NANO-2024: "Quo Vadis – Ethics of the Scientific Research"

The event is devoted to the 60th anniversary of the Technical University of Moldova

15-18 April 2024, Chisinau, Moldova

Chișinău, 2024

Conceptualization: Prof. Anatolie Sidorenko

The Responsible Editor: Dr. Oleg Bujor

DESCRIEREA CIP A CAMEREI NAȚIONALE A CĂRȚII

NANO-2024: "Quo Vadis–Ethics of the Scientific Research" : 15-18 April 2024, Chisinau : Program and proceedings of the conference / conceptualization: Anatolie Sidorenko. – Chişinău : [S. n.], 2024 (Blitz Poligraf). – 115 p.

Antetit.: Technical University of Moldova [et al.]. – Referințe bibliogr. la sfârşitul art. – With financial support of Alexander von Humboldt Foundation, Germany. – [60] ex.

ISBN 978-9975-64-422-8.

606:[61+62](082)

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Scope of the Kolleg

The Alexander von Humboldt Foundation aims at strengthening regional and interdisciplinary links between the scientists sponsored by the foundation, establishment of the worldwide contacts, introducing young scientists to the scholarship supported by the Humboldt Foundation and to research in Germany. Following these purposes, we organize the interdisciplinary meeting - Humboldt Kolleg:

NANO-2024: "Quo Vadis– Ethics of the Scientific Research"

The central goal of the Kolleg is to bring together professors, lectures and researchers from different research centers and universities, working in an intensive cooperation to share their experience, new ideas and results in various directions of NANO-world.

One of the central problems, which will be discussed: how can we increase the level and the number of AvH-applications? The role of Humboldt clubs and their networks for resolving the problem will be profound increased.

Organizers of the Humboldt Kolleg:

Technical University of Moldova, Institute of Electronic Engineering and Nanotechnologies; State University of Medicine and Pharmacy "Nicolae Testemitanu"; Academy of Sciences of Moldova; Moldavian Physical Society; Humboldt Club Moldova.

Organizing committee

Prof. Anatolie SIDORENKO, President of Humboldt Club Moldova, Vice-President of SFM, Technical University of Moldova, Chisinau, Moldova, email: sidorenko.anatoli@gmail.com

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Prof. Ion TIGHINEANU, President of Academy of Sciences of Moldova, Vice-President of SFM, Chisinau, Moldova, email: tiginyanu@asm.md

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Prof. Eugen SAVA, General Secretary of Humboldt Club Moldova, Director of National Museum of Moldova History, Chisinau, Moldova, email: eugen.sava2022@gmail.com

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Dr. Oleg BUJOR, Director of Scientific Library (Institute) "A. Lupan" of Moldova State University, Chisinau, Moldova, email: bujor.oleg@gmail.com

Concept of the Humboldt Kolleg

The rapid progress of Nanoscience and Nanotechnologies that have penetrated into all spheres of human activity - industry, agriculture, medicine, supercomputer design, telecommunications and many others, has demonstrated tremendous success over the past decade and the expansion of the introduction of new nanotechnologies, functional nanostructures and nanomaterials is valued by society.

At the same time it was found also the negative aspects of the modern technologies. Albert Einstein formulated the need to follow ethical standards in scientific research, noted the responsibility of scientists for that and organized the Pugwash Movement on Science and World Affairs. Taking into account the intensive development of nanotechnologies, it is time to pay due attention to the ethical aspects in that area, which will be one of the important tasks of this Humboldt Kolleg.

Another important task is to intensify cooperation of scientists, creation and expansion of networks. The third important task is to attract young scientists to international cooperation and motivate them to participate in competitions for the A.v.Humboldt Foundation scholarship.

Networking at collaboration of researchers is a very important and powerful instrument not only for development of the scientific field of collaborators but also for development of the whole community. Intensive collaboration of research Institutes and Universities of Moldova, Ukraine, Romania, France, Poland, Cehia, Netherlands with colleagues from Germany within a bilateral or multilateral projects was established last decade which assists a strengthening of scientific cooperation and, at the same time, ensures the sustainable development of European countries. A noticeable role in this process plays networking and regularly contacts with the assistance of Humboldt associations and clubs.

The central idea of the proposed Humboldt-Kolleg is to bring together professors, lectures, PhD students from a number of universities, working in an intensive cooperation with scientists of research institutions to share their

experience, new ideas and different forms of collaboration for organization of modern forms of education using facilities of good equipped laboratories of research institutes for “study by doing research”. It will increase the level of education, give the possibilities for young researchers to gain experience in the modern laboratories, participating in a real research process in frame of research projects, also to help to young researchers to find their own field of activity in science. At the same time it should give information about the further perspectives, to inform participants about the wide possibilities which offers the programs of the Alexander von Humboldt Foundation.

Fulfilment of the goals of the proposed Kolleg should assist to motivate qualified young people for intensive scientific collaboration and for application to the AvH-scholarship.

The Humboldt – Kolleg director,

Prof.Dr. Anatolie Sidorenko

Chisinau, 15.04.2024

NANO-2024: "Quo Vadis– Ethics of the Scientific Research"

Day 1, Monday			
15.04.2024	12^{00} 23^{59}	**ARRIVAL OF PARTICIPANTS, accommodation in the Hotel "BRISTOL"** *BRISTOL Central Park Hotel, 32, A. Puskin Street, Chisinau*	
	15^{00} 19^{00}	**REGISTRATION, Distribution of the Conference materials** *In the lobby of hotel "BRISTOL"*	
	18^{00} 19^{00}	**MEETING OF THE ORGANIZING COMMITTEE**	
	19^{00} 21^{30}	**WELCOME RECEPTION** *Bar of hotel "BRISTOL"*	
Day 2, Tuesday			
16.04.2024	8^{30} 9^{00}	**REGISTRATION, Distribution of the Conference materials in the lobby of campus no. 1 of TUM** *Bd. Stefan cel Mare 168, Chisinau*	
	9^{10} 10^{00}	**CONFERENCE OPENING, WELCOME SPEECHES**	
	10^{00} 11^{00}	**PLENARY SESSION PL** Anatolie SIDORENKO; Viorel BOSTAN; Ion TIGHINEANU *Room 1-205, TUM*	
	11^{00} 11^{30}	**COFFEE BREAK**	
	11^{30} 12^{30}	Ashok VASEASHTA; Leonid BOSHKOV *Room 1-205, TUM*	
	13^{00} 14^{00}	**LUNCH**	
	14^{30} 16^{30}	**SECTION 2-1** **Environmental protection from CBRN** *Room 1-205, TUM*	**POSTER SECTION** **Young researchers forum**
	16^{00} 17^{30}	**SECTION 2-2** **Podium discussion 1: Ethical problems of implementation of the results of research** *Room 1-205, TUM*	
	17^{30} 18^{00}	**The best posters award and appreciation of young researchers-winners of the posters competition**	
	19^{00} 22^{00}	**CONFERENCE DINNER** – *Restaurant of hotel "BRISTOL"* **Presentation of the best posters of young researchers at the NANO-2024 Humboldt Kolleg, prizes award**	

Day 3, Wednesday		
17.04.2024	9^{30} 11^{00}	**SECTION 3-1** **Limits of Novel Technologies** *Conference room of hotel "BRISTOL"*
	11^{00} 11^{30}	**COFFEE BREAK**
	11^{00} 12^{30}	**SECTION 3-2** **Limits of Novel Technologies** *Conference room of hotel "BRISTOL"*
	14^{00} 18^{00}	**EXTERNAL SECTION 4** **Limits of Novel Technologies** (*bus transfer to the External Session in "Milești Mici"*) Podium discussions. Networking and international Collaboration: experience, new forms and perspectives
Day 4, Thursday		
18.04.2024	9^{30} 11^{00}	**SECTION 5-1** **Novel technologies** *Conference room of hotel "BRISTOL"*
	11^{00} 11^{30}	**COFFEE BREAK**
	11^{30} 13^{00}	**SECTION 5-2** **Novel technologies** *Conference room of hotel "BRISTOL"*
	13^{00} 14^{00}	**LUNCH**
	14^{00} 15^{30}	**SECTION 6** **Health and Environment - Limits of Nanotechnologies** *Conference room of hotel "BRISTOL"*
	16^{00} 16^{30}	**COFFEE BREAK**
	16^{30} 17^{00}	**SUMMING-UP SECTION** **Discussion about networking, collaboration strengthening, and Memorandum elaboration** *Conference room of hotel "BRISTOL"*
	17^{00} 23^{00}	**DEPARTURE OF PARTICIPANTS**

Program of the Humboldt-Kolleg
NANO-2024: "Quo Vadis – Ethics of the Scientific Research"
Chişinău, Republic of Moldova, 15-18 April 2024

The event dedicated to the Jubilee: 60 Years of the Technical University of Moldova

organized by Technical University of Moldova, Moldavian Physical Society (SFM), State University of Medicine and Pharmacy "Nicolae Testemitanu", Academy of Sciences of Moldova, Humboldt Club Moldova, with financial support of Alexander von Humboldt Foundation, Germany.

Day 1, Monday, 15.04.2024

12:00-24:00	**Arrival of participants**, accommodation in the hotel "BRISTOL" ("BRISTOL Central Park Hotel" 32, A. Puskin Street, MD-2012, Chisinau).
15:00-19:00	**Registration of participants** in the lobby of hotel "BRISTOL".
18:00-19:00	**Meeting of the Organizing Committee**.
19:30-21:00	**Welcome reception** in the Bar of hotel "BRISTOL".

Day 2, Tuesday, 16.04.2024

SESSION 1.
OPENING SESSION OF THE HUMBOLDT KOLLEG IN THE SENAT HALL OF THE TECHNICAL UNIVERSITY OF MOLDOVA
Chișinău, Republic of Moldova, MD-2004, Bd. Stefan cel Mare, 168, room 205

9:00-10:00 Welcome addresses of Director of the Humboldt Kolleg, President of the "Humboldt Club Moldova" **Anatolie Sidorenko**, Minister of Education of Moldova **Dan Perciun**, Rector of the Technical University of Moldova **Viorel Bostan**, President of the Academy of Sciences of Moldova **Ion Tighineanu**, Deputy Head of Mission – Embassy of the Federal Republic of Germany in Moldova **Peter Buschmann**, Representative of the Alexander von Humboldt Foundation **Steffen Mehlich**.

10:00-12:30 PLENARY SESSION PL

10:00-10:20 **PL1. Prof. Anatolie Sidorenko**. Goals and programs of the Alexander von Humboldt Foundation and Humboldtians at the Techical University of Moldova.

10:20-10:40 **PL2. Prof. Viorel Bostan**. 60 Years of Technical University of Moldova: achievements, prospects.

10:40-11:00 **PL3. Prof. Ashok Vaseashta**. Quo Vadis - Artificial Intelligence Internet of things, Internet of Behaviors and Nano-generators: Opportunities, Challenges and Ethical Concerns. International Clean Water Institute, Manassas, USA.

11:00-11:30 COFFEE BREAK

11:30-12:00 **PL4. Ion Tighineanu**. Nanotechnologies development and ethics of their implementation (goals, impact, perspectives and limits of implementation). Academy of Sciences of Moldova, Chisinau, Moldova.

12:00-12:30 **PL5. Prof. Leonid Boshkov**. Sustainable Development: A New Paradigm, Theoretical Fundamentals and Integrated Ethics. Odessa State Academy of Refrigeration, Ukraine.

12:30 **Press-Conference** TV: Moldova-1, Publica-TV; Radio: Radio-Moldova; Newspapers: Moldova News, and other Mass media (40 min). Moderators: Prof. Anatolie Sidorenko, Prof. Adam Łukaszewicz, Prof. Mikhail Zveryakov.

13:00-14:00 LUNCH

14:30-16:30 YOUNG RESEARCHERS FORUM: POSTER SESSION

Chairs: Prof. Eduard Monaico, Prof. Marian Jaskula, Prof. Mousa Marwan, Prof. Mikhail Zveryakov

Presentation of young researchers reports and selection of the winners with the best presentations

PS1. DEVICE FOR CONTROLLED HYPOTHERMIA ON FUZZY LOGIC ALGORITHMS. V. Cojocaru, T. Fedorisin, R. Galus. Technical University of Moldova, Institute of Electronic Engineering and Nanotechnologies, Academiei str., 3/3, Chisinau, Moldova.

PS2. STUDYING THE EFFECT OF VARIOUS GASES ON THE OUTPUT CHARACTERISTICS OF THERMOCOUPLE PRESSURE TRANSDUCERS. I. Belotserkovskii, A. Sibaev and A. Sidorenko. Technical University of

Moldova, Institute of Electronic Engineering and Nanotechnologies, Chisinau, Moldova.

PS3. ENHANCED MICROBIOLOGICAL DEGRADATION OF POLYETHYLENE. Serghei Corcimaru, Lilia Mereniuc, Feodora Sitnic. Technical University of Moldova, Institute of Microbiology and Biotechnology.

PS4. APPLICATION OF CoFe2O4/PEG NANOCOMPOSITE AS A PEROXIDASE MIMETIC IN THE COLORIMETRIC DETECTION OF GLYPHOSATE. Tatiana Gutsul, Andrei Sirbu, Maria Lupu, Anatolie Sidorenko. Technical University of Moldova, Institute of Electronic Engineering and Nanotechnologies, Chisinau, Moldova.

PS5. SENSORS FOR BATTERY SAFETY APPLICATIONS. Nicolai Ababii, Oleg Lupan. Technical University of Moldova, Department of Microelectronics and Biomedical Engineering, Chisinau, Moldova.

PS6. PREVALENCE OF SOME PIK3CA MUTATIONS IN PATIENTS WITH CERVICAL SQUAMOUS CARCINOMA FROM THE REPUBLIC OF MOLDOVA. Cristina Popa, Valentina Stratan, Valeri Tutuianu, Victor Sitnic, Veronica Balan, Novac Mihail, Mariana Sprincean, Neonila Casian. Institute of Oncology, Scientific Laboratory of Cancer Biology, Chisinau, Republic of Moldova, "Nicolae Testemitanu" State University of Medicine and Pharmacy, Department of Molecular Biology and Human Genetics, Chisinau, Moldova.

PS7. MIXED METAL OXIDE BASED GAS SENSOR. Rajat Nagpal. Technical University of Moldova, Department of Microelectronics and Biomedical Engineering, Center for Nanotechnology and Nanosensors, Chisinau, Moldova.

PS8. SEMICONDUCTING METAL OXIDES IN BIOMARKER DETECTION FOR MEDICAL APPLICATIONS. Mihai Brînză. Technical University of Moldova, Center of Nanotechnologies and Nanosensors, Chisinau, Moldova.

PS9. PHOTOCATALYTIC DEGRADATION OF TETRACYCLINE USING AERO-TiO2. Vladimir Ciobanu, Tatiana Galatonova. National Center for Materials Study and Testing, Technical University of Moldova, Chisinau, Moldova.

PS10. GOLD DECORATED GALIUM OXIDE NANOWIRES FOR MULTIFUNCTIONAL APPLICATIONS. Elena I. Monaico, Eduard V. Monaico, Veaceslav V. Ursaki, Ion M. Tiginyanu. National Center for Materials Study and Testing, Technical University of Moldova, Republic of Moldova.

PS11. OBSOLETE PESTICIDES DECOMPOSITION IN SOIL USING MAGNETITE NANOPARTICLES. Inna Rastimesina, Tatiana Gutul, Olga Postolachi, Alexandr Sibaev. Technical University of Moldova, Institute of Microbiology and Biotechnology, Institute of Electronic Engineering and Nanotechnologies "D. Ghitu", Chisinau, Moldova.

PS12. USING OF THE MEAM MODEL FOR ADJUSTING THE TECHNOLOGICAL PARAMETERS OF MAGNETRON DEPOSITION OF NB/CO NANOLAYERS. Vladimir Boian, Eugen Boian. Technical University of Moldova, Institute of Electronic Engineering and Nanotechnologies "D. Ghitu", Chisinau, Moldova.

PS13. COMPLEXES OF SILVER NANOPARTICLES WITH ANTIBIOTICS OF VARIOUS CLASSES AGAINST RESISTANT STRAIN OF BACTERIA ESCHERICHIA COLI KO11. Chakhoyan, S. Oganian, Sh. Kazaryan, A. Hovhannisyan. Institute of biomedicine and pharmacy Russian-Armenian University, Erevan, Armenia.

PS14. GAS SENSING DEVICES BASED ON $A_{II}B_{VI}$ SEMICONDUCTING OXIDE FILMS AND SINGLE NANOWIRE. . Cristian Lupan. Technical University of Moldova, Department of Microelectronics and Biomedical Engineering, Center for Nanotechnology and Nanosensors, Chisinau, Moldova.

PS15. FUNCTIONALIZED NANOMATERIALS ZnO:PdO FOR GAS SENSORS. Alexandr Sereacov, Nicolae Magariu, Oleg Lupan. Technical University of Moldova, Department of Microelectronics and Biomedical Engineering, Center for Nanotechnology and Nanosensors, Chisinau, Moldova.

PS16. SYNTHESIS OF SnSe FILMS OBTAINED BY MAGNETRON SPUTTERING. Victor Suman, Vadim Morari, Victor Zalamai , Eduard Monaico, Emil Rusu. Technical University of Moldova, Institute of Electronic Engineering and Nanotechnologies "D. Ghitu", National Center for Materials Study and Testing, Chisinau, Moldova.

PS17. STUDY OF Ga2O3 THIN FILMS OBTAINED BY AEROSOL SPRAY PIROLYSIS. Vadim Morari , Emil Rusu , Victor Zalamai, Alexei Meshalkin. Technical University of Moldova, Institute of Electronic Engineering and Nanotechnologies "D. Ghitu", National Center for Materials Study and Testing, Technical University of Moldova, State University of Moldova, Institute of Applied Physics, Moldova.

PS18. MOLECULAR GENETIC APPROACHES IN THE TREATMENT OF AMYOTROPHIC LATERAL SCLEROSIS. Rintu Ann Reji, Ludmila

Sidorenko. State University of Medicine and Pharmacy "Nicolae Testemitanu", Chisinau, Moldova.

PS19. TECHNOLOGY OF FABRICATION AND APPLICATIONS OF 3D MICRO-NANO-ARCHITECTURES BASED ON AERO-GaN. Tudor Braniste. National Center for Materials Study and Testing, Technical University of Moldova.

PS20. THERMOELECTRIC PROPERTIES OF A THERMOELECTRIC MODULE MADE OF TTT2I3 AND TTT(TCNQ)2 ORGANIC CRYSTALS. Ionel Sanduleac, Silvia Andronic. Faculty of Electronics and Telecommunications, Technical University of Moldova, Chișinău, Moldova.

PS21. SUPERCONDUCTOR-INSULATOR TRANSITION IN SUPERCONDUCTING NANOWIRES. Andrei Zaikin. Institute for Quantum Materials and Technologies, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany.

PS22. FUNCTIONAL CAPABILITIES OF TWO-BARRIER SEMICONDUCTOR STRUCTURES. Mane Khachatryan, Elya Makaryan, Surik Khudaverdyan. Armenian National Polytechnic University, Teryan str., 105, Yerevan, Armenia.

PS23. THE USE FLOATING MULTICHANNEL ELECTRODE FOR MONITORING THE ELECTRICAL ACTIVITY OF THE MYOCARDIUM. Oksana Vlasenko, Ihor Rokunets, Olga Chaikovska, Viktor Chechel, Ludmila Sidorenko, Svetlana Sidorenko, Oleg Vlasenko. National Pirogov Memorial Medical University, Vinnytsya, Ukraine, State Medical University of Medicine and Pharmacy Nicolae Testemitsanu, Chisinau, Moldova.

PS24. IS IT POSSIBLE TO AVOID TERMINOLOGICAL ERRORS IN SCIENTIFIC TEXTS? (ON EXAMPLE OF MINERALOGICAL TERMS IN A.C. CELSUS' TREATISE DE MEDICINA). PhD Natalia Kulikova. Jagiellonian University, Krakow, Poland.

PS25. SUPERCURRENT REVERSAL IN ZEEMAN-SPLIT JOSEPHSON JUNCTIONS. A.A. Golubov, S.-I. Suzuki, Y. Asano. Faculty of Science and Technology and + Institute MESA for Nanotechnology, University of Twente, Enschede, The Netherlands.

PS26. MEDICINES BASED ON NANOSIZED SILICA – ACHIEVEMENTS AND PROSPECTS. Igor Gerashchenko. Chuiko Institute of Surface Chemistry of NAS of Ukraine, Kyiv, Ukraine.

PS27. QUANTUM OSCILLATIONS IN TOPOLOGICAL INSULATOR MICROWIRES CONTACTED WITH SUPERCONDUCTING In_2Bi LEADS. Leonid Konopko,

Albina Nikolaeva, Tito Huber.Technical University of Moldova, Institute of Electronic Engineering and Nanotechnologies, Chisinau, Moldova.

PS28 **BASIC ASPECTS OF BACTERIAL TRANSFORMATION.** Niconova Tatiana, Costeva Anastasia, Sidorenko Svetlana, Sidorenko Ludmila. State University of Medicine and Pharmacy "NicolaeTestemitanu", Chisinau, Moldova, Rehabilitation Clinic Valens, Bad Ragaz, Switzerland

PS29. METHODOLOGY FOR THE FORMATION OF ANN's ELEMENTS. Maria Lupu. Technical University of Moldova, Institute of Electronic Engineering and Nanotechnologies "D. Ghitu", Chisinau, Moldova.

PS30. SUPERCONDUCTING PROPERTIES OF NANOSTRUCTURES SUPERCONDUCTOR/FERROMAGNET. Andrei Prepelita. Technical University of Moldova, Institute of Electronic Engineering and Nanotechnologies "D. Ghitu", Chisinau, Moldova.

PS31. THE CRITICAL MAGNETIC FIELDS OF SUPERCONDUCTING NANOSTRUCTURES BASED ON NB AND CU-NI – ALLOY LAYERS. Evgheni Antropov. Technical University of Moldova, Institute of Electronic Engineering and Nanotechnologies "D. Ghitu", Chisinau, Moldova.

PS32 RE-ENTRANCE SUPERCONDUCTIVITY IN NANOSTRUCTURES BASED ON NB AND CU-NI – ALLOY LAYERS. Roman Morari. Technical University of Moldova, Institute of Electronic Engineering and Nanotechnologies, Chisinau MD2028 Moldova.

PS33. APPLICATION OF NARROW BAND IMAGING FOR EARLY DIAGNOSTIC OF URINARY BLADDER TUMORS. Ivan Vladanov, Alexei Plesacov, Ludmila Sidorenko, Ghenadie Scutelnic, Vitalii Ghicavii. State University of Medicine and Pharmacy "Nicolae Testemitanu", Chisinau, Republic of Moldova.

PS34. AN INSIGHT INTO TECHNOLOGIES AIDED IN THE ENCODE PROJECT. Anaswara Kuzhipurayidathil Vijayakumar, Ludmilla Sidorenko. State University of Medicine and Pharmacy Nicolae Testemitanu, Chisinau Republic of Moldova.

PS35. MOLECULAR AND GENETIC APPROACH TO ALZHEIMER'S DISEASE. Mohamed Azhar, Svetlana Sidorenko, Ludmila Sidorenko. State University of Medicine and Pharmacy "NicolaeTestemitanu", Chisinau, Republic Moldova, Rehabilitation Clinic Valens, Bad Ragaz, Switzerland.

PS36. MOLECULAR TRIGGER MECHANISMS FOR NEURODEGENERATION PROCESS VIA MITOPHAGY IN PARKINSON'S DISEASE. Alexandra Sochirca, Ludmila Sidorenko, Svetlana Sidorenko. State University of

Medicine and Pharmacy “Nicolae Testemitanu”, Chișinău Republic of Moldova, Rehabilitation Clinic Valens, Bad Ragaz, Switzerland.

PS37. ADVANCES IN RECENT TECHNIQUES OF SOFT TISSUE TRAUMA IN CHILDREN. Tatiana Cozariz, Egor Porosencov, Ludmila Sidorenko. State University of Medicine and Pharmacy “Nicolae Testemitanu”, Chisinau, Moldova.

PS38. COMBINATION OF KINETOTHERAPY AND NANOPLASMA TECHNOLOGIES: IMPACT ON IMPROVING THE GENERAL HEALTH INDEX IN THE THERAPY OF PAIN CONDITIONS OF THE SPINE. Rodion Uzun, Radii Babanu, Alla Pogorleţchi, Svetlana Sidorenko, Ludmila Sidorenko. Physical Rehabilitation Clinic “Kineto Plus”, Chisinau, Moldova. Rehabilitation Clinic Valens, Bad Ragaz, Switzerland. State University of Medicine and Pharmacy “Nicolae Testemitsanu”.

PS39. GENETIC PREDISPOSITIONS IN ATRIAL FIBRILLATION: IMPLICATIONS FOR PRECISION MEDICINE. Wesam Elabid, Ludmila Sidorenko. State University of Medicine and Pharmacy “Nicolae Testemitanu”, Chisinau, Moldova.

PS40. EFFECTS OF BETA-BLOCKERS ON CARDIAC PHENOTYPES. Rahul Rejimon Nair, Sidorenko Ludmila. State University of Medicine and Pharmacy “Nicolae Testemitanu”, Chisinau, Moldova.

PS41. THE APPROACH OF MOLECULAR MEDICINE TO THE TREATMENT OF GAUCHER DISEASE. Ludmila Rotaru, Ludmila Sidorenko, State University of Medicine and Pharmacy “NicolaeTestemitsanu”, Chisinau, Moldova

14:30-18:00

SESSION 2. ENVIRONMENTAL PROTECTION FROM CBRN

Chairs: Prof. Ioana IONEL, Prof. Leonid BOSHKOV

14:30 Prof. Ildiko Tulbure. ”1 Decembrie 1918” University of Alba Iulia. Quo vadis technology advance – prospects and provocations.

14:55 Prof. Ioana Ionel. West University of Timişoara, Romania. Research in the field of air quality control. Ethics and results.

15:20 Karam Al Qalawi. ”1 Decembrie 1918” University, Faculty of Engineering, Unirii-Str., 15-17, Alba Iulia, Romania. Usage perspectives of renewable energy resources in Jordan.

15:35 Prof. Mikhail Zveryakov. Odessa State Economic University, Odessa, Ukraine. Theoretical Paradigm of Sustainable Development and Ukrainian Realities.

16:30-17:30

PODIUM DISCUSSION 1: ETHICAL PROBLEMS OF IMPLEMENTATION OF THE RESULTS OF RESEARCH

Moderators: Prof. Vladimir Fomin, Prof. Pavel Donec, Prof. Mikhail Zveryakov

17:30-18:00

THE BEST POSTERS AWARD AND APPRECIATION OF YOUNG RESEARCHERS-WINNERS OF THE POSTERS COMPETITION

Commission members: Prof. Eduard Monaico, Prof. Marian Jaskula, Prof. Marwan Mousa, Prof. Mikhail Zveryakov

19:00-22:00 CONFERENCE DINNER

Presentation of the best posters of young researchers at the NANO-2024 Humboldt Kolleg, prizes award. Recommendations for application to the Alexander von Humboldt fellowship.

Day 3, Wednesday, 17.04.2024

9:00-13:00

SESSION 3. LIMITS OF NOVEL TECHNOLOGIES

Chairs: Prof. Eduard Monaico, Prof. Leonid Boshkov

9:00 Prof. Eduard Monaico. Technical University of Moldova, Chisinau. Controlled engineering of gold nanodots deposition using hopping electrodeposition.

9:30 Prof. Vasile Tronciu. Technical University of Moldova, Chisinau. Theoretical studies of the dynamics of two section blue-violet semiconductor lasers.

9:50 Prof. Mihai Macovei. Institute of Applied Physics, Moldova. Quantum hybrid system's dynamics via environmental thermostat.

10:10 Dr. Aurelian Buzdugan. State University from Moldova. Risks associated with nanoengineering and researchers responsability.

10:30 Prof. Vadim Sirkeli. State University from Moldova. High performance ZnSe-based ultraviolet photodetectors with Cr/Au, Ni/Au and hybrid Ag-nanowire contacts.

11:00-11:30 COFFEE BREAK

11:30 Prof. Sawłowicz Zbigniew. Institute of Geological Sciences, Jagiellonian University, Kraków, Poland. Advancing Geological Education Through Artificial Intelligence: Opportunities, Challenges, and Future Directions.

11:50 Prof. Marian Jaskula. Faculty of Chemistry at Jagiellonian University, Kraków, Poland. Silver Nanowire Array Sensor for Sensitive and Rapid Detection of H2O2.

12:10 Prof. Leonid Boshkov. Odessa State Academy of Refrigeration, Ukraine. Types and Stages of Ethnogenesis and the Origins of Ethnic Passionarity.

12:40 Dr. Gheorghe Para. Institute of Electronic Engineering and Nano-technologies "D. Ghitu" of Technical University of Moldova. Topological surface state in the thermoelectric properties of Bi2Te3 layers.

14:00-18:00

EXTERNAL SESSION 4. LIMITS OF NOVEL TECHNOLOGIES

bus transfer to the External Session in "Milești Mici"

Podium discussions. Networking and international Collaboration: experience, new forms and perspectives. Moderators: Prof. Adam Łukaszewicz, Prof. Anatolie Sidorenko, Prof. Leonid Boshkov.

Day 4, Thursday, 18.04.2024

9:00-13:00 SESSION 5. NOVEL TECHNOLOGIES

Chairs: Prof. Marwan Mousa, Prof. Detlef Beckmann

9:00 Prof. Vladimir Fomin. Institute for Emerging Electronic Technologies, Leibniz IFW, Dresden, Germany. Superconductor 3D Nanoarchitectures.

9:30 Prof. Detlef Beckmann. Institute for Quantum Materials and Technologies, Karlsruhe Institute of Technology, Germany. Spin transport in high-field superconductors.

10:00 Dr. Svitlana Kondovych. Institute for Theoretical Solid State Physics, IFW Dresden, Germany. Strain-driven topological textures in ferroic materials.

10:30 Prof. Marwan S. Mousa. Jadara University, Jordan. Advanced Analysis of Copper Nano-tips as Cold Field Emission Electron Sources.

11:00-11:30 COFFEE BREAK

11:30 Dr. Zalamai Victor. National Center for Materials Study and Testing, UTM, Chisinau, Republic of Moldova. Excitonic states in layered semiconductor singlecrystals.

11:50 PhD stud. Litra Dinu. Technical University of Moldova. Sensors based on metal oxides for medical applications.

12:10 PhD stud. Lupan Cristian. Technical University of Moldova, Department of Microelectronics and Biomedical Engineering. Nanodevices based on AIIBVI semiconducting oxide nanowire.

12:30 Prof. Pavel Donec. Ukrainian State University of Railway Transport, Kharkiv, Ukraine. Rationalization as a principle of civilization process and the problem of "common sense".

13:00-14:00 LUNCH

14:00-15:30

SESSION 6. HEALTH AND ENVIRONMENT - LIMITS OF NANOTECHNOLOGIES

Chairs: Prof. Ionel Ioana, Prof. Gerd Antes

14:00 Prof. Gerd Antes. Freiburg, Germany. From Randomized Clinical Trials (RCTs) to Artificial Intelligence (AI) – History and Methodological Challenges.

14:30 Dr. Ludmila Sidorenko. State Medical and Pharmaceutical University "Nicolae Testemitanu", Chisinau, Moldova. Pathologically increased central regulation of the heart rhythm – a diagnostic biomarker.

14:50 Prof. Mariana Sprincean. State University of Medicine and Pharmacy "Nicolae Testemitanu", Chisinau, Moldova. Bioethical principles in prenatal diagnostics and genetic counseling

15:10 Dr. Oleksii Chepliaka. Vinnitsa National Pyrohov Memorial Medical University, Vinnitsa, Ukraine. Hemostatic effect of nanosilica-alginate composition vs kaolin on model of parenchymal bleeding in rats.

15:30 Dr. Shushanik Kazaryan. Institute of biomedicine and pharmacy Russian-Armenian University, Erevan, Armenia. Comparative analysis of biocompatibility of chemical and biogenic Fe3O4 nanoparticles.

15:50 Dr. Roman Chornopischuk. Vinnitsa Medical University, Ukraine. Use of computer morphometry in the complex diagnostic program of patients with burn injuries.

16:00 Prof. Oleg Vlasenko. National Pirogov Memorial Medical University, Vinnytsa, Ukraine. The use of floating multichannel electrodes for monitoring the electrical activity of the myocardium.

16:20-16:40 COFFEE BREAK

16:40-17:30 SUMMING-UP SESSION: DISCUSSION ABOUT NETWORKING, COLLABORATION STRENGTHENING, AND MEMORANDUM ELABORATION

Moderators: Prof. Anatolie Sidorenko, Prof. Eugen Sava, Prof. Detlef Beckmann, Prof. Marian Jaskula

18:00-23:00 DEPARTURE OF PARTICIPANTS

BASE ELEMENTS FOR SUPERCONDUCTING ARTIFICIAL NEURAL NETWORK

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Energy efficiency and the radically reduction of the power consumption level becomes a crucial parameter constraining the advance of supercomputers. The most promising solution is design and development of the non-von Neumann architectures, first of all – the Artificial Neural Networks (ANN) based on superconducting elements. Superconducting ANN needs elaboration of two main elements – nonlinear switch (neuron) [1] and linear connecting element (synapse) [2]. We present results of our design and investigation of superconducting spin-valves and superconducting synapse, based on layered hybrid structures superconductor-ferromagnet. Results of our theoretical and experimental study of the proximity effect in a stack-like superconductor/ferromagnet (S/F) superlattice with Co- ferromagnetic layers of different thicknesses and coercive fields, and Nb-superconducting layers of constant thickness equal to coherence length of niobium, are presented. The superlattices Nb/Co demonstrate change of the superconducting order parameter in thin s-films due to switching from the parallel to the antiparallel alignment of neighboring F-layers. We argue that such superlattices can be used as tunable kinetic inductors for ANN synapses design. The study was supported by the Project «Nanostructures and advanced materials for implementation in spintronics, thermoelectricity and optoelectronics» no. 020201.

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QUO VADIS - ARTIFICIAL INTELLIGENCE INTERNET OF THINGS, INTERNET OF BEHAVIORS AND NANO-GENERATORS: OPPORTUNITIES, CHALLENGES AND ETHICAL CONCERNS

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Abstract: The current landscape in the 21st century has become exceedingly complex and interconnected by resources, systems, and networks – both physical and virtual. Using cyber-physical systems (CPS), the Internet of Things (IoT) based devices form highly connected and adaptive environments through smart and intelligent systems and protocols to provide situational awareness. The use of Artificial Intelligence plays a pivotal role in augmenting the potential of the IoTs, now commonly termed as AIoT. Potential applications of AIoT are driving the growth and evolution of IoT, with significant impacts on consumers, the research community, the public sector, as well as commercial and industrial sectors. One of the constraints that limit such operations is the sources of energy to power such devices. Recent advances in next-generation triboelectric nanogenerators (TENG) along with the integration of finite-state machines (FSM) and built-in edge computing in onboard IoT devices have reduced the energy requirement, thus shifting the energy storage requirements to built-in power generation and ambient sources. It is essential to have the synergetic integration of exponential technologies to minimize energy storage and reduce energy consumption in commercial off-the-shelf (COTS) configurations. As the complexity and functionality of systems around us increase exponentially, combinatorial technologies in conjunction with artificial intelligence (AI), machine learning (ML), and data analytics (DA) are used as decision support tools to provide a comprehensive analysis and strategy to optimize usage[1,2]. The economic and societal potential of such systems is vastly greater than what has been realized, and major investments are being made worldwide to develop the technology, hence CPS, in conjunction with AI with IoT (AIoT) and the Internet of Behavior (IoB) will further expand the boundaries of smart and connected systems to provide numerous societal opportunities. Applications of AIoTs, IoB, and onboard energy harvesting devices also include tactile sensing, smart agriculture, and transportation logistics. Despite its tremendous beneficial applications, there are potential concerns about privacy, security, and exploitation for nefarious misinformation/disinformation purposes. A balanced *Quo Vadis* viewpoint will be presented.

Keywords: AIoT, IoB, TENG, CPS, FSM, COTS, Ethical concerns

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QUO VADIS TECHNOLOGY ADVANCE – PROSPECTS AND PROVOCATIONS

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Nowadays we live in the modern world, a technology-driven society. Beginning in around 1780, the first revolution focused on industrial production based on machines that were powered by steam and water, being *Industry 1.0*. Some 100 years later, the second industrial revolution was based on electrification and took place with mass production, representing *Industry 2.0*. Stepping forward another 100 years, to 1970, *Industry 3.0* saw automation using computers and electronics, being enhanced by globalization. We are currently living in the fourth industrial revolution, *Industry 4.0*, which is based on digitalization and includes automation, AI technologies, connected devices, Internet of Things, IoT, robotics, smart systems, and virtualization, digital transformation, smart cities, and more. The fifth industrial revolution, *Industry 5.0* has a focus on man and machines working together trying to consider increased resilience, a human-centric approach, and a focus on sustainability. Nevertheless, there are also negative sides of registered developments, which must be considered. Related to social communication in today's technology-driven society it is to be remarked that time spent in social interactions has decreased dramatically in all familiar settings and social institutions. Rapidity is currently almost everywhere, starting with professional activities and ending with familiar ones, driven by technological advance made possible by *Artificial Intelligence*, *Machine Learning*, and *Data Science*. *Digital transformation* based on *digital leadership* has four central goals, customization, insight-driven manufacturing, incremental innovation, and digital innovation. Anyway, there is a need to consider ethical aspects in technology, such as misuse of personal information, in the future being a need for *ethical leadership* to a sustainable future.

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RESEARCH IN THE FIELD OF AIR QUALITY CONTROL. ETHICS AND RESULTS

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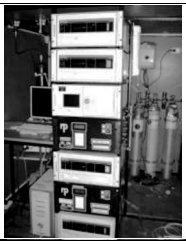
The climate change is more than evident presently. In order to protect the environment (indoor and outdoor) and slow down the phenomena generated by climate change, research activities are carried out in all countries. The Fuel Analysis Laboratory, Investigations Ecological and Noxious Dispersion (LACIEDIN) Laboratory is holding a national trademark. It is an OECs (Conformity Assessment Bodies), and applies SR EN ISO/IEC 17025/2018 standard, by carrying out with the economic environment, supporting the functioning of a market oriented towards quality and competitiveness, but also the educational process (for master and PhD students), succeeding that, through technical competence, impartiality and integrity to gain the trust of partners and the awareness of the authorities, the business environment and civil society. Over the years, LACIEDIN has built a reputation for offering quality services, through teams characterized by work well done and extensive practical and managerial experience. With the support of the Alexander von Humboldt Foundation the lab was started by 1994, and completed, in time, up to present, when it is acknowledged as a RENAR accredited laboratory (www.mediu.ro), running emission and air quality control. The paper will highlight the first steps of the lab, will nominate the contributors, and present some representative results, based on graphs and figures.

		
Interior of the Lab	Present outfit of the mobile laboratory, including the truck	RENAR accreditation

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USAGE PERSPECTIVES OF RENEWABLE ENERGY RESOURCES IN JORDAN

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Human development registered in the last century has been possible without doubt on the base of designing a multitude of technological applications by applying diverse natural resources, especially energy ones [1]. Anyway, recorded advances especially in technological field was substantially feasible because of applying fossil fuels for energy supplies, fact that has had as a result also undesired environmental pollution, especially by CO_2 emissions; thus, bringing currently much debated climate change and global warming [2]. Another challenging situation is brought by the limited availability of fossil fuels, which is presently much debated on the global level. In this regard renewable energy resources are understood as being the pragmatic solution for assuring the future energy supply of humanity. Considering the energy needs of human beings on a global level, attention is currently oriented to existing possibilities of using renewable energy resources. In this context Arab countries could play an important role regarding the usage of solar energy for assuring electric energy supply for the population. By emphasizing different renewable energy resources for energy supply such as solar, wind, and water energy as well as bioenergy, their usage odds in the Arab World will be pointed out. In this regard a case study for the Jordanian situation will be debated about applying potential of solar energy, especially of photovoltaic panels for delivering needed electric energy [3]. By considering different levels of solar radiation in different parts of the world, existing odds to produce electric energy by photovoltaic panels in the Arab countries will be emphasized, thus contributing by this to new modern methods for electric energy supply. In the end, appropriate conclusions will be drawn regarding assuring intended sustainability of human society by applying renewable energy resources [3].

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THEORETICAL PARADIGM OF SUSTAINABLE DEVELOPMENT AND UKRAINIAN REALITIES

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CONTROLLED ENGINEERING OF GOLD NANODOTS DEPOSITION USING HOPPING ELECTRODEPOSITION

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In this work, the applications of the previously elaborated „hopping electrodeposition" approach for the deposition of gold nanodots on semiconductor surfaces [1] is addressed. As was demonstrated [1], one monolayer of Au nanodots can be routinely deposited via pulsed electrochemical deposition regardless of the morphology of the porous structure. Hopping electrodeposition enabled one to estimate the conductivity of semiconductor nanostructures with different thicknesses [2]. Moreover, taking into account the site-selective deposition on semiconductor regions with higher conductivity, the technological approaches for the deposition of Au nanodots along definite lines were developed [3]. Precise control of the deposition process of gold nanodots opens new possibilities for the creation of highly complex 3D hybrid nanostructures, in which the gold nanodots play a crucial role as catalysts [4]. As a result, this controlled deposition approach offers a versatile tool to engineering nanostructures with tailored properties and enhanced performance for various applications. The work was supported by the institutional subprogram 02.04.02 no. 4/FI «Development of technologies and investigation of the properties of layered semiconductor compounds, hybrid nanostructures and laser sources».

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QUANTUM HYBRID SYSTEM'S DYNAMICS via ENVIRONMENTAL THERMOSTAT

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Hybrid quantum systems attracted a lot of attention nowadays, especially, in connections to quantum technologies. In this respect, here, we shall present our recent investigations on quantum dynamics in hybrid quantum systems mediated by the environmental quantum thermostat. Particularly, we will discuss the quantum efficiency of a quantum heat engine consisting from many three-level quantum emitters collectively interacting with the cold and the hot baths, respectively. We have found that the quantum performance may be enhanced considerably in a three-level ensemble, depending on the level's configuration [1]. Then, we turn to a hybrid quantum optomechanical setup, where we demonstrate enhanced effective phonon lifetimes [2] and multi-phonon effects in dispersive regimes of interaction. These regimes can be achieved involving few-level emitters as well [3]. The entanglement creation in a pair of laser pumped two-level qubits and its relationship with cooling effect of the boson mode which is coupled to them shall be reported as well. We demonstrate that the entanglement occurs even for resonance laser-qubit interaction - an effect arising due to the presence of the dipole-dipole interaction among the two-level qubits [4].

The study was supported by the Project «***Non-linear Quantum Optics in high-frequency intense electromagnetic fields***» no. 011205.

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RISKS ASSOCIATED WITH NANOENGINEERING AND RESEARCHERS RESPONSABILITY

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Nanoengineering is an essential branch of modern science and electronics, ensuring the sustainability of development in energy, communications, materials, and environmental and health protection. However, nanoengineering is dual-use in its genesis, posing a real dilemma that cannot be ignored [1]. The progress in diversifying the spectrum of conventional CBRN weapons raises the issue of defining new classes of destructive offensive weapons, liaisons with nanoengineering, such as genetic and cyber weapons, as weapons of mass destruction. This denotes a key warning about gaps in non-proliferation policies and regimes [2]. The new interdisciplinary branches of science are always ahead of the policies that can and must regulate them. One thing is certain: the need for more research to better understand the latest offerings of deep technologies and assess the risks associated with them.

To achieve targeted and effective research, it is imperative to follow strategic objectives such as: a risk-oriented approach with comprehensive risk characterizations and assessments; evaluation of the novelty of nanoengineering; application-oriented and regulatory-relevant research; consideration of sustainability and the precautionary principle; public transparency [3]. Considering the importance of educating the new generation of researchers in the spirit of assuming responsibility and assessing the risks of research, the Department of Microelectronics and Biomedical Engineering at TUM has launched a new course, "Research, Engineering, and the Culture of Non-Proliferation," available to master's students as a free choice.

This study was supported by the European Union through the STCU Projects no. 9608.

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TOPOLOGICAL SURFACE STATE IN THE THERMOELECTRIC PROPERTIES OF Bi_2Te_3 LAYERS

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Topological materials have elicited interest from a wide variety of fields due to their unique symmetry- protected electronic states. Using the new developed by us technology preparing single-crystal layers of topological insulator Bi_2Te_3 and Bi_2Se_3 , *n* and *p*-tip without substrate [1] , we received layers with thickness 10-20 μm and with orientation the trigonal axis C_3 perpendicular to the cleavage plane layers (according X-ray-diffraction studies).The process was repeated several times to obtain layers with different thickness. Thermoelectric properties at 4.2-300K- and Shubnikov de Haas (SdH) oscillations of single crystals layers of an n- and *p*-type bismuth telluride topological insulator (TI) are investigated. Using experimental data on SdH oscillations in both longitudinal (H||I) and in transverse (H⊥I) magnetic fields at temperature of 2.1–4.2 K, the cyclotron effective mass, Dingle temperature and the quantum mobility of charge carriers are calculated.It has been revealed that the phase shift of the Landau levels index is 0.5 for both the longitudinal and transverse magnetic fields, like as in Bi_2Te_3 microwires [2]. This finding is attributed to the Berry phase of the surface state. From temperature dependences of resistance and thermo-power, the power factor in a temperature range of 2–300 K was calculated. It has been found that the maximum value of the power factor $S^2\sigma = 4.5 \times 10^{-5}$ W/m K^2 for *p*-layers at 300 K. Structures based on Bi_2Te_3 can be used to design miniature sensors for thermoelectric devices, such as thermoelectric micro-coolers for cooling a computer processor.
The study was supported by the Project « Nanostructures and advanced materials for implementation in spintronics, thermoelectricity and optoelectronics » no. 020201.

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ADVANCING GEOLOGICAL EDUCATION THROUGH ARTIFICIAL INTELLIGENCE: OPPORTUNITIES, CHALLENGES, AND FUTURE DIRECTIONS

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The use of artificial intelligence (AI) in geology, and generally in science and technology, is becoming the norm and does not raise much controversy. The situation is different with education. It has been a long time since there has been such extreme polarization of views as regarding the use of AI in education.

Artificial intelligence (ChatGPT-4, Copilot, Gemini, and others) is not killing today's education. AI simply makes us realize that we are often still stuck in the 19th century model. There are those who would like to ban GPT Chat, but for their information - we have no real ability to enforce this ban. So all we have to do is like it and embody it in a reasonable way. We must remember that the use of AI in education involves certain risks. Care must be taken to protect data, avoid over-reliance on technology, and ensure that AI is treated as a tool to support and not replace traditional teaching methods (from Copilot 2024).

There are two approaches to AI in education: based on artificial intelligence and supported by artificial intelligence. Each of them has its pros and cons and should be tailored to a specific situation, without going to extremes.

How to use AI tools?: a/ Ask for study strategies; b/ Ask for an explanation in simple words of what you did not understand during class; c/ Get examples to support your claims in written documents; d/ Ask for recommendations on resources, apps and websites; e/ Practice quizzes to better remember concepts; f/ Give instructions to create your own exercises; g/ Support your AI tool to motivate you (based on https://www.euroeducation.net/articles/how-to-use-ai-tools-for-studying.htm).

How to modify the geology curriculum using AI?: a/ Personalization of teaching; b/ Interactive educational tools; c/ AI-based grading systems; d/ Personalized learning suggestions; e/ Use of virtual reality (VR); f/ Analysis of geological data; g/ Educational bots; h/ AI-supported research projects (suggested by GPT-4). Introducing these innovations has the potential to significantly improve geology education, make it more engaging and effective, and better prepare students to understand and cope with the challenges of geology in the future.

Of course, relying on AI in education may lead to students becoming lazy while mindlessly completing tasks or solving problems, and reducing their ability or motivation to think critically and independently. Whether this happens, however, is mainly up to the teacher.

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SILVER NANOWIRE ARRAY SENSOR FOR SENSITIVE AND RAPID DETECTION OF H_2O_2

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A rapid, accurate and reliable determination of hydrogen peroxide traces is important issue due to the fact that H_2O_2 plays a crucial role in many fields including food, pharmaceutical, chemical and biochemical industries and in clinical control and environmental protection [1]. Determination of the concentration of hydrogen peroxide is often essential issue in clinical trials. It is noteworthy that the excess of H_2O_2 may be involved in the etiology of aging and progressive neurodegenerative diseases, such as Parkinson's disease [2]. On the other hand, the presence of H_2O_2 can affect the indirect determination of the level of glucose in the blood [3, 4].
In the present work nanostructured electrochemical H_2O_2 sensor was prepared by simple cathodic electrodeposition of noble metals inside home-made nanoporous alumina (AAO) templates or on the surface of silver-coated supports. Anodic porous alumina templates was synthesized via a simple and cost-effective two-step anodization of aluminum. After suitable treatment, metallic nanostructures (nanowire/nanorod arrays, nanoporous thin films) was obtained and investigated as amperometric sensors for the detection and determination of hydrogen peroxide in the presence of various interfering substances [5-6] showing good sensitivity, repeatability and accuracy.
The project was funded by the National Science Centre granted under decision no. DEC-2012/07/N/ST5/00155.
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HIGH PERFORMANCE ZnSe-BASED ULTRAVIOLET PHOTODETECTORS WITH Cr/Au, Ni/Au AND HYBRID Ag-NANOWIRE CONTACTS

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Zinc selenide is attractive wide bandgap semiconductor for fabrication of many optoelectronic devices, including the ultraviolet (UV) photodetectors, due to its large bandgap energy (2.67 eV at 300 K) and high resistance to intense UV and X-ray radiation [1, 2]. Most commercial UV-photodetectors are based on Si or GaAs and the intense UV radiation induces aging effects that leads to their degradation. To solve this issue, the bulk high-resistivity ZnSe could be used for fabrication of UV photodetectors with metal-semiconductor-metal structure, as we shown recently [2]. Among different metals, the metals with high work functions, like Ni, Cr, Ag or Au, are required to achieve a large Schottky barrier height on ZnSe [2, 3]. A large barrier height would lead to a small leakage current and high breakdown voltage. In this work, we report on fabrication and characterization of high-performance ZnSe-based UV photodetectors with Cr/Au, Ni/Au and hybrid Ag-nanowire contacts.

V.S. grateful acknowledges the support from the Alexander von Humboldt Foundation. V.S, N.N. and D.N. also acknowledge the support from the projects no. 011208 and no. 011207.

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SUPERCONDUCTOR 3D NANOARCHITECTURES

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Advances of high-tech fabrication techniques have allowed for generating geometrically and topologically nontrivial manifolds at the nanoscale, which determine novel electronic, magnetic, optical and transport properties of such objects due to their complex geometry and non-trivial topology [1]. 3D superconductor (SC) nanoarchitectures, with unconventional vortex configurations, are promising for the future efficient and multifunctional technologies. A topological transition between the vortex and phase-slip regimes determines the magnetic-field–voltage characteristics revealing a nontrivial topology of SC screening currents. An abrupt switch-on of the transport current triggers the transition from the vortex to phase-slip regime. A novel hysteresis effect is unveiled in the current–voltage characteristics of SC open nanotubes [2]. Dynamic topological transitions in SC open nanotubes take place under a combined dc+ac transport current [3]. Various vortex chains, vortex jets, phase-slip regimes [4] occur in SC open nanotubes due to the inhomogeneity of the normal magnetic field component. Efficient steering of vortex chains and jets in SC open nanotubes is provided by tilting of the magnetic field [5].

I am grateful to I. A. Bogush, R. Córdoba, O. V. Dobrovolskiy, and R. O. Rezaev for fruitful collaboration. The study was supported by the E-COST via Action #CA21144 “Superconducting Nanodevices and Quantum Materials for Coherent Manipulation”.

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SPIN TRANSPORT IN HIGH-FIELD SUPERCONDUCTORS

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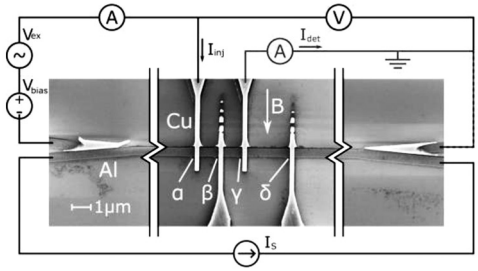
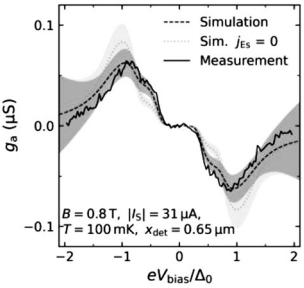
Quasiparticle transport in high-field superconductors is characterized by four nonequilibrium modes, reflecting the particle-hole and spin degrees of freedom [1-2]. We will give a brief overview of the field, and report on an experimental investigation of the spin-dependent coupling of supercurrent and quasiparticles in superconducting aluminum wires [4]. At low temperature, we observe the supercurrent-induced coupling of energy and charge imbalance with spectral resolution. At high magnetic fields, in the presence of a Zeeman splitting of the density of states, we find evidence for a recently predicted [3] spin-dependent coupling of supercurrent and quasiparticles.





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STRAIN-DRIVEN TOPOLOGICAL TEXTURES IN FERROIC MATERIALS

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Our objective is to explore new ways of creating and stabilizing topological textures — such as domain walls, vortices, merons, skyrmions, and Hopfions — in ferroic materials [1-3] through the utilization of strain- and geometry-induced effects. The pronounced coupling between the order parameter and crystal lattice, particularly evident in certain types of ferroics like ferroelectrics or antiferromagnets, plays a pivotal role in establishing the equilibrium electric or magnetic state. This coupling not only facilitates the control but also enables the optimization of technological parameters within the sample, thereby paving the way for diverse industrial applications.

One of the key applications of ferroics lies in memory devices, where their properties can significantly enhance information processing, storage, and communication efficiency. Additionally, ferroic materials are being explored for use in terahertz nanoelectronics, neuromorphic computing systems, and low-dissipation computing circuits, offering opportunities for advanced device design and improved functionalities [4-6].

Engineering and manipulating various ferroic textures through by-design approaches opens the way to novel material functionalities and advance the development of innovative devices. This pursuit not only expands our fundamental understanding of ferroic materials but also holds promise for practical applications across multiple disciplines.

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ADVANCED ANALYSIS OF COPPER NANO-TIPS AS COLD FIELD EMISSION ELECTRON SOURCES

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Field electron emission measurements were performed on high purity copper emitters, with apex radii in the nanometer and micrometer ranges, produced by an electrochemical etching technique with phosphoric acid (H3PO4) solution. The measurements were carried out in a high vacuum in rande of 10^{-5} mbar. The current-voltage characteristics (I-V) have been studied and analyzed using Murphy–Good (MG) method type plots. A Scanning electron microscope - Energy- dispersive X-ray spectroscopy (SEM- EDS) were utilized to visualize the emitter's surface and for Study the purity of samples. Furthermore, the spatial distribution of electron emission and the current stability were recorded and used to analyze the electron emission behavior from the tips' surface. Electron mapping indicated a consistent component distribution throughout the copper tips. The results showed an emission current with a bright and additionally stable spatial distribution that started at low voltage.
Keywords: Field electron emission, Current-voltage characteristics, Copper tips, High vacuum.

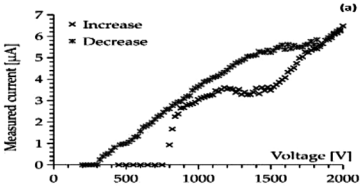

Figure 1: Shows the current-voltage characteristics of copper emitter Cu1.

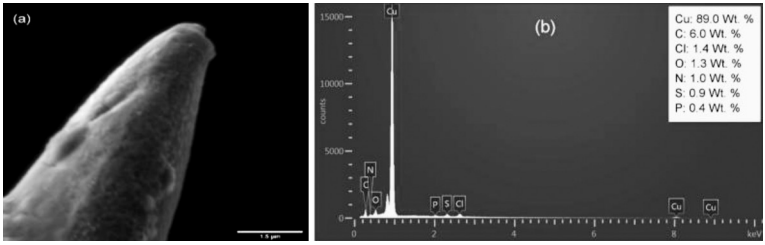

Figure 2: Scanning electron micrograph of a copper field emission apex as shown in (a), and its related EDS results as presented in (b).

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SENSORS BASED ON METAL OXIDES FOR MEDICAL APPLICATIONS

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Copper oxides and zinc oxides have been abundantly studied due to their versatile applications in gas sensors, biosensors, batteries, solar energy, temperature superconductors, photodetectors, etc [1]. One of the attractive challenges where CuO nanostructures are involved is the detection of different biomarkers for medical applications. Biomarkers are measurable indicators present in the human body that can be seen through various tests. CuO-based sensors are used in the determination of volatile organic compounds (VOC) as biomarkers of various diseases, realizing increased interest on acetone sensors as a biomarker used for the detection of diabetes mellitus by the non-invasive method of the human body [2]. Just like the detection of gases, volatile organic compounds that are naturally found in nature, an interesting field of research is the detection of ultraviolet light (UV) to which we are influenced every day both positively and negatively. There is a wide range where this type of light is used, starting with agriculture and cosmetics, ending with the medical field or the creation of integrated circuits [3]. The results obtained from the research carried out are promising with the prospect of developing multifunctional devices for detecting not only gases and VOCs, but also rays with different wavelengths. So, the studies in the given field will be continued.

The study was supported by the by State Program LIFETECH « Innovations in Biomedical Engineering: Advanced Technologies and Applications for Data Acquisition, Processing and Analysis » No. 020404 at Technical University of Moldova.

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EXCITONIC STATES IN LAYERED SEMICONDUCTOR SINGLECRYSTALS

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Since the discovery of graphene in 2004, monatomic and multi-atom thick materials have attracted increasing attention due to their excellent mechanical and electronic properties [1]. The absence of dangling bonds over large specific areas ensures low charge dissipation in graphene and other two-dimensional (2D) non-graphene materials, making them suitable for applications in high-speed electronics, optoelectronics, sensing, and energy generation and storage. However, the use of graphene in electronics is limited due to its zero bandgap. In this regard, graphene alternatives that have a similar two-dimensional structure, but with their own band gap, have been intensively studied in recent years. Among these materials are transition metal chalcogenides such as SnSe, and GaSe. And, the optical properties of these materials, in particular excitonic states, and the influence of the layered structure of the material on them are also of interest.

Optical properties of GaSe single crystals were investigated by measuring of reflection, transmission and photoluminescence spectra in wide temperature diapason 10 – 300 K. The parameters of three excitonic series for C_1-V_1, C_2-V_1 and C_3-V_1 bands were determined [2].

Layered SnSe demonstrate presence of A, B, C and D excitonic series in the minimum of interband interval. By analysis of low temperature reflection spectra of the excitons parameters (Rydberg constant, tramnslaiton and reduced effective masses) were determined. The effective masses of electrons and holes forming these excitons were also determined [3].

The work was supported by the institutional subprogram 02.04.02 no. 4/FI «Development of technologies and investigation of the properties of layered semiconductor compounds, hybrid nanostructures and laser sources».

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NANODEVICES BASED ON $A_{II}B_{VI}$ SEMICONDUCTING OXIDE NANOWIRE

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Choosing material as sensor is an important part for fabrication of fast and reliable devices, capable of detecting dangerous gases. ZnO is one of the most promising and used material in sensing applications, due to its proprieties, but has drawbacks like poor selectivity, high operating temperature, etc. [1]. These drawbacks can be improved by doping with rare-earth materials, like Eu, which can lead to a higher response and lower operating temperature [2]. Another method of improving sensing proprieties is by using 1D material, instead of 2D [3]. In our work, we present an improved sensing performance of a device based on a single ZnO:Eu_2O_3 nanowire, compared to ZnO:Eu_2O_3 films. ZnO:Eu_2O_3 nanowire arrays were grown using electrochemical deposition method, and single nanowire was integrated using FIB/SEM. Morphology was studied using SEM, observing uniform deposition with nanowires with similar size. Structural proprieties were studied using XRD, observing presence of ZnO and Eu_2O_3 peaks. Device based on a single ZnO:Eu_2O_3 nanowire was tested to a series of gases at different operating temperatures, observing selectivity to 100 ppm hydrogen, an improved response value and lower operating temperature compared to non-doped ZnO and ZnO:Eu_2O_3 films. These results show that by using a single nanowire as sensing material and modifying $A_{II}B_{VI}$ semiconducting oxide proprieties by doping with different metals, we can obtain an improved sensing performance. C. Lupan gratefully acknowledges Kiel University, Chair for Multicomponent Materials, Germany and PSL Université, Chimie-ParisTech IRCP, Paris, France for internship positions in 2023 and TUM, Chisinau, Republic of Moldova.

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RATIONALIZATION AS A PRINCIPLE OF CIVILIZATION PROCESS AND THE PROBLEM OF "COMMON SENSE"

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Civilization process (in the understanding of N. Elias) appears to be based on two principles: "the principle of care/parsimony (бережность, Behutsamkeit)" and "the principle of rationality".

The first of them manifests itself, among other things, in a careful attitude: 1) – to a human person and body, rejection of physical violence (humanism); 2) – to one's own health (hygiene, sports, healthy lifestyle); 3) – to nature (ecology, environmental protection, sustainable use of resources), 4) – to representatives of ethnic and other minorities (multiculturalism); 5) – to the opinions and values of others (tolerance).

The second principle is characterized by: 1) – suppression of the emotional (especially the passionary); 2) – overcoming the mythological, religious vision of the world; 3) – formalization of conflict resolution (law); 4) – understanding of cause-effect and other logical connections, ability to predict the future; 5) – a sense of proportion; 6) continuity/succession, etc.

Many factors of both "care/parsimony" and "rationalization" are based on the mechanism of the so-called "sublimative spiral". Its excessive unwinding can lead to dysergetic (destructive) consequences due to the loss of connection with the primary object of sublimation.

Recently, the topic of "reason" or "common sense" has increasingly come up in political discourse. During heated political debates opponents are often denied not only cognitive abilities of an educated, intellectually developed person, but also the ability to use elementary logical operations, tested by mankind for thousands of years in everyday life. These operations may concern the correct identification of objects (in particular, "one's own" and "stranger's" or rather "friend-or-foe"), calculating the consequences of steps taken, assessing emerging risks, crossing "red lines", understanding the ratio of big and small, part and whole, harmful and useful, norm and deviation from the norm, qualitative leap, use of double standards, neglecting the sense of proportion, etc.

The issue of the reasons for the departure from common sense deserves separate consideration – among such reasons can be mentioned passionarization caused by natural and social cataclysms, attempts to implement obviously utopian projects, wars or malicious manipulation of public opinion, as well as general civilizational degradation.

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FROM RANDOMIZED CLINICAL TRIALS (RCTS) TO ARTIFICIAL INTELLIGENCE (AI) – HISTORY AND METHODOLOGICAL CHALLENGES

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Generating knowledge from studies or trials has been one of the key objectives of empirical research. This has been an essential issue in many research specialties with plenty examples during the last centuries, showing the movement towards increasingly more systematic approaches. A rich source of this development is the James Lind Library [1] evolved from a website called Controlled Trials from History. It's using material from history to illustrate the principles underlying fair tests of treatments and their development and application over time. Modern times have started in the late 1920 with the first publications describing the principles of randomization as a tool to minimize bias in the comparison of the effectiveness of interventions. This work was completed with the publication of the methodology and advantages of the design of trials in which groups were filled by the randomization procedure, by R. A. Fisher (The Founder of Modern Statistics) in 1929. Those designs were called experimental, in contrast to observational studies where the treatment allocation was not influenced but simply observed. The next decades saw a steady development of these principles in trial designs, their practical application and next steps of progress of these designs. Implicit in this progress was a permanent competition between experimental and observational studies, with permanent controversies, often very fierce. A significant event in the gradual evolvement was the first steps of a development which led, three decades later, to what is now known as Evidence-based Medicine (EBM), at the McMaster University in Hamilton, Canada, in 1969. This pioneering work was guided by Dave Sackett, a US doctor in internal medicine. Parallel to those early days the foundation of the methodology of systematic reviews was laid in the United Kingdom by Archie Cochrane with his legendary book "Effectiveness and Efficiency: Random Reflections on Health services". There he claimed that all medical interventions should show their effectiveness in RCTs. In this period the more theoretical principles of clinical trials and medical practice were merged into a shared model of both perspectives. However, the first two decades were not labelled as EBM but used Clinical Epidemiology as specialty name for that framework. The term Evidence-based was introduced 1991 and marked the starting of a remarkable era of major methodological developments. More than 35 years of Evidence-Based Medicine (EBM) have achieved major contributions to systematically integrating the results of clinical trials into decision making in health care. This progress has been enabled and supported by an enormous amount of methodological developments. The rigour of the methodological framework, in particular addressing quality assessment and quality issues in general, is a characteristic of EBM. However, considering 35 years as time for those achievements is misleading because that time period included the pandemic where in 4 years time many of the achievements were destroyed or lost. This can easily be seen by the role

quality issues played in all aspects of the planning, conduct, analysing the results of trials. From 1991 to 2020 a considerable number of quality devices (i. e. Equator [2] have been developed and implemented, for the quality of all steps of trials from planning to implementing the knowledge derived from results. This may sound as if it was an easy path but it was not. Quality is a value which is under permanent attack and has to be defended. Bias is a major aggressor, probably the most famous in that camp is the publication bias. Up to 50% of research results are not published, with a heavy bias of what is published and visible [3], accordingly with serious ethical impact [4]. In recent years a new era has been launched, starting 2008 with a provocative article claiming that enough data make the scientific method obsolete [5]. Big Data, artificial intelligence (AI) and personalized medicine (also called precision medicine) have generated a realm of visions and promises where the quality issue seems to have completely disappeared: Unlimited data guarantee any level of needed quality, without particular effort. Can this be expected, or where is the border between realistic expectations and marketing-driven promotion? We are observing a confrontation and a cultural clash between the "old", methods-driven world and the new "informatics-based" or "data-driven" world which is not receiving the attention it deserves in the current climate of enthusiasm and hype [6]. It is urgent to avoid misleading perspectives and return to strictly quality-driven research agendas and the implementation of these methods [7]. The presentation describes and illustrates these different methods worlds and their tensions and controversies.

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PATHOLOGICALLY INCREASED CENTRAL REGULATION OF THE HEART RHYTHM – A DIAGNOSTIC BIOMARKER

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Pathologies with affected heart regulation belong to a challenging problem in modern medicine. The problem is, on the one hand, because of the peculiarities of a fast shift from the medullar to the central regulation of the heart rhythm, and on the other hand, lack of methods to diagnose this state in time. This study aimed to find out whether the recently described pathological signs analyzing a cardiorhythmogram can be characterized an increased cardiac regulation. Material and methods. In the study 330 individuals were included. Individuals were of both genders and average age of 45.5± 11.0 years. The main group consisted of 150 patients with arterial hypertension. The control group was made up of 180 healthy individuals. In all individuals, the steady-state cardiorhythmogram was analyzed, mainly the new pathological signs. In healthy individuals a baseline measurement was done, followed by a second measurement after an induced state of increased central activity done in several stages. The state was induced by solving a complicated math task. Results. In all 180 healthy individuals the signs for an increased central modulation of the heart rhythm, when solving the math task, compared with the baseline measurement $p < 0.01$. From 150 patients with arterial hypertension, in the steady-state cardiorhythmograms of 138 patients the signs of increased central cardiac regulation $p < 0.01$, like in healthy individuals during solving a math task, were observed. Conclusions. The analysis of the recently-described pathological signs in cardiorhythmograms characterizes pathologically increased central modulation of the heart rhythm. Detecting these in healthy individuals during steady-state should be regarded as biomarkers for cardiovascular risks, like arterial hypertension.

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BIOETHICAL PRINCIPLES IN PRENATAL DIAGNOSTICS AND GENETIC COUNSELING

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The field of bioethics, as a new reality in the contemporary world, has left a deep imprint on prenatal diagnosis and genetic consultation through the profound influence of principles and values such as respect for life in general, for human dignity, respect for the patient, for their well-being, and their autonomy within the medical act. The bioethical principles of genetic research, including those referring to prenatal diagnosis, at the current stage of scientific development, continue to deserve special attention, as well as the methodological and clinical aspects as well as those, related to the organizational improvement of genetic assistance. The continuous evolution of society and the rapid development of biomedical technologies and medical genetics bring bioethical aspects to the fore. Specifically, the ethical aspects of medical genetics and genetic technologies have been the object of special attention by the World Health Organization (WHO, 1998) and have been repeatedly reviewed in the specialized literature.

In this context, within genetic consultation and prenatal diagnosis of hereditary diseases in the doctor-patient relationship, bioethical principles must be respected. Practical recommendations are based on the following general principles and foundations of medical bioethics:

1. The principle of justice involves risk assessment, risk minimization, and benefit maximization for the patient and their family.
2. The principle of responsibility and freedom refers to the amount of freedom that is proportional to the responsibility. The more freedom both the doctor and the patient possess, the more responsibility they have. The principle of the patient's and the doctor's responsibility and freedom consists of the patient assuming the risk of giving birth to a child with genetic diseases, a fact that represents inalienable individual freedom but is correlated at the level of each future mother with a responsibility towards society and also towards their family members. The doctor's responsibility is to reduce the risk through information, accurate assessment, and knowledge of the degree of risk.
3. The principle of informed consent requires that the genetic consultation includes full information for the patient regarding the risk, nature of the disease, prophylaxis methods, etc., intending to obtain the patient's consent to be medico-genetically counseled within the genetic consultation. The patient has the right to give their consent voluntarily, without being coerced by anyone, based on full information, for carrying out genetic tests or any other diagnostic method.

4. The principle of morality assumes that the doctor's actions must be moral, following general ethical norms (to be honest, to respect the patient's dignity, interests and autonomy).
5. The principle of accessibility to genetic services refers to involving as many patients as possible who require genetic assistance by reducing the barriers between them and the geneticist.
6. The principle of efficiency and usefulness, for the prevention of the birth of children with genetic diseases, aims at the actions of medical collaborators to obtain an increase in the efficiency of prophylactic measures and reduce the incidence of medical errors in diagnosis through the high degree of qualification of specialists.
7. The principle of the confidentiality of medical and genetic information aims at the comfort of the patient and strengthening their relations both with the geneticist doctor and with the entire genetic assistance system because the data provided by them to the doctor, as well as the information ascertained following the analyzes or regarding the possible risks of genetic diseases in offspring, are confidential.
According to these basic principles, genetic assistance, including prenatal diagnosis, must be provided to those who need it, according to medical indications, regardless of their income level and other social and legal conditions. Prenatal diagnosis (PD) is based on the "benevolent" principle. The essence and value of prenatal diagnosis are determined especially by the information regarding the genotype and phenotypic manifestations in fetuses and avoiding the birth of children with genetic pathologies. These aspects are analyzed from all points of view, taking into account the vital prognosis and the quality of life.
The genetic consultation must anticipate prenatal diagnosis. The geneticist provides the woman (couple) with clinical information related to the condition under discussion, the evolution of the disease, including the terms of manifestation. After confirming the diagnosis, any decision taken by the woman or the couple must be received with respect and protected within the limits of family rights and legal norms, which determine the social and cultural principles of each country. Only the parents, and in no case the medical workers, make decisions about the fate of the fetus. Repeated genetic consultation is performed when indicated in the case of invasive prenatal diagnosis and other non-invasive genetic and laboratory tests. Accordingly, the family receives complete information and signs the "Informed Consent Regarding the Genetic Investigation or Test," and the geneticist in their clinical activity is guided by the basic bioethical principles, and the following information must be provided to the family:
• The exact name and general characteristic of pathologies, which can be diagnosed in the PD result. The influence of the condition on the future child, their parents, and family members will be mentioned.
• Calculating the genetic risk and describing the probability that the child may be ill. Risk can be expressed in percentages, proportions, or in words.

• The possibility of unwanted test results and sporadic (happening) cases, “de novo” mutations. The probability of obtaining informative laboratory and ultrasound data for the diagnosis and prophylaxis of hereditary diseases.
• Resources to improve the development of the child born with genetic pathology, including drug treatment and social support, from which parents can benefit.
• Possible ways to solve the problem if the child is sick. For example, the birth and education of the child in the family or the state medical institution, the refusal and granting of the right to adoption, the termination of the pregnancy, and the treatment of the fetus during pregnancy, or immediately after birth.
• Explanation of certain laws of transmission of hereditary diseases (Mendelian, multifactorial, “de novo” mutations), some principles of treatment, and resistance to symptomatic therapy of hereditary diseases, since most of the diagnoses and fetal malformations are not treated prenatally.
• No genetic test can give a full guarantee regarding the child’s health because there are many monogenic pathologies, that do not manifest themselves until birth or have a late onset of clinical manifestations (Huntington’s chorea, Marfan’s syndrome, Reklinhausen’s neurofibromatosis). Moreover, specialists may be incompletely informed if this family has a certain risk for a certain condition (there are situations when both spouses can be carriers of the same genetic mutation in a heterozygous state and are at risk of transmitting a serious autosomal-recessive genetic condition).
• Information about the existence of non-invasive screening programs, such as biochemical screening, which is the first stage of prenatal diagnosis that does not allow for establishing a concrete definitive diagnosis.
• The name and address of specialized organizations for people with pathologies diagnosed in fetuses, which can be contacted if necessary.

The bioethical principles listed above and the aspects that regulate medico-genetic consultation, including prenatal diagnosis, are general and, by all their scope, they cannot foresee all the organizational and clinical complications that the geneticist constantly faces. Of course, the possibilities of genetic testing, which are changing and developing so quickly, must also be taken into account. In some situations, and cases when serious fetal pathologies incompatible with life are diagnosed, therapeutic abortion, up to the term of 22 weeks gestation, can and must become a saving solution, because it is important to live a healthy life. The decision to keep the pregnancy or not rests with the couple, the parents and/or the expectant mother. Sometimes, for religious or other reasons, the family does not want to terminate the pregnancy even in the presence of serious congenital or hereditary pathology in the fetus. Much depends on the social and cultural status and the nationality of the future parents. In the Republic of Moldova, prenatal genetic diagnosis is increasingly used, and its possibilities in the prophylaxis of hereditary and congenital diseases are growing rapidly, enjoying remarkable successes. Thus, prenatal diagnosis for chromosomal anomalies and congenital malformations is carried out at the population level through biochemical and ultrasound screening tests, as well as prenatal cytogenetic diagnosis technologies. As non-invasive methods of prenatal diagnosis of

genetic disorders, including congenital malformations, we mention the biochemical screening (triple test), which involves examining the level of alpha-fetoprotein, chorionic gonadotropin, and unconjugated estriol. Among the invasive methods of prenatal diagnosis, amniocentesis is most frequently indicated, with the study of the fetal karyotype at the 16th - 18th week of gestation. Knowing about and performing prenatal testing in the 1st and 2nd trimesters of pregnancy must become a priority. Anyone can fall into the category of increased genetic risk, and the involvement of a specialist and compliance with his indications by the pregnant woman justifies the need to perform prenatal tests. Prenatal screening offers the possibility of early diagnosis of serious fetal conditions at early stages of pregnancy. At the same time, it allows the selection of a group of pregnant women for invasive prenatal diagnosis - amniocentesis, through cytogenetic or molecular genetic research of fetal amniocyte cultures. Conclusions:

1. Bioethical principles and values become mandatory recommendations and postulates to be followed in the daily activity of prenatal genetic diagnosis and medico-genetic consultation to streamline and modernize curative relationships as well as due to the need to connect the local medical system to international provisions.
2. The diagnosis of genetic diseases, using the entire spectrum of biotechnologies, is carried out during the prenatal period. Thanks to ultrasonographic and biochemical screening, cytogenetic and molecular-genetic analyses, it has become applicable in the case of hundreds of hereditary pathologies and congenital malformations.
3. The methods of prenatal diagnosis are considered to be safe tests, applied on a large scale, and the specialist, the geneticist within the medico-genetic counseling, following the bioethical imperatives, informs correctly and completely, in the understanding of the proband, the role, the advantages, the degree of risk, the indications and contraindications of these investigations.

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HEMOSTATIC EFFECT OF NANOSILICA-ALGINATE COMPOSITION VS KAOLIN ON MODEL OF PARENCHYMAL BLEEDING IN RATS

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Stopping of external bleeding is a critical step in eliminating of preventable pre-hospital death of the wounded in battle. Almost two-thirds of these deaths occurred as a result of injuries to the body, since the existing methods of temporarily stopping bleeding (applying a tourniquet) cannot be used in such anatomical areas as the neck, groin, armpit, buttocks, etc. Therefore, for these cases, hemostops in the form of powder, granules, gauze or bandage have not lost their relevance.

One of the preparations widely used in the US army is QuikClot®, the active substance of which is the aluminosilicate mineral Kaolin, which is used to impregnate dressing materials. With the financial support of the US Army, the search for substances to create a universal hemostatic agent continues [1, 2].

The powder hemostatic composition under investigation was developed based on the results of research conducted at the Chuiko Institute of Surface Chemistry of the National Academy of Sciences of Ukraine. The idea of creating this composition was to complement the specific hemostatic effect of silica through the adsorption mechanism [3] with the gelling properties of sodium alginate. For its preparation, highly dispersed silica brand A-300 (Experimental Plant of Chuiko Institute of Surface Chemistry NAS of Ukraine, Kalush) and sodium alginate («Agnex», Poland) were used. Certain parts of the components were ground in a ball mill, obtaining the intermediate product «A-300/sodium alginate»; then this semi-product, A-300 and sodium alginate were mixed, obtaining the final product.

The study of hemostatic properties was carried out on the model of parenchymal bleeding from the liver of white rats [4]. It was established that in the control group (without the use of hemostatic materials), bleeding lasted more than 30 minutes. When covering the liver section with kaolin powder, abundant blood impregnation of the gauze, which was wrapped around the liver, was observed during the first 3-6 minutes. At 9, 12 and 15 minutes, bleeding continued, but its intensity was significantly reduced. The use of the developed composition stopped the bleeding from the liver wound instantly, during the following 3-minute periods of observation, no bleeding was observed. After 15 minutes, a layer of hydrogel was present on the surface of the cut, which left a trace of blood when touched.

Thus, a laboratory technique for the production of an affordable, safe and effective hemostatic agent designed to temporarily stop external bleeding has been developed. The composition of nanosized silica and sodium alginate has a pronounced hemostatic effect in case of parenchymal bleeding, is characterized by moderate adhesion to liver tissues and does not damage them during removal. As the next stage, we consider the development of the factory technology for the production of a hemostatic agent, which involves the immobilization of the drug on an inert carrier.

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COMPARATIVE ANALYSIS OF BIOCOMPATIBILITY OF CHEMICAL AND BIOGENIC Fe_3O_4 NANOPARTICLES

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Introduction. Due to their unique physicochemical and biological properties, the application of nanoparticles (NPs) in medicine opens up new possibilities for enhancing the effectiveness of diagnosis and treatment of various diseases, including tumors. Numerous data regarding the biological properties of iron oxide NPs demonstrate their potential for biomedical research, and the use of green synthesis methods leading to the formation of biocompatible biogenic NPs contributes to expanding the scope of their research. **Research aim.** The aim of this study was to investigate the complex impact profile of biogenic and chemically synthesized paramagnetic Fe_3O_4 NPs of the core-shell structure with the anticancer drug fluorouracil (Accord, UK). **Materials and Methods.** Biogenic and chemical syntheses of paramagnetic Fe_3O_4 NPs were performed as indicated [1]. The size and shape of NPs were determined using TEM, SEM, XRD. The cytotoxicity of NPs was assessed on the breast cancer cell line ZR-75 (ATCC CRL-1500) by colorimetric method, with NP loading ranging from 4 to 0.25 μg per well. **Results.** Biogenic synthesis resulted in spherical Fe_3O_4 NPs with a hydrodynamic particle size 750-1500 nm, while chemical synthesis produced NPs ranging from 4 to 24 nm in diameter. Previously, it was found that biogenic and chemical Fe_3O_4 NPs did not induce erythrocyte hemolysis and did not exhibit genotoxicity or antibacterial properties [1]. It was observed that neither chemical paramagnetic Fe_3O_4 NPs nor biogenic ones showed antitumor activity at any of the tested concentrations. However, when used in combination with fluorouracil, biogenic Fe_3O_4 NPs exhibited antitumor activity only at low concentrations (49±4.5% cytotoxicity at 0.25 μg/well), whereas chemical Fe_3O_4 NPs, when used in combination with fluorouracil, not only did not induce cell death, but instead led to an increase in proliferative activity and the number of viable cells by 43±5% (2 μg/well). **Conclusion.** Biogenic and chemical paramagnetic Fe_3O_4 NPs do not possess cytotoxic properties. The growth-stimulating effect observed with chemical Fe_3O_4 NPs may result from the blocking of the active fluorine atom in the structure of fluorouracil due to the formation of a complex with the components of the Fe_3O_4 NP shell. At high concentrations, chemical Fe_3O_4 NPs also exhibit a growth-stimulating effect on E.coli K12, indicating the commonality of this mechanism of action [2]. This research was funded by MESCS RA SC, grant number 10-2/24-I/RAU-BIOL, 21T-1F243.
Keywords: ZR-75 breast carcinoma, biocompatibility, core-shell structure, NP, Fe_3O_4.

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THE USE OF FLOATING MULTICHANNEL ELECTRODES FOR MONITORING THE ELECTRICAL ACTIVITY OF THE MYOCARDIUM

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Introduction: The development of novel drugs necessitates meticulous monitoring of various critical aspects to mitigate the risk of cardiovascular complications. Researchers must consider a plethora of targets ranging from the molecular level of ionic channels to the systemic effects of novel compounds. Employing techniques of different scales, such as electrocardiogram (ECG) recordings and field potential recordings of cardiomyocytes with implanted electrodes, presents a challenging yet rewarding approach. This design can yield comprehensive insights into the state of cardiomyocytes within the heart chambers and the heart as a whole. By conducting measurements under conditions where other organs remain intact, researchers can assess the systemic effects of compounds and anticipate or confirm adverse effects during preclinical research. Moreover, this setup provides an opportunity for additional interventions and the simultaneous monitoring of other parameters in the same animal. Material and Methods: Xenopus frogs were utilized for the experiment. The animals were anesthetized with diethyl ether and decapitated. Following the opening of the thoracic cavity, the intact heart was exposed. Recordings were carried out under constant temperature conditions of 20°C within a Faraday cage. Four two-channel tungsten wire electrodes (diameter = 25 µm) were employed to record the electrical activity of the ventricular myocardium in an intact heart. To capture data from various locations, eight microelectrodes were arranged in four groups in a cross-like configuration. The electrode's design facilitated both rigid fixation to a micromanipulator and additional fixation to a holding frame with an electromagnet. After precise electrode positioning and implantation in myocardial tissue, it transitioned from rigid to floating mode, preventing microelectrode deformation, heart tissue damage, and improving the signal-to-noise ratio. This electrode construction is suitable for long-term recordings, drug administration, and electrostimulation. Results: ECG recordings allowed clear detection of P-waves and R-waves, enabling the calculation of R-R intervals and heart rate. Field potential recordings yielded three distinct complexes, two of which coincided with P and Q waves. Conclusion: The proposed electrophysiological setup with floating multichannel electrodes enables rapid, efficient, and cost-effective evaluation of myocardial state during pharmacological interventions. The technique was validated using standard pharmacological drugs with well-known mechanisms of action. Field potentials from the intact heart were successfully recorded, and key myocardial parameters were calculated and analyzed. This technique facilitates the assessment of

myocardial profiles during the preclinical stage of novel drug development, as well as during the action of various factors such as electrical, chemical, or genetic stimuli. Additionally, this method could be employed for parallel recordings of different organs and organ systems within a single animal.

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DEVICE FOR CONTROLLED HYPOTHERMIA ON FUZZY LOGIC ALGORITHMS

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New methods of terrorist's activity appeared recently. Last decade it was observed rapid increasing of attempts of terror attacks against important elements of critical infrastructure: bridges, sky-scrapers, and other big strategic constructions, using mechanical oscillating devices. In case of destruction of such buildings are inevitable human trauma and research and development equipment to equip rescue teams.

We propose a sample of a device for therapeutics with hypothermia used in medical purposes for directed cooling of specific tissues using Peltier, elements. Peltier cooling elements allow elaboration of a small mobile device that can be operated in emergency medical service, in this way reducing the risk of ischemic tissue trauma after heart failure or blockage of arteries to embolism.

Studies have shown that patients under risk for ischemic brain injury present better results using hypothermic methods of treatment. This studies where focused on researching ischemic accidents that unlike usual strokes reduces coagulation threshold. These researches shown that hypothermia used in therapeutical purposes has a neuroprotective effect. Studies showed as well that use of therapeutic hypothermia in order to control intracranial pressure (ICP) after an ischemic stroke is a safe and feasible procedure.

To conduct this system Fuzzy logic algorithms are used. These algorithms are fundamentally different from conventional methods of automation by "human" approaching ,,human" techniques for control and management problems.

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PS2

STUDYING THE EFFECT OF VARIOUS GASES ON THE OUTPUT CHARACTERISTICS OF THERMOCOUPLE PRESSURE TRANSDUCERS

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The main cause of the limited use of commercial thermocouple transducers for pressure measurements in modern technological processes using various gases in a moderate vacuum is the calibration of commercial transducers against dry air. Therefore, increasingly close attention is being paid to the problem of expanding the possibilities of using thermocouple transducers for accurately measuring the pressure of various gases, in particular, aggressive gases, in a pressure range of 5 to 1×10^{-3} mmHg. In this study, the possibility of using thermocouple pressure transducers with a conversion range of 20 to 5×10^{-5} mmHg and a conversion error of 10–15% for measuring the pressure of various gases has been explored; the output characteristics of the film transducer model taking into account the design features of the transducer have been calculated; and experimental studies of the output characteristics of thermocouple gas pressure transducers have been conducted. The calibration characteristics of the thermocouple transducer for air, nitrogen, carbon dioxide, and argon have been determined. Analysis of the experimental data suggests that the dependence of the effect of various gases on the calibration characteristics is more complex than the dependence that could be assumed according to the calculated data. Thus, the relative behavior of the curves in a pressure range of 1×10^{-4} to 10 mmHg does not remain constant and significantly depends on pressure. The discrepancy between the calculated and experimental data can apparently be attributed to the following factors: (i) idealization of the calculation model, (ii) insufficient reliability of reference data that characterize the studied gases, and (iii) design and technological imperfection of real pressure transducers. The calibration characteristics of thermocouple transducers depend on the type of gas; to date, correlation coefficients based on constants that determine gases (molecular mass, thermal conductivity, heat capacity), which could be introduced, even for a known composition of the gaseous medium, to take into account the effect of the gaseous medium composition on the pressure measurement accuracy have not been revealed. However, experimental studies have shown a real possibility of using thermocouple (and in a broader sense) thermal converters to measure the pressure of various gases in a wide pressure range with a low error, subject to mandatory precalibration of the transducers for each of the gases or their mixture. In addition, a constant pattern of the dependence of the calibration characteristic of the thermocouple transducer for different gases is observed over the entire pressure range of 5 to 5×10^{-3} mmHg. Owing to this feature, a thermocouple transducer can be calibrated for different gases at one pressure point using a strain transducer, the readings of which do not depend on the type of gas; subsequently, certain coefficients can be used for any transducers of this type in a pressure range of 5 to 5×10^{-3} mmHg.

The study was supported by the Project no. 020201 «Nanostructures and advanced materials for implementation in spintronics, thermoelectricity and optoelectronics».
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PS3

ENHANCED MICROBIOLOGICAL DEGRADATION OF POLYETHYLENE

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Micrological degradation of plastic waste is one of the most promising directions for finding sustainable solutions to the global problem of environmental pollution by plastics. Low-density polyethylene (LDPE) is one of the prevalent recalcitrant plastic pollutants. Under standard conditions LDPE biodegradation rate can be as low as 0.5% in 10 years. So, elaboration of efficient biodegradation techniques depends, among other things, on identification of means that can substantially stimulate the biodegradation process. Irradiation by ultraviolet light, exposure to various nanoparticles, and to enzymes participating in lignin decomposition were suggested among such means. The purpose of our work was to test whether microbiological degradation of LDPE in mineral media can be enhanced by LDPE pretreatment by UV light and by nanocomposites consisting of magnesium ferrite and stabilized by polyvinylpyrrolidone ($MgFe_2O_4$/PVP), and by introduction of lignin into the medium. According to the obtained results, introduction of LDPE films pretreated by UV light and by $MgFe_2O_4$/PVP into mineral medium with added lignin caused a substantial increase in CO_2 efflux during 100 days of incubation under standard conditions. This efflux was 1.3 and 2.2 times greater than the one in the controls with untreated LDPE and without LDPE, respectively. By the end of the incubation the weight loss in the control with untreated LDPE was negligible, while in the variant with pretreatment it reached 18%.
The study was supported by the Project «Innovative biotechnological solutions for agriculture, medicine and environment» no. 020101.
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PS4

APPLICATION OF $CoFe_2O_4$/PEG NANOCOMPOSITE AS A PEROXIDASE MIMETIC IN THE COLORIMETRIC DETECTION OF GLYPHOSATE

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The technological revolution in agriculture, along with the achievements of obtaining high yields, has led to the use of huge amounts of herbicides. One of the widely used herbicides is glyphosate, the so-called "chemical weeding". Glyphosate is a broad-spectrum organophosphorus herbicide, which causes plant death by inhibiting the activity of 5-enolpyruvylshikimate-3-phosphatase in an important plant metabolic pathway. Currently, the abuse of glyphosate has led to contamination of soil, water and agricultural products. Recent studies have shown that glyphosate can affect the internal regulation of cells, cause chronic kidney disease and even cause cancer. The US Environmental Protection Agency (EPA) has issued relevant standards providing for a maximum limit of glyphosate residues in agricultural products and it is 500 μg/kg [1]. Thus, the search for new herbicide detection systems is an urgent task.

Recently, a new class of artificial enzymes, the so-called nanosimes, has been proposed – these are nanomaterials with their own enzyme-like activity, they are able to combine both the catalytic properties of enzymes and the properties of nanoscale materials. Due to these advantages, methods based on the catalytic activity of nanoparticles with mimetic properties of enzymes, in particular of peroxidase, such as palladium nanoparticles, porous nanostructures of cobalt oxide and others, are being developed, they are successfully used to detect pollutants in the environment [2, 3]. In the presented work, cobalt ferrite nanoparticles stabilized with polyethylene glycol were synthesized by the solvathermal method, the $CoFe_2O_4$/PEG nanocomposite was created on their basis, and identification by various SEM, EDX, XRD, and FI-IR methods was carried out. The peroxidase-like activity of the resulting $CoFe_2O_4$/PEG nanocomposite was studied, which makes it possible to use this catalytic process for the detection of glyphosate. A method for the determination of glyphosate was developed on model aqueous solutions and it was shown that the minimum detectable concentration is 0,13 μM. It was shown that the nanocomposite $CoFe_2O_4$/PEG has the property of mimetic enzyme peroxidase and can be used to detect glyphosate.

The study was supported by the Project «Nanostructures and advanced materials for implementation in spintronics, thermoelectricity and optoelectronics» no. 020201.

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PS5

SENSORS FOR BATTERY SAFETY APPLICATIONS

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In the contemporary world, a lot of attention is drawn to achieving the goals of zero emissions and in the transition to a carbon-free society and a more circular economy through the use of electrical batteries [1]. Thus, the field of electric batteries based on Li-ion, Li-S or solid state is intensively investigated by researchers to improve the performance in terms of energy and power densities, but also an insurance for both producers and consumers [2]. Permanent monitoring of the safety of batteries is crucial because various defects or reactions that can occur in the cell(s) of a battery can lead to serious safety risks, such as fires and explosions, due to the enormous heat generated in the electrolyte, which leads to the release of toxic and flammable gases and namely in the so-called thermal runaway [2]. The results presented here are the development of sensors based on layered semiconducting metal oxides reliable to detect early the electrolyte components typical of batteries, which can appear during their failure, such as 1,3-dioxololane, 1,2-dimethoxyethane, ethylene carbonate, dimethylcarbonate, lithium bis(trifluoromethanesulfonyl)imide, lithium nitrate and lithium hexafluorophosphate [1-4].
The devices obtained demonstrate the possibility of using them as 2 in 1 sensors, thus working as a temperature sensor at low operating temperatures and as a gas sensor at temperatures above 200 ^{o}C [1]. In the same way, schematic concepts were proposed for the location of the sensors obtained in the battery pack for an early warning of battery thermal runaway [1,2].
This work was supported by State Program LIFETECH, code 020404 at Technical University of Moldova.

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PS6

PREVALENCE OF SOME PIK3CA MUTATIONS IN PATIENTS WITH CERVICAL SQUAMOUS CARCINOMA FROM THE REPUBLIC OF MOLDOVA

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Introduction. Cervical Squamous Cell Carcinoma (CSCC) is a significant health issue and results in high mortality when it metastasizes or recurs after primary local treatment, thus requiring new molecular classification models directed toward precision therapies. Genes involved in the PI3K signaling pathway, such as *PIK3CA*, represent a prospective target and biomarker for targeted treatment. The PIK3CA protein, which belongs to the PI3K family, is involved in many cellular functions and is

often overactive in cancer cells, leading to uncontrolled proliferation of cancer cells. **Research aim.** The study aimed to determine the prevalence of mutations in the *PIK3CA* gene in a cohort of CSCC patients from the Republic of Moldova. **Materials and Methods.** Ninety-two freshly collected tumor tissue samples from patients primarily diagnosed with CSCC were analysed. DNA was isolated using the GeneJET Genomic DNA Purification Kit and the PureLink Genomic DNA Mini Kit and subsequently tested for three mutations in the *PIK3CA* gene: c.1624G>A, c.1633G>A, and c.3140A>G by the castPCR method. **Results.** The prevalence of PIK3CA mutations in our study group was 29.35% (27/92), of which 27.17% (25/92) were positive for a single mutation, but 2.17% (2/92) showed double mutations. Among these, 17.39% of patients were positive for the c.1624G>A mutation, 9.78% for the c.1633G>A mutation, and 2.17% for the c.3140A>G mutation. **Conclusion.** The tested prevalence of the *PIK3CA* mutations was 29.35%. Testing revealed that 25 patients were positive for a single mutation, and two tested positive for a double mutation. Since many patients have these mutations, there is a chance that CSCC patients from the Republic of Moldova will benefit from the development of anti-PI3K targeted therapy.
Keywords: cervical squamous cell carcinoma, mutation, PIK3CA.

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PS7

MIXED METAL OXIDE BASED GAS SENSOR

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Metal oxide based gas sensors are continuously being evolved with new technologies for the development of sensing industry [1]. Biomarker detection through exhaled breath is one of the most developing non-invasive technique in diagnostic industry. There are lot of technologies being used for VOCs testing like gas chromatography, mass spectrometry [2], which are non-portable and pretty expensive. Metal oxide

based gas sensors are portable, inexpensive, and simple to be scaled for various applications. Mixed copper oxide (CuO/Cu_2O) based gas sensors doped with Sn has shown remarkable results for ethanol vapor detection. At operating temperature of 300°C, ethanol vapor shows maximum gas response ~220% over other VOC analytes like n-propanol, n-butanol, and acetone. The sensor shows response / recovery time of ~14 seconds/125 seconds for ethanol vapor detection. The morphology of Sn doped CuO/Cu_2O was characterized through SEM. Ethanol vapor being potential biomarker for liver damage [3], auto brewery syndrome [4], etc. This work can be further extended to improve sensing performance and developed sample can be tested for medical devices. Using different appropriate doping elements, sensing performance for ethanol as a biomarker can be improved.

Rajat Nagpal gratefully acknowledges Kiel University, Chair for Functional Materials, Germany and TUM, Chisinau, Republic of Moldova, for constant support. Financial support by the EU-project SENNET "Porous Networks for Gas Sensing", which runs under the Marie Skłodowska-Curie Actions funded by the European Union, under the number 101072845.

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PS8

SEMICONDUCTING METAL OXIDES IN BIOMARKER DETECTION FOR MEDICAL APPLICATIONS

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Healthcare sector is gradually developing and in a constant need of new technologies appealing to daily needs and evolution of different diseases. A big potential, as well as a big challenge for the entirety of research community is to make novel methods that will help medical field experts in diagnosing through non-invasive methods different diseases.

Human breath presents a bigger potential in diagnosis as it has a lot of biomarkers in it, therefore their detection could present a big opportunity to detect and determine physiological state, to diagnose diseases or even assess environmental exposure [1]. Different gases of different concentrations offer information to different diseases. For instance, in a recent study on volatile organic compounds in exhaled breath for lung cancer discrimination [2], it was determined that specific doses of 2-propanol have been found in patients of with lung cancer. Thus, another study could take place [3], therefore a MOX based sensor from TiO2 and coated with PTFE was made with the reason to detect different gases, 2-propanol being targeted as well. In the same way, another step of progress has been made in another study [4] where a TiO2 thin film nanostructure has been made and coated with PV4D4 to detect both NH3 which usually is associated with kidney failure and H2 which is associated not only with gastric and lower bowel diseases, but also in food industry with some defect canned products.

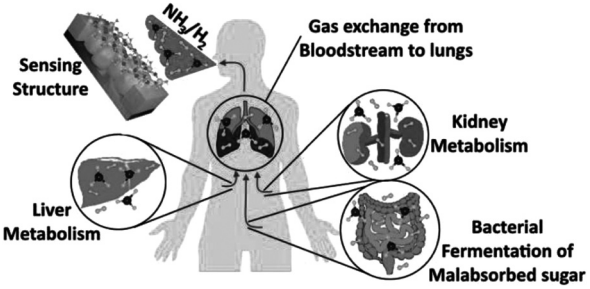

Figure 1. Abstract concept on Human Breath's biomarkers detectors and applied field [4]

Thus the awareness of this potential technologies, progressing diseases and new methods to detect them beforehand remains to be researched further. Succeeding in this direction will benefit both researchers and medical experts as it will offer the possibility to improve further breath biomarker detectors and new data on human body.

The study was partially supported by the by State Program LIFETECH « Innovations in Biomedical Engineering: Advanced Technologies and Applications for Data Acquisition, Processing and Analysis » No. 020404 at Technical University of Moldova.

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PS9

PHOTOCATALYTIC DEGRADATION OF TETRACYCLINE USING AERO-TiO_2

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Numerous nanomaterials have been investigated for the photocatalytic breakdown of antibiotics. These include graphene-based materials [1], metal oxides [2], or modified semiconductor materials including doping or functionalization mechanisms [3]. Amongst a range of nanomaterials, TiO_2 has garnered considerable interest due to its remarkable photocatalytic characteristics, facilitating the breakdown of organic contaminants when exposed to UV or visible light [4,5]. In this work, a novel nanomaterial composed of TiO_2 hollow microtetrapods with a wall thickness of only 50 nm, with $ZnTi_3O_8$ intrusions is fabricated by Atomic Layer Deposition technique [6] and its photocatalytic performance is investigated by degradation of tetracycline under visible or UV light irradiation. The Raman and XRD study showed the presence

of rutile phase TiO_2 according to the observed Raman active vibrations and reflections detected in the XRD spectrum. The material's optical bandgap was found to be 3.12 eV according to the Tauc plot determined from the diffuse reflectance spectrum. The photocatalytic performance showed a degradation rate of tetracycline of 0.0064 min^{-1} and 0.0119 min^{-1} by irradiation with visible or UV light, respectively.
Acknowledgments This work was supported by the Ministry of Education and Research from Republic of Moldova subprogram 020402 ETISEL "Development of technologies and investigation of the properties of layered semiconductor compounds, hybrid nanostructures and laser sources".

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PS10

GOLD DECORATED GALIUM OXIDE NANOWIRES FOR MULTIFUNCTIONAL APPLICATIONS

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A three-step fabrication process to produce hybrid nanostructures consisting of Ga_2O_3 nanowires decorated with gold nanodots on GaAs substrates is reported. The process involves electrochemical etching of GaAs substrates [1,2], followed by electrochemical deposition of gold nanodots [3] on GaAs nanowires possessing good electrical

conductivity. Subsequently, thermal treatment in argon atmosphere with a small amount of oxygen is employed to selectively convert GaAs nanowires into Ga_2O_3 nanowires covered by gold nanodots. Moreover, it was demonstrated that this approach offers a controlled fabrication route, enabling precise tuning of nanowire dimensions, crystallographic orientation of the nanowires, as well as modulation of the nanowire' diameter [4]. Characterization techniques such as SEM, EDX and XRD validated the morphology and structure of the produced Ga_2O_3 nanowires. The fabricated hybrid nanostructures exhibit promising properties for various applications in sensing, photodetection, and catalysis, with potential for further optimization through parameter adjustments and functionalization for reaching tailored properties.

The work was supported by the institutional subprogram 02.04.02 no. 4/FI «Development of technologies and investigation of the properties of layered semiconductor compounds, hybrid nanostructures and laser sources».

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PS11

OBSOLETE PESTICIDES DECOMPOSITION IN SOIL USING MAGNETITE NANOPARTICLES

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Soil pollution with different persistent contaminants is a global problem, and the Republic of Moldova is no exception. The application of organochlorine pesticides on the territory of Moldova has been suspended, but several decades of their use in Moldovan agriculture have left hundreds of contaminated places, persistent until now [1]. The elaboration and development of effective technologies for the remediation of soils is an objective necessity. The iron-containing nanoparticles, well-known nanozymes, such as magnetite (Fe_3O_4), that exhibit pronounced redox properties, could be used as a active component of nanobioremediation of polluted soils.

The aim of this study was to evaluate potential of ferrite nanoparticle to remediate the soil, long-term exposed to obsolete pesticides (HCH, DDT and their metabolites). The soil from orchard situated in Călăraș district, Republic of Moldova, was contaminated with obsolete organochlorine pesticides, $\sum$DDTs (dichlorodiphenyltrichloroethane and related compounds) was amounted from 3.0 to 5.0 mg/kg dry soil, $\sum$HCH (isomers of hexachlorocyclohexane) – up to 1.2 mg/kg dry soil. The bioremediation was established *ex situ* and it was designed in oxic and cycled anoxic/oxic conditions. At the set up of the experiment in anoxic conditions the soil was amended with colloidal aqueous solution of Fe_3O_4/PVP nanoparticles. The determination of pesticide residues in soil was confirmed by gas chromatography with mass spectrometry GC/MS multiresidue method. As a result, HCH, represented mostly by persistent beta-HCH isomer, completely disappeared. Concentration of $\sum$DDT decreased by 13 times, mainly due to decomposition of p,p'-DDT. The breakdown of DDT took place both in aerobic and anaerobic pathways, with the formation of DDE and DDD metabolites correspondingly and their further decomposition.

The study was supported by the Project «Innovative biotechnological solutions for agriculture, medicine and environment» no. 020101.The study was supported by the Project « Nanostructures and advanced materials for implementation in spintronics, thermoelectricity and optoelectronics» no. 020201.

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PS12

USING OF THE MEAM MODEL FOR ADJUSTING THE TECHNOLOGICAL PARAMETERS OF MAGNETRON DEPOSITION OF NB/CO NANOLAYERS

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Superconductivity and ferromagnetism being two antagonistic orders, we can meet them only in artificial formations, usually in the form of nanolayers deposited by certain technological methods. A common and highly effective method is the deposition of nanolayers by the magnetron method. Deposition by the magnetron sputtering method proposes nanofilms of well- controlled thicknesses, deposition in a single vacuum cycle and reproduction of layered structures with high precision. All these possibilities strongly highlight the deposition of nanofilms by the magnetron sputtering method.

In this way, a problem that appears at the interface between two adjacent layers is the appearance of a metamort layer that prevents the expressiveness of the quantum phenomena that occur at the contact between two nanometric layers, that is, the interface becomes diffuse. In this sense, in order to create nanoscale structures with atomically smooth interfaces, a series of physically performed experiments is needed in order to adjust the technological parameters of coating by the magnetron method! This parameter adjustment requires a lot of time and human resources, but we propose mathematical modeling in order to adjust these technological parameters through the computer. Molecular dynamics modeling is a very efficient and feasible alternative. For this purpose we used the model – MEAM (Modified Embedded Atom Method) of the immersed atom, which allows once the modeling is completed the values of the technological parameters of magnetron deposition. A verification of the technological parameters was the realization of an XRD experiment which in the experimental field shows that computer modeling is an effective and beneficial alternative to use.

Acknowledgments. This work was supported financially by the MEC, subprogram title: Nanostructures and advanced materials for applications in spintronics, thermoelectricity and optoelectronics, code 020201.

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PS13

COMPLEXES OF SILVER NANOPARTICLES WITH ANTIBIOTICS OF VARIOUS CLASSES AGAINST RESISTANT STRAIN OF BACTERIA ESCHERICHIA COLI KO11.

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PS14

NANODEVICES BASED ON $A_{II}B_{VI}$ SEMICONDUCTING OXIDE NANOWIRE

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Due to the necessity of decarbonization, hydrogen has an important role as the replacement of fossil fuels in the energy sector and other industries. Unfortunately, hydrogen has proprieties that make it dangerous. Choosing material as sensor is an important part for fabrication of fast and reliable devices, capable of detecting dangerous gases. ZnO is one of the most promising and used material in sensing applications, due to its proprieties, but has drawbacks like poor selectivity, high operating temperature, etc. [1]. These drawbacks can be improved by doping with rare-earth materials, like Eu, which can lead to a higher response and lower operating temperature [2]. Another method of improving sensing proprieties is by using 1D material, instead of 2D [3].

In our work, we present an improved sensing performance of a device based on a single ZnO:Eu_2O_3 nanowire, compared to ZnO:Eu_2O_3 films. ZnO:Eu_2O_3 nanowire arrays were grown using electrochemical deposition method, and single nanowire was integrated using FIB/SEM. Morphology was studied using SEM, observing uniform deposition with nanowires with similar size. Structural proprieties were studied using XRD, observing presence of ZnO and Eu_2O_3 peaks. Device based on a single ZnO:Eu_2O_3 nanowire was tested to a series of gases at different operating temperatures, observing selectivity to 100 ppm hydrogen, an improved response value and lower operating temperature compared to non-doped ZnO and ZnO:Eu_2O_3 films. These results show that by using a single nanowire as sensing material and modifying $A_{II}B_{VI}$ semiconducting oxide proprieties by doping with different metals, we can obtain an improved sensing performance.

C. Lupan gratefully acknowledges Kiel University, Chair for Multicomponent Materials, Germany and PSL Université, Chimie-ParisTech IRCP, Paris, France for internship positions in 2023 and TUM, Chisinau, Republic of Moldova, for constant support.

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PS15

FUNCTIONALIZED NANOMATERIALS ZNO:PDO FOR GAS SENSORS

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Today, there is a growing tendency to use renewable resources. Thus, researchers from different research institutions are developing different nanotechnologies to be able to solve the given problem. One of the solutions may be to use electric batteries and environmentally ecological fuels. One of the ecological fuels can be hydrogen [1]. Thus, there is a need to obtain new sensors using cost-effective methods for hydrogen detection and reliable smart nanomaterials. Large-scale applications of hydrogen in production also require the availability of varieties of hydrogen sensors, as these sensors have several advantages over conventional hydrogen detection methods, including their lower cost, smaller size, and faster response. These advantages make them more suitable for portable hydrogen detection and in a wide range of applications. Such sensors are well established for use in industry, where they can be regularly calibrated and operated by trained personnel [2]. However, the emergence of a hydrogen economy provides the impetus for the production of low-cost, simple-maintenance, easy-to-install, easy-to-use, and accurate hydrogen sensors suitable for use by untrained individuals in a variety of applications. One of the sensors that can detect hydrogen are structures based on nanostructured ZnO films functionalized with Pd nanodots. [3]. The use of Pd nanodots made it possible to obtain sensors that can detect high hydrogen concentrations even at low operating temperatures [3]. Thus, in this paper it is proposed to obtain new sensors that can detect hydrogen based on ZnO:PdO nanomaterials. The study was supported by the by State Program LIFETECH "Innovations in Biomedical Engineering: Advanced Technologies and Applications for Data Acquisition, Processing and Analysis" No. 020404 at Technical University of Moldova and "Satellite systems and platform for monitoring plantations and water surfaces with the application of space technologies and drones" at TUM No. 020401.

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PS16

SYNTHESIS OF SnSe FILMS OBTAINED BY MAGNETRON SPUTTERING

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This work presents a study of SnSe thin films obtained by RF magnetron sputtering, which is a technology relatively cheap and easy for devices based on thin film, unlike most SnSe fabrication techniques for thermoelectric applications already present in the literature. In this study we characterize the optical, electrical and compositional properties of the materials. SnSe films deposited by magnetron sputtering, demonstrate low thermal conductivity substantially below that of the single crystal A-axis. A low thermal conductivity is useful for the development of thermoelectric generators, but it is also of interest for the development of other devices based on SnSe films such as solar cells, etc. To confirm the SnSe film and the SnSe single crystal, the materials were investigated using X-ray diffraction (EDX). The peak in these patterns can be attributed to the low temperature phase of film deposition (200 °C) which belongs to the prime space group (database file number 1537675), at the same time analogous results were also obtained by Matthew R. Burton in the paper [1]. Scanning electron microscopy (SEM) of SnSe films demonstrates homogeneous morphologies, while the SnSe crystal exhibits a uniformly flat surface morphology typical of a layered crystal. These nano-layers are formed throughout the film, further indicating that the non-porous structure may form due to an initial energy preference interaction with the glass substrate, which is maintained throughout the film growth. Electrical measurements performed for SnSe films indicated for a current I = 30 μA and applied voltage V = 342 mV, a resistance of approximately R_{4w} = 11.4 kΩ and R_{2w} = 15.6 kΩ. Measurements made on a Jasco V-670 spectrophotometer at room

temperature of the transmission and reflection spectra revealed that in both spectra the interference pattern is observed, particularly well evidenced in the reflection spectrum. According to the position of the interference lines, the thicknesses of the films were estimated to be approximately 440 nm. From the reflection and transmission spectra the absorption spectra of the SnSe films were determined. Since SnSe is an indirect energy bandgap semiconductor, the $(h\upsilon\alpha)^{1/2}$ dependence was constructed to determine the bandgap of the film. Crossing the linear part with the ordinate axis indicated a bandgap of Eg = 1.1 eV which is a little too large, while for this material the bandgap is known to be 0.94 eV [2].

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PS17

STUDY OF Ga_2O_3 THIN FILMS OBTAINED BY AEROSOL SPRAY PIROLYSIS

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Gallium oxide (Ga_2O_3), has attracted much attention in recent years as a transparent semiconducting oxide, relatively high electron mobility (~150 $cm^2/V{\cdot}s$) and due to its ultra-wide band gap (~4.9 eV) [1], become a potential material for high-performance ultraviolet (UV-C) photodetectors in the wavelength range of 200–280 nm [2]. Besides this, Ga_2O_3 exists in five crystallographic phases α, β, σ, γ and ε, where only the β phase is the most stable at temperatures higher than 900 °C. The crystalline phases can be change from corundum α-Ga_2O_3 form at 400 °C to pure monoclinic β-Ga_2O_3 increase of the treatment temperature up to 900 °C. Gallium oxide thin films have been grown by various techniques such as chemical vapor deposition (CVD) [3], vacuum thermal evaporation, atomic layer deposition (ALD), but less from chemical solutions. In this research, we have developed the spray pyrolysis technology which is a pretty cheap, low-cost and simple technology, ideal for optoelectronic applications

and allows us to obtain thin films of different thicknesses controlling the temperature and speed of deposition. The obtained film thickness is determined by the rate of precursor solution injection and the duration of deposition process. Thin films of Ga_2O_3 films was carried out by aerosol spray pirolysis on Si substrates under an O_2 gas flow. Gallium chloride ($GaCl_3$) with molar mass (0.5M) dissolved in ethanol (C_2H_5OH) were used as precursors, they being mixed in an ultrasonic bath for 30 minutes at a temperature of 50 - 60 °C. Before the deposition process, the solution was left for 24 hours to make the mixture as clean and clear as possible without some sediment. The thermocouple value was the same as the actual temperature of the substrate 450 °C and the deposition process lasted depending on the desired thickness. The obtained films were characterized by SEM, EDX, optical transparency and electrical conductivity characterization of Ga_2O_3 films.

Acknowledgments. This work was supported financially by the Ministry of Education and Research of Moldova, through project **nr. #020201** „Nanostructuri și materiale avansate pentru aplicații în spintronică, termoelectricitate și optoelectronică”.

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PS18
MOLECULAR GENETIC APPROACHES IN THE TREATMENT OF AMYOTROPHIC LATERAL SCLEROSIS

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Amyotrophic lateral sclerosis is a complex and fatal neurological disorder whose underlying mechanisms are not fully understood, and there are no effective treatments available to slow or stop its progression. However, recent progress in ALS genomics has connected specific genes with observable characteristics, leading to the development of innovative therapeutic strategies and providing researchers with

valuable tools like genetically modified rodent models that mimic ALS pathology. These animal models have proven to be highly valuable for advancing translational research in ALS. Since the identification of the Cu/Zn superoxide dismutase (SOD1) gene mutation in 1993 as the first genetic anomaly in amyotrophic lateral sclerosis (ALS), more than 50 genes have been linked to either causing or modifying ALS and ALS/frontotemporal dementia (FTD) spectrum disease. The most common mutations occur in C9orf72, SOD1, TAR DNA binding protein 43 (TARDBP), and fused in sarcoma (FUS) genes. Over the past three decades, extensive global efforts have been made to uncover the biological pathways responsible for these gene mutations in ALS/FTD pathogenesis. Consequently, gene therapy strategies aimed at suppressing the toxic effects of these etiologic genes have been widely explored. These strategies include: (i) targeting abnormal transcribed RNA with microRNA or antisense oligonucleotides (ASOs) to remove or inhibit them, (ii) using RNA interference (RNAi) to degrade abnormal mRNA, (iii) reducing or inhibiting mutant proteins (e.g., using antibodies against misfolded proteins), and (iv) editing DNA genomes using techniques like clustered regularly interspaced short palindromic repeats (CRISPR)/CRISPR-associated protein (CRISPR/Cas). The promising outcomes from these investigations have resulted in the implementation of some of these strategies in ALS clinical trials, particularly for genes like C9orf72 and SOD1. This shows an overview of advances in gene therapy for ALS/FTD, with a focus on genes such as C9orf72, SOD1, TARDBP, and FUS.

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PS19

TECHNOLOGY OF FABRICATION AND APPLICATIONS OF 3D MICRO-NANO-ARCHITECTURES BASED ON AERO-GAN.

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PS20

THERMOELECTRIC PROPERTIES OF A THERMOELECTRIC MODULE MADE OF TTT2I3 AND TTT(TCNQ)2 ORGANIC CRYSTALS

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In this study, we conduct a comprehensive examination of the thermoelectric characteristics observed in crystals of TTT2I3 [1], which exhibit p-type behavior, and TTT(TCNQ)2 [2], functioning as an n-type conductor. These crystals have demonstrated adjustable thermoelectric properties by controlling the stoichiometry of charge carriers and impurity concentrations [3]. TTT2I3 crystals, structured with alternating layers of tetrathiotetracene and iodide, display effective charge transport along the primary crystallographic axis. Similarly, TTT(TCNQ)2 shares the layered architecture of TTT2I3 but with electron conductivity facilitated by TCNQ chains. In this investigation, we developed a theoretical model incorporating electron-phonon interactions and impurity scattering to analyze transport and thermoelectric characteristics. The kinetic equation is formulated utilizing two-particle retarded Green functions.

Numerical calculations were performed to assess electrical conductivity, Seebeck coefficient, thermoelectric power factor, and thermoelectric figure-of-merit, with consideration of charge carrier concentrations, temperatures, and impurity concentrations. This research enhances comprehension of organic thermoelectric materials and their prospective applications in sustainable energy contexts.

The study was supported by the Project «***Development of technologies and investigations of properties of layered structures and semiconducting lasers***».

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PS21

SUPERCONDUCTOR-INSULATOR TRANSITION IN SUPERCONDUCTING NANOWIRES

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We investigate superconductor-insulator quantum phase transitions in ultrathin capacitively coupled superconducting nanowires with proliferating quantum phase slips. We derive a set of coupled Berezinskii-Kosterlitz-Thouless-like renormalization group equations demonstrating that interaction between quantum phase slips in one of the wires gets modified due to the effect of plasma modes propagating in another wire. As a result, the superconductor-insulator phase transition in each of the wires is controlled not only by its own parameters but also by those of the neighboring wire as well as by mutual capacitance. We argue that superconducting nanowires with properly chosen parameters may turn insulating once they are brought sufficiently close to each other [1].

Hence, superconducting nanowires may turn insulating provided they are brought close enough to each other. It would be interesting to observe this effect in forthcoming experiments with superconducting nanowires.

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PS22

FUNCTIONAL CAPABILITIES OF TWO-BARRIER SEMICONDUCTOR STRUCTURES

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Two-barrier semiconductor structures with a high-resistance sublayer and longitudinal illumination, using certain design and technological parameters, have several unique functionalities, such as injection amplification of the photocurrent, and spectral selective sensitivity. This investigation considers the possibility of creating highly sensitive devic-es in the optical (CdTe, Si) and X-ray (CdTe) ranges of electromagnetic waves. The process of mutual compensation of photocurrents arising in opposite potential barriers overlapping the sublayer, with longitudinal absorption of radiation, leads to pronounced short-wavelength and long-wavelength maxima in the spectral distribution of intensity or photocurrent. Using structures based on cadmium and silicon telluride, as examples, the phenomenon of the sign reversal of the spectral photocurrent and the possibilities of measuring wavelengths, are demonstrated. To study the photoelectronic processes occurring in these structures, the obtained mathematical expressions are used, which relate the parameters of the structure and optical radiation. The algorithm developed us-ing these expressions is based on a new

spectral analysis mecha-nism, which makes it possible to implement it as affordable, small-sized, low-material, and low-power devices. All this is considered in the context of solving urgent prob-lems of quantitative remote identification of the components of an optically trans-parent medium suitable for solving environmental issues.

The work was supported by the Science Committee of the Republic of Armenia in the frames of research projects No. 21AG-2B011 and No. 21T-2B028.

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PS23

THE USE OF FLOATING MULTICHANNEL ELECTRODES FOR MONITORING THE ELECTRICAL ACTIVITY OF THE MYOCARDIUM

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Introduction: The development of novel drugs necessitates meticulous monitoring of various critical aspects to mitigate the risk of cardiovascular complications. Researchers must consider a plethora of targets ranging from the molecular level of ionic channels to the systemic effects of novel compounds. Employing techniques of different scales, such as electrocardiogram (ECG) recordings and field potential recordings of cardiomyocytes with implanted electrodes, presents a challenging yet rewarding approach. This design can yield comprehensive insights into the state of cardiomyocytes within the heart chambers and the heart as a whole. By conducting measurements under conditions where other organs remain intact, researchers can assess the systemic effects of compounds and anticipate or confirm adverse effects during preclinical research. Moreover, this setup provides an opportunity for additional interventions and the simultaneous monitoring of other parameters in the same animal. Material and Methods: Xenopus frogs were utilized for the experiment. The animals were anesthetized with diethyl ether and decapitated. Following the opening of the thoracic cavity, the intact heart was exposed. Recordings were carried out under constant temperature conditions of 20°C within a Faraday cage. Four two-channel tungsten wire electrodes (diameter = 25 µm) were employed to record the electrical activity of the ventricular myocardium in an intact heart. To capture data from various locations, eight microelectrodes were arranged in four groups in a cross-like configuration. The electrode's design facilitated both rigid fixation to a micromanipulator and additional fixation to a holding frame with an electromagnet. After precise electrode positioning and implantation in myocardial tissue, it

transitioned from rigid to floating mode, preventing microelectrode deformation, heart tissue damage, and improving the signal-to-noise ratio. This electrode construction is suitable for long-term recordings, drug administration, and electrostimulation. Results: ECG recordings allowed clear detection of P-waves and R-waves, enabling the calculation of R-R intervals and heart rate. Field potential recordings yielded three distinct complexes, two of which coincided with P and Q waves. Conclusion: The proposed electrophysiological setup with floating multichannel electrodes enables rapid, efficient, and cost-effective evaluation of myocardial state during pharmacological interventions. The technique was validated using standard pharmacological drugs with well-known mechanisms of action. Field potentials from the intact heart were successfully recorded, and key myocardial parameters were calculated and analyzed. This technique facilitates the assessment of myocardial profiles during the preclinical stage of novel drug development, as well as during the action of various factors such as electrical, chemical, or genetic stimuli. Additionally, this method could be employed for parallel recordings of different organs and organ systems within a single animal.

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Biography

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PS24

IS IT POSSIBLE TO AVOID TERMINOLOGICAL ERRORS IN SCIENTIFIC TEXTS? (ON EXAMPLE OF MINERALOGICAL TERMS IN A.C. CELSUS' TREATISE *DE MEDICINA*)

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Abstract:

The status of scientific or professional texts that transfer knowledge of a certain field using specialized vocabulary or terminology used in classic texts on medicine is rather specific. Reading ancient medical texts, we come across terms and names of substances used as drugs, the meaning of which is difficult to define today. One of such texts is the A.C. Celsus' treatise *De medicina libri octo*, created in the 1st century. Since its publication in 1478, it became a basic medical textbook for almost 400 years and was published and translated many times. But on the other hand, it contains (especially Book V concerning pharmacy) a number of terms which meanings are unclear and cause problems in translations.

A specialist, who translates technical text, must be knowledgeable in this field. The objective of this work is to show on the example of the unit *misy* used as a pharmaceutical term in Book V of the *De medicina*, what mistakes can be made when it is not enough to know the terms. This difficulty can be solved by a clear identification of terminological designates, i.e. find out what exactly is hidden behind the term. The analysis of prescriptions contained therein showed that *misy* was a mineral substance and an ingredient of recipes with a certain therapeutic effect. The comprehensive analysis, starting from the etymology of the Greek original of this term, revealed significant difficulties in establishing the exact lexical meaning of *misy*. The main sources of information about it were descriptions found in the Ancient Greek and Roman literature, mainly from such authors as Pliny the Elder, Dioscorides and Galen.

Definitions presented in numerous most reputable dictionaries and thesauri in Latin and Ancient Greek were also examined. Their analysis showed that not all definitions and equivalents reflect the real designation of the sought term. Some of definitions seem to be non-correct and even wrong.

On the basis of examined above-mentioned ancient texts, dictionaries and numerous publications in the field of chemistry and mineralogy, the author made an attempt to establish what kind of mineral substance could actually be *misy* from the point of view of modern mineralogy. She hypothesizes that the lexeme under consideration meant substances that were most likely sulphate iron compounds accompanying copper-rich ores or being products of their processing (after copper smelting). The author also proposes that in similar cases, due to difficulties in determining the exact meaning of the term, treat it as a „terminus technicus" and keep it in translations in its original form with an additional comments on a possible designate.

Key words: Celsus, *De Medicina*, *misy*, drugs in Antiquity, mineral as pharmaceutical substance, terminological meaning.

PS25

SUPERCURRENT REVERSAL IN ZEEMAN-SPLIT JOSEPHSON JUNCTIONS

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We theoretically study the current-phase relation in a Josephson junction comprising the Zeeman-split superconductors (ZSs) and a normal metal (N). We show that at low temperatures the Josephson current in the ZS/N/ZS junctions exhibits a supercurrent reversal at a certain phase difference $\varphi_c \in (0, \pi)$. By calculating the spectral Josephson current, we demonstrate that the band splitting due to the Zeeman interaction causes the level crossing in the spectra of the Andreev bound states and the sign reversal of the Josephson current, similar to the known case of an SFIFS junction (F is a ferromagnet, I is an insulator). Additionally, we propose an alternative method to observe the supercurrent reversal. We have demonstrated that φ_c depends on the Rashba spin-orbit interaction in the normal segment. The spin precession of a quasiparticle due to the spin-orbit interaction modifies the energy spectra of the Andreev levels and φ_c. In experiments, the amplitude of the spin-orbit interaction is tunable by applying the gate voltage. Therefore, by measuring the CPR by tuning the spin-orbit coupling, one would be able to observe the anomalous current reversal.

Acknowledgements. S.-I. S. acknowledges Overseas Research Fellowships by JSPS. The work is partially supported by RSF under grant number 23-72-30004

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PS26

MEDICINES BASED ON NANOSIZED SILICA – ACHIEVEMENTS AND PROSPECTS

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Nanosized (highly dispersed, fumed) silica obtained by the vapor phase process has an extremely wide application in various areas of industrial activity. Its physicochemical

characteristics, including adsorption capacity, have been well examined [1]. In pharmaceuticals, fumed silica has long been used as an effective and safe excipient in the manufacture of tablets, ointments, liniments and other dosage forms. A real innovation was the use of fumed silica as an independent medicine with sorption action. The credit for this belongs to the Ukrainian team of chemists, pharmacists and doctors [2]. The effectiveness of fumed silica as an enterosorbent is based primarily on its extraordinary ability to bind proteins, such as microbial and food toxins. Fumed silica is also considered as an enveloping agent that interacts with the glycoproteins of the intestinal mucosa, forming a barrier for the absorption of toxic substances and preventing the adhesion of pathogenic microorganisms [3]. The peak of studying the medical and biological properties of nanosized fumed silica has already passed; today, enterosorbents based on it, for example Polysorb plus, Atoxil®, Carbowhite®, are in stable demand on the Ukrainian market. If the initial dosage form of fumed silica was powder, now there is a trend towards the production of gel-like dietary supplements (Atoxil Gel, Neosorb Activ Gel, Eliminal Gel™), where polysaccharides, in particular inulin, are introduced as gelling agents.

The next direction is the development of sorption preparations based on nanosized silica for the local treatment of wounds – postoperative complications, trophic ulcers, diabetic foot, etc. Considering that the overly hydrophilic fumed silica powder, due to its strong drying effect, can be applied only in the first, exudative phase of the wound process, we have created a generation of hydrophilic-hydrophobic compositions Flotoxan, Metroxan, Pathelen®, Pathelen® Hybrid, which also contain antimicrobial substances. The industrially produced Pathelen® Hybrid has received good reviews from surgeons and, thanks to the efforts of Swiss investors, has been patented and is undergoing registration in Europe [4].

Another property of nanosized silica – a powerful hemostatic effect due to a specific adsorption mechanism – is used for the manufacture of powder hemostops, for example, by combination with sodium alginate. Kaolin and zeolites stop bleeding through a similar mechanism, however, the size of their surface and the concentration of hydroxyl groups on it, which act as adsorption centers, are smaller than those of silica, so the hemostatic effect of these minerals is weaker. The next step could be to create a bandage that is more convenient to use, in which an inert non-woven matrix will be impregnated with nanosized silica (analogous to American Quick Clot® Combat Gauze).

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PS27

QUANTUM OSCILLATIONS IN TOPOLOGICAL INSULATOR MICROWIRES CONTACTED WITH SUPERCONDUCTING In_2Bi LEADS

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Here we studied the magnetoresistance (MR) of polycrystal Bi_2Te_2Se topological insulator (TI) microwires contacted with superconducting In_2Bi leads. Bi_2Te_2Se has a simple band structure with a single Dirac cone on the surface and a large non-trivial bulk gap of 300 meV. To study the TI/SC interface, the Bi_2Te_2Se glass-coated microwire with a diameter of d = 17 μm was connected to copper leads on one side using superconducting alloy In_2Bi (T_c=5.6 K), and on the other side using gallium. The topologically nontrivial 3D superconductor (SC) In_2Bi has proximity-induced superconductivity of topological surface states. To eliminate conventional contribution to superconductivity from the bulk, the resulting edge states of the TI/SC contact area were studied in magnetic fields above Hc_2 in In_2Bi. The $h/2e$ oscillations of magnetoresistance (MR) in longitudinal and transverse magnetic fields (up to 1 T) at the TI/SC interface were observed at various temperatures (4.2 K–1.5 K) [1,2]. To explain the observed oscillations, we used magnetic flux quantization, which requires a multiply connected geometry where flux can penetrate into normal regions surrounded by a superconductor. The effective width of the closed superconducting area of the TI/SC interface is determined to be 15 nm from an analysis of FFT spectra and the beats of the MR oscillations for two different directions (longitudinal and transverse) of magnetic field.

This study was supported by the Project no. 020201 "Nanostructures and advanced materials for implementation in spintronics, thermoelectricity and optoelectronics", NSF through STC CIQM 1231319, the Boeing Company and the Keck Foundation.

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PS28

BASIC ASPECTS OF BACTERIAL TRANSFORMATION

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Actuality. To survive under different environmental stresses, such as antibiotic stress and DNA damage, bacteria have evolved a mechanism to naturally convert and take up potentially useful foreign genes from nearby strains. Goal. To evaluate the natural mechanism of bacterial transformation and and its applicative value. Material and Methods. The research is based on bibliographic sources that were analyzed using PubMed, Google Scholar, Oxford Academic and Medline, published within the period of 2013-2024. Results. Natural bacterial transformation involves the exogenous DNA and a recipient cell. Transformation is defined as the uptake of foreign DNA as a single strand, which was formed from the exogenous double-stranded DNA (dsDNA) and its integration into the bacterial chromosome by homologous recombination. One strand of dsDNA is degraded, the other is internalized in single-stranded form through the ComEC transmembrane channel in a 3'–5' orientation. Then, internalized single-stranded DNA (ssDNA) is bound by the DNA processing A protein, which loads the recombinase protein RecA onto ssDNA. In turn, RecA polymerizes on the ssDNA and promotes a homology search in the host chromosome. When a homologous sequence is found, the ssDNA and a homologous strand chromosomal DNA is pairing, forms the transformation heteroduplex, the recombination is over. Conclusion. Natural bacterial transformation enables bacteria to acquire new genetic traits and to adapt to changing environmental conditions, promoting, for example, resistance to antibiotics and evasion of vaccines.

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PS29

METHODOLOGY FOR THE FORMATION OF ANN's ELEMENTS

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Elaboration of two main Artificial Neural Networks elements – nonlinear switch (neuron) and linear connecting element (synapse) is based on layered hybrid structures [1].

The relevance of this construction was determined by the development of technological capabilities and the convenience of varying the characteristics of transitions on the other. The formation of a planar Josephson Junction is based on the formation of a multilayer superconducting heterostructure, in the simplest cases consisting of three functional layers.

In fact, the required characteristics of the Josephson transition are laid down during the formation of a superconducting heterostructure. The intermediate layer or interlayer enclosed between two layers of a superconductor completely determines the mechanism of current transport and, accordingly, the characteristics of the Josephson Junction [2].

The most convenient method of forming a superconducting heterostructure is the method of magnetron sputtering of materials. This method, in the presence of several magnetrons in a vacuum installation, makes it possible to form a superconducting heterostructure in a single vacuum cycle, which completely eliminates the introduction of additional contaminants at the interface of the layers. The magnetron sputtering method is characterized by a relatively low energy of the process, which practically eliminates mutual diffusion, especially of refractory materials, at the interface of layers and provides atomic sharpness of the boundaries during the formation of a superconducting heterostructure.

The study was supported by the Project «Nanostructures and advanced materials for implementation in spintronics, thermoelectricity and optoelectronics» no. 020201.

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PS30

SUPERCONDUCTING PROPERTIES OF NANOSTRUCTURES SUPERCONDUCTOR/FERROMAGNET

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An original vacuum technology for reliable and reproducible preparation of high quality nanostructures "superconductor/ferromagnet" (S/F) using magnetron sputtering is developed.

Superconducting properties of Nb/Ni bilayers prepared by on atomic smooth glass subtrates are investigated. The quality of the films was characterized by small-angle X-ray diffraction analysis(XRD Θ-2Θ). The thickness of the layers was determined by the Rutherford backscattering spectrometry (RBS). For specimens with constant Nb layer thickness we observed distinct oscillations of the superconducting critical temperature upon increasing the thickness of the Ni layer. The results are interpreted in terms of Fulde-Ferrell-Larkin-Ovchinnikov (FFLO) like inhomogeneous superconducting pairing in the ferromagnetic Ni Layer.

The obtained results can be used for superconducting electronics and spintronics.

This work has been done using „Coolpower-4,2GM" closed-cycle He-liquifier donated by Alexander von Humboldt Foundation to the Laboratiory of Superconductivity of Professor A.S. Sidorenko. For the possibility to do research with this equipment the author is thankful to A.v.H.-Foundation.

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PS 31

THE CRITICAL MAGNETIC FIELDS OF SUPERCONDUCTING NANOSTRUCTURES BASED ON NB AND CU-NI – ALLOY LAYERS

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Based on studies of resistive transitions in ferromagnet/superconductor/ferromagnet samples $Cu_{41}Ni_{59}/Nb/Cu_{41}Ni_{59}$ it were investigated the thermodynamic fluctuations of the superconducting order parameter, the width of the critical region and the change of the Ginzburg-Levanyuk criterion; execute the theoretical calculation of the critical magnetic fields for the three-layered nanostructures of the ferromagnet-superconductor-ferromagnet and compare them with experimental data in three-layered nanostructures $Cu_{41}Ni_{59}/Nb/Cu_{41}Ni_{59}$

In frame of this work the main scientific and technical problem was resolved: found a significant increase (by 9-10 orders) of the Ginzburg-Levanyuk criterion in three-layered F/S/F nanostructures in compare with value for pure bulk superconductors ($Gi_{3D} = 10^{-13} - 10^{-14}$), which significantly increased the broadening of the critical fluctuations and the width of the resistive transition of layered superconductor-ferromagnet structures to the experimentally observed values, $Gi = 10^{-3} - 10^{-4}$; performed theoretical calculations for the critical magnetic fields of layered nanostructures ferromagnet-superconductor-ferromagnet based on Usadel formalism, which provided an adequate description of the critical magnetic fields, which is in agreement with experimental data; increasing of thickness of ferromagnet layer in system $Cu_{41}Ni_{59}/Nb/Cu_{41}Ni_{59}$ substantially influenced on the temperature dependence of the critical magnetic fields in perpendicular and parallel orientation and increase the non-linearity and their anisotropy in compare with the critical magnetic fields of single niobium films.

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PS32

RE-ENTRANCE SUPERCONDUCTIVITY IN NANOSTRUCTURES BASED ON NB AND CU-NI – ALLOY LAYERS

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An original vacuum technology for reliable and reproducible preparation of high quality nanostructures "superconductor /ferromagnet" (S/F) using magnetron sputtering is developed.
Superconducting properties of atomic smooth Nb/CuNi bilayers are investigated. The quality of the films was characterized by Auge-spectoscopy, AFM, TEM and SEM microscopy studies. The thickness of the layers and their composition was determined by the Rutherford backscattering spectrometry (RBS). For specimens with constant Nb layer thickness we observed distinct oscillations of the superconducting critical temperature till the re-entrant behavior upon increasing the thickness of the CuNi layer. The results are interpreted in terms of Fulde-Ferrell-Larkin-Ovchinnikov (FFLO) like inhomogeneous superconducting pairing in the ferromagnetic CuNi layer.
The obtained results can be used for superconducting electronics and spintronics.

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PS33

APPLICATION OF NARROW BAND IMAGING FOR EARLY DIAGNOSTICS OF URINARY BLADDER TUMORS

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Background: One of the recent directions in modern urology is an early diagnosis of bladder tumors which allows the disease recognition in its early stages of development. Cystoscopy remains the method of choice for diagnosis of bladder tumors. In the last decade, new methods for the detection and visualization of bladder tumors have been proposed. Purpose of the study: To assess the difference between narrow-band imaging (NBI) cystoscopy for the detection of non-muscular invasive bladder tumors and white light (WL) cystoscopy. Material and methods: 187 patients with diagnosed bladder tumors were included. The study was done at the Urology Clinic of Nicolae Testemitanu State University of Medicine and Pharmacy from 2017 to

2022. White light cystoscopy was performed in all patients, followed by narrow band imaging cystoscopy, and the obtained data were compared. Results: From 187 patients with bladder tumors the diagnosis was established by WL cystoscopy in 166 (89%) patients, as whereas in 21 (11%) patients the tumor was detected by NBI cystoscopy performed after WL. Quantitatively, a total of 279 tumor lesions were detected. 212 (76%) were determined through WL and 67 (24%) tumor lesions were identified using the NBI method. Conclusions: Compared to white light cystoscopy, narrow band imaging cystoscopy shows more favorable results regarding the early diagnosis of non-muscular invasive bladder tumors.

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PS34

AN INSIGHT INTO TECHNOLOGIES AIDED IN THE ENCODE PROJECT

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The Encode (Encyclopaedia of DNA Elements) Project, which began over a decade ago, has been a valuable resource in the realm of science, assisting in understanding the intricacies of the human genome and its fundamental elements. Through the process of decoding DNA, the Encode Project provides public access to the blueprint of human existence. The functional significance and regulatory roles of hitherto unknown genomic regions have been clarified by encode. This remarkable endeavour at the forefront of genomic exploration, has successfully assembled the complex human genome using a range of cutting-edge technologies.

This paper examines the technological marvels that enabled the project, from the ability of ChIP-seq to clarify protein-DNA interactions to the three-dimensional insights gained from Hi-C and 3C techniques. It highlights the noteworthy

contributions of the project, exposing regulatory elements and offering a glimpse into the future directions of genomics, predictive modelling, and personalized medicine. The ENCODE Project is a testament to human ingenuity and provides new insights into our genetic makeup and the mysteries of our DNA. Using high-throughput sequencing methods such as ChIP-seq, RNA-seq, and ATAC-seq, scientists have tracked the dynamics of chromatin accessibility, transcription factor binding, and gene expression with unprecedented resolution and accuracy.

Through the application of cutting-edge CRISPR-based methods, precise genomic element manipulation was made possible, leading to a greater comprehension of the functional significance of these elements. Future prospects seem promising for single-cell resolutions, predictive modeling, and multi-omics integrations, as the project advances and the scientific community makes use of these technological marvels. Ongoing partnerships and unrestricted access to data will advance our comprehension of disease mechanisms and the creation of personalized medicine.

Aside from its remarkable discoveries, the ENCODE Project leaves a lasting legacy that is a never-ending source of inspiration, reminding us of the boundless opportunities brought about by human curiosity, inventiveness, and collaboration in the quest to comprehend the essential characteristics of life as encoded in our DNA. In its pursuit of discovering the mysteries of the human genome, the ENCODE Project is a shining example of human perseverance, curiosity, and the unwavering pursuit of knowledge.

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PS35

MOLECULAR AND GENETIC APPROACH TO ALZHEIMER'S DISEASE

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Alzheimer's disease (AD) is a complex neurodegenerative condition marked by gradual cognitive decline and memory impairment, posing significant challenges for healthcare and society globally. It is the predominant form of dementia, affecting millions worldwide. AD manifests in two main forms: familial and sporadic. Familial AD, comprising a small percentage (1-5%) of cases, is linked to genetic mutations leading to early-onset AD (EOAD) before age 65, often aggressive and genetically driven by mutations in genes like PSEN1, PSEN2, and APP. On the other hand, sporadic AD constitutes 95% of cases, where aging is the primary risk factor, though a complex interplay of genetic and non-genetic factors contributes. Multiple genes, including PSEN1, PSEN2, APP, and APOE, have been identified as key players in inherited AD risk, notably impacting late-onset AD (LOAD). The genetic landscape of AD has been extensively explored, shedding light on mechanisms like amyloid precursor protein dysregulation and Aβ plaque accumulation. Advances in genomic research, such as GWAS, have uncovered additional candidate genes influencing AD susceptibility, revealing the intricate and varied genetic underpinnings of the disease. Understanding AD's genetic foundation is pivotal for targeted treatments, early detection, and personalized interventions. Ongoing research aims to untangle the complex interplay of genetic, environmental, and neurobiological factors in AD, paving the way for more effective therapeutic and preventive strategies.

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DOI: 10.46300/9106.2023.17.21.

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PS36

MOLECULAR TRIGGER MECHANISMS FOR NEURODEGENERATION PROCESS VIA MITOPHAGY IN PARKINSON'S DISEASE.

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Introduction. Parkinson's disease (PD) is a chronically progressing neurodegenerative disorder, which is associated with the following clinical core features bradykinesia, tremor, and rigidity. It is considered the second most common central nervous system degenerative disorder, which occupies the second place after Alzheimer's disease. Its molecular mechanism lies in the process of mitophagy, which is involved in the development of a range of neurodegenerative diseases, and the mutation of PINK1 and Parkin genes. Goal: The evaluation of the molecular background of PD's pathogenesis. Methods and materials: A bibliographic study of scientific literature specialized in molecular mechanisms of pathogenesis of Parkinson's disease. The number of researched scientific articles has counted 15 essays on the subject, analyzed using PubMed, Google Scholar, Oxford Academic, and Medline, published from 2014 to 2024, filtered out by the keywords. Results: Scientific data analysis has shown that the fundamental process of Parkinson's disease lies in mitochondrial dysfunction, which is why the removal of the damaged organelles exerts significant influence over the disease. Parkin and PINK1 proteins create together the so-called Pink1-Parkin signaling pathway, which plays the core role in mitochondrial degradation because Pink1 encodes the PTEN-induced putative kinase with mitochondrial targeting sequence and Parkin is an E3 ubiquitin ligase. PINK1 forms a unique translocase complex on the outer membrane of the mitochondria, by which this organelle can regulate the level of PINK1 and Parkin. Thus, mutations of Parkin and PINK1 lead to the translocation of both of the proteins, which causes the incorrect regulation of mitochondrial autophagy and the accumulation of defective mitochondria as a consequence, starting the neurodegenerative process of Parkinson's disease. Conclusion: Thus, the main molecular mechanism for PD emergence is the accumulation of defective mitochondria, caused by the mutations of PINK1 and Parkin genes, the expression of which dysregulates the mitochondrial activity, leading to the accumulation of the defected mitochondria and disruption of the mitophagy.

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PS37

ADVANCES IN RECENT TECHNIQUES OF SOFT TISSUE TRAUMA IN CHILDREN

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Introduction: Childhood injuries contribute to more than 20% of all injury cases, making the prevention and treatment of such injuries a pressing medical and social concern, as underscored by the World Health Organization (WHO). Over the past two years, childhood trauma has ranked as the second leading cause of visits to the Department of Maxillofacial Surgery. The selection of the most effective treatment method is crucial as it impacts the child's jaw and tooth development, chewing and speech functions, and overall appearance. Objective: This study aims to assess recent techniques in treating soft tissue trauma in children. Materials and Methods: A comprehensive review of bibliographic sources published between 2013 and 2024 was conducted using databases such as PubMed, Google Scholar, Oxford Academic, and Medline. Results: Accurate assessment and classification of soft tissue injuries are the initial steps in their treatment. Early intervention and closure of such injuries are associated with improved functional and aesthetic outcomes and reduced risk of complications. Management of soft tissue injuries involves controlling bleeding, thorough wound irrigation, debridement of necrotic tissue, and removal of foreign bodies before closure. Administration of antibiotics and tetanus prophylaxis are essential in wound care, particularly for infected wounds. Various tissue engineering approaches, including the use of growth factors, play a vital role in promoting optimal wound healing by influencing various stages of the process. Techniques such as direct cell transplantation or application of growth factors can accelerate healing. Additionally, fibrin glue or sealant can be used to deliver cells or growth factors. Platelet-rich plasma (PRP) and tissue-engineered skin or mucosa substitutes serve as scaffolds to promote healing. Soft tissue injuries resulting in tissue loss often require flap reconstruction, which can be tailored based on the type, location, and severity of the damage.
Conclusion: Recent advancements in soft tissue trauma management offer promising techniques for optimizing wound healing and preserving tissue integrity in children.

These advancements encompass various approaches, including tissue engineering and flap reconstruction, tailored to the specific needs of each patient.

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PS38
COMBINATION OF KINETOTHERAPY AND NANOPLASMA TECHNOLOGIES: IMPACT ON IMPROVING THE GENERAL HEALTH INDEX IN THE THERAPY OF PAIN CONDITIONS OF THE SPINE

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Introduction: Plasma technologies are being intensively investigated across many medical-related areas. Numerous experimental results with preclinical models reveal the potential benefit of plasma in the decontamination of wounds and stimulation of wound healing. Many of the encouraging results seen in preclinical models are also being clinically translated, with plasma treatments benefiting patients by decreasing the bacterial load on wounds and accelerating wound healing, as well as in physiotherapy. More importantly, the plasma treatments are generally painless and well-tolerated by patients, and without any major clinical side effects reported to date, indicating that plasma technologies can be implemented for relatively safe and effective clinical use. The current study evaluates the effectiveness of integrating nanoplasma technologies in combination with kinetotherapy in the treatment and rehabilitation of patients with lumbago and sciatica. Purpose of the study: To determine the optimal rehabilitation strategy to provide maximum reduction in pain and improve the quality of life of patients. Material and methods: The study was conducted at the Physical Rehabilitation Clinic "Kineto Plus", in Chisinau. In the study 72 patients diagnosed with lumbago and sciatica, aged from 29 to 39 years, were included. The individuals were divided into three groups, each group containing 8 men and 16 women. Each group was compared with a control group. The individuals from the control group were treated according to a rehabilitation program on kinetotherapy. For the first test group, the rehabilitation program included sessions in

a nanoplasma installation solely. For the second test group, the rehabilitation program included a complex treatment by kinetotherapy and sessions in the nanoplasma installation. The rehabilitation course lasted four weeks and included 20 sessions. Each session lasted one hour. The assessment of the functional state of the body was carried out using the Lotus Heart Activity Monitor before the first session and at the end of the study. A complex indicator of health was assessed based on autonomic regulation, neurohumoral regulation, psycho-emotional state and adaptation of the body. Results of the study: The combination of nanoplasma therapy and kinetotherapy showed maximum effectiveness in the rehabilitation of patients with lumbago and sciatica, the complex health indicator in this group was 84.36%, exceeding the results achieved when using each method separately - 69.42% in the test group one and 72.24% in the control group, treated only by kinetotherapy. Conclusions: The study confirmed that nanoplasma fields in combination with kinetotherapy improve the functional state of biological systems. This integration of approaches provides a comprehensive effect on the patient, improving not only physiological indicators, but also the overall quality of life. In terms of future outlook, the results of the study may contribute to the development of new treatment and rehabilitation protocols, expanding the understanding of the capabilities of modern medicine in the treatment of diseases of the musculoskeletal system.

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PS39

GENETIC PREDISPOSITIONS IN ATRIAL FIBRILLATION: IMPLICATIONS FOR PRECISION MEDICINE

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Atrial fibrillation (AF) presents a significant challenge to global cardiovascular health, characterized by its prevalence and severe complications, notably stroke and heart failure. While environmental factors influence AF, there is growing recognition of the pivotal role of genetic predisposition in its etiology and progression. With an estimated 33.5 million affected individuals worldwide in 2010, projections indicate a rising prevalence due to aging populations and shifting lifestyles. This paper provides a comprehensive examination of AF, including its prevalence, clinical implications, and the historical trajectory of genetic research. By contextualizing the broader relevance of genetic factors, the thesis seeks to refine risk assessment, diagnostics, and therapeutic interventions for AF. Genetic predisposition not only impacts the development of AF but also extends to various facets of cardiovascular health, encompassing heart morphology, ion channel functionality, and susceptibility to inflammatory processes. The historical narrative of genetic inquiry into AF traces a path from early familial investigations to the advent of genome-wide association studies (GWAS), significantly enriching our understanding of the genetic underpinnings of this arrhythmia. Appreciating this evolutionary journey prepares readers for nuanced methodologies and insights discussed in subsequent sections, underscoring the indispensable role of genetic exploration in tackling the multifaceted nature of AF and cardiovascular disorders. Focusing on the theme "Aspects of Genetic Predisposition in Atrial Fibrillation," this paper embarks on a meticulous exploration of the intricate interplay between genetic factors and AF. It delineates how genetic predispositions intersect with environmental influences to shape individual susceptibility, disease trajectory, and treatment response. Furthermore, by elucidating the genetic landscape of AF, this research aims to furnish clinicians and researchers with invaluable tools for personalized risk assessment and targeted therapeutic interventions. Ultimately, this comprehensive inquiry into genetic predispositions in AF not only advances our understanding of this complex arrhythmia but also paves the way for precision medicine approaches tailored to individual genetic profiles. By unraveling the genetic dimensions of AF, this study endeavors to catalyze transformative advancements in the prevention, diagnosis, and management of this pervasive cardiovascular condition.

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PS40

EFFECTS OF BETA-BLOCKERS ON CARDIAC PHENOTYPES

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Adrenergic β-blockers are medications that attach to β-adrenergic receptors without causing any activation. Rather, they obstruct the effects of β-adrenergic agonists and are employed in the management of several illnesses, including heart failure, stress, anxiety, angina pectoris, myocardial infarction, hypertension, headaches, migraines, and prostate cancer. In general, β-blockers alleviate symptoms and lower the chance of cardiovascular events. β-adrenergic blocking medications have been extensively employed in the treatment of heart failure because of their capacity to avert the negative effects of stimulation of the sympathetic system on the cardiovascular system and offer patients therapeutic advantages. A meta-analysis was conducted to examine the relationship between the Arg389Gly polymorphism in the β1-adrenergic receptor gene with the risk of heart failure in humans. Using data from approximately 7000 patients and 3000 healthy controls, we conducted a meta-analysis to examine the effects of β adrenergic receptor polymorphisms on heart failure prognosis, response to β-blocker medication, and susceptibility to heart failure. The Gly389 homozygote and allele have been shown to raise the risk of heart failure (HF) in East Asians, while decreasing the risk in White people. Overall, the Arg389 homozygote responded to β-blockers more than the Gly389 carrier, but the reductions in HR were comparable. However, patients with heart failure did not significantly benefit from the Arg389 homozygotes' prognosis. Given that these investigations reveal disparities in the effects of metoprolol and carvedilol on the two unique phenotypic profiles of the two receptors under investigation, in vivo data also point to variations in the drug–gene interaction between these two β-adrenoceptor blockers. Metoprolol has been demonstrated to primarily interact with the ADRB1 Arg389Gly-polymorpism about LVEF, blood pressure,

and heart rate responses, while carvedilol has most consistently been demonstrated to interact with the ADRB2 Gln27Glu-polymorphism. It appears that those with heart failure may benefit from genetic testing for the genotype involving Arg389Gly and Gln27Glu before starting β-adrenoceptor blocker treatment. Since this would provide the best possible treatment choice with the three suggested β-adrenoceptor blockers.

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PS41

THE APPROACH OF MOLECULAR MEDICINE TO THE TREATMENT OF GAUCHER DISEASE

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Introduction. Gaucher disease presents a metabolic rare disease with the autosomal recessive transmission. The cause of this monogenic disease is the mutation of the gene GBA. As a consequence of this mutation, a deficiency of synthesis of the enzyme β- gucocerebrosidase occurs. As a result, glucocerebrosides accumulate throughout the body, especially in the bone marrow, spleen and liver. Three different forms of Gaucher disease have been determined, distinguished by the absence or presence and extent of neurological complications. Currently, five therapies for the treatment of Gaucher disease are described. This review study provides the most recent

information on the therapies approved for the treatment of the disease. Material and methods. Narrative synthesis of specialized literature in databases: *PubMed, Gene Cards, National Library of medicine, Google Scholar* and *Hinari* of the years 2014 to 2024 were analyzed. Results. Enzyme replacement therapy is an effective tool in the treatment of Type 1 Gaucher disease. Treatment is done via infusion of imiglucerase. This is a synthetic substance called glucocerebrosidase. It ensures the breakdown of accumulated lipids. Substrate reduction therapy uses a small molecule drug miglustat and eliglustat tartrate that inhibits the first committed step in glycosphingolipid biosynthesis. Chaperone therapy treatment with non-inhibitory chemical chaperones can increase glucocerebrosidase levels and activity in lysosomes. Gene therapy as a potential therapeutic approach for the treatment of GD type 1, ex vivo autologous bone-marrow-derived GD 1 hematopoietic stem cells were genetically corrected by infection with self-inactivating lentiviral vectors expressing WT GBA1 induced by different cellular promoters. Hematopoietic stem cell transplantation, involving the replacement of affected stem cells with healthy stem cells is a treatment that can provide a permanent source of enzyme to people with Gaucher disease and is a considerably less expensive procedure. People with Type 3 Gaucher disease showed no further neurological deterioration. The important limitations of HSCT are the mortality and morbidity associated with the procedure and the non-availability of HLA-matched donors. Conclusions. The different methods of Gaucher disease treatment have been permanently researched. Advances in this field are promising regarding the increase in life quality of patients. The treatment choice should be personalized by the severity of the disease as well as other associated medical conditions. The most commonly applied therapy is still enzyme replacement. Even though this therapy form is the one that is well-tolerated by the patient, healthcare providers should be aware of any unexpected complications.

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PECULIARITIES IN THE QUANTUM TRANSPORT AT THE INTERFACES OF BISMUTH-ANTIMONY BICRYSTALS

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As a result of the study of the magnetic and superconducting properties of tilt-type crystallite interfaces in bismuth-antimony bicrystals were detected some properties unusual for their similar bulk semiconductors.

A comprehensive study was carried out on the bicrystals with nanoscale multilayer interfaces, where superconductivity (Tc ≤ 21K) is exhibited separately or simultaneously with weak ferromagnetism.

Magnetotransport anomalies identified in magnetic field transport manifest themselves in the Hall effect, longitudinal magnetoresistance and Seebeck effect. Behaviour of the Seebeck coefficient and magnetoresistance peculiarities indicate the occurrence of a new small group of the electrons; thermomagnetic phenomena in crystallite interfaces layers exhibit behavior of the 3D topological semimetals, whereas in semiconductor bulk bicrystals they manifest typical features of the 3D topological insulators. Both phenomena indicate to the electronic phase transitions of the semiconductor-semimetal type in magnetic field.

The study was supported by the Project « Nanostructures and advanced materials for implementation in spintronics, thermoelectricity and optoelectronics » no. 020201.

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ENHANCEMENT OF THE THERMOPOWER IN BI WIRES UNDER ANISOTROPIC DEFORMATION

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The prospect of the thermoelectric application of Bi based materials will require the ability to control their parameters. Investigations of Bi wires in a wide range of temperatures, magnetic fields and anisotropic deformation have revealed an effective way to control the magnitude of the thermopower under the influence of uniaxial deformation.

Measurements of the thermopower of submicron Bi wires in the temperature range of 4.2 - 77 K, revealed the possibility of changing not only the magnitude and sign of the thermopower coefficient but also the overall nature of the thermopower mechanism under the influence of uniaxial deformation or magnetic field.

Submicron Bi wire exhibits positive thermopower being generated in the diffusion transport mechanism of carriers at low temperatures. The diffusion transport mechanism can be transformed into phonon-dominated transport through a smooth manipulation with the phonon spectrum and Fermi surface by applying a uniaxial strain. The phonon mechanism becomes a dominant in the total thermopower above deformation value of 1.1 %, that is indicative of a change in the Fermi surface topology under strain known as Lifshitz transition. It seems that strain value of 1.1 % is as an "inflexion point" in the trend of the thermopower from diffusive to phonon drag mechanism, where the required condition $q \leq 2k_F$ for the interacting of the electrons with phonons is satisfied (q is the phonon momentum, $2k_F$ is the maximum dimension of Fermi surface changed after topological transition). The application of a magnetic field at a given point can enhance or diminish this effect depending on the field direction relative to the crystallographic axis of Bi wire.

The study was supported by the Project « Nanostructures and advanced materials for implementation in spintronics, thermoelectricity and optoelectronics » no. 020201.

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A COMPACT 2×1 MIMO MICROSTRIP PATCH ANTENNA WITH ENHANCED GAIN FOR UWB APPLICATIONS

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Abstract.
An ultra-wideband UWB 2×1 MIMO antenna, based on the reference single UWB antenna, to enhance the realized peak gain is proposed. The antenna is designed by a modified circular radiator constructed from a circular patch integrated with two circular shapes at 5mm from the main patch center with a radius of 5.35mm for each circle.

The modified patch is fastened on the top of a FR4-epoxy substrate dielectric material and fed by a microstrip type transmission line, and partial ground, while the proposed MIMO UWB antenna is composed of two optimized patch antennas, placed 180 degrees from each other, and a 2mm distance was inserted between the grounds. The simulation results, using CST-EM software package, prove that the realized peak gain is enhanced at about 1.5 dB more than the single UWB antenna without effecting the operating UWB and the Relative BW of the MIMO antenna is about 131%. The radiation pattern of the investigated MIMO antenna also has been investigated for selected resonant frequencies.

The proposed MIMO antenna covers the whole UWB range, while the antenna improves the narrow bands gain that lie within this band, such as narrow bands WLAN, WIMAX, and X-Band, which are suitable for different telecommunication applications.

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PARTIFICIAL NEURAL NETWORKS FOR PROCESSING BIG DATA USING THE EXAMPLE OF VIBRATION TESTS

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Vibration testing is a mandatory step in the development and production of various products, especially in aviation, automotive, energy, etc. They check the reliability, safety and quality of service of products, and also adjust their parameters.

At the site of vibration processes, huge streaming signals and data arise, which characterize both the physical state of most products, as well as the processes occurring when operating in various modes. Collecting and analyzing this data allows you to solve various engineering problems. The more these conditions of fixation and attention, the higher the efficiency of development and the reliability of testing, and the lower the likelihood of sudden emergency situations.

The proposed research work is aimed at creating and studying artificial intelligence neural network models to search for structural dependencies in vibration spectra during bench tests of diesel engines with a wide power range and various design features. Research is carried out on the basis of data obtained from bench tests of engines.

An important feature of neural networks is that, due to their design features, they allow one to successfully solve problems with a large number of variables without requiring a large amount of computing resources (compared to standard deterministic methods).

This problem uses artificial neural network models based on deep learning networks. Training neural networks requires the most complete display of the collected statistics of the subject area. This ensures the accuracy of artificial intelligence in forecasting systems.

The advantage of this algorithm is that it can be applied to unstudied complex processes without constructing a mathematical model. There is no need to change the algorithm; It is enough to build a new neural network trained on experimental data.

Moreover, a neural network trained on Big Data will give a more adequate and complete description of the process.
In conclusion, the proposed research cloud-based vibration testing facility for diesel engines has the potential to revolutionize engine development, testing and maintenance in various industries. By taking advantage of cloud computing, this system improves efficiency and cost-effectiveness while supporting the continuous improvement of diesel engine technology.

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ANISOTROPIC THERMOELECTRIC DEVICES BASED ON SINGLE-CRYSTAL SEMIMETAL MICROWIRES AND FILMS

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Thermoelectric heat conversion based on the Seebeck and Peltier effects generated at the junction between two materials of type-*n* and type-*p* is well known. Here, we present a demonstration of an unconventional thermoelectric energy conversion that is based on a single element made of an anisotropic material. In such materials, a heat flow generates a transverse thermoelectric electric field lying across the heat flow. Potentially, in applications involving miniature devices, the anisotropic thermoelectric effect has the advantage over traditional thermoelectrics that it simplifies the thermoelectric generator architecture. A feature of anisotropic thermoelectrics is that the thermoelectric voltage is proportional to the element length and inversely proportional to the effective thickness. We have prepared an experimental sample consisting of a 10-m-long glass-insulated single-crystal tin-doped bismuth microwire (D=20 μm, d=4 μm) [1,2]. Crucial for this experiment is the ability to grow the microwire as a single-crystal using a technique of recrystallization with laser heating and under a strong electric field. The sample was wound as a spiral, bonded to a copper disk, and used in various experiments. The sensitivity of the sample to heat flow is as high as 10^{-2} V/W with a time constant s of about 0.5 s. Polycrystalline Bi films with a thickness of 2-5 μm were deposited on the mica support by the vacuum thermal evaporation method. Experimental samples of heat flux sensors were made on the basis of recrystallized Bi films under laser heating and in a strong electric field.

This study was supported by the Project no. 020201 "Nanostructures and advanced materials for implementation in spintronics, thermoelectricity and optoelectronics".

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SEMICONDUCTOR - SENIMETAL TRANSITION IN STRONG MAGNETIC FIELD IN $Bi_{0.92}Sb_{0.8}$ SINGLE CRISTAL WIRES

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The electron transport and transverse magnetoresistance of glass-insulated $Bi_{0.92}Sb_{0.08}$ single-crystal wires with diameters of 180 nm to 2.2 μm and the (1011) orientation along the wire axis have been studied. Thin wires can be varied as a function wire diameter, pressure, temperature and growth orientation. Glass-insulated $Bi_{0.92}Sb_{0.08}$ semiconductor single-crystal wires with various diameters (0.2–2.2 μm) were prepared by liquid phase casting (the Ulitovsky method) [1]. All samples had a strictly cylindrical shape with a circular cross section and are single-crystal had the (1011) orientation along the wire axis. It has been first found that the energy gap ΔE increases by a factor of 4 with a decrease in wire diameter d due to the manifestation of the quantum size effect, which can occur under conditions of a linear energy–momentum dispersion law characteristic of both the gapless state and the surface states in topological insulators (TIs) [2]. It has been revealed that, in strong magnetic fields at low temperatures, a semiconductor–semimetal transition occurs, which is evident as an anomalous decrease in the transverse MR anisotropy and the appearance of a metallic temperature dependence of resistance at $T < 100$ K. The features of the manifestation of the quantum size effect in $Bi_{0.92}Sb_{0.08}$ wires, semiconductor–semimetal electronic transitions induced by a magnetic field, and a decrease in the transverse MR anisotropy indicate the occurrence of new effects in low-dimensional structures based on semiconductor wire (TIs), which require new scientific approaches and applications.

The study was supported by the Project « Nanostructures and advanced materials for implementation in spintronics, thermoelectricity and optoelectronics » no. 020201.

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THE APPROACH OF MOLECULAR MEDICINE TO THE TREATMENT OF GAUCHER DISEASE

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Introduction. Gaucher disease presents a metabolic rare disease with the autosomal recessive transmission. The cause of this monogenic disease is the mutation of the gene GBA. As a consequence of this mutation, a deficiency of synthesis of the enzyme β- gucocerebrosidase occurs. As a result, glucocerebrosides accumulate throughout the body, especially in the bone marrow, spleen and liver. Three different forms of Gaucher disease have been determined, distinguished by the absence or presence and extent of neurological complications. Currently, five therapies for the treatment of Gaucher disease are described. This review study provides the most recent information on the therapies approved for the treatment of the disease. Material and methods. Narrative synthesis of specialized literature in databases: *PubMed, Gene Cards, National Library of medicine, Google Scholar* and *Hinari* of the years 2014 to 2024 were analyzed. Results. Enzyme replacement therapy is an effective tool in the treatment of Type 1 Gaucher disease. Treatment is done via infusion of imiglucerase. This is a synthetic substance called glucocerebrosidase. It ensures the breakdown of accumulated lipids. Substrate reduction therapy uses a small molecule drug miglustat and eliglustat tartrate that inhibits the first committed step in glycosphingolipid biosynthesis. Chaperone therapy treatment with non-inhibitory chemical chaperones can increase glucocerebrosidase levels and activity in lysosomes. Gene therapy as a potential therapeutic approach for the treatment of GD type 1, ex vivo autologous bone-marrow-derived GD 1 hematopoietic stem cells were genetically corrected by infection with self-inactivating lentiviral vectors expressing WT GBA1 induced by different cellular promoters. Hematopoietic stem cell transplantation, involving the replacement of affected stem cells with healthy stem cells is a treatment that can provide a permanent source of enzyme to people with Gaucher disease and is a

considerably less expensive procedure. People with Type 3 Gaucher disease showed no further neurological deterioration. The important limitations of HSCT are the mortality and morbidity associated with the procedure and the non-availability of HLA-matched donors. Conclusions. The different methods of Gaucher disease treatment have been permanently researched. Advances in this field are promising regarding the increase in life quality of patients. The treatment choice should be personalized by the severity of the disease as well as other associated medical conditions. The most commonly applied therapy is still enzyme replacement. Even though this therapy form is the one that is well-tolerated by the patient, healthcare providers should be aware of any unexpected complications.

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NANOPHYTOREMEDIATION OF SOILS POLLUTED BY POLYETHYLENE

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Biological degradation of plastic waste is one of the most promising directions for finding sustainable solutions to the global problem of environmental pollution by plastics. Under standard conditions plastic waste biodegradation goes too slowly, so elaboration of efficient bioremediation techniques depends, among other things, on identification of means that can substantially stimulate this process. The purpose of our work was to test whether phytoremediation of soils polluted by low-density polyethylene (LDPE) waste can be stimulated by nanocomposites consisting of magnesium ferrite and stabilized by polyvinylpyrrolidone ($MgFe_2O_4$/PVP). According to the obtained results, introduction into soil of LDPE films pretreated by $MgFe_2O_4$/PVP caused a substantial growth stimulation of vetch and soybean plants compared to the control variants with untreated LDPE and without LDPE. For example, compared to the

control without LDPE the dry mass of these plants was, respectively, 50,2% and 76,4% higher. It was observed that after 27 days of vegetation the LDPE weight loss was up to 12% in the variants with the $MgFe_2O_4$/PVP pretreatment, while remaining negligible in the control without the nanocomposite. The obtained results demonstrate a substantial potential of nanomaterials in stimulating phytoremediation of soils polluted by polyethylene.

The study was supported by the Project « Innovative biotechnological solutions for agriculture, medicine and environment » no. 020101.

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EFFECT OF UVC RADIATION ON REGIONS OF THE SARS-COV-2 CORONAVIRUS GENOME ENCODING THE SYNTHESIS OF STRUCTURAL PROTEINS

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We studied the inactivation of SARS - CoV - 2 viruses by annihilating the structural components of the viruses that are manifested in the amplification process in the PCR procedure. For irradiation we fabricated and applied an LED matrix emitting UVC with a power of 190 mW in a narrow range of wavelengths, close to 255 nm. Each individual portion of the biomaterial (sample) was irradiated with a certain dose. The dose was determined by the duration of irradiation with a constant power density on the sample surface of 4 mW/cm^2. One of the samples was not exposed to radiation. Then, all samples, including the non-irradiated one, were analyzed using real-time PCR. The effect of irradiation on the virus was evaluated by comparing the data from the PCR analysis of the irradiated samples with the data for the non-irradiated sample. The data obtained during the experiments showed that irradiation of samples with 255 nm ultraviolet radiation with a power density of 4 mW/cm^2 for 70 seconds (280 mJ/cm^2) reduces the content of the gene capable of translating the E – protein by 100 times. To reduce the amount of this gene by ~1000 times, an exposure with a duration of 320 seconds (1.28 J/cm^2) is necessary, and exposure to radiation with the above characteristics for a time of about 400 seconds (~1.6 J / cm^2) will reduce the E – gene content by 10^4 times. Irradiation of the gene encoding the structure of the N-protein for ~270 seconds leads to a 100-fold decrease in the content of the analyzed code fragment. To reduce the number of the target code fragment by 1000 times, irradiation is necessary for ~530 seconds.

The current work, TEHMED COVID 20.70086.07/COV(70105), was supported by a grant from the ``ERAvsCORONA'' Action Plan part of the CG-ENI / 2017 / 386-980 EC "Financial Support for the participation of Republic of Moldova in the Framework Program of the European Union for research and innovation HORIZON 2020", and also of the Moldova State Program, Project «Nanostructures and advanced materials for implementation in spintronics, thermoelectricity and optoelectronics» No. 020201. We are thankful to Ion Rotari (Invitro Diagnostics SRL) for providing his support and access to PCR testing in his laboratory.

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STUDY OF THE EFFECT OF HEAT TREATMENT ON OPTICAL AND ELECTRICAL PARAMETERS OF CuO FILMS

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The effect of vacuum heat treatment of CuO films obtained using RF magnetron sputtering at a pressure of 10^{-5} Pa for further use in CuO/ZnO and CuO/TiO2 heterojunctions was studied. A 99.95% pure Cu wafer with a diameter of 50 mm and a thickness of 2 mm was used as a target. The sapphire supports used had a dimension of 20 × 20 mm. The pressure in the chamber was 5.4 x 10^{-5} Pa, and the target–support distance was 80 mm. The temperature of the holder was kept constant at 500°C, and the O_2/Ar ratio in the gas flow was 3 : 5, respectively. Film deposition took place under the following conditions: a pressure of 7.4 × 10^{-3} Pa, a magnetron power of 80 W, and a condensation rate of 5 nm/min. The thickness of the resulting films was 500 nm. The obtained CuO films were subjected to heat treatment in a temperature range of 500–800°C. The upper limit of 800°C was selected because, at higher temperatures, CuO metal oxide undergoes decomposition into Cu_2O and O_2, as estimated in [1]. Scanning election microscopy studies revealed a significant increase in the crystallite size with increasing heat treatment temperature. The chemical composition of the CuO films analyzed by EDX spectroscopy showed a composition of 47/53 for Cu/O, respectively, which indicates that the CuO compound is of high purity. An increase in the curing temperature of CuO metal oxide films up to 600°C leads to a significant decrease in the surface resistance of the films on the order of a few kΩ, which can be attributed to lattice defects simultaneously with the increase in crystallite size. It was observed that an increase in the treatment temperature of the films from 600 to 800°C results in an increase in the resistance of CuO films from approximately 20 to 200 kΩ, in

contrast to L. Fara et al., who argue that, for Cu_2O films, their resistance decreases with an increase in temperature up to 900°C [2]. Unlike the conditions described by L. Fara et al., in this case, the films were treated in a chamber at a pressure of about 10^{-5} Pa and the heat treatment time was about 20 min.

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SYNTHESIS OF COLLOIDAL AgNP – SUBSTITUTED ZnPc SYSTEMS AND THEIR ANTIMICROBIAL ACTIVITY

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Colloidal solutions of noble metals have catalytic properties and biological properties. It is known to use them as catalysts for carrying out various transformations of organic compounds, and also for the defense against pathogens [1]. In addition, colloidal silver is also promising for the manufacture of lubricating and light-absorbing materials, coatings, sensors, conductive pastes, highly effective electrode materials, etc. The main method for the synthesis of colloidal silver is reduction of Ag(I) cations using various reducing agents. For the stabilization of AgNP different compounds are used, including high molecular weight ones (polyvinylpyrrolidone, polyvinyl alcohol, etc.). The synthesis of colloidal silver was carried out using next technologies:

1. To 100 mL deionized H_2O, 0.002 ml $AgNO_3$ solution is added. The vessel with solution is placed in a water bath, heated to 50 ℃ and subjected to continuous stirring. When the set temperature is reached, 3 drops of 0.01 mL of tannic acid and 3 drops of 1% trisodium citrate solution was added. After 20 minutes of continuous stirring, the heater is disconnected. It is obtained a light-yellow solution. Testing by centrifugation the obtained solution showed that sedimentation does not occur.
2. To 99.9 mL deionized H2O it adds 0.1 g of "Glucose Anhydrous" (ACS), then under the action of continuous stirring and upon reaching the temperature of 50 ℃, the 0.002 mL AgNO3 solution is added. As a stabilizer 3 drops of tannic acid are used.

After 20 minutes of continuous stirring, the heater is disconnected. A light brown colloidal Ag solution is obtained.

3. The prepared colloidal AgNPs were characterized by using ultraviolet-visible (UV-Vis) spectroscopy. The absorption spectrum of AgNP colloidal solution shown a peak at around 420 nm in the case when is used glucose as reducing agent, while in the case of tannic acid agent, the absorption peak is situated at 410 nm. The use of tannic acid as a reducing agent in the synthesis of AgNp provides colloidal solutions with more astability. Both Ag colloidal solutions were conjugated by self-assembly with water-soluble Zinc Phthalocyanine (ZnPc) substituted with sulfur-containing group. Probably, electrostatic attraction occurs between negatively charged Pcs and positively charged AgNPs. The conjugates were evaluated for photodynamic antimicrobial chemotherapy against *S. aureu and, E. coli.* The concentrations of ZnPc-AgNP were optimised for each of the microorganisms wherein 5 μM of the of ZnPc-AgNP was applied for *S. aureus* and 10 μM was applied for *E. coli*. Log reductions (LR) were used for the quantification of viable microorganisms [2]. The LR = log (number of organisms per carrier before exposure) – log (number of organisms per carrier after exposure). The calculated log reductions for the ZnPc-AgNP with tannic acid and glucose agents are listed in the below table.

Sample	Log reduction	
	S. aureus	E. coli
ZnPc- AgNP- glucose	7.38	6.86
ZnPc- AgNP-tannic acid	8.70	7.35

The microorganisms treated with ZnPc- AgNP using tannic acid as reducing agent show a greater survival percentage than when treated with ZnPc- AgNP- glucose reducing agent.

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QUO VADIS – Nature and Technology

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In the Republic of Moldova, large-scale work to protect agricultural crops from hail has been carried out on a systematic basis since 1967, with thousands of anti-hail missiles being used annually. Moldova currently uses Alazan-6 and Loza-2 missile systems, equipped with pyrotechnic ice-forming compositions based on silver iodide (AgJ).

The influence of the temporary factor on reducing the ice-forming activity of ShAD anti-hail missiles under the conditions of their practical operation was noted in studies [2], therefore, it is relevant not only to control the effectiveness of anti-hail missiles at the manufacturing stage, but also during their practical use.

Based on [3], as well as the experience of other research centers, at the Institute of Engineering Electronics and Nanotechnologies named after. D. Ghitsu (now the Technical University of Moldova) developed and manufactured a stand for the study of ice-forming compositions used in anti-hail rockets in static conditions, as well as an aerodynamic stand that allows testing full-size generators of ice-forming aerosols (rockets, squibs, etc.).

An aerosol cube is used to generate (sublimate) small samples of ice-forming substances. The active substance is ignited and burned in the cube.

Next, an air sample containing active particles is taken from the cube using a syringe and supplied to the “cloud” chamber (mixing chamber), where the active particles are mixed with water mist at low temperatures. The chamber has the ability to change temperature and humidity, thereby simulating similar conditions in the clouds. Active particles, interacting with water droplets in the fog, cause their crystallization. At the bottom of the mixing chamber there are thermostats, which are metal cylinders with glued glass with a mirror surface.

The resulting ice crystals, settling to the bottom of the chamber within a few minutes, fall on the mirror surfaces of the thermostats, which makes it possible to subsequently count them in a certain field of view of the microscope and determine with high accuracy the number of active particles per unit weight of the substance.

To test rockets of the Loza and Alazan types, a horizontal wind tunnel is used, in which the movement of a rocket in a cloud is simulated and air samples with combustion products are taken for mixing with water mist in the mixing chamber and further analysis of the amount of ice-forming particles.

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ИССЛЕДОВАНИЕ ВЛИЯНИЯ РАЗЛИЧНЫХ ГАЗОВ НА ВЫХОДНУЮ ХАРАКТЕРИСТИКУ ТЕРМОПАРНЫХ ПРЕОБРАЗОВАТЕЛЕЙ ДАВЛЕНИЯ

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Применение промышленных термопарных преобразователей для измерения давления в современных технологических процессах, использующих различные газы при среднем вакууме, ограничивается, главным образом тем, что выпускаемые промышленностью преобразователи, проградуированы, при выпуске, по сухому воздуху. Поэтому внимание к задаче расширения возможности применения термопарных преобразователей для точного измерения давления разных газов, в том числе агрессивных, в диапазоне давлений от 5 до $1 \cdot 10^{-3}$ мм рт.ст. с каждым годом усиливается.

В настоящей работе:

- изучена возможность использования термопарных преобразователей давления с диапазоном преобразования от 20 до $5 \cdot 10^{-5}$ мм рт.ст. и погрешностью преобразования 10-15 % для измерения давления различных газов;
- проведен расчет выходных характеристик модели пленочного преобразователя с учетом его конструктивных особенностей;
- проведены экспериментальные исследования выходных характеристик термопарных преобразователей давления газа;

В результате проведенных исследований определены градуировочные характеристики термопарного преобразователя для воздуха, азота, двуокиси углерода и аргона,

Анализ полученных экспериментальных данных указывает на то, что существует более сложная зависимость влияния различных газов на градуировочные характеристики, чем та, которую можно было предположить исходя из расчетных данных. Так относительный ход кривых в диапазоне давлений от $1 \cdot 10^{-4}$ до 10 мм рт.ст. не сохраняется постоянным и существенно зависит от давления.

Отличие расчетных и экспериментальных данных, по видимому, может быть объяснено следующими причинами:
- идеализацией расчетной модели;
- недостаточной достоверностью справочных данных, характеризующих исследуемые газы;
- конструкторско-технологическим несовершенством реальных преобразователей давления.

Градуировочные характеристики термопарных преобразователей зависят от рода газа и к настоящему времени, не удалось обнаружить корреляционных коэффициентов, основанных на определяющих газы константах (молекулярная масса, теплопроводность, теплоемкость), введением которых, даже для известного состава газовой среды, можно было бы учесть влияние состава газовой среды на точность измерения давления.

Тем не менее, экспериментальными исследованиями показана реальная возможность использования термопарных (и в более широком смысле) тепловых преобразователей для измерения давления различных газов в широком диапазоне давлений с невысокой погрешностью, при условии обязательной предварительной градуировки преобразователей по каждому из газов или их смеси.

Гладкий, непрерывный и пропорциональный характер отличия градуировочных характеристик термопарных преобразователей для различных газов, от таковых для воздуха, (по крайней мере для диапазона преобразования от 5 до $6 \cdot 10^{-3}$ мм рт.ст.) так же позволяет проводить дополнительную калибровку термопарного преобразователя для всякого газа или для всякой газовой смеси, давление которых предполагается измерять, при помощи, дополнительно размещаемого в измеряемом объеме, деформационного преобразователя давления газа, градуировочная характеристика которого от рода газа не зависит.

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STRUCTURING OF WATER CLUSTERS UNDER THE SOLAR INFLUENCE AND THEIR COPYING BY BULK WATER. INFLUENCE OF THE SUN ON THE NIGHT SIDE OF THE EARTH

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Even 0.02% water in acetonitrile can form clusters, the size and chemical reactivity of which can change under the influence of the Sun. Bulk water added to such acetonitrile can copy and reproduce these original clusters and acquire different hydrolytic activities depending on the size of the copied clusters. As a result, the rate of hydrolytic reactions with the added water can vary greatly depending on where the acetonitrile was located before the reaction – outdoors, inside buildings or underground. [1]

The influence of the Sun is accounted for by the decomposition of water clusters by muons, which are generated in the upper atmosphere by the solar wind. Due to the anisotropy of the muon flux the rate of hydrolysis depends on the geometry of the reaction solution, its position in space and constantly changes during the day depending on the position of the Sun in the sky. [2]

For example, at noon, when the Sun is at its zenith, the rates of this reaction in three 5-mm NMR-tubes directed North-South, East-West and Vertically are considerably higher in the horizontal tubes, and at sunrise and sunset when the Sun shines along the East-West line the rate is higher in the vertical tube.

It was logical to assume that at night when the Sun irradiates the opposite side of the Earth, this phenomenon should disappear, and the reaction rates should be the same in all differently directed tubes. However, experiments carried out at midnight did not confirm this and gave the same results as at noon. In the vertical tube, the rate is significantly less than in the horizontal tubes. The same distribution of triethyl phosphite hydrolysis rates in multidirectional tubes day and night allows us to conclude that on the night side of the Earth the influence of the Sun is inducing the appearance of some radiation vertically from underground. The mechanism of the solar influence at night requires a detailed comprehensive study. Measuring the rate of hydrolysis of triethyl phosphite in acetonitrile in multidirectional 5mm NMR-tubes at different locations on Earth at different latitudes may help to explain this fundamental phenomenon, which is important for biological, chemical, physical and environmental research.

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THE USE OF FLOATING MULTICHANNEL ELECTRODES FOR MONITORING THE ELECTRICAL ACTIVITY OF THE MYOCARDIUM

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Introduction: The development of novel drugs necessitates meticulous monitoring of various critical aspects to mitigate the risk of cardiovascular complications. Researchers must consider a plethora of targets ranging from the molecular level of ionic channels to the systemic effects of novel compounds. Employing techniques of different scales, such as electrocardiogram (ECG) recordings and field potential recordings of cardiomyocytes with implanted electrodes, presents a challenging yet rewarding approach. This design can yield comprehensive insights into the state of cardiomyocytes within the heart chambers and the heart as a whole. By conducting measurements under conditions where other organs remain intact, researchers can assess the systemic effects of compounds and anticipate or confirm adverse effects during preclinical research. Moreover, this setup provides an opportunity for additional interventions and the simultaneous monitoring of other parameters in the same animal. Material and Methods: Xenopus frogs were utilized for the experiment. The animals were anesthetized with diethyl ether and decapitated. Following the opening of the thoracic cavity, the intact heart was exposed. Recordings were carried out under constant temperature conditions of 20°C within a Faraday cage. Four two-channel tungsten wire electrodes (diameter = 25 µm) were employed to record the electrical activity of the ventricular myocardium in an intact heart. To capture data from various locations, eight microelectrodes were arranged in four groups in a cross-like configuration. The electrode's design facilitated both rigid fixation to a micromanipulator and additional fixation to a holding frame with an electromagnet. After precise electrode positioning and implantation in myocardial tissue, it transitioned from rigid to floating mode, preventing microelectrode deformation, heart tissue damage, and improving the signal-to-noise ratio. This electrode construction is suitable for long-term recordings, drug administration, and

electrostimulation. Results: ECG recordings allowed clear detection of P-waves and R-waves, enabling the calculation of R-R intervals and heart rate. Field potential recordings yielded three distinct complexes, two of which coincided with P and Q waves. Conclusion: The proposed electrophysiological setup with floating multichannel electrodes enables rapid, efficient, and cost-effective evaluation of myocardial state during pharmacological interventions. The technique was validated using standard pharmacological drugs with well-known mechanisms of action. Field potentials from the intact heart were successfully recorded, and key myocardial parameters were calculated and analyzed. This technique facilitates the assessment of myocardial profiles during the preclinical stage of novel drug development, as well as during the action of various factors such as electrical, chemical, or genetic stimuli. Additionally, this method could be employed for parallel recordings of different organs and organ systems within a single animal.

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EFFECT OF TRAINING DATA CHANGING STEP AND INPUT VECTOR EXCESSIVE DIMENSION OF A NEURAL NETWORK ON APPROXIMATION ACCURACY. LOAD CALCULATION OF A UNSTABLE COMMUNICATION LINE

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Machine learning and neural networks are increasingly use in various areas activities. Artificial neural networks, including on superconducting elements [1], have qualities that are absent in computers with the von Neumann architecture. Such qualities, in particular, are the capability to training and generalization, tolerance to errors, parallelism of work. The machine and especially deep learning do not have a powerful mathematical platform and are based almost exclusively on engineering solutions. It is a practical discipline in which ideas are often proven empirically rather than theoretically [2].

One of the applications of neural networks are the approximation or regression tasks. The calculation of a resistive sensor as the load of an unstable communication line is the example of this task. Used a feedforward neural network is trained by input and target data [2, 3]. Such data are calculated from a mathematical model of the communication line in the form of a resistive two-port with some type of change step of the load and line parameters. Usually or by default, the values of the changing parameters are set with some constant or regular step. According to the well-known practice of solving the overfitting problem, data are usually split into training, validation, and test sets. As the result of training, small mean squared error values for these sets are achieved. Subsequent simulations for an extended control data were to confirm the calculation accuracy of this trained network. But, as it turned out, there were large variations in relative error values for individual data.

The initial researches of two-port with stable parameters have shown that it is all about the input and target data generation [4]. On the one hand, a given step of changing parameters is present in the training, validation, and test sets and the neural network reveals this internal pattern. Therefore, the small mean squared errors are obtained. On the other hand, if the control data uses the same type of change step, small relative error values for the entire data set are also obtained. But, if the control data with a different type of step, relative errors immediately appear.

Therefore, for a two–port with one unstable parameter, the training data generation is carried out by combining data with both regular and irregular steps of changing parameters [5]. Hence, in these three sets, this internal pattern is excluded and the network shows the capability to generalization by presented numerical experiments.

The presented study considers the two–port circuit with all the unstable three elements as r0, r1, r10 in Fig.1. The equation *I*0(*RL*) has the known fractionally linear view

$$I0(RL) = V0\frac{RL + r1 + r10}{RL(r0 + r10) + r0(r1 + r10) + r1r10} = \frac{a1RL + a2}{a3RL + 1}.$$

In turn, the load values are calculated from the measured input current by the inverse equation

$$RL(I0) = \frac{b1I0 + b2}{b3I0 + 1}$$

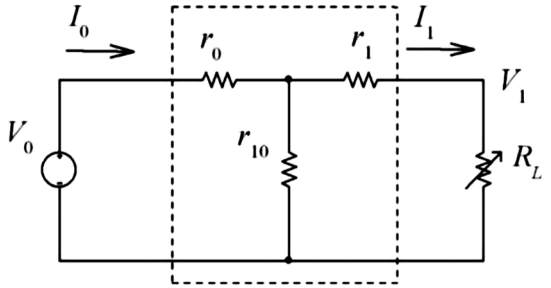

Fig. 1. Two-port with a load resistor RL

Parameters of this two–port are possible determined by known measurement methods [6]. In this case, three measurements are made with three values of the base load and the system of equations with three unknown *b*1, *b*2, *b*3 is solved. But for unstable elements, the redefine line parameters takes time and complicates this calculation method.

An attractive side of using a neural network is the ability to immediately put all the changes of circuit elements and loads into training data. The corresponding calculated set of input currents forms the input vector of four components, and the measuring load values are the target vector. Conducted numerical experiments with neural network training and verification on extended control data showed unsatisfactory results.

In turn, the use of already excessive four basic load values radically increase the capability to generalization of the network, provides the necessary accuracy on a much smaller size of training data. In this case, the input vector contains five elements.

The study was supported by the Project «Nanostructures and advanced materials for implementation in spintronics, thermoelectricity and optoelectronics» no. 020201.

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