



Academy of Sciences of Moldova

Section of Exact and Engineering  
Sciences

# Research fields

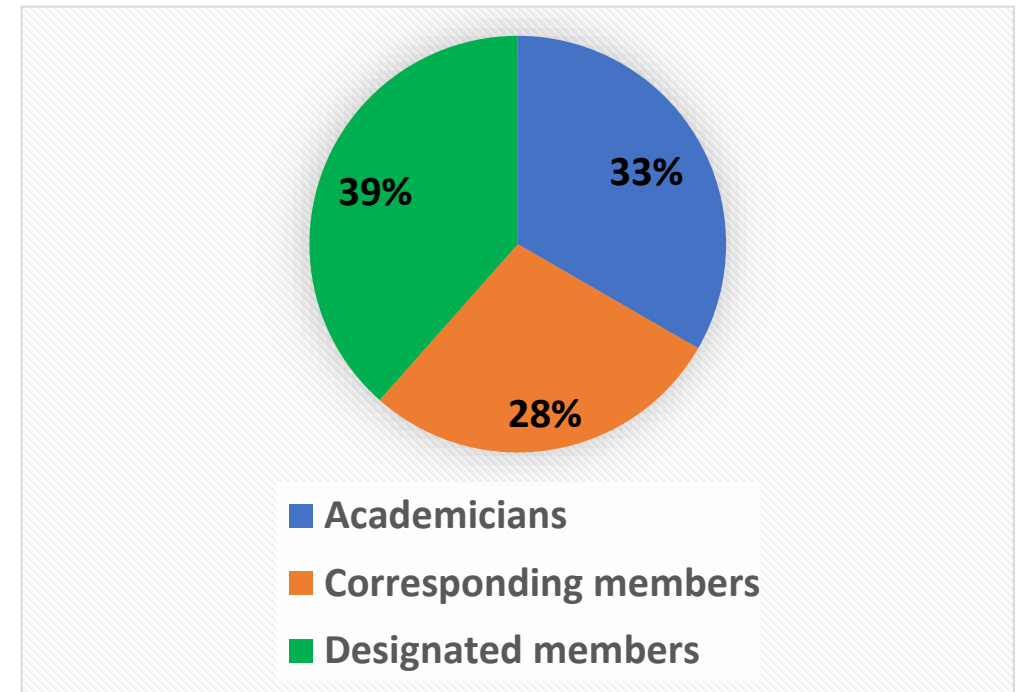
- Physics
- Material Science
- Chemistry
- Mathematics
- Computer Science
- Engineering Sciences
  - Geology and Seismology
  - Energetics etc.

# Main institutions

- Moldova State University (4 research institutions);
- Technical University of Moldova (2 research institutions, 3 research centers);
- “Ion Creangă” State Pedagogical University of Chişinău (2 faculties);
- "Alecu Russo" State University of Bălţi (1 faculty).



- 13 academicians (full members)
- 11 corresponding members
- 15 designated members (PhD and Dr.Hab.)
- In 2023, 44 projects were running on the section research fields



Public hearings of reports on research projects

# Journals indexed in Web of Science and/or Scopus

- Chemistry Journal of Moldova
- Buletinul Academiei de Științe a Republicii Moldova.  
Matematica
- Computer Science Journal of Moldova
- Quasigroups and Related Systems
- Surface Engineering and Applied Electrochemistry
- Problemele Energeticii Regionale

# Conferences

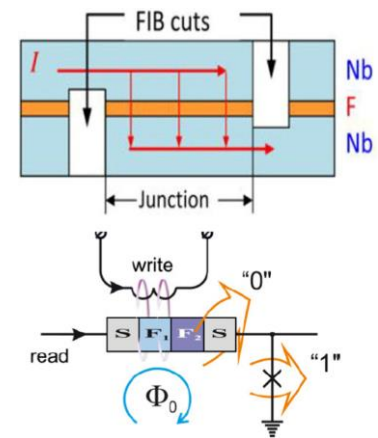
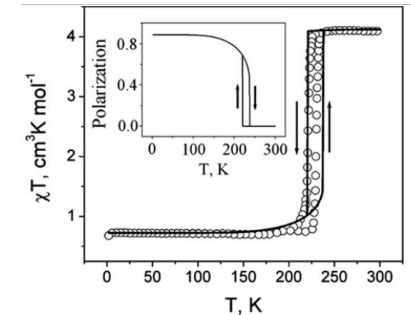
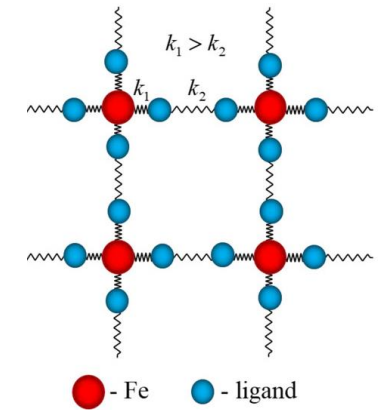
- International Conference on Materials Science and Condensed Matter Physics (next 10<sup>th</sup> edition: October 1-4, 2024, Chişinău, Republic of Moldova)
- International Conference on Ecological & Environmental Chemistry (7<sup>th</sup> edition held in March 3-4, 2022, Chişinău, Republic of Moldova)
- International Conference on Nanotechnologies and Biomedical Engineering (next 7<sup>th</sup> edition: October 7-10, 2025, Chişinău, Republic of Moldova)
- Workshop on Intelligent Information Systems (4<sup>th</sup> edition held in October 19-21, 2023, Chişinău, Republic of Moldova)
- International Conference dedicated to the 60<sup>th</sup> anniversary of the foundation of Vladimir Andrunachievici Institute of Mathematics and Computer Science (announced edition: October 10-13, 2024, Chişinău, Republic of Moldova)
- Innovative Manufacturing Engineering & Energy, (the 27<sup>th</sup> edition held in October 12-14, 2023, Chişinău, Republic of Moldova, the next 28<sup>th</sup> edition will be organized by the National Technical University of Athens, October 24-25th, 2024)
- International Conference on Electronics, Communications and Computing ECCO 2024: October 17-18, 2024, Republic of Moldova)

# The National program in the fields of research and innovation for the years 2024-2027: Research priorities

- Fundamental research in physics, chemistry, and mathematics;
- Innovative technologies and products;
- Nanotechnologies and smart materials;
- Secure energy and energy-efficient technologies;
- Information technology, communications, and digital development.

# Main scientific directions: Physics

- Technology and physics of layered crystals, exfoliated lamellas, and two-dimensional (2D) films of transition metal dichalcogenides  $\text{TX}_2$  ( $\text{T}=\text{Mo}, \text{W}$ ;  $\text{X}=\text{S}, \text{Se}$ ), pure and intercalated with halogen molecules.
- Physics of molecular systems with labile electronic states manifesting spin transitions under external action.
- Technology and physics of Josephson junctions based on superconductor/ferromagnet/superconductor (S/F/S) structures.
- Theory and applications of multi-section semiconductor lasers.
- Diffractive optics for optical and digital holography.



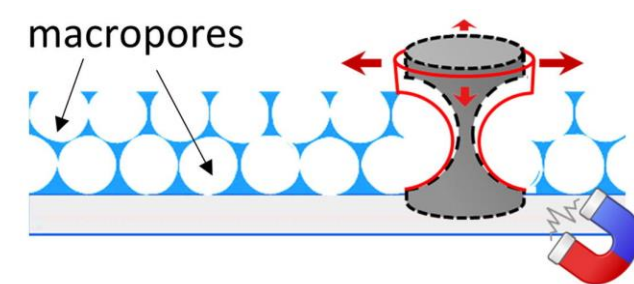
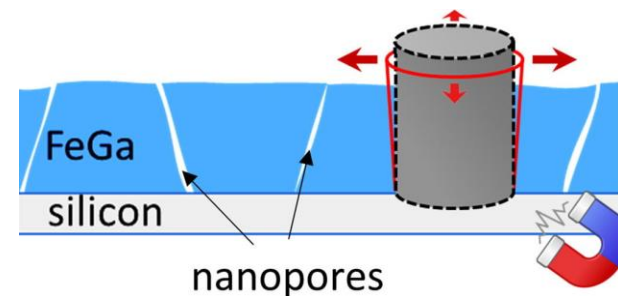
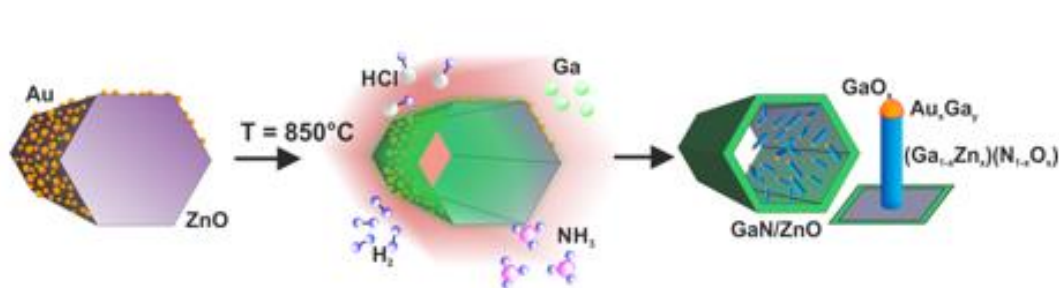


# Proposals for cooperation

- Development of van der Waals heterojunctions on the basis of layered crystals, investigation of their optical, photoelectrical, and electrophysical properties for practical applications, particularly for the elaboration of field effect transistor biosensors.
- Development of dinuclear, trinuclear, and tetranuclear complexes, investigation of their magnetic properties, electron transfer phenomena, spin crossover, and formulation of recommendations for their practical applications in spintronic, optoelectronic, and nanoelectronics devices and single-molecule magnets.
- Fabrication and investigation of spin valves on S/F/S Josephson junctions, and development of memory elements, prototypes of artificial neurons and neuronal networks on their basis.
- Development of semiconductor lasers with various topology with active medium based on quantum wells and quantum dots and investigation of their nonlinear dynamics for various applications.
- Development of diffractive optics elements for digital interferometry, holography and microscopy.

# Main scientific directions: Materials Science

- Materials science of binary, ternary, and alloyed semiconductor compounds; technologies for preparation of device structures on their basis, and basic principles of operation of electronic, spintronic and optoelectronic devices.
- Basic concepts for application of chemical and electrochemical technologies for the preparation of nanostructured semiconductor materials with high-surface-to-volume ratio architectures.
- Basic concepts for preparation and materials science of hybrid nanocomposite materials consisting of semiconductor, polymer and metallic components.
- Physics and chemistry of coatings with enhanced tribological, anticorrosive, and catalyst properties.

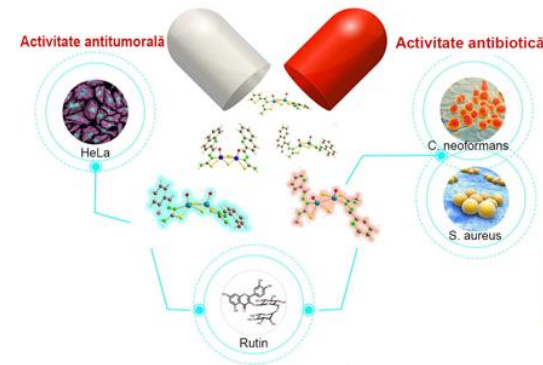


# Proposals for cooperation

- Growth and characterization of binary (III-V, II-VI etc.) and ternary semiconductor compounds as well as of their alloys and development of electronic, spintronic and optoelectronic device structures on their basis;
- Nanostructuring of semiconductor materials using chemical and electrochemical technologies for the preparation of high-surface-to-volume ratio architectures for sensor, photocatalytic, photovoltaic, biomedical and battery applications;
- Fabrication and characterization of nanocomposites based on hybrid materials consisting of semiconductor, polymer and metallic components for photonic and optoelectronic applications.
- Electrochemical and electrospark synthesis of coatings with enhanced tribological, anticorrosive, and catalytic properties.

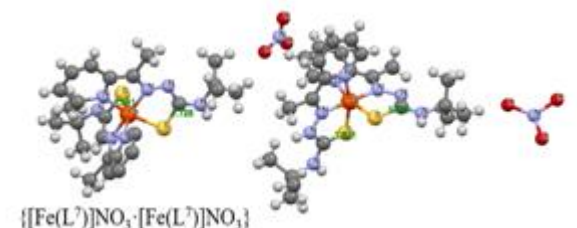
# Main scientific directions: Chemistry

- Development of new chemicals with antiviral, antibacterial, antifungal, anticancer, antioxidant, growth-promoting, etc. properties for applications in disease treatment, pharmaceuticals, animal husbandry and agriculture;
- Adsorbent, catalytic, and photocatalytic materials and substances for the degradation of organic and inorganic pollutants, for applications in environmental protection, wastewater treatment, groundwater and surface water purification, etc.;
- Physico-chemical mechanisms of electron transfer redox processes involved in vital, technological, and environmental systems.



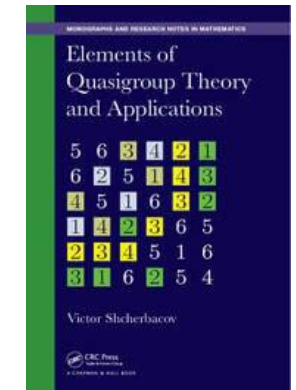
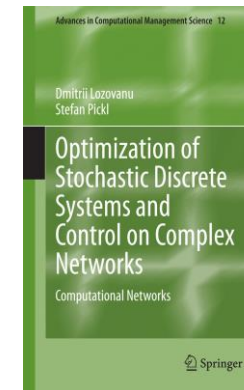
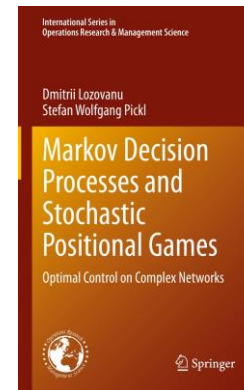
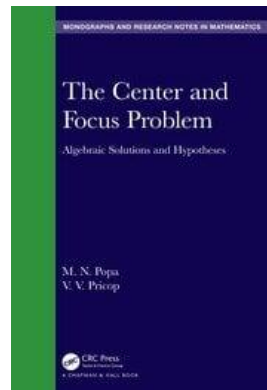
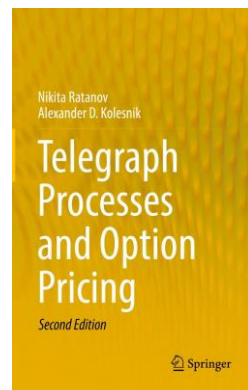
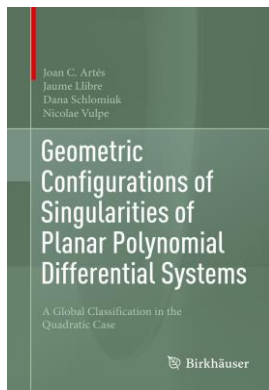
# Proposals for cooperation

- Molecular design, development, and analysis of pharmaceuticals and food products;
- Synthesis and study of new materials based on coordination compounds with polyfunctional ligands and with useful properties in medicine, biology, and technology;
- Synthesis of new carbon adsorbents from autochthonous raw material and catalysts based on activated carbons;
- The elaboration of innovative adsorption and catalytic technologies for the potability of natural waters. Optimization of treatment processes used in biological stations (WWTP) for wastewater purification.



# Main scientific directions: Mathematics

- The qualitative study of differential equations. Method of algebraic invariants;
- Theory of quasigroups and its applications in cryptography;
- Mathematical modeling of deterministic and stochastic dynamical processes.

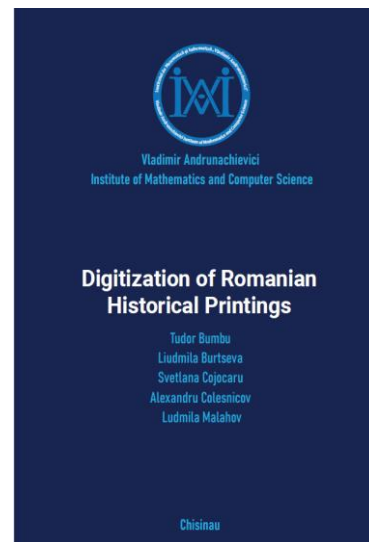


# Proposals for cooperation

- Development of the theory of quasigroups and non-associative systems with different identities and their application for information encryption;
- Investigation of polynomial systems of differential equations by applying the methods of the qualitative theory of differential equations as well as the methods of algebraic invariants of systems of differential equations;
- Studying and solving stochastic dynamic decision problems that extend and generalize the discrete Markov decision processes, telegraph processes (diffusion processes), and optimal control problems on dynamic networks.

# Main scientific directions: Computer Science

- Formal models of computations. Natural computing.
- Decision support systems (in medicine).
- Natural Language Processing (with application to Romanian).
- Application of technologies based on Augmented, Mixed and Virtual Reality in education.





## Proposals for cooperation

- E-learning systems as additional tools for acquiring and deepening knowledge for all groups of the population throughout life;
- Intelligent medical information systems and applications to support medical staff in diagnosis, personalized treatment, and prediction of patient's condition;
- Artificial intelligence-based application systems for cultural heritage enhancement and digitization.

# Main scientific directions: Geology and Seismology

- Regional geology. Analysis of the composition of remains of faunal complexes and development of paleogeographic scheme in the territory of the Republic of Moldova.
- Geological surveys and establishment of stratigraphic nomenclature in the territory of the Republic of Moldova; correlations of the local stratigraphic units with the geological time scale.
- Seismic survey of the territory of the Republic of Moldova, production of macroseismic maps, and investigation of the focal seismic mechanism.
- Nuclear geophysics. Water isotopes in the critical zone.

# Proposals for cooperation

- Environment radioactivity;
- Nuclear geochronology;
- Ground water dynamics;
- Sustainable using of mineral resources;
- Increasing of regulation in field of mining and use of mineral resources;
- Geohazards evaluation.

# Main scientific directions: Energetics

- Energy transition – Republic of Moldova assumed to reach climate neutrality in 2050. In this regard, most of researches are related to development of clean technologies and integration of renewable energy sources.
- Energy efficiency first – the moto of the Ministry of Energy. In this regard researches are directed to develop technical solutions for increase energy efficiency in industry and residential sector
- Switching to consumption of electricity – is main priority for our country. In this regard researches are directed to the modeling of different scenarios how to better replace fuels with clean electricity in all economic sectors, including heating which share in demand is around 50%.

# Proposals for cooperation

- Integration of renewable energy sources in the district heating systems;
- Deployment of heat pumps both in residential sector and district heating;
- Electricity storage systems (best solutions for deployment);
- Smart energy communities (best solutions depending on energy demand and type of activity).

# Contacts

Section of Exact and Engineering Sciences

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