**САРАТОВСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ**

**ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ ИМЕНИ Н.Г. ЧЕРНЫШЕВСКОГО**

**Факультет иностранных языков и лингводидактики**

**Кафедра английского языка и межкультурной коммуникации**

XI научно-практическая конференция «Presenting Academic Achievements

to the World»(он-лайн)

**03.06.2020**

**Саратов**

**Организационный комитет конференции**

Председатель мероприятия:

– Назарова Р.З. - декан факультета иностранных языков и лингводидактики, профессор кафедры английского языка и методики его преподавания.

**Организационный комитет:**

Председатель организационного комитета:

- Шилова С.А. – зав. кафедрой английского языка и межкультурной коммуникации.

Секретарь организационного комитета:

- Алексеева Д.А. – преподаватель кафедры английского языка и межкультурной коммуникации.

**Программный комитет:**

Председатель программного комитета:

- Сосновская А.А. – доцент кафедры английского языка и межкультурной коммуникации.

Секретарь программного комитета:

- Пыжонков С.В. – старший преподаватель кафедры английского языка и межкультурной коммуникации.

Члены программного комитета:

- Боц Т.С. – старший преподаватель кафедры английского языка и межкультурной коммуникации;

- Павлова О.В. – преподаватель кафедры английского языка и межкультурной коммуникации;

- Скроб Т.В. – доцент кафедры английского языка и межкультурной коммуникации;

- Смирнова А.Ю. – доцент кафедры английского языка и межкультурной коммуникации;

- Каневский М.В., к.биол.н., преподаватель кафедры биохимии и биофизики

- Пожаров М.В., к.хим.н., доцент кафедры общей и неорганической химии;

- Портенко М.С. – старший преподаватель кафедры информатики и программирования

- Гребенюк К.А., к.ф.-м. н., доцент кафедры радиотехники и электродинамики

- Червяков М.Ю., к.геогр.н., доцент, зав. кафедрой метеорологии и климатологии

- Маркин А.В., к.хим.н., вед.инженер отдела наномеханики ОНИ наноструктур и биосистем

- Рытик А.П. - к.ф.-м. н., доцент кафедры медфизики

- Пономарев Д.В. - к.ф.-м. н., доцент, кафедры физики твердого тела

**Panel Discussion 1: Natural Science (Discord)**

**June3, Wednesday, 10:00-12:30**

**Time-limit: 7 minutes**

*Chairpersons:*

***Mikhail V. Pozharov*** *(PhD in Chemistry, Junior Researcher, Laboratory of General and Inorganic Chemistry, SSU)*

***TatyanaS. Bots*** *( Senior Lecturer, Department of English and Intercultural Communication, SSU)*

***Matvey V. Kanevskiy*** *(PhD in Biology, Lecturer,* [*Department of Biochemistry and Biophysics*](https://www.sgu.ru/en/structure/biological/biochembiophys)*, SSU)*

**ArtemBakal**

*Hydrothermal Synthesis of Carbon Nanostructures Using Ovalbumin Coprecipitation into Pores of Calcium Carbonate Microparticles*

In this work we report a new approach to the synthesis of the protein based luminescence carbon nanostructures (CNS). The current work is aimedto design a test model for the development of luminescent labels based on proteins with an example on ovalbumin (OVA). The label was a heat-treated system with the luminescence properties and specific binding to antibodies.

(*Scientific Advisor: I. Yu. Goryacheva, Professor, SSU)*

**Nataliya Dementieva**

*Bioremediation of Oil-contaminated Soils by Means of Microorganisms*

Since the process of remediation of oil-contaminated areas in nature takes a long time, scientists have proposed to use bacteria to accelerate this process. It is in the interests of scientists to identify and study the properties of those bacteria that can use oil as a food source.

(*Scientific Advisor: Natalia F. Shurshalova, PhD in Biology, Associate Professor, SSU)*

**Nikolay Gorkov**

*Integration of Physiological Processes of Shoot Phytomers and Germinal Root System of Wheat Seedlings*

The article deals with international of some phytomers of wheat germ roots.Special emphasis is placed on their adaptability in drought conditions.It is spoken in detail about the medium for seed germination.Short description is given of the processed of nutrition and photosynthesis.  
(*Scientific Advisor: Mikhail Yu. Kasatkin, PhD in Biology, Associate Professor, SSU)*

**Stanislav Gritsenko**

*The Effect of Surface Preparation of a Titanium Substrate on the Properties of a Lead Dioxide-based Electrode Material for a Hybrid Supercapacitor*

Supercapacitors are currently one of the most promising energy storage systems, since they are characterized by high power density, fast charge-discharge, and long-term cyclic stability. The aim of this work is to study the effect of surface preparation of a titanium substrate on the properties of deposited lead dioxide for a hybrid supercapacitor.

*(Scientific Advisor: Marina M. Burashnikova, Doctor of Chemistry, Associate Professor, SSU)*

**Eduard Khachaturov**

*Quantitative Content of Photosynthetic Pigments in the Nodes of the Triticum Aestivum L. Shoot*

The object of the study is seedlings of *TriticumAestivum* L. soft wheat of the Saratovskaya 29 variety. Information is presented on the quantitative content pigments (chlorophylls and carotenoids) in the nodes of the upper vegetative metamers.

(*Scientific Advisor: Valeria V. Korobko, PhD in Biology, Associate Professor, SSU)*

**Alexander Khorovodov**

*Perspective of Clinical Application of the Beta2-Adrenoreceptors Blockade for Glioma Treatment*

This study shows the role of adrenergic mechanisms in the development of GBM in rats and the impairment of the blood-brain barrier (BBB) permeability. The results demonstrate that the progression of GBM was accompanied by a gradual increase in the BBB permeability and an increased expression of vascular beta2-adrenoreceptors (B2-AR). The Blockade of B2-AR reduced the degree of BBB disruption, the migration of cancer cells and increased the survival of animals. Our data support the idea that blockade of B2-AP may be a new therapeutic strategy for the treatment of GBM and the prevention of metastases.

(*Scientific Advisor: Oxana Semyachkina-Glushkovskaya, Doctor of Biology, Associate Professor, SSU)*

**Irina Kosheleva**

*Conversion of Rutin and Quercetin in the Growth Rate of Аzospirillum Brasilense Sp7*

This study is devoted to the study of the ability of soil microorganism *A. brasilense* Sp7 to modify flavonoids quercetin and rutin. The study is assessed to the growth dynamics of the bacterial culture in the presence of flavonoids and the determination of the presence of products of flavonoid modification by thin layer chromatography.

(*Scientific Advisor Matvey V. Kanevsky, PhD in Biology, Associate Professor, SSU)*

**RuslanMursalov, AnastasiyaVoevodina, Anastasiya Alekseeva**

*Planar Sensors in Modern Pharmaceutical Analysis*

In this article planar amoxicillin-selective sensors have been developed. Amoxicillin is one of the most important antibiotics used in the treatment of bacterial infections. Planar potentiometric sensors are promising for express detection of β-lac antibiotics in pharmaceutical medications and biological fluids. Their electroanalytic and operational properties in amoxicillin solutions have been investigated. The main idea of this article is the introduction of such sensors for express detection of antibiotics in pharmaceuticals. The presented results are visually compared and analysed.

*(Scientific Advisor: Elena G. Kulapina, Doctor of Chemistry, Professor, SSU)*

**Kirill Polkovoy**

*On the Ammonite Taxonomical Diversity of the Lower Aptian Deposits of the Kislovodsk Region*

The research is devoted to the appraisal of the Lower Aptian ammonite taxonomical diversity and structure in the Kislovodsk Region. The material was the author’s collection of more than 200 specimens. Most discovered genera have not been designated from the researching region before. Stages of ammonite assemblage changes are traced.

*(Scientific Advisor: Vladimir B. Seltser, PhD in Geology and Mineralogy, Associate Professor, SSU)*

**Ilya Ryabov**

*Benthic Foraminifera of Turonian-Santonian from the «Kommunar» Opencast (Volsk). Assemblage Description, Biostratigraphy*

At this paper the results of the «Kommunar» section benthic foraminifera (BF) studying were presented for the first time. This data gives a more completely understanding for the Volsk structural zone Turonian-Santonian deposits stratigraphy fullness.

*(Scientific Advisor: Evgeny M. Pervushov, doctor of Geological and Mineralogical Sciences, head of Historical geology and paleontology department, professor SSU)*

**Aleksander Zemlyakov**

*Methodology for Obtaining Commodity Products from Oil Shale of Saratov Region*

In this paper physical and chemical bases of reception of commercial products of a functional purpose from the oil shale of the Kotsebinsk field (Russia) are offered. On the basis of the revealed criteria the combined fuel briquettes, liquid fuel, sorbents for a sewage disposal and slate composites are received.

*(Scientific Advisor: Svetlana B. Romadenkina, PhD in Chemistry, assistant professor, SSU)*

**Kseniya Zubova**

*Antimicrobial Activity of Aqueous Dispersions of Silver Nanoparticles on the Bacteria Staphylococcus Aureus*

The increased incidence of antibiotic-resistant strains of microorganisms is a serious problem. In this regard, the search and introduction of new substances with antimicrobial activity is relevant. The report presents the study results of aqueous dispersions effect of silver nanoparticles with various stabilizers on standard and clinical strains of *Staphylococcus aureus.*

*(Scientific Advisor: E.V. Glinskaya, PhD in Biology, associate professor, SSU)*

**Panel Discussion 2: Computer Science & Economics (Discord)**

**June 3, Wednesday, 14:30-16:40**

**Time-limit: 7 minutes**

*Chairpersons:*

***Marina S. Portenko*** *(Senior Lecturer, Department* ***of Informatics and Programming,*** *SSU)*

***Dina A. Alexeeva*** *(Lecturer, PhD in Linguistics, Department of English Language and Intercultural Communication, SSU)*

***Olga V. Pavlova*** *(Lecturer, Department of English and Intercultural Communication, SSU)*

**Egor Batyr**

*Modified Search Algorithm of the Coefficient of Moisture Conductivity*

The problem of determining the coefficient of moisture conductivity is considered. The complex of non-linear optimization methods, based on Mitrofanov's algorithm, is used to find the optimal values. A computational experiment is performed based on laboratory datasets. Parallelization of calculations is performed.

*(Scientific Advisor: Alexander S. Falkovich, Doctor of Engineering Sciences, Professor, Clinical Decision Support System Laboratory, SSU)*

**Kafui Mensah Bensah**

*Investigation into the Causes of the Ghana Cedi Relative to the US Dollar (1990-2009)*

The research identified the exchange rate policy switch from the pegged system to the flexible exchange rate system under the SAP and ERP (which were policy recommendations from the IMF) as the source and the cause of long term depreciation of Ghana’s currency which is called cedi.

*(Scientific Advisor: Inga E. Zhadan, Doctor of Economics, Professor, Department of Finance and Credit, SSU)*

**Victor Davydov**

*Datasets for Neural Networks (NN) Training for Tasks of Detecting and Identification of Faces*

The report is about the dataset preparation for tasks of face detection and face recognition. The ML algorithm basically is a function which transposes the input data into the features which may be used to distinguish the data and to analyze the newly obtained information. So, using appropriately prepared dataset is crucial. In academic studies, prepared datasets are always used; and this report is not an exception. But here it will be described how these datasets may be gathered, how they look like and how they were changed in order to correspond the tasks of face detection and face recognition.

*(Scientific Advisor: Alexander А. Kuznetsov, PhD in Physics and Mathematics, Assosiate Professor, Department of Programming Technologies, SSU)*

**Elizaveta Grigorieva, Margarita Oleynik**

*The Development of the System for Restoring the Three-Dimensional Geometry of Damaged Biological Objects (Using the Example of the Pelvis and Pelvic Ring)*

The task of developing the system for the restoration of three-dimensional geometry of damaged biological objects is currently relevant. The purpose of this work is to develop software with such features as: the ability to create a three-dimensional computer model of a damaged pelvis and the pelvic ring promptly, a quick assessment of the current condition of the patient and the issuance of reasonable recommendations based on computer analysis of surgical intervention.

*(Scientific Advisor: Vladislav S. Zolotov, Assistant, Department of Mathematic Theory of Elasticity and Biomechanics, SSU)*

**Kirill Guk**

*The Construction of the Radius-vector for Curve and Surface*

The report presents the technique for the construction of the radius-vector comprised of three smoothly connected elements – a sphere, a cylinder, and a sphere. The Causs-Codazzi conditions have been proved. The problem of momentless thermoelastic behavior has been solved for this shell under the influence of normal load.

*(Scientific Advisor: Olga A. Myltcina, PhD in Physics and Mathematics, Associate Professor, Department of Functions and Approximations Theory, SSU)*

**Ivan Komkov**

*The Concept of Digital Economy, Its Features and Prospects on Russian Market*

The main aspects of the concept "digital economy", its characteristic features are considered in this report. Standard and legal regulation of digital economy in the Russian Federation, tasks and the objects set for its development in our state is defined as well as the conditions of the development of digital economy in the Russian Federation. The main perspective directions of development of digital economy in Russia are revealed.

*(Scientific Advisor: Elena V. Ogurtsova, PhD in Economics, Associate Professor, Department of Economics Theory and National Economy, SSU)*

**Maria Kuznetsova**

*Local Solvability and Stability of Inverse Spectral Problem for Non-Self-Adjoint Sturm-Liouville Operator*

We study the inverse problem of recovering a complex-valued smooth potential in the Sturm-Liouville equation from the spectra of Dirichlet and mixed boundary value problems. It is proved that small perturbations of the spectra of the boundary value problems with a fixed potential are the spectra of the boundary value problems with some potential close to the fixed one.

*(Scientific Advisor: Sergey A. Buterin, PhD in Physics and Mathematics, Associate Professor, Department of Mathematical Physics and Numerical Analysis, SSU)*

**Anastasiia Kulgina**

*Computational Processing of Verbal Associations: Web App Project*

The report presents a project of a web application designed to process and analyze verbal associations. The modern psycholinguistics’ need for such an application is discussed and the functions that are planned to be implemented are described.

*(Scientific Advisor: Marina V. Ogneva, PhD in Physics and Mathematics, Associate Professor, Department of Informatics and Programming, SSU)*

**Mariya Krylova**

*Diffusion Models of Mobile Telephony in the Russian Federation*

In this report we apply different models for diffusion analysis (such as the Gompertz model, the Logistic model, the Bass model, the time-series autoregressive moving average) to the data on the number of subscriber devices of mobile phone communication.

*(Scientific Advisor: Sergey P. Sidorov, Doctor of Physics and Mathematics, Professor, Department of Functions and Approximations Theory, SSU)*

**Alexandr Lobov**

*Fault Tolerant Graph Extensions*

Reliability is an important property of many systems. One way to increase system reliability is to make it fault tolerant. In this report graph-based models of fault tolerance will be considered and some examples will be shown.

*(Scientific Advisor: Mikhail B. Abrosimov, Doctor of Physics and Mathematics, Professor, Department of Computer Security and Cryptography Theory, SSU)*

**Dmitriy Lushin**

*Example Of Evaluation Of Learning Outcomes Based On Graph Theory*

The report presents an attempt to use graph theory methods to assess the process of formation of competence portraits of university graduates on the example of competencies of the major 44.03.01 "Pedagogical education" of the faculty of СS&IT, SSU (Saratov). Primary data is collected on the branches of the cause-and-effect graph. The resulting estimates are presented in the form of a radar chart illustrating the competence-based graduate profile of the university.

*(Scientific Advisor: Irina V. Veshneva, Doctor of Engineering Sciences, Associate Professor, Department of Education Management, SSU)*

**Roman Panteleev**

*Monomial Dynamical System and Their Dependency Graphs*

The most important problem in the theory of dynamical systems is to relate the structure of the system to its dynamics. The relationship for a family of nonlinear systems above a field with two elements (monomials), as well as the dependence of this connection and the system on the dependence graph are considered.

*(Scientific Advisor: Anastasia V. Zharkova, PhD in Physics and Mathematics, Associate Professor, Department of Computer Security and Cryptography Theory, SSU)*

**Evgeniy Stepanov**

*Analysis of Convolutional Codes Close to Optimal*

The report considers the problem of transmitting information through noisy channels. The basic convolutional algorithms that reflect their strengths and weaknesses are described.

*(Scientific Advisor: Valeriy A. Romanov, PhD in Physics and Mathematics, Professor, Department of Mathematic Cybernetics and Computer Sciences, SSU)*

**3 June, Wednesday, 2020, 12:00 – 14:00 (Skype)**

**Poster Session: Natural Science 1**

***Sergey V. Pyzonkov*** *(Senior Lecturer, Department of English and Intercultural Communication, SSU)*

***Konstantin A. Grebenyuk*** *(PhD in Physics and Mathematics, Assoc.Prof., Department of Radiophysics and* [*Electrodynamics*](http://www.multitran.ru/c/m.exe?t=1260594_1_2)*, SSU)*

**Alexander Golokolenov**

*The Dynamics of the Van der Pol Oscillator with the Change of the Function of External Action, which Describes the Dependence of the Amplitude of the Pulses on the Dynamic Variable*

We study the van der Pol oscillator subjected to an external action by δ-pulses depending on the dynamical variable. It is shown how the structure of the space of parameters and phase space depend on the form of the function of external action.

*(Scientific Advisor: Dmitry V. Savin, Ph.D in Physics and Mathematics, Associate Professor SSU)*

**Anna Doronkina**

*Erythrocyte Aggregation Stimulated by NaYF4: Er3+, Yb3+ Upconversion Nanoparticles*

Being injected into the bloodstream, upconversion nanoparticles used in therapeutic / diagnostic purposes can affect red blood cells. Using light optical microscopy in this work we show that the removal of citrate groups from the surface of NaYF4: Er3+, Yb3+ nanoparticles synthesized by the hydrothermal method prevents the formation of large clod-like aggregates from a suspension of washed rat erythrocytes incubated with the nanoparticles. However, the tendency toward the change in cell shape with an increase in nanoparticles concentration still takes place.

*(Scientific Advisor: Vyacheslav.I. Kochubey, Dr.,Professor, SSU)*

**Daria Klychkova**

*The Effect of Defocusing of an Object Image on a Signal in Digital Holographic Microscopy with Partially Space Coherent Illumination*

The work is devoted to an experimental study of the effect of defocusing of an object image on a signal in digital holographic microscopy on transmission mode with partially spatially coherent illumination. High degree of similarity between the experimental results and the theory is shown.

*(Scientific Advisor: Vladimir P. Ryabukho, Doctor of Physical-Mathematical Sciences, Professor, SSU)*

**Denis Kochnev**

*2D Modeling of Gradient Porous Silicon Proton Exchange Membrane Micro Fuel Cell*

The article presents 2D model of species transport within gradient porous silicon proton exchange membrane micro fuel cell. Nernst-Planck equation, Maxwell-Stefan diffusion, Darcy's law, Butler-Volmer equation were used to build this multicomponent model.

*(Scientific Advisor; Denis V. Terin , PhD in Physics and Mathematics, Associate Professor, SSU)*

**Nikita Koronevsky, Bela Sergeeva**

*Metamaterials for Bone Tissue Regeneration*

The method of polycaprolactone (PCL) fibrous matrix modification by composite coatings of porous calcium carbonate microparticles (vaterite) and magnetite nanoparticles, which can be used as a tissue engineering scaffold and in regenerative medicine as a drug delivery system, which enables to control the process of their release was presented.

*(Scientific Advisor: Sergey A. Sergeev, PhD in Physics and Mathematics, Associate Professor, SSU)*

**Aleksandr Martyshkin**

*Controlled Spin-Wave Transport in a Magnon-Crystal Antidote Structure*

Spin-wave transport in a lateral system of microwaveguides coupled to each other through a magnonic crystal structure with a one-dimensional array of holes has been analyzed. The proposed structure can be used as a functional element of interconnections in magnonic networks and devices.

*(Scientific Advisor: Aleksandr V. Sadovnikov, PhD in Physics and Mathematics, Associate Professor, SSU)*

**Petr Mavrin**

*Control of Optical Solitons via Dispersion Variation in Optical Fibers*

Results of numerical simulation of the propagation of solitons in optical fibers with variable dispersion in the length are presented. It is shown that dispersion oscillation can be used to control number of solitons, amplitude of solitons, and soliton group velocities.

*(Scientific Advisor: Andrei I. Koniukhov, PhD in Physics and Mathematics, Associate Professor, SSU)*

**Pavel Nesterchuk**

*Network Modeling of Various Topologies, the Study of Individual Characteristics*

The paper deals with various types of networks: regular networks, small world networks, random networks, scalefree networks, modular and hierarchical. It was possible to isolate and study their features. Software packages were also mastered that allow us to carry out deeper analysis and research in the field of complex networks.

*(Scientific Advisor: Olga I. Moskalenko, Doctor in Physics and Mathematics, Professor, SSU)*

**Anastasia Plotnikova**

*Generalized Synchronization in Systems with Delay by the Coupling of Mackey-Glass Equations as an Example*

The work is aimed at revealing the general laws of establishing a generalized synchronization regime in unidirectional and mutually coupled delay systems. To detect the generalized synchronization mode, the method of calculating the spectrum of Lyapunov exponents was used. A universal dependence was obtained in the form of an increase, followed by saturation of the delay time from the value of the communication parameter, indicating the establishment of a generalized synchronization mode.

*(Scientific Advisor: Olga I. Moskalenko, Doctor in Physics and Mathematics, Professor, SSU)*

**Alena Rostuntsova**

*On the Self-Similar Nature of Short Pulse Amplification in Cherenkov-type Devices*

This paper presents the results of studies of short pulse amplification in Cherenkov-type devices. Comparison with the results of numerical simulation shows that evolution of the parameters of such pulses comes in agreement with the analytical self-similar solutions obtained by using Lie symmetries analysis.

*(Scientific Advisor: Nikita M. Ryskin, Doctor in Physics and Mathematics, Professor, SSU)*

**Evgeny Ryabov, Roman Shchiptsov, Nikita Koronevsky**

*An Automated Apparatus for Measuring VSWR Spectra and Transmission of Liquid Dielectrics*

The apparatus for reducing the experiment time and providing automation of the measurement process of the reflection and transmission spectra of microwave radiation in the 3-cm range was developed. This apparatus consists of a panoramic VSWR meter and P2-61 attenuation and a personal computer connected to the meter through an Arduino Nano board.

*(Scientific Advisor: Sergey A. Sergeev, PhD in Physics and Mathematics, Associate Professor, SSU)*

**Alexander Scryabin**

*Creation of Coherent Loads Based on Disordered Microwave Photonic Crystals Containing Thin Absorbing Layers*

The purpose of this work is to create and study coherent loads on the basis of disordered microwave photonic crystals containing composite dielectric layers and nanometer metal structures.

*(Scientific Advisor: Alexander V. Skripal,, Doctor in Physics and Mathematics, Professor, SSU)*

**Evgeniy Schurkin**

*Generation of Dispersion Wave in an Optical Fiber with a Variable Diameter*

Artificial periodic structures offer an additional degree of freedom in manipulation of nonlinear waves and solitons. The interacting solitons can be selected by an appropriate period of the variation of the coefficients of nonlinear Schrödinger equation.

*(Scientific Advisor: Andrey I. Konyukhov , PhD in Physics and Mathematics, Associate Professor, SSU)*

**Sergey Ustalkov**

*Application of NaYF4: Yb, Er Upconversion Nanoparticles to Study Denaturation Process inside Biological Tissues*

The paper describes an experimental method to investigate temperature dynamics inside bio-tissues and to measure denatured layer thickness using luminescence of NaYF4:Yb,Er during laser thermolysis. The common patterns of ovalbumin denaturation are investigated by plasmonic photothermal therapy.

*(Scientific Advisor: Alexander A.* Skaptsov*, PhD in Physics and Mathematics, Associate Professor, SSU)*

**Kirill Zykov**

*Development of a Geopositioning Device Prototype Using the Lorawan Technology*

The technology of LoRaWAN long-range packet data transmission with low power consumption was studied, firmware and a printed circuit board for a geolocation device were developed, an industrial design of the device was developed. A server part responsible for processing data from the device was also developed.

*(Scientific Advisor: Sergey A. Sergeev, PhD in Physics and Mathematics, Associate Professor, SSU)*

**Poster Session: Natural Science 2 12:30-15:30 (Discord)**

***Anna Yu. Smirnova****(PhD in Literature, Assoc. Prof., Department of English and Intercultural Communication, SSU),*

***Anna A. Sosnovskaya*** *(PhD in Linguistics, Assoc. Prof., Department of English and Intercultural Communication, SSU)*

***Maksim Yu. Chervyakov****(PhD in Geography, Assoc. Prof., Department of Meteorology and Climatology, SSU)*

***Alexey V. Markin (****PhD in Chemistry, Assoc. Prof., Institute of Chemistry, SSU)*

**Mariya Alimpieva**

*The use of digital technology to detect the variability of circulation objects in transitional seasons*

The article demonstrates some aspects of the application and use of the capabilities of the digital sphere in the learning process at Saratov State University. On the example of the Department of Meteorology and Climatology methodological techniques for introducing students to digital technologies in solving narrow-profile problems are described. Various methods of analysis, processing and interpretation of digital data are being developed in order to master modern methods of weather forecasting for long periods, regional adaptation of existing methods and the development of new methods for long-term forecasting. The use of digital technologies is shown for the analysis of observed climate changes.

*(Scientific Advisor: Svetlana V. Morozova, PhD in Geography, Associate Professor, SSU)*

**Veronika Danilina**

*Extractive crystallization of sodium chloride in the ternary system sodium chloride–water–diisopropylamine*

We study of phase equilibria in component mixtures of the ternary system sodium chloride + water + diisopropylamine in order to clarify the possibility of its usage for extractive crystallization of sodium chloride and isolation of the amine from its aqueous solutions under the action of this salt.

(*Scientific Advisor: Dmitry G. Cherkasov, Doctor of Chemistry, Associate Professor, SSU)*

**DaniilDrozd**

*The quantum dots application in the analytical systems based on the luminescence quenching*

In the last two decades, many scientific groups stay focused on bioanalytical application development based on quantum dots (QDs). A lot of QDs modification procedures to make them applicable in different immunoassay types have already known. The simpler way to use QDs is the realization of the quenching systems based on enzymatic reaction. This approach allows combining the specificity of fluorescent immunoanalysis and the high sensitivity of the enzymatic reaction.

(*Scientific Advisor: Irina. Yu. Goryacheva, Doctor of Chemistry, Professor, SSU)*

**Anatoly Fonin**

*Increasing the efficiency of well construction by optimizing drilling modes*

This article considers the possibility of increasing the efficiency of well construction by optimizing drilling modes. The main idea is to increase the ROP by reducing the time of slide drilling. The increase in the share of rotary drilling will also improve the quality of the wellbore.

(*Scientific Advisor: Sergey I. Mikheev, Doctor of Geology and Mineralogy, Professor, SSU)*

**Kseniya Kazimirova**

*Surface modified magnetic nanoparticles: synthesis, characterization and application for the removal of dye*

Magnetic nanoparticles (MNPs) of magnetite modified with polyelectrolyte chitosan were synthesized by chemical co-precipitation. Their sizes, zeta potential at different pH, and chemical composition were determined. The optimal sorption conditions of the Allura Red dye on modified MNPs were found.

(*Scientific Advisor: Sergey N. Shtykov, Doctor of Chemistry, Professor, SSU)*

**Raushan Kubasheva, Nurgul Yerzhanova**

*Pyrolysis as a method of waste treatment*

During drilling in gas condensate fields in Western Kazakhstan, the annual volume of waste exceeded ten tons. Pyrolysis technology for waste treatment in the form of oil sludge and silt sediment is effective. The experiments were conducted at a temperature of 700-800°С with different heating speeds. The main characteristics of pyrolysis products (gas, oil, coal) are studied.

(*Scientific Advisor: Raisa I. Kuzmina*, *Doctor of Chemistry, Professor, SSU)*

**Yakov Neyshtadt**

*Solar energy resources of Saratov Oblast*

The article discusses the assessment of climatic conditions for the solution of problems of solar energy, especially spatial and temporal distribution of the radiation regime on Saratov Oblast territory. The main indicators are total solar radiation and sunshine duration.

(*Scientific Advisor: Maksim Yu. Chervyakov, PhD in Geography, Associate Professor, SSU)*

**Pavel Pidenko**

*Microstructured optical fibers in bioimprinting monitoring*

The main advantages of HC MOFs based on biosensors are high sensitivity and microliter sample volume. Also, the HC MOF architecture provides unique optical properties, which gives the possibility for monitoring minor changes on the HC inner surface. Molecular imprinted polymers based on proteins matrix are prospective recognition tools for low molecularly targets. In the current research, we present the new approach for monitoring efficiency stages during bioimprinting on the inner surface of HC MOFs.

(*Scientific Advisor: Natalia А. Burmistrova, Doctor of Chemistry, Associate Professor, SSU)*

**Nikita Poverenny**

*Phylogenetic relationships of the Scorpion Mesobuthus eupeus (C. L. Koch, 1839)*

*(Scorpiones) from the Lower Volga region and southern Kazakhstan.*

Habitats of the Scorpion species Mesobuthus eupeus are established. The analysis showed the relationship between the representatives of the Zhambyl -Kyzylorda population and the Volga population. The isolation of the Volga population from the closest subspecies living on the territory of southern Kazakhstan was proved.

*(Scientific Advisor: Vasily V. Anikin, Doctor of Biology, Professor, SSU)*

**Kirill Rybakov**

*Modeling the ionic conductivity of the electrode material LiCoVO4*

Currently, energy storage devices based on lithium-ion systems are the most energy-intensive and energy-efficient types of commercially available energy storage systems. The aim of this work is to consider the possibility of using high-voltage material based on LiCoVO4 as a potential cathode of a lithium-ion battery.

*(Scientific Advisor: Arseni V. Ushakov, PhD in Chemistry, Associate Professor, SSU)*

**Dmitry Sidorenko**

*Biomechanical modeling in reconstructive surgery of the vertebral and pelvic complex*

In the surgical treatment of spinal and pelvic ring injuries, biomechanical modeling is increasingly being used. Its use in modern medicine has led to a significant improvement in postoperative results, which explains the high importance of this approach.

*(Scientific Advisor: Leonid Yu. Kossovich, Doctor of Physics and Mathematics, Professor, SSU)*

**Poster Session: Natural Science 3**

***Tatyana V. Skrob*** *(PhD in Linguistics, Lecturer, Department of English and Intercultural Communication, SSU),*

***Andrey P. Rytik****, (PhD in Physics and Mathematics, Associate Profe*ssor*, SSU)*

***Denis V. Ponomarev*** *(PhD in Physics and Mathematics, Associate Profe*ssor*, SSU)*

**Pavel Barkov**

*Composite graphene-nanotube films with irregular arrangement of nanotubes*

Topological models of graphene/CNT composite films are constructed. The films consist of tubes lying irregularly between graphene single layers parallel to them and covalently bound with graphene. The distance between the tubes is measured in graphene hexagons (H1 and H2) between ribs participating in the formation of covalent bonds.

## (Scientific Advisor: Olga Ye. Glukhova, Doctor in Physics and Mathematics, Professor, SSU)

**Aleksey Dzhafarov**

*Distance measurement by frequency-modulated laser autodyne*

This report is about the theoretical measurement of distance to object by the laser self-mixing diode with a resolution of several nanometers. The possibilities of the method of harmonic frequency modulation of laser autodyne radiation for determining the absolute distances. The advantages of the harmonic modulation method due to the possibility of determining the distance by the results of the amplitudes measuring of the spectral components of the autodyne signal. The results of the external optical feedback influence on the signal form of the laser autodyne are obtained.

## (Scientific Advisor: Anatoly V. Skripal, Doctor in Physics and Mathematics, Professor, SSU)

**Evgeniy Evstifeev**

*Application of local Lyapunov exponents to analyze the characteristics of intermittent generalized synchronization*

In the present work, general characteristics of intermittent generalized synchronization of chaos in case of unidirectional and mutual coupling were obtained using method of local Lyapunov exponents calculation.

## (Scientific Advisor: Olga I. Moskalenko, Doctor in Physics and Mathematics, Professor, SSU)

**Maksim Gavrikov**

*Investigation of InSb quantum dots by method of normalized differential tunneling CVCs*

Some important properties of the InSb quantum dots, such as size and energy spectrum, were studied by method of normalized differential tunneling CVCs. The results of size evaluation (16-20 nm) are qualitatively and quantitatively consistent with the results obtained by scanning electron microscopy and analysis of absorption coefficient spectral dependence with an error less than 15%. During the study it was also shown, that method of normalized differential tunneling CVCs also allows us to analyze the energy spectrum of semiconductor quantum dots (position of the first three energy levels).

## (Scientific Advisor: Aleksandr I. Mikhailov, Doctor in Physics and Mathematics, Professor, SSU)

**Evgenii Geraskin**

*DNA dynamics in the Peyrard-Bishop-Dauxois model with alternative on-site potential*

Equations of a DNA model with a modified on-site potential based on Morse potential are presented. DNA dynamics was simulated in this model. The process of the formation and propagation of mobile breathers excited by the initial displacements of a row of adjacent nucleotide pairs has been studied.

## (Scientific Advisor: Alexander P. Chetverikov, Doctor in Physics and Mathematics, Professor, SSU)

**Vladislav Khanadeev**

*Intermittent behavior near the boundary of generalized synchronization in mutually coupled systems with complex topology of attractor*

The mechanisms of occurrence and characteristics of intermittent behavior taking place near the boundary of generalized synchronization in mutually coupled systems with a complex (two-sheeted) topology of a chaotic attractor are investigated.

## (Scientific Advisor: Olga I. Moskalenko, Doctor in Physics and Mathematics, Professor, SSU)

**Ekaterina Kozlova**

*Synthesis and characterization of CuInS2 nanoparticles*

The absorption luminescence spectra of nanoparticles were obtained, as well as the dependences of the luminescence spectra on temperature, the In / Cu ratio, and particle coating. The obtained nanoparticles can be used as temperature sensors for deep incorporation into biological tissue.

## (Scientific Advisor: Vyacheslav I. Kochubey. Doctor in Physics and Mathematics, Professor, SSU)

**Oksana Kutikova**

*Device for correcting urodynamic disorders of the upper urinary tract in children with chronic pyelonephritis*

The results of studies developed by the method of electrical stimulation of urodynamics in pyelonephritis are presented. The principle of the device for electrical stimulation is described. It was found that after a course of electromyostimulation, high-speed indicators of the ureteric discharge increase by 15-20%, while the duration of the ureteral discharge in the consequences reaches values that reach normal values. In the comparison group in children with chronic pyelonephritis, the ureteric changes did not change.

*(Scientific Advisor: Andrey P. Rytik, PhD in Physics and Mathematics, Associate Profe*ssor*, SSU)*

**Anton Mantsurov**

*Investigation of the photoluminescent properties of silicon porous structures obtained by the electrochemical method when exposed to gamma radiation*

The purpose of the work: to study the effect of gamma irradiation on the photoluminescence of porous silicon.

For this you need:

1. to obtain samples of porous silicon by electrochemical method.

2. to study the photoluminescence spectra.

*(Scientific Advisor: Denis V. Terin, PhD in Physics and Mathematics, Associate Profe*ssor*, SSU)*

**Mikhail Polozhenkov**

*Change in the properties of low carbon steel by high temperature surface recrystallization*

An installation was developed and created for high-temperature surface recrystallization of low-carbon steels, on which the technological parameters of producing structures with desired properties were worked out.

## (Scientific Advisor: Sergey B. Venig, Doctor in Physics and Mathematics, Professor, SSU)

**Andrey Ploskikh**

*Research and development of a multiSheet-beam traveling-wave tube (TWT) amplifier with output frequency of 0.2 THz*

We present the results of design and simulation of the G-band frequency amplifier with a double grating SWS and sheet electron beam. The output and amplitude-frequency characteristics of the device are investigated.

## (Scientific Advisor: Nikita M. Ryskin, Doctor in Physics and Mathematics, Professor, SSU)

**Arina Rodina**

*The effect of reflection from nonresonant load on the generation of oscillations in the gyrotron of the terahertz frequency range*

Currently, the gyrotron is considered as the main candidate for the role of a generator of powerful coherent electromagnetic radiation in the sub-terahertz and terahertz ranges due to the ability to generate signals at these frequencies with powers ranging from tens of watts to several megawatts, depending on the applications in which the gyrotron is used. An important problem in the creation of such devices is to increase the stability of the generated frequency, for which they use, in particular, the signal reflected from the inhomogeneity in the output path and returned to the resonator where the interaction takes place. The report considers the effect of such reflections from a remote non-resonant load on the operation of the terahertz gyrotron operating at the second cyclotron harmonic.

*(Scientific Advisor: Andrey G Rozhnev, PhD in Physics and Mathematics, Associate Profe*ssor*, SSU)*

**Kirill Sayapin**

*Differential phase shifter based on a tapered transmission line*

In this work, we study a differential phase shifter with a phase-shifting channel based on a single nonlinear transmission line with a nonlinear short-circuited stub. In the TEM-wave approximation, a fixed phase shifter with a nominal value of the phase shift φ0=45° and a coefficient of overlapping the working frequency range ϰ = 2 was synthesized. Based on the results obtained, circuitry and electrodynamic models of a microstrip fixed phase shifter for a frequency range of 2 ... 4 GHz are developed. A prototype of a phase-shifting channel was made and experimentally studied. The experimental value of the VSWR does not exceed 1,15, and the deviation of the phase-frequency characteristic from the nominal value of 45 ° is 1,01 ° in a given frequency range.

## (Scientific Advisor: Mikhail V. Davidovich, Doctor in Physics and Mathematics, Professor, SSU)

**Ivan Zaletov**

*The study of peripheral blood vessel tone by the method of two-dimensional thermal imaging*

The report is devoted to the possibility of using dynamic thermography as a method of two-dimensional analysis of hemodynamics in the limb region. The wavelet transform in the time domain was used to decompose the temperature signal into spectral components and to obtain a signal of blood flow oscillations. Wavelet processing of thermograms in the spatial domain made it possible to obtain a map of the distribution of open sweat channels on the skin surface.

*(Scientific Advisor: Andrei A. Sagaidachnyi,, PhD in Physics and Mathematics, Associate Professor, SSU)*

**Ivan Volkov**

*Thermometric device for monitoring fluctuations of peripheral blood supply based on a high-pass filter.*

A device has been developed for conversion skin temperature fluctuations into peripheral blood supply fluctuations. The operation of the device is based on using an analogy between the thermal properties of the skin and the electrical properties of a low-pass filter.

*(Scientific Advisor: Andrei A. Sagaidachnyi,, PhD in Physics and Mathematics, Associate Professor, SSU)*

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