-technical means, which will be able to solve all the problems of fire protection of farmland, forest masses and peat bogs [14, 15].

Also, when equipped with additional means, the airship will be able to monitor fire parameters, amphibious and rescue operations in hard-to-reach places, and is also able to perform long-term tasks of patrolling remote regions where there is a risk of fires.

Conclusion

Thus, the technical results of the claimed method are the reduction of costs for extinguishing fires of farmland, steppe, forest and peat fires and damage from them, and the implementation of regular monitoring of steppe and forest areas not only in the zones of their active protection, including farmland, with the possibility of using agrotechnologies of precision agriculture on them, such as local mapping, analysis of the state of agricultural crops, soil and other parameters.

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NUMERICAL SIMULATION OF GAS FLOWS WITH DEFLAGRATION IN TWO-DIMENSIONAL REGIONS

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Annotation. Algorithm of two-velocity calculation is developed for two models of system kinetic equations and system of gas dynamics equations on the basis of explicit TVD schemes for flows of deflagration of hydrogen-air gas mixes. Calculations where provided for test problems of deflagration initiation from thermal spot and propagation of deflagration front in isolated cylinder and axisymmetric channels with obstacles.

Keywords: nonlinear explicit TVD schemes for multi component reactive gas mixes, branching chain reaction, detonation engine.

Introduction

Employment of hydrogen as motor fuel instead of decreasing amounts of oil and gas is treated by many authors as main way of future energetic (so called hydrogen energetic). Main preference of hydrogen as a fuel is detonation fuel cycle which is more energetic preferable in comparing with ordinary fuel cycle [1]. In connection with this preference (beyond the problems of producing, collecting and transporting of hydrogen) problem of constructing hydrogen detonation engine is extreme actual. Perspective results are projects of pulsing detonation engine [1] and spin detonation engine [2,3]. Nowadays investigations in this field are provided mainly by mathematical modelling methods. Essential part of investigations is developing and improving of mathematical methods for numerical simulation of deflagration initiation and transition from deflagration to stable detonation in hydrogen-air gas mixes flows. From the kinetic point process of transition to detonation can be treated as transition from slowly deflagration to branching chain reaction in hydrogen-air mix. This reactions where developed by N.N.Semenov [5].

Kinetic model

Equations of chemical reactions can be presented as follows:

$$\sum_{i=1}^{n} \alpha_{ij} A_i = \sum_{i=1}^{n} \beta_{ij} B_i, j = 1, ..., M$$
(1)

where M,N-number of reactions and components of the mix a_{ij}, β_{ij} - coefficients of direct and inverse reactions. Arrhenius low is predicted for calculating of speeds of changing of mix components concentration c_i :

$$\frac{dc_i}{dt} = \sum_{j=1}^{M} (\beta_{ij} - \alpha_{ij}) w_j(\vec{c}, T),$$
(2)

$$w_{j}(\vec{c},T) = k_{f}(T) \prod_{i=1}^{n} c_{i}^{\alpha_{ij}} - k_{b}(T) \prod_{i=1}^{n} c_{i}^{\beta_{ij}}, \qquad (3)$$

$$k_{f,b} = A_{f,b} T^{l_{f,b}} \exp(-E_{f,b} / RT))$$
(4)

For preserving of non decreasing of entropy condition coefficients of inverse reaction where calculated from equilibrium constants:

$$k_b / k_f = K = \exp\left[\sum_{i=1}^n (\beta_{ij} - \alpha_{ij}) (\frac{G_i^0(T)}{RT} + \ln\frac{RT}{P_0})\right],$$
(5)

where $G_i^0(T)$ - Gibbs potential for mix component.

For numerical solving of system (2)-(5) for hydrogen-air mix different numbers of reactions and mix components are used. In the papers of different authors ([6-8] for example) meanings of coefficients $k_{f,b}$ diverse essentially. Results of numerical simulation of flows with deflagration and detonation essentially depends of what system of reactions and meanings of coefficients $k_{f,b}$ where used. One of the aims of present work is testing of different systems of reactions and meanings of coefficients in model (2)-(5).

Gas mix of 9 component: H_2 , O_2 , H, O, H_2O , OH, HO_2 , H_2O_2 , N_2 was treated. Components as Ar, O_3 , NO, NO₂ where neglected.

For present investigation the next 9 most widespread reaction where choose:

$-H_2 + O_2 = 2OH$	$-H_2 + OH = H + H_2 O$	$-2HO_2 = H_2O_2 + O_2$
$-H+O_2=O+OH$	$-H_2 + O = H + OH$	$-HO_2 + M = H + O_2 + M$
$-H_2 + M = 2H + M$	$H_{2}O_{2}+M=2OH+M$	$OH + H_2 O = H + H_2 O_2$

Table 1. Chemical reactions

Characteristic feature of hydrogen-air gas mix deflagration is appearance of sudden explosion after long period of induction . In this induction period grows of radicals H, O and OH appears. Mass of radicals, nevertheless stay small, and one radical component transverse to the others.

This explosion mechanism is branching chain reaction introduced by N.N.Semenov [4].

Two sets of coefficients meanings where used for system of equations (2)-(4), for reactions from Table 1: the first from [10] (for slow deflagration simulation), the second from [5] (for calculation on the basis of branching chain reaction theory).

2. Numerical simulation of flows of hydrogen-air reactive mixes

The system of the equations of ideal gas and the kinetic equations in the integral form for two dimensional flows with source term which are velocities of changing gas mix components (2) can be presented as follows:

$$d / dt \int_{V} \vec{Q} dV + \oint_{S} \vec{n} F dS + \Phi = 0$$
⁽⁵⁾

where $\vec{Q} = (\rho, \vec{m}, \rho e, \rho c_i), i = 1,...n$ vector of conservative unknowns, $c_i = \rho_i / \rho$ - mass concentration of mix component, $\Phi = (0,0,0,0,0,\rho f_i)$ source term, $F = (\vec{m}, \vec{m} \cdot \vec{m} / \rho + PI, \vec{m}(e+p) / \rho, \vec{0})$

Vector of flows
$$P = \rho R_B T \sum_i \frac{c_i}{\mu_i}$$
, $e = R_B T \sum_i \frac{c_i}{\mu_i} / (\gamma - 1) + V^2 / 2 + \sum_i \frac{c_i}{\mu_i} - \text{ pressure and full energy of volume unit } \sum_i \frac{c_i}{\mu_i} - \frac{c_i}$

chemical reactions.

Numerical simulation where provided for test problems of deflagration initiation from thermal spot and propagation of deflagration front in isolated cylinder and axisymmetrical channels with obstacles for gas mixes methane -air and hydrogen-air. Numerical algorithm [6] was developed on the basis of difference schemes of Harten [7] of second order of accuracy for time and space and Chakravarthy - Osher [8] one of second order of accuracy for time and third order accuracy for space. Aim of calculation providing was simulation of initial stage of deflagration appearing in flows of reacting gas mixes

Numerical simulation of methane -air gas mix deflagration

For specification of flow structure of investigated problem (appearing of deflagration from initial thermal spot in closed cylinder) calculations of methane -air gas mix deflagration where provided on the basis of one-reaction mode (initial molar concentration of methane was 0.4 and thermal spot was situated in outer part of cylinder exclude areas near boundaries):

$$CH_4 + 2O_2 = CO_2 + 2H_2O. (11)$$

For Arrhenius low $k = A \cdot \exp(-E / RT)$ the next meanings of coefficient from [9] where used: $A = 1.35 \cdot 10^{20}$, $E = 3 \cdot 10^4 kJ / mol \cdot c$.

On Figure 1, A-C level lines of methane molar concentration are drown (in write column corresponding to level lines meanings of concentration are drown in percentage) and velocity vectors in consecutive time moments:





Fig. 1 A-C – level lines of methane molar concentration are drown (in write column corresponding to level lines meanings of concentration are drown in percentage) and velocity vectors in consecutive time moments; D, E - graphics of temperature and molar concentration in the middle cylinder section in consecutive time moments.

Graphics on figure 1 demonstrate fast deflagration methane and corresponding grows of temperature in closed cylinder.

Numerical simulation of hydrogen -air gas mix deflagration

Two kinetic model where used for numerical simulation of hydrogen - air gas mix deflagration.

1. Model on the basis of full system of kinetic equations with 9 reactions for numerical simulation of slow deflagration

Flow in closed cylinder initiated from thermal spot with $T=550^{\circ}$ C was calculated on the basis of full system of kinetic equations with 9 reactions (Table 1) with meanings of Arrhenius constants from [10]. Results of calculations on orthogonal grid 300x300 are shown on figure 2.A-C - level lines of temperature and in write column corresponding to level lines meanings of molar concentration in percentage are drown. On figure 2. D, E – graphics of temperature and molar concentration are drown for grid line i=20 in consecutive time moments.



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Fig.2 A-C – C - vectors of velocity, level lines of temperature and in write column corresponding to level lines meanings of molar concentration of H_2 in consecutive time moments are drown. On figure 2. D, E – graphics of temperature and molar concentration are drown for grid line i=20 in consecutive time moments. Calculation where provided on the basis of full system of kinetic equations with 9 reactions

2. Model on the basis of branching chain reaction [5] for numerical simulation of transition deflagration to detonation.

Flow in closed cylinder initiated from thermal spot with T= 700° C was calculated on the basis of model of branching chain reaction with meanings of Arrhenius constants from [5]. On the full time step of numerical algorithm initially simplified differential kinetic equation for concentration of [H] was decided numerically separately with small time step (some time step for one time step for solving gas dynamics system (5)). Then with using new meanings of concentration of [H] on n+1 - layer and meanings of concentration $[H_2]$ [O₂] from n-layer we define quasi -stationary concentration of radicals [O] and [OH] from algebraic equation and finally find solution of system of differential for meanings molar concentration for $[H_2]$, $[O_2]$, $[H_2O]$, $[HO_2]$, $[H_2O_2]$ on the n+1 time layer. Then we use this meanings of molar concentration of species for solving gas dynamics system of equations (5) on the n+1 time layer. Results of calculations on orthogonal grid 300x300 are shown on figure 3.A-C - level lines of temperature and in write column corresponding to level lines meanings of molar concentration in percentage are drown. On figure 3. D, E – graphics of temperature and molar concentration are drown for grid line i=20 in consecutive time moments.



D



Fig. 3 A-B – A-C -vectors of velocity, level lines of temperature and in write column corresponding to level lines meanings of molar concentration of H_2 in percentage in consecutive time moments are drown. On figure 3. D, E – graphics of temperature and molar concentration are drown for grid line i=20 in consecutive time moments Calculation where produced on the basis of branching chain reaction [5]

Numerical simulation of flows with transition deflagration to detonation in axisymmetric channels with obstacles where also produced on the basis of branching chain reaction [5]. Form of obstacles are analogous to ones, used in [11], nevertheless geometry of channels essentially different. Thermal spot initiates reaction in left chamber of channel region initially filled by hydrogen-air mixture. Curvilinear structural grids for region of channel where constructed on the basis ob algorithm [12].





Puc 4 A-D – vectors of velocity, level lines of temperature and in write column corresponding to level lines meanings of molar concentration of H_2 in percentage multiplied by 100 inside the axisymmetric channel in consecutive time moments are drown.; E – Graphics of temperature for middle grid coordinate line i=50 in consecutive time moments, F – curvilinear structured calculation grid (every 10-th coordinate line is drown). Calculation where provided on the basis of branching chain reaction

Structure of flow on figure 4, A-D corresponds to deflagration of hydrogen - air mix inside the axisymmetric channel. Condensations of H_2 level lines correspond to fronts of deflagration and transition to detonation ones.

Conclusion

Testing was provided of application kinetic model of branching chain reaction for gas dynamics numerical simulation of initial stage of deflagration and transition to detonation for hydrogen-air mix.

Algorithm was developed of two-velocity calculations with small time step for one ordinary differential equation for [H] concentration and subsequent definition concentrations of the others component of gas mix and and greater time step for numerical decision of gas dynamics system of equation for reactive gas mix on the basis of TVD - schemes of Harten and Chakravarthy - Osher.

On the basis of this algorithm numerical simulations of two test problems where provided:

Initiation of deflagration from thermal spot and propagation of deflagration fronts for isolated cylinder and axisymmetric channel with obstacles

Calculations provided demonstrate applicability of developed algorithm for numerical simulations of initial stage of deflagrationof hydrogen-air mixes.

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THE ROLE OF MODELS IN THE DEVELOPMENT OF PHYSICS

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Abstract. The role of models in the development of physics is considered. It is shown that all physical theories are based on models - idealized structures that reproduce parts of reality in a simplified form. The development of physics is presented as a change of models.

Keywords: model, physics, physical theory, objective reality, method, analogy, symmetry.

At the beginning of the XXI century, it is absolutely obvious that physics, as a science that studies the most general laws of nature, is not only the leader of natural science and the scientific base of most modern technologies, but also represents one of the most important elements of the culture of society. The general cultural significance of physics is primarily due to the fact that the achievements of physics form the basis of the modern natural science worldview and form the basic scientific ideas of mankind about the world around us. Physics is closely related to technology. It is difficult to find now such a branch of technology that would not grow out of physics. The entire history of the development of technology is a gallery of theoretical and experimental physical discoveries brilliantly realized in engineering structures and technologies. Physics has now become the direct productive force of human society. Many physical effects and phenomena, which at first glance are very far from technical applications, become the basis for new branches of technology and ensure further technical progress. That is why physics is the basis for the fundamental training of an engineer and a bachelor in technical areas [1].

In the process of teaching physics at a university, it is important not only to inform the student of the knowledge necessary for further professional activity, but also to form a natural science worldview. For this, it is necessary to pay great attention to methodological issues, the process of the genesis of physical knowledge. Neglect of these issues leads to shortcomings in the theoretical knowledge and worldview of graduates, an unformed understanding of the physical picture of the world and clear ideas about the limits of applicability of physical theories, which further interferes with the correct explanation of the physical phenomena of the surrounding world, the successful application of physical methods of cognition in the development of other sciences. It is very important in the learning process to focus students' attention on the model nature of theoretical knowledge, the model nature of the cognition process in physical science, to form an idea of physics as a combination of a large number of different models, to one degree or another reflecting reality. Theoretical knowledge is of a model nature, it is impossible to give it the status of complete adequacy of physical reality.

Physical theories operate not with real objects, but with their idealizations, ideal models that abstract from some real, secondary sides of objects and therefore give an incomplete picture of reality (ideal gas, ideal liquid, etc.). Many researchers have emphasized the model nature of our scientific ideas about the natural world. Thus, in the article "The Role of Models in Science" A. Rosenbluth and N. Wiener wrote: "None of the parts of the Universe is so simple that it could be understood and controlled without abstractions. Abstraction is the replacement of the considered part of the Universe with some of its model, a model of a similar, but simpler structure. Thus, the construction of formal or ideal ("mental") models, on the one hand, and material models, on the other, necessarily takes a central place in the procedure of any scientific research". - Quote. [2, 24]. All science in this article is interpreted as a process of modeling, the development of science as the construction of more and more accurate models. In natural sciences, a model in a broad sense is understood as "a mentally or practically created structure that reproduces this or that part of reality in a simplified (schematized or idealized) and visual form" [3, 8]. Ideal objects (models), in contrast to real ones, are characterized not by an infinite, but by a quite definite number of properties. A model is an abstract reflection of reality in some form, designed to represent certain aspects of this reality and allowing you to get answers to some of the questions being studied and new information about this reality. Models constitute a necessary element of scientific knowledge, they are an important component of the changing natural science picture of the world.

Acting as some idealization of reality, the model can change over time, i.e. the degree of idealization and simplification of reality changes. From the initial ideal objects, a certain theoretical model of a given concrete phenomenon is built and it is assumed that this model in its essential aspects, in certain respects, corresponds to reality. As a result, a theory that describes the properties of ideal objects, the relationship between them, as well as the properties of structures formed from primary ideal objects, is able to describe the variety of data that a researcher encounters at the empirical level. In theory, a scientist deals with an intellectually controlled object, while on an empirical level, with a real object with an infinitely

large number of properties. A scientific theory built on the basis of a system of abstract models is not a direct, but an idealized reflection of reality. "The concepts and statements of the theory in the strict sense of the word describe not the properties and relations of real phenomena or systems, but the features of the behavior of an idealized scheme, or a conceptual model, which was built as a result of the study of a particular real system" [4, 14]. From the point of view of model representations, the content of the theory is the description of the model [5, 34]. The model, therefore, is one of the forms of cognition, a specific means of displaying the material world by a person.

Physical science is a collection of a large number of different models to one degree or another reflecting reality. "Physical theory is usually based on a few selected experimental results... These results are initially very simplified and systematically put into a model that may contain many additional human inventions that originate from the scientist's imagination rather than direct experimental facts. Proceeding from this, some theoretical system is not built too accurately and not too logically, and predictions are made" [6, 65 - 66]. Thus, the model as an element of the scientist's creative imagination.

Let us consider the main stages in the development of physics from the point of view of model concepts. Models as a means and forms of scientific knowledge appeared in ancient times (the continual model of Aristotle, the ideas of Democritus and Epicurus about atoms, the geocentric model of the world of Ptolemy). True, these models were purely speculative. Models were widely used in the creation of classical mechanics. Galileo used models as idealized mental systems as logical and methodological devices (for example, the movement of a body along an inclined plane without friction), which allowed him to discover the law of inertia. He understood the role of the mental model as a kind of abstract reproduction of the object under study. The models were widely used by I. Newton. At the same time, such logical devices as abstraction, idealization (absolute space and time, material point, etc.) were used. So, material points with which mechanics deals, have only mass and the ability to be in space and time. In theory, not only ideal objects are set, but also the relationships between them, which are described by laws. Derived objects (for example, a system of material points) can be constructed from primary ideal objects in theory. In classical mechanics, the following abstractions acquired the status of fundamental models: a material point and a system of material points, an absolutely rigid body, an elastic or plastic medium, ideal and viscous fluids, etc. [7, 43] These models were later widely used as basic ones.

The successes of classical mechanics gave rise to the tendency to regard all physical phenomena as mechanical, to reduce all physical phenomena to the mechanical motion of particles or their combinations. The greatest physicists of the
past centuries argued that they do not understand the phenomenon until they have built a mechanical model of it. After Faraday's discovery of the phenomenon of electromagnetic induction in the XIX century, attempts were made to explain electromagnetic phenomena on the basis of mechanical models (W. Thomson, G. Lorentz, D.K. Maxwell, etc.). W. Thomson wrote: "I never feel satisfied until I can build a mechanical model of the thing being studied. If I can build a mechanical model of it, I understand it. Until I can build a mechanical model of it, I don't understand it during all this time; that's why I don't understand electromagnetic theory". - Quote. [3, 40]. Attempts to build a mechanical model of electromagnetic phenomena led to the idea of a special hypothetical medium - ether, which has mutually exclusive mechanical properties. D.K. Maxwell made extensive use of mechanical analogies and models built on their basis. To create his theory, later called electromagnetic. Maxwell used the mechanical model of field lines created by him, the vortex model of the magnetic field [8]. Maxwell solved the problem of constructing a mechanical model of non-mechanical phenomena. Maxwell's model is based on the concept of vortex motions of an ideal fluid, which meant the world ether filling space. In his work "On physical lines of force" he builds a mechanical model of electromagnetism from hexagonal magnetic vortices, between which electric conducting spheres are located in the form of friction rollers. This speculative model provided a reliable representation of the laws of electricity and magnetism known at that time. Using his model, Maxwell generalized the previously experimentally discovered laws of Coulomb, Bio-Savard-Laplace, Ampere, the phenomenon of electromagnetic induction by M. Faraday and derived the famous equations that now bear his name. Maxwell's system of equations fully describes electromagnetic phenomena, is a logically harmonious and perfect theory, similar to Newtonian mechanics. Very important predictions about the independent existence of an electromagnetic field not "tied" to charges followed from Maxwell's equations, i.e. that the field can independently exist and spread in space. The analogy between Maxwell's equations describing the electromagnetic field and the wave equations made it possible to predict the existence of electromagnetic waves.

The "catastrophe" of mechanical models is associated with the penetration into the world of electromagnetic phenomena, with the concept of an electromagnetic field and other new concepts. "Being at first only an auxiliary model, the field becomes more and more real... The assignment of energy to the field is a further step in development, in which the concept of the field becomes more and more essential, and the substantial concepts inherent in the mechanistic point of view are increasingly receding into the background". [9, 445 - 446]. The special theory of relativity did away with the world ether hypothesis.

There are many different phenomena, different in their physical nature, but

having the same signs and patterns. In these cases, models are often built by analogy. The analogy method was widely used to create models of physical phenomena and theories based on them [10]. Newton's idea of the analogy between the motion of celestial bodies (the Moon around the Earth) and the motion of bodies thrown on the Earth (the fall of an apple), about the similarity of the Moon's acceleration to the gravitational acceleration on Earth, led him to the creation of the theory of gravitation. The analogy with the flow of liquid in a pipe played an important role in the creation of the theory of electric current. Its hydrodynamic model was created. The current was considered as the flow of an electric fluid through a conductor, similar to the flow of a fluid in a pipe. By analogy with hydraulic resistance, the concept of electrical resistance was introduced. G.S. Ohm used this analogy and, transferring the laws of hydrodynamics to electricity, formulated the now well-known Ohm's law. The mechanical analogy was also used by Maxwell when deriving the law of distribution of gas molecules by velocities. There are other examples of the successful application of analogy as a method of scientific knowledge to create models. A. Einstein widely used analogy in his works. The main ideas that led Einstein to create the special theory of relativity are based on analogy. By analogy, Galileo's principle of relativity was extended to electromagnetic phenomena. The postulate of the independence of the speed of light from the speed of the source was put forward by Einstein by analogy with the fact that the speed of sound propagation in a medium is independent of the speed of the source. The general theory of relativity is based on the principle of equivalence of inertial and gravitational forces, formulated by analogy with the principle of equivalence of inertial and gravitational masses.

An important moment in the development of modern physics was the hypothesis of M. Planck about the discreteness of radiation. True, M. Planck considered the idea of a quantum as a successful mathematical device. Developing Planck's idea, Einstein considered quanta as real particles in the theory of the photoelectric effect. At the beginning of the XX century, physics developed an understanding that different models can be used to describe the same phenomenon, describing this phenomenon from different angles. The concept of wave-particle dualism was formed. The combination of different models in describing one phenomenon (object) is a consequence of the fundamental principle of Bohr's complementarity. The various models complement each other.

Modeling is of particular importance in the study of the microworld. The micro-object model is a substitute for the studied subject, which cannot be directly perceived by the human sense organs. In the case of cognition of the microworld, its objects are not directly observed, therefore physicists are forced to create a rough model of it on the basis of a few data about it. Analogy becomes an important means of creating models that replace the sensory image of an invisible

material entity. The model is based on empirical data on the objects of the microworld, obtained in a material experiment. Such models help to understand the data obtained in the experiment about the studied objects of the microworld, to reveal the laws of their functioning, their connection with the rest of the world. In cognizing the microcosm, physicists were initially forced to use the objects of the macrocosm and the laws of the macrocosm as analogs, and only then, as the microobject was cognized, to make refinements and changes in the created models. Attempts were made to visualize the objects of the microcosm using such representations as a material point, trajectory, etc. Later, this had to be abandoned". Visibility is a very conditional and changeable thing... The word "visual" is not clearly defined. In essence, it means only something familiar and accessible to us without deep thought. It is clear that, in accordance with this, atomic physics is beloved. Only mathematical formalism can help to understand it. Those who do not understand him should leave physics alone. Nature does not care about our mathematical abilities, she is a much better mathematician than we are, and she conforms her laws not with the simplest, but with the highest and most effective mathematical methods". [11, 122-123].

Modeling micro-objects began with studying the structure of the atom. Consider how the atomic model gradually changed and became more complex. The first model of the atom was the model of J. Thomson, according to which the atom consists of a positively charged sphere, inside which negatively charged electrons move. In 1904, the Japanese physicist H. Nagaoka, by analogy with the theory of stability of the rings of Saturn, developed by Maxwell, put forward a hypothesis that the atom consists of a heavy positive nucleus surrounded by rings of a large number of electrons, whose vibrations in the plane of the rings should be accompanied by the emission of atomic spectra. It was replaced by Rutherford's planetary model of the atom, based on a large amount of experimental data and more accurately reflecting the processes in the atom. In this model, electrons revolve around an atomic nucleus like planets orbiting the sun. This model came into conflict with classical physics, according to classical electrodynamics, such an atom would be unstable, which contradicted reality.

In 1913 N. Bohr proposed a hypothesis that contradicted the classical electromagnetic theory, based on two postulates. According to Bohr's hypothesis, an electron in a stationary orbit does not emit. Radiation occurs when an electron passes from a higher orbit to a lower one. These transitions form the spectrum of the atom. Bohr formulated the rules for quantization, introduced quantum numbers. Based on Bohr's model, the spectrum of the hydrogen atom was calculated, which was in good agreement with experiment. Bohr's theory was a major step forward in the development of atomic physics and was an important stage in the creation of quantum mechanics. However, it had internal contradictions (it was based on quantum postulates, but applied the laws of classical physics to the description of the motion of an electron). It failed to calculate the spectra of more complex atoms.

Based on an analogy with the solar system, Rutherford and Bohr's crude atomic models made it possible to take the first steps in understanding the structure of the atom, which became the starting point for further study of this complex material formation. By analogy with the wave-particle duality of light, Louis de Broglie suggested that the wave-particle duality is also inherent in microparticles. In each case, scientists have tried to make the theory similar to earlier theories. Light was likened to sound, waves of matter to a light wave. Often, further research revealed a discrepancy in the analogy due to the specifics of the object under study, which led to the need to expand the boundaries of the theory and preserve its productive side.

Later, a quantum-mechanical model of the atom appeared, taking into account the wave properties of the electron. It made it possible to more accurately understand the structure of the atom, the laws governing the interaction of the nucleus and electrons, etc. Many historians of science note that E. Schrödinger derived the basic equation of wave mechanics, which bears his name, by analogy with the de Broglie equation describing the wave properties of matter. Some models based on analogy, as it turned out later, had no physical meaning, but played a large role in the development of physics. Rutherford - Bohr's planetary model of the atom, which compared the motion of an electron around the nucleus with the motion of a planet around the sun, led to the question of the position and speed of an electron in an atom. Further research has shown that similar answers cannot be given to these questions. But from this idea, atomic and quantum physics arose. In 1925, based on the analysis of spectroscopic data, J. Uhlenbeck and S. Goudsmit put forward a hypothesis about the existence of an electron spin by analogy with the angular momentum of planets rotating around an axis. Later it was found that spin has a specific quantum nature, not associated with the movement of particles as a whole.

The more complex the object of cognition and the deeper it is located in the structure of the material world, the more difficult it is to find an analogue for it in the macrocosm, which makes it difficult to create its model. "As our mental gaze penetrates more and more small distances and short periods of time, we are faced with the fact that nature behaves so differently from what we observe in visible and tangible bodies from our environment, *that neither one model* created from our large-scale experiments cannot be "true". A completely satisfactory model *of such type* is not only practically inaccessible, but also unthinkable. More precisely, we, of course, can invent it, but no matter how we invent it, it will be wrong...". **[12, 28-29]**. In such cases, at first, scientists are forced to use not one,

but several models, each of which helps to cognize some side, property, regularity of the most complex material formation. This is how the research of the atomic nucleus was conducted. The first model of the nucleus was the droplet model developed independently by N. Bohr and Ya.I. Frenkel'(1936). It was based on the analogy between the behavior of nucleons in a nucleus and the behavior of molecules in a liquid droplet. The droplet model of the nucleus made it possible to explain the mechanism of nuclear fission and nuclear reactions. In 1949-1950, the American physicist M. Geppert-Mayer and the German physicist H. Jensen developed a shell model of the nucleus, which made it possible to explain the different stability of atomic nuclei, the frequency of changes in their properties, the spin and magnetic moments of nuclei. To explain the process of neutron scattering by various nuclei, the interaction of a nucleus with incident particles, VF Weisskopf and G. Feshbach developed an optical model of the nucleus. With the accumulation of experimental data on the properties of atomic nuclei, new facts appeared that could not explain the above models. O. Bohr and B. Mottelson proposed a collective (generalized) kernel model. Later, statistical, cluster and other models of the atomic nucleus were developed.

Physicists go even further from "clarity" when studying elementary particles. Particular attention is paid to the application of the methods of symmetry and group theory, which establish the relationship between objects, phenomena and theories that are outwardly unrelated in any way. The interconnection of various kinds of groups in group theory reflects the objectively existing variety of common sides, relationships, properties, movements and states of material systems of the most diverse nature. The hierarchy of groups constructed in mathematical theory reflects to a certain extent the hierarchy of more and more general levels of reality. Fundamental symmetry groups are consistently applied in physics: development proceeds from classical mechanics with the Galileo - Newton group to special relativity with the Poincaré group, to quantum mechanics with the Lorentz group, to the physics of elementary particles with the SU (2) and SU (3) groups. In 1964, M. Gell-Mann and J. Neeman suggested that the presence of supermultiplets in hadrons is a manifestation of the strong interaction of the symmetry of the unitary group SU (3), a transformation group in three-dimensional complex space. In 1964, M. Gell-Mann and J. Zweig, analyzing the mass spectra of hadrons in supermultiplets on the basis of the mathematical structure of representations of the unitary group SU (3), put forward the idea that hadrons are built from quarks. By analogy with the experiments of E. Rutherford, E. Mardsen and H. Geiger (bombardment of atoms with alpha particles) J. Friedman, G. Kendall and R. Taylor performed experiments on deep inelastic scattering of electrons by protons and bound neutrons. The scattering occurred as if there were three point objects inside the nucleons, in which the entire mass of the nucleon was concentrated. These

experiments confirmed the quark model of hadrons. On the basis of the concepts of symmetry, the Standard Model of elementary particles is constructed, which describes quite well the properties of open elementary particles participating in strong, electromagnetic and weak interactions.

The general direction in the physics of the microworld is the creation of a theory in which the currently known four fundamental interactions (strong, electromagnetic, weak and gravitational) would be special cases of one fundamental interaction. Confidence in the possibility of creating such a theory increased after the unification of the electromagnetic and weak interactions into the electroweak and the discovery of the Higgs boson. The models used to develop these theories include concepts such as multidimensional spaces; supersymmetries that unite physical systems obeying different statistics; superstrings - trelativistic supersymmetric extended objects, including fermionic degrees of freedom and other mathematical objects.

Thus, the entire history of the development of physics shows that modeling is the most important method of understanding the surrounding reality. Any physical theory is based on this or that model. The model is formed on the basis of limited experimental and available theoretical knowledge about the object. Therefore, the model often cannot be built unambiguously. Physical theories should be viewed as intermediate utility models, but not as complete knowledge. They will be changed, altered, revised, etc. when new experimental data become available. The modern understanding of the processes of the microworld does not provide for visual representations of objects. In models describing the microworld, the role of abstractions, including mathematical ones, is increasing. The ability to choose a mathematical model adequate to a micro-object is on the verge of science and art [7, 43]. Therefore, the development of physics can be viewed from the point of view of the art of modeling.

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ON THE NONLINEAR LIGHT SCATTERING IN A DIELECTRIC NANOCOMPOZITE

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Summary. The paper discusses the possibility of using nonlinear light scattering in dielectric nanocomposites in nanomedicine. An appropriate physical method is proposed, which allows to clarify some essential issues related to its possible use for practical purposes. The issue posed is considered in terms of the basic regularities of quantum physics, which is essential for the practical application of the results obtained. However, results obtained in solving the task under consideration are interesting in terms of application in nanomedicine, which is essential in general, as well as in terms of the practical application of nanomaterials and nanotechnologies. Relevant conclusions are made, which allows the issues discussed and results obtained to be taken into account for further research, which is also essential.

The paper discusses possibility of the light beam propagation in a dielectric nanocomposite. The appropriate physical model is given and appropriate conclusions are made. The obtained results are interesting in terms of application in nanomedicine, which requires further research in this area based on results of relevant experiments.

Keywords: Dielectric nanocomposites, nanomedicine, model, nanomaterials.

Introduction

In recent decades, scientists have discovered new properties of nanomaterials. Nanocomposites are becoming more and more widely usable in various fields of technics and technologies. Active research into the medical application of nanocomposites, which will be crucial for humanity in the nearest future is currently underway. Due to all above mentioned factors, intensive research of nanotechnologies and nanomaterials is one of the main determinants of the development of modern medicine, which is also of great importance for the future of mankind. This paper discusses one possible application of the possibility of nonlinear light scattering in dielectric nanocomposites in nanomedicine. An appropriate physical model is given, which fits well with the data in the literature and is essential for the further research. The obtained results are essential in terms of the application of dielectric nanocomposites and nanomaterials in nano-biomedicine.

Theoretical model

As it's known, heat is transfered chaotically within a solid, as a result of the oscillation of the atoms and molecules constituting the body. The propagation of such oscillations is convenient to consider as the propagation of particles of a linear spectrum - phonons. Sound - is also the propagation of oscillation, but the corresponding waves have the direction of a propagation. The unified mechanism of propagation is revealed in the fact that in macroscopic bodies the coefficient of heat transfer and the speed of sound are proportional to each other [1,2]. This issue is very relevant for many branches of technics and technology, including the development and use of biomedical materials.

Let's use a general phenomenological assessment to assess the thermal conductivity [2;3]:

$$\lambda = \alpha V l$$
, (1)

Where:

 $\lambda\,$ - is the thermal conductivity of the composite, (W/(m.k));

V - is the characteristic velocity of the heat transfer particles in the sample. The heat transfer is a phonon for which the characteristic velocity is equal to the velocity of the sound in the material, (m/sec);

l - is the length of the free path of the phonons, (m);

 $\alpha\,$ - is the volumetric heat-acoustic coefficient, which is proportional to the phonon concentration (J / $m^2K),$

 $k_{\rm B}$ - is the Boltzmann constant, and characterizes the volume at which the ballistic motion of phonons is transformed into chaos. It's obvious that this volume is proportional to l^3 and,

$$\alpha = k_B(Cl^3),$$

where:

C - is a dimensionless value and equal to one.

In order to study the given issue, first let's turn to the issue of heat transfer during the irradiation of a nanocomposite, which is one of the principal issues for practical purposes.

As it is well known, heat in solid bodies is transferred chaotically as a result of the oscillation of atoms and molecules that make up the body. The propagation of such oscillations is convenient to consider as the propagation of particles of a linear spectrum - phonons.

The paper [1] discusses the bond state of solitons in the graphene waveguide.

In particular, based on the theoretical foundations of quantum mechanics, electrons were considered in terms of coulomb interactions within quantum formalism framework. The electronic system Hamiltonian was even represented within the Hubbard model framework [1,2,4].

In the work [1] we have discussed connected state of solitary waves in graphene waveguide. Particularly, based on the theoretical basis of quantum mechanics, the electrons were discussed within quantum formalism, taking into consideration Coulomb's inverse-square law. As for the electronic system hamiltoniana was represented within Hubbard model [1-3]:

$$H = \sum_{j\Delta\sigma}^{t_p} a_{j\sigma}^+ a_{j+\Delta\sigma} + U \sum_j a_{j\sigma}^+ a_{j\sigma} a_{j-\sigma}^+ a_{j-\sigma} + h.c.$$
(1)

Where $a_{j\sigma}^+$; $a_{j\sigma}$ is the operator of electrons' emergence and disappearance in J knot with the spin σ , t_p - is the integral saltus, which is d

In this work, discussable diel etermined overlapping wave functioning neighboring knots, Δ -is the vector of electrons bond in neighboring knots, U- is electron Coulomb repel energy, which are situated in one spin.ectric and magnet features and Callipers for the considered system, Maxvel's equations,

$$\vec{E} = -rac{1}{c}rac{\partial \vec{A}}{\partial t}$$

shall have the following expression: [1,4]:

$$\frac{\partial^2 \vec{A}_k}{\partial t^2} - \frac{1}{c^2} \frac{\partial^2 \vec{A}_k}{\partial t^2} + \frac{4\pi}{c} \vec{J}_k - \frac{4\pi}{c} \frac{\partial \vec{P}_k}{\partial t} = 0. (2)$$

Here \vec{A}_k is vector-potential, which conforms to electromagnetic field in graphene's K-th layer, and is considered to have the following expression: $\vec{A}_k = (0,0, A_k(x,t)); \vec{j}_k$ is electric current, which streams in the graphene's K-th layer with electromagnetic field and neighboring graphene's layer.

As a result of conducted discussion and appropriate calculating in the work [1] was accepted the following expression for the current compactness and the graphene waveguide systems:

$$j_{k} = -en_{0}\sum_{l}D_{l}\sin\left(\frac{le}{c}A_{k}(t)\right), \quad (3)$$

$$D_{l} = \sum_{s=1}^{m} \int_{-\pi/a}^{\pi/a} dp B_{ls} \cos(lp) \frac{\exp\left(-\varepsilon_{s}(p)/k_{B}(T)\right)}{1 + \exp\left(\varepsilon_{s}(p)/k_{B}(T)\right)},$$
(4)

As a result of appropriate changes Sine-Gordon equation was accepted.

In addition, there is mentioned, signal inversion is observed from a moment. Furthermore, inverted signal amplitude, practically, remains the same.

Taking into consideration that it is possible to receive nanocomposites with the use of graphene as well, which could be characterized by dielectric features, therefore, we shall further discuss the falling of the plane electromagnetic wave on the flat surface of nanocomposite.

It's known that for calculation concrete physical features of separate nanomaterial as a whole system, can be difficult, because they consist of various particles, which match the quantum mechanics laws. It is also known, that the optical features of quantum mechanical system are related to spectrum features of energy carriers' energetic state: to electrons and holes. Currently, it could be regarded to be confirmed, that optical and electrophysical features are essentially different from capacitance sample features, which is connected to energetic spectrum variation [5-8].

It is possible to determine quantum state of nanoparticle according to current electromagnetic radiation spectrum. If we compare current spectrum of nanocomposites consisted of various size of nanoparticles, it is possible to calculate general features of the ongoing processes at this time. If we regard, that number of nanoparticles N are not too big and plain electromagnetic wave fall on it, the wave vector of which lays in plane (x; y) then transmission coefficient will have the following expression while the beam of light normally falls on the plane surface, which is placed perpendicular to the x-axis, for the conductivity coefficient the expression can be recorded as follows [9]:

$$T(\omega; N) = \frac{(1-R^2)^{2} \cdot \exp(-\beta L)}{1+R^2 \cdot \exp(-2\beta L)}, \quad (5)$$

Where β - is the coefficient of extinction, R- light beam reflection coefficient near the border of layer, which as a rule, is less than 1 during the experiment, L- is the distance which goes through the nanocrystal composite.

Coefficient of extinction in the approach of unit diffusion can be expressed through unit volume diffusion $\sigma^{z}(\omega; a)$ cross of nanocomposite

$$\beta(\omega; a) = [\sigma^a + \sigma^s(\omega; a)] + \alpha^m(\omega);$$

Where $a^{m}(\omega)$ - is the coefficient of reflection weakened with matrix, α -is the characterized size of nanoparticle. In case of such orientation of nanocomposite scatter cross $\sigma^{s}(\omega, a)$ and absorption cross $\sigma^{a}(\omega, a)$ in laboratory coordinate system can be found through unit volume component of composite $\chi_{zz}(\omega, a)$ [9,10]:

$$\sigma^{a}(\omega,a) = \frac{4\pi\omega}{c} Im\chi_{zz}(\omega,a)$$
$$d\sigma^{z}(\omega,a) = \frac{\omega^{4}}{c^{4}} |\chi_{zz}(\omega,a)|^{2} sin^{2} \theta d\Omega; \quad (6)$$

Where θ - is the angle between scatter and electrical wave's electric intensity vectors, and *c* is the speed of light.

In the work [11] is given expression for cross in absorption line.

$$\begin{split} \sigma_{a} &= \frac{4\pi\omega Na^{2}}{c\hbar} F(I) \left[G_{1}S_{1}arctg \left(\frac{\Delta\omega_{1}\Gamma_{n}F(I)}{\Gamma_{n}^{2} + F^{2}(I)\cdot\Delta\omega_{n}\cdot(\Delta\omega_{n} + \Delta\omega_{1})} \right) + \right. \\ &\left. + G_{2}S_{2}arctg \left(\frac{\Delta\omega_{2}\Gamma_{n}F(I)}{\Gamma_{n}^{2} + F^{2}(I)\cdot\omega_{n}\cdot(\Delta\omega_{n} - \Delta\omega_{2})} \right) \right] (7) \end{split}$$

Where G_1 and G_2 are density of condition, and $\Delta \omega = \omega - \omega_n$; $F(l) = \sqrt{\frac{l_s}{l+l_s}}$.

In these expressions S_1 and S_2 are determined as the medium value of particle form-factor consequently are located in upper and lower zones for transmission to $S_{ng}(I)$.

Taking into consideration (5) expression to (7) expression shall be accepted expression for an optical radiation with dielectric nanocomposite and absorption in a layer of ω_n with central frequency:

$$T(\omega, N, I) \approx exp\left(-L\frac{4\pi\omega N}{c\hbar}DF(I)\right);$$
 (8)

Where the following marking are proposed:

$$D = a^{2}(G_{1}S_{1}) \cdot \arctan\left(\frac{\Delta\omega_{1}\Gamma_{n}F(I)}{\Gamma_{n}^{2} + F^{2}(I) \cdot \Delta\omega_{n} \cdot (\Delta\omega_{n} + \Delta\omega_{1})}\right) + a^{2}(G_{1}S_{1}) \cdot \operatorname{arctg}\left(\frac{\Delta\omega_{1}\Gamma_{n}F(I)}{\Gamma_{n}^{2} + F^{2}(I) \cdot \Delta\omega_{n} \cdot (\Delta\omega_{n} - \Delta\omega_{2})}\right) (9)$$

Discusion and analysis

From the discussion given above, it can be seen that the magnitude of the light conduction coefficient in the dielectric nanocomposite according to equation (9) essentially depends on the intensity of the laser radiation field (I). This relationship has the minimum point (I_p) , in which the conduction coefficient is minimal for certain parameters and the given radiation of the composite. However, when

shifting from a value of I_p to a large or small side, there is a small radiation limiting effect according to the intensity scale. The conduction spectrum profile is generally asymmetric with respect to the central frequency value due to the difference in $\Delta \omega_1$ and $\Delta \omega_2$ frequencies.

The paper [13] provides figures of nanocomposites from which it can be seen that the depth of the absorption band strongly depends on the magnitude of the intensity and the size of the nanoparticles. However, for solid dielectric nanocomposites, the orientation of the nanoparticle along the field requires a high intensity of radiation. It should also be noted that the conductivity coefficients behavior for solid and liquid matrices are the same at high intensities. In this case, the value of the conduction coefficient at the central frequency is equal:

$$T(I) = \exp\left(-L\frac{4\pi\omega_n N}{c\hbar\Gamma_n}a^2(GS_n)_{g=n}(\Delta\omega_1 + \Delta\omega_2) \cdot F^2(I)\right).$$
(11)

As the intensity increases, this equation exponentially tends to 1, it does it faster with the larger nanoparticle size, $\Delta \omega_1 + \Delta \omega_2$, and value of the **GS**.

Conclusion

The issue discussed in this paper is interesting for solving different types of practical tasks. The appropriate solution to the problem of nonlinear light scattering in a dielectric nanocomposite is obtained. It should be noted that the discussed task allows to further specify the possibilities of using dielectric nanocomposites and nanomaterials in biomedicine. It is also possible to modify the model under consideration, which should be carried out according to further experimental studies.

The obtained results from Fig. 10 shows, that in a system in which the dipoledipole interaction of the nanoparticle can no longer be neglected, the magnitude of this interaction will strongly depend on the intensity that will take the maximum value in fairly weak fields $(I \approx I_p)$. This peculiarity should be taken into account when studying the optical properties of similar composites, as well as when designing real devices in bionanomedicine which work is based on this property.

As it is well known, many materials of biological origin (proteins, bacteria, etc.) can be considered as nanoparticles, and at same the time particles are dielectric. In this regard, the question arises about the existence of nonlinear lowthreshold optical radiation in the biological environment, which is also interesting in terms of specifying possible effects.

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THE USE OF LOW LEVEL LASER THERAPY IN THE TREATMENT OF SURGICAL PATHOLOGY

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Abstract. An overview of the mechanisms of the effect of low level laser therapy at various structural levels and the main directions of its application for the treatment and prevention of surgical pathology is given. *Keywords:* low level laser therapy, surgical pathology.

The progress of medical science and technology, clinical medicine is now largely determined by advances in the field of quantum electronics. The growing interest of physicians in optical generators (lasers) is primarily due to the inexhaustible possibilities of laser radiation. The unique properties of the laser beam have opened up wide possibilities for its application in various fields: surgery, therapy and diagnostics [1,2,8,14,15]. Clinical observations have shown the effectiveness of a laser of ultraviolet, visible and infrared spectra for local use on a pathological focus and for affecting the entire body.

Depending on the nature of the interaction of laser light with biological tissues, three types of photobiological effects are distinguished [2]:

1. Photodestructive effects - thermal, hydrodynamic, photochemical effects of light cause tissue destruction. This type of laser interaction is used in laser surgery.

2. Photophysical and photochemical effects, in which light absorbed by biological tissues excites atoms and molecules in them, causes photochemical and photophysical reactions. The use of laser radiation as a therapeutic one is based on this type of interaction.

3. Non-disturbing effect, when the biosubstance does not change its properties in the process of interaction with light. These are effects such as scattering, reflection and penetration. This type is used for diagnostics (for example, laser spectroscopy). The article discusses examples of the application of photobiological effects depending on the parameters of low level laser therapy. The role of the use of low level laser therapy in the treatment of surgical pathology is indicated. Some examples are given and the corresponding conclusions are drawn.

Photobiological effects depend on the parameters of laser radiation: wavelength, intensity of the light energy flux, time of exposure to biological tissues, as well as the initial state of the organism and the irradiated tissues [7]. In laser therapy, light fluxes of low intensity are used, no more than 100 mW/cm². Therefore, this type of laser treatment is called Low Level Laser Therapy (LLLT). LLLT is used in medicine in two main directions: in photodynamic therapy (PDT) of tumors, where its damaging effect is used, and also for the treatment of a wide range of various inflammatory diseases, bearing in mind the stimulating effect of LLLT.

Laser therapy has the following features [1]:

1) the LLLT power required for indication by its body falls into the non-thermal effect area (wavelength range 0.3-1.55 microns);

2) the normalizing physiological effect persists after the termination of this effect; the duration of the preservation of the effect increases from procedure to procedure, overlapping at a certain moment the time between procedures;

3) the therapeutic effect is observed in the focus of pathology, although the effect can be made in a zone remote from the focus.

Light in the ultraviolet, visible and infrared regions of the spectrum has photobiological activity. Photobiological processes are based on photophysical and photochemical reactions that occur in the body when exposed to light [2]. Photophysical reactions are mainly caused by the heating of the object to varying degrees (in the range of 0.1-0.3 C) and the spread of heat in biological tissues. The temperature difference is more pronounced on biological membranes, which leads to the outflow of Na⁺ and K⁺ ions, the opening of protein channels and an increase in the transport of molecules and ions. Photochemical reactions are caused by the excitation of electrons in the atoms of a substance that absorbs light. At the molecular level, this is expressed in the form of photoionization of a substance, its reduction or photooxidation, photodissociation of molecules, in their rearrangement - photoisomerization.

Low level laser therapy both interacts with photosensitive cells and complexes [7,10] (copper-containing redox enzymes, catalase, cytochrome complex, peroxide radicals, singlet oxygen, some pigments, etc.) and disrupts weak interactions in biological systems. The strong interactions that determine the chain structure of biopolymers are not violated. The transformation of the excitation energy of a photosensitive cell is carried out by intramolecular conversion, nonradiative transfer of excitation energy to another molecule, and the use of excitation energy in photochemical reactions [14]. It is assumed that the action of laser radiation

on human tissue leads to a reversible (non-damaging) change in the spatial configuration of cell membranes and enzyme molecules, which causes a change in their regulatory functions and, as a consequence, the functional activity of cells [1,12].

Low level laser therapy stimulates the metabolic activity of the cell. Stimulation of biosynthetic processes can be one of the important points that determine the effect of low level laser therapy on the most important functions of cells and tissues, vital processes and regeneration [4].

LLLT leads to an increase in the content of DNA and RNA in the nuclei of human cells, which indicates the intensification of transcription (division) processes. This is the first step in the protein biosynthesis process. This raises the question of triggering mutations. However, it has been proven that the frequency of chromosomal mutations in human cells decreases when exposed to LLLT [10,11].

LLLT stimulates the production of a universal source of energy ATP in mitochondria, accelerates the rate of its formation, and increases the efficiency of the mitochondrial respiratory chain [3]. At the same time, the amount of oxygen consumed decreases. LLLT has an antioxidant effect [11].

Changes in blood microcirculation and oxygenation can be considered the most confirmed body response to laser exposure. The biological effect of LLLT on the microcirculation system [1,2,3,4] is explained by an increase in erythrocyte deformability and blood flow velocity, a decrease in spastic reactions of microvessels, especially in the arterial link, normalization of the permeability of the microvascular wall and elimination of edema, and an improvement in the rheological properties of blood. This is due to both photoreactions of smooth muscle sphincters of arterioles and biological substances stimulated by laser radiation.

Summarizing the data of modern research, it can be said that LLLT causes the activation of energy-binding processes in pathologically altered tissues with metabolic disorders, an increase in the activity of the most important enzymes, a decrease in oxygen consumption by tissues with an increase in the phosphorylating activity of mitochondria, their enrichment with energy, an increase in the intensity of glycolysis (glycogen formation) in tissues, and others.

Secondary effects are a complex of adaptive and compensatory reactions resulting from the implementation of primary effects in tissues, organs and the whole living organism [5,7,8,10,15]:

- anti-inflammatory,
- anesthetic,
- regenerative,
- desensitizing,
- immunocorrecting,

- improvement of regional blood circulation,
- hypocholesterolemic,
- bactericidal and bacteriostatic.

Currently, the high efficiency and safety of low level (not damaging biological tissues) laser therapy has been proven in the treatment of various diseases. Average indicators of the therapeutic efficiency of LLLT in hundreds of thousands of patients with various pathologies, including surgical, in Russia and the CIS for the period 1990-2002. make up 78-95% [1].

The high therapeutic efficacy of LLLT has been shown in studies in surgical patients in the treatment of postoperative complications, anastomositis, postoperative intestinal paresis, wounds, burns, obliterating vascular diseases of the extremities and other surgical diseases [1,8].

Laser light accelerates the regeneration processes, contributes to the reduction of microflora, resorption of infiltrates, normalization of blood counts and ultimately leads to wound healing. The radiation of the helium-neon laser helps to cleanse wounds from microorganisms, accelerates the processes of repair and epithelization, normalizes blood counts and significantly accelerates healing [2, 11]. The data obtained in the studies indicate that the processes of maturation of granulation tissue are more active in the case of irradiation of the wound with LLLT. There is a 2-3-day advance of the processes of maturation of granulation tissue in comparison with the control group, where the cellular reaction is less active.

Thus, LLLT has a pronounced stimulating effect on the processes of reparative regeneration of infected wounds and, therefore, is an effective treatment for such pathology [15].

The photodynamic effect has a powerful bactericidal effect, destroying the purulent-necrotic substrate, stimulating growth factors (TGF-b, PDGF, sFGF) as a result of exposure to granulation tissue. Antimicrobial photodynamic effect does not decrease after long-term treatment of local chronic infectious processes. The bactericidal photodynamic effect is local in nature and does not affect the state of microbiocinosis.

There are two main pathogenetic directions of the action of photon energy in patients with peritonitis: stimulation of the motor function of the gastrointestinal tract and optimization of the processes of reparative regeneration of the peritoneum. The achieved positive effect is explained by the combination and summation of the local and general biological effects of infrared laser radiation on the body. The local effect of the laser beam is to increase the activity of the energy-synthesizing processes of the cells of the nervous apparatus of the gastrointestinal tract, which are the point of application of the factors of the neurohumoral system, and the general biological effect indirectly stimulates the higher autonomic centers of regulation of the sympathetic-adrenal system.

The use of low-frequency laser radiation along with traditional methods of treatment significantly improves the immediate and long-term clinical results in the problem of acute pancreatitis. Laser therapy dramatically reduces the development of destructive forms of acute pancreatitis, potentiating the effect of drugs [13].

The use of laser radiation in the initial stage of lysis of the autodermotransplant terminates this process with further engraftment of the autosplash [6]. A short exposure to laser light with certain parameters significantly enhances the process of repair (restoration) of the structure of damaged cells. By activating reparative enzymes, the cycles of repairing damage to various elements of the cell structure, including its genetic material, are accelerated. It is important that all these stages of repair occur before DNA replication (cell division) [9,12]. At the same time, activation of flaccid granulations with subsequent epithelization without gross scarring is noted, i.e. the tissue becomes organ-specific [6].

To stop the reaction of aseptic inflammation and prevent gross scarring in the first 2 weeks after surgery, a good effect is given by the use of low-energy heliumneon laser radiation. The stimulating effect of laser therapy on regeneration processes in diseases and injuries of peripheral nerves has been experimentally established. Low-energy helium-neon laser radiation has a pronounced positive effect on reparative nerve regeneration [8].

In the focus of inflammation, laser radiation restores microcirculation and improves the outflow of fluid from the intercellular space into the blood vessels. The key role of microcirculation in maintaining homeostasis in tissues, as well as in the implementation of the effect of exposure to tissues and the body as a whole, of various exo- and endogenous factors is beyond doubt [1].

So, the effectiveness of laser light therapy is shown in almost all diseases under consideration. In many works, it is noted that this method is superior in effectiveness to other means and methods previously used to treat these diseases. The unprecedented breadth of therapeutic effects and the practical absence of objective contraindications indicate that laser radiation is not an ordinary physiotherapeutic factor. This is a new treatment method with great potential.

Thus, the stimulating effect of low level laser therapy on the activity of the most important enzymes is a key link in the mechanism of its therapeutic efficacy. Enzyme activation leads to an increase in bioenergetic and biosynthetic processes, stimulation of cell division, acceleration of regeneration, an increase in the activity of the immune system and, ultimately, to the observed therapeutic effect.

Laser therapy can be carried out both as an independent method and in combination with medication, including hormonal and physiotherapy methods. It should be borne in mind that in the course of treatment, the body's sensitivity to drugs changes and it becomes necessary to reduce the usual dosages, sometimes up to 50%, and in some cases even abandon them, while the sensitivity to LLLT does not decrease even with prolonged use for the treatment of chronic pathology.

After analyzing the scientific literature on this topic, we can conclude that the use of LLLT in the clinic for the treatment and prevention of surgical diseases and their complications is a very promising and experimentally substantiated area of modern medicine.

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