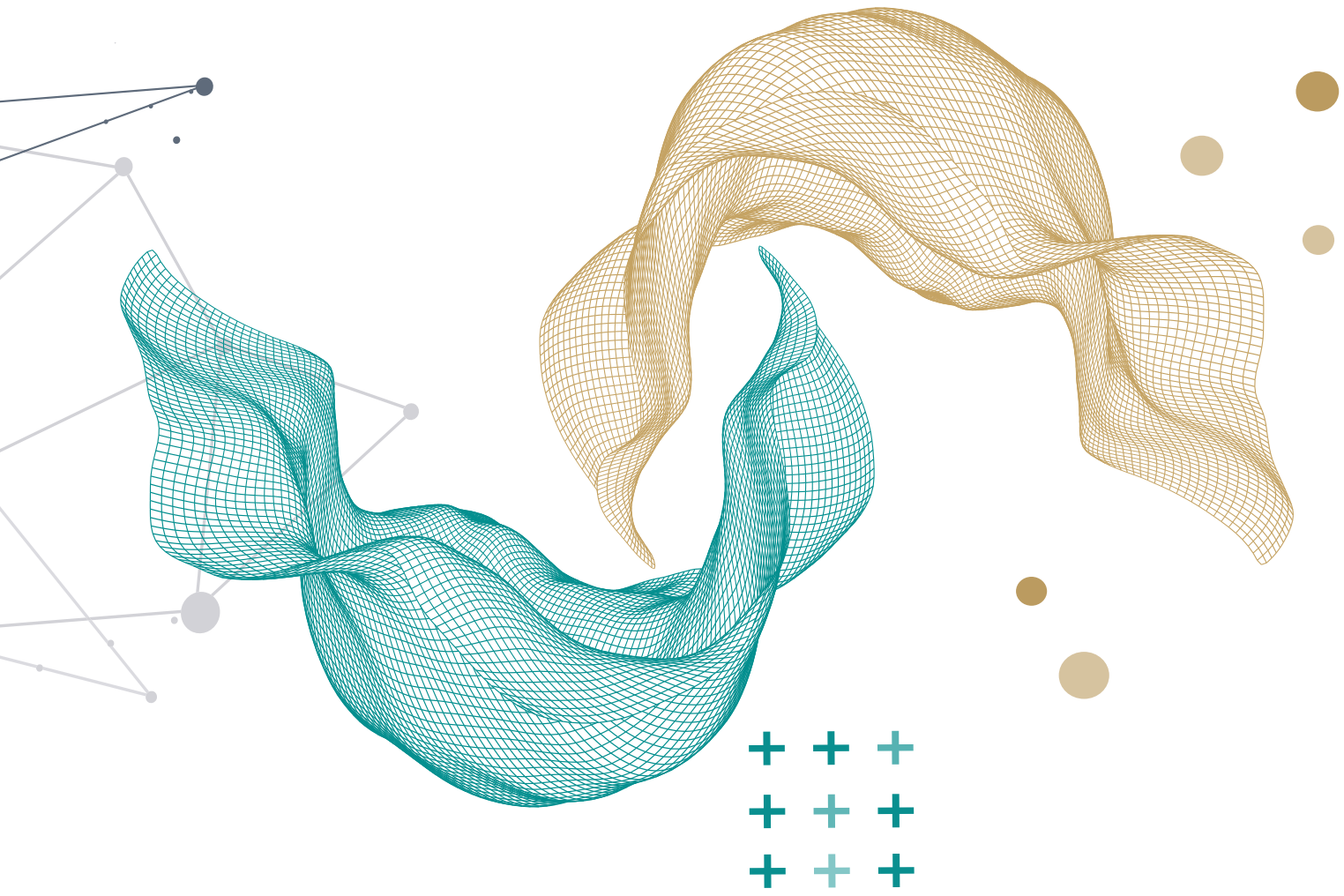
ČASOPIJS '24



The Jožef Stefan Institute in 2024

JSI in numbers • Scientific Excellence • Awards and Recognitions • Science and Art • JSI for Society

The Institute in Numbers

5
locations

1,263
employees*

838
researchers*

835
young researchers***

243
faculty members who are lecturers**

*Data collected on 31. 12. 2024
**Data are for 2024
***Data for 2000–2024

Staff

1,263

Number of employees by gender and area of activity

39 % female

61 % male

66 % researcher

33 % 67 %

34 % support staff

52 % 48 %

838 researchers

from **48** different countries

77 % local staff

23 % international staff

Main areas of research

Physics, nuclear engineering and energy

- Theoretical physics
- Low and medium energy physics
- Thin films and surfaces
- Surface technology
- Solid state physics
- Gas electronics
- Complex matter
- Reactor physics
- Experimental particle physics
- Reactor technology

10 departments

Electronics and information technologies

- Automation, biocybernetics and robotics
- Systems and control
- Artificial intelligence
- Open systems and networks
- Communication systems
- Knowledge technologies
- Intelligent systems

8 departments

Chemistry, biochemistry, materials and environment

- Biochemistry, molecular and structural biology
- Molecular and biomedical sciences
- Biotechnology
- Inorganic chemistry and technology
- Physical and organic chemistry
- Electronic ceramics
- Nanostructured materials
- Synthesis of materials
- Advanced materials
- Environmental sciences

10 departments

838

researchers divided by scientific fields, **27** female researchers and **36** male researchers are employed in centres and technical services
the other 775 researchers are employed in research departments

41 %
researchers are employed in the field of Physics, nuclear engineering and energy

23 % 77 %

26 %
researchers are employed in the field of Electronics and Information Technologies

23 % 77 %

33 %
researchers are employed in the field of Chemistry, biochemistry, materials and environment

54 % 46 %

SCIENTIFIC EXCELLENCE through ERC projects

European Research Council

Total
13
ERC projects

Andrii Tykhonov	**2024**	**PeVGALAXY**
Matjaž Humar	**2024**	**SoftQuanta**
Matjaž Humar	**2024**	**EdibleLasers**
Dragan Mihailović	**2023**	**HIMMS**
Lev Vidmar	**2023**	**Boundary**
Zala Lenarčič	**2022**	**DrumS**
Peter Križan	**2022**	**CherPET**
Matic Lozinšek	**2020**	**HiPeR-F**
Igor Muševič	**2019**	**LOGOS**
Peter Križan	**2019**	**FAIME**
Matjaž Humar	**2019**	**Cell-Lasers**
Dragan Mihailović	**2017**	**Umem4QC**
Dragan Mihailović	**2012**	**Trajectory**

Hidden Metastable Mesoscopic States in Quantum Materials by Prof. Dr Dragan Mihailović

The head of the Department of Complex Matter Prof. Dr Dragan Mihailović successfully won an ERC Advanced Grant for his five-year project entitled Hidden Metastable Mesoscopic States in Quantum Materials worth €2.5 million. This is Dr Mihailović's second ERC research project and his third ERC grant overall. The project team will be studying the dynamics of electronic arrangements in quantum systems on an as of yet unexamined temporal level. The research team led by Prof. Mihailović has an ambitious plan to develop new methods that enable imaging of the movement of individual electrons with exceptional atomic spatial and temporal resolution – 0.000,000,000,002 seconds or two picoseconds. "We are trying to create a sort of video camera that can record with an atomic resolution and a shutter speed of two picoseconds," explained prof. Mihailović.

Edible Lasers and Soft Quantum Light Sources by Dr Matjaž Humar

Asisst. Prof. Dr Matjaž Humar from Humar Lab and the Department of Condensed Matter Physics was awarded two ERC project grants in 2024. Following his Starting ERC grant for talented early-career scientists in 2019, he has been granted the ERC Proof of Concept Grant. The goal of the newly granted EdibleLasers project is to build lasers made entirely of biocompatible and living materials for use as sensors in food, medicines and other applications. This is a virtually unexplored research field with extensive application opportunities, as these lasers enable very precise measurements of food characteristics, which will contribute to food quality and safety. Humar has also been granted a second ERC grant, his third in total. The goal of the SoftQuanta – Soft and Biological Quantum Light Sources project is to develop unprecedented quantum light sources in soft and biological matter based on liquid crystals. In other words, the project envisions the creation of a quantum LCD, with the potential to radically transform the field of quantum optics.

PeVGALAXY by Dr Andrii Tykhonov

Dr Andrii Tykhonov, a Ukraine-born astrophysicist who received his PhD in Slovenia, has been granted an ERC grant for his research project Direct PeV Detection of Galactic Cosmic Rays in Space (PeVGALAXY) worth €2 million. This is Tykhonov's second ERC research grant and its aim is to accurately detect for the first time cosmic rays in space at the highest energy levels, which will allow scientists to pinpoint the origin of the most powerful stellar explosions in our galaxy.

SCIENTIFIC EXCELLENCE
through Publications in International Scientific Journals

Total
1,060+
publications

Publication of JSI articles in top scientific journals (Elsevier CiteScore)

69 %
articles in **the top 25%** of scientific journals

40 %
articles in **the top 10%** of scientific journals

17 %
articles in **the top 5%** of scientific journals

3 %
articles in **the top 1%** of scientific journals

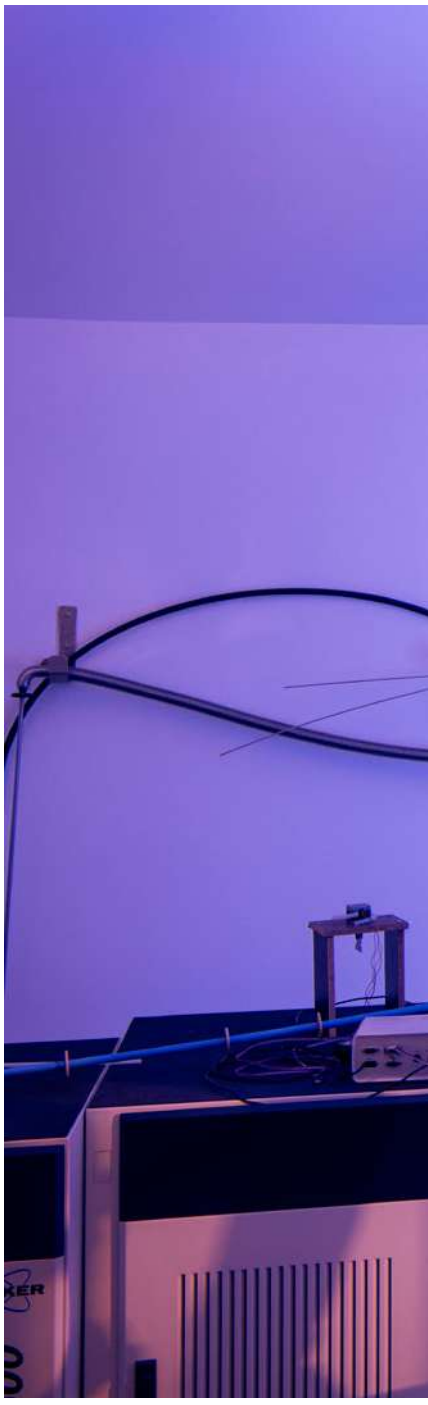
**Data are for 2024, data acquisition 16. 01. 2025, Source: SciVal

Publication of JSI articles in top scientific journals (Web of Science)

60.751
citations of all JSI articles

1.069
number of published JSI articles

**Data are for 2024




BRUKER
ULTRASHIELD™
500 WB PLUS

Physics, nuclear engineering and energy

10
departments

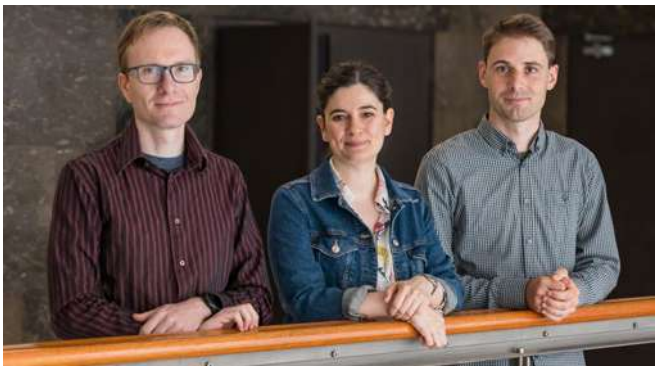
- Theoretical physics
- Low and medium energy physics
- Thin films and surfaces
- Surface technology
- Solid state physics
- Gas electronics
- Complex matter
- Reactor physics
- Experimental particle physics
- Reactor technology

41 %
researchers are employed in the field of Physics, nuclear engineering and energy

Articles in Journals with Impact Factor over 17 and High-Profile International Events

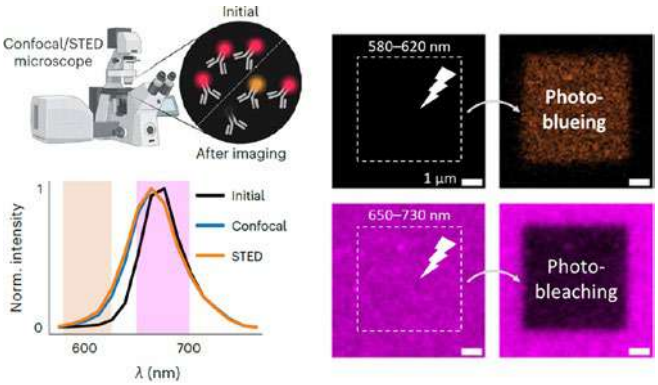
Kavčič, Humar and Sebastián Ugarteche Pioneer Entangled Photons in Liquid Crystals

Aljaž Kavčič and Doc. Dr Matjaž Humar from the Laboratory for Biological and Soft Photonics at the Department of Condensed Matter Physics and the Faculty of Mathematics and Physics of the University of Ljubljana and Dr Nerea Sebastián Ugarteche from the Department of Complex Matter collaborated with colleagues from the Max-Planck Institute for the Science of Light to publish an article in Nature entitled Tuneable Entangled Photon Pair Generation in a Liquid Crystal. They are the first to present the formation of entangled photons in liquid crystals, pioneering the demonstration of this process in organic matter. In addition to the fact that the efficiency of entangled photon generation in liquid crystals is comparable to the best existing sources, their main advantage lies in the tunability of the state of photon pairs. This tunability can be achieved by applying an electric field or by arranging the liquid crystal molecules into the appropriate configuration. The ability to tune the quantum state indicates significant practical potential for numerous quantum technologies. The article has also been covered by NewScientist.



Combining STED Microscopy and a Spectral Detector for New Findings

Doc. Dr Iztok Urbančič and Dr Boštjan Kokot from the Laboratory of Biophysics at the Department of Condensed Matter Physics have collaborated with colleagues from the Institute for Applied Optics and Biophysics (Jena, Germany) to publish an article in Nature Methods entitled Effects and Avoidance of Photoconversion-Induced Artifacts in Confocal and STED Microscopy. Fluorescence microscopy is limited by photoconversion due to continuous illumination, which results in not only photobleaching but also the conversion of fluorescent molecules into species of different spectral properties through photoblueing. The authors have shown in the article that high laser powers in fluorescence microscopy should be used with care; besides the well-known photobleaching, the dye's emission spectrum can shift towards lower wavelengths (photoblueing). The fluorescence signal is consequently detected in another spectral channel attributed to another dye, possibly leading to erroneous experimental conclusions. The characterization of this phenomenon was made possible by a unique combination of a STED microscope equipped with a spectral detector, implemented at JSI.

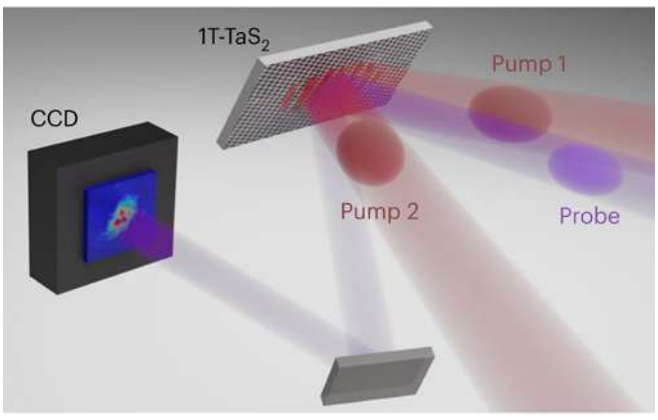


Leading Global Experts in New Ferroelectric Soft Matter Materials Converge

The groups Light & Matter and Physics of Soft and Partially Ordered Matter at the Faculty of Mathematics and Physics of the University of Ljubljana organized an international expert meeting in Ljubljana on the emerging field of new ferroelectric soft matter materials entitled Workshop on Ferroelectric Nematic Liquid Crystals, which was held in the main lecture hall at JSI from 29 to 31 May 2024. The event was attended by some of the world's leading researchers in this field, highlighting the excellence of the research conducted at JSI and UL FMF. Although the idea of a ferroelectric 3D liquid was first theoretically conceptualized over a hundred years ago, it was not until very recently that it was experimentally realized. The uniqueness of ferroelectric nematic liquid crystals (FNLC) has been widely recognized, as demonstrated by the large collective research effort that followed their recent discovery. By organizing this workshop, the groups at JSI and FMF aim to contribute to knowledge exchange and collaborative opportunities in this rapidly advancing and dynamic research area.

Researchers at JSI Develop the First Tunable Light Modulator

A group of physicists including Dr Igor Vaskivskyi, Dr Anže Mraz and Dr Rok Venturini from the Department of Condensed Matter Physics collaborated with colleagues from Italy to discover the first tunable light modulator that is able to function in extreme ultraviolet and x-ray spectral ranges. After the first research a decade ago revealed the material's unique properties, the latest published article in Nature Photonics best summarized the past decade of research and set a new foundation for new uses in technology, chip production and science. The device is based on photoinduced phase transitions into so-called hidden states in the single-crystalline 1T-TaS_2. The structure is imprinted on a sub-picosecond timescale using EUV laser pulses and acts as a high-efficiency diffraction grating that deflects EUV or soft X-ray light. The imprinted grating does not damage the crystal but is extremely stable and does not require an external energy source. The device is most promising for a wide array of scientific and technological applications. Most encouraging is its potential use in the production of complex electronic chips with nanometre-sized elements.

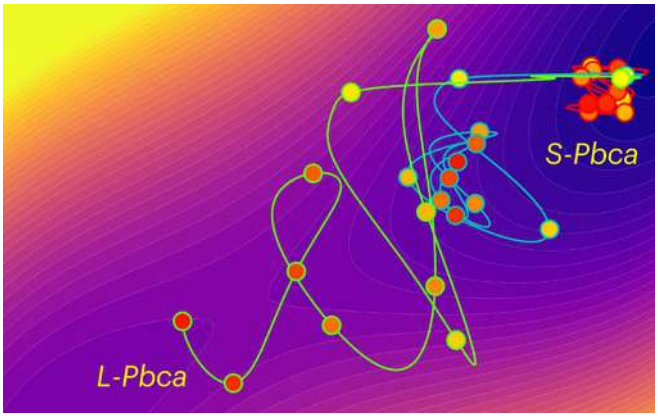


Launch of the New KATANA Experiment Device

On 3 June 2024, the new KATANA experimental device was launched at TRIGA. It is a water activation loop facility that enables scientists to run a number of experiments involving activated water and calibrate gamma ray signal detectors, as well as run experimental validations of the calculation methodologies and computer programmes used to model temporally- and spatially-dependent radiation sources. In addition, the device will also improve water activation under fusion-relevant conditions and enable material testing for shielding from the ionizing radiation in future fusion reactors. The device was newly developed under the supervision of Prof. Dr Luka Snoj, head of the Reactor Physics Department and the TRIGA reactor, with most of the operational efforts coming from doctoral students Domen Kotnik and Julijan Peric. The international fusion community is thrilled about this globally impactful acquisition and a number of proposals for collaborating in experimental campaigns in the future have already been received. This unique device has placed Slovenia on the map of global research infrastructures that will have a major impact in fusion as a sustainable carbon-free energy source for the future of mankind.

Insulator–Metal Transition in Ca_2RuO_4

Doc. Dr Denis Golež from the Department of Theoretical Physics conducted an experiment with American colleagues from Cornell University and Columbia University to demonstrate how quickly a Ca_2RuO_4 crystal can be transitioned from insulator to metal using an ultrafast laser pulse. The most surprising finding arose during the analysis of the metal phase properties, in which it was determined that the state differed from those in the equilibrium phase diagram. Such exotic states of matter in physics are called hidden states of matter; the new finding was published in Nature Physics. The study's theoretical breakthrough is the correlation between the photoinduced transition and the thermodynamic phase transition. The latter resembles water-ice transition, since it is a first order phase transition, thus enabling capture in the metastable state. The researchers have shown that the analogy with supercooled water can be directly transferred to the insulator-metal transition dynamic, allowing them to observe the transition trajectories from one phase to the other. The finding has opened up a range of materials that could potentially be used for new hidden states of matter. This has motivated Doc. Dr Denis Golež and his colleagues to actively continue researching the topic.

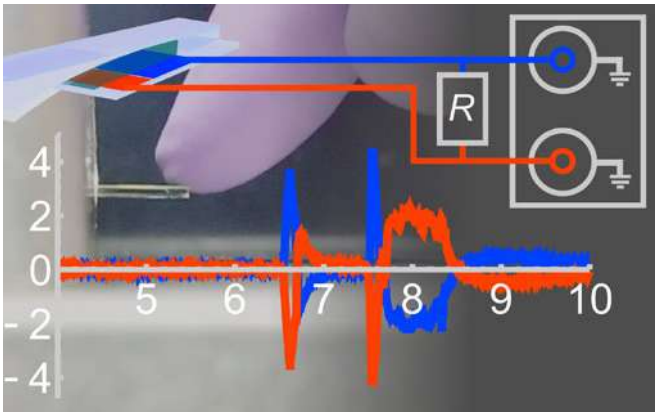


Mechanic Cell Actuation for Changes to Electric Polarization in Nematic Liquid

Colleagues at the Department of Complex Matter Peter Medle Rupnik, Luka Cmok, Nerea Sebastián, and Alenka Mertelj have published a paper in Advanced Functional Materials entitled Viscous Mechano-Electric Response of Ferroelectric Nemanic Liquid. They report on mechano-electric transduction phenomena in ferroelectric liquid at room temperature and demonstrate that the actuation of a cell filled with ferroelectric nematic liquid crystal causes changes in the electric polarisation structure, and consequently electric current is generated. The observed phenomena fundamentally differ from the piezoelectric effect due to their viscous character, i.e. the polarisation changes with flow. This indicates a high technological potential since even a very soft touch leads to electric signals, which depend on the touch strength. Ferroelectric liquids are therefore promising for use in various fields from tactile sensorics to energy harvesting at low actuation frequencies.

Agreements between Slovenia and France to Strengthen the Nuclear Sector

On 13 September 2024, Slovenia and France signed two agreements strengthening the Slovenian and French nuclear sectors and further improving cooperation in the civil uses of nuclear energy. The Jožef Stefan Institute signed a memorandum of understanding with France-based company EDF, a global leader in low-carbon energy, which is active in the production, distribution and supply of energy and energy services. According to JSI director Prof. Dr Boštjan Zalar, the memorandum will allow the Jožef Stefan Institute to access the expertise of EDF in nuclear industry and to promote the development of new projects, including the possible cooperation in the construction of a new research reactor at JSI. The memorandum of understanding was also signed by the International Institute of Nuclear Energy (I2EN) and the University of Maribor with the aim to develop new university programmes on nuclear science and technology, constituting a major step to shore up the university's personnel and technological capabilities.

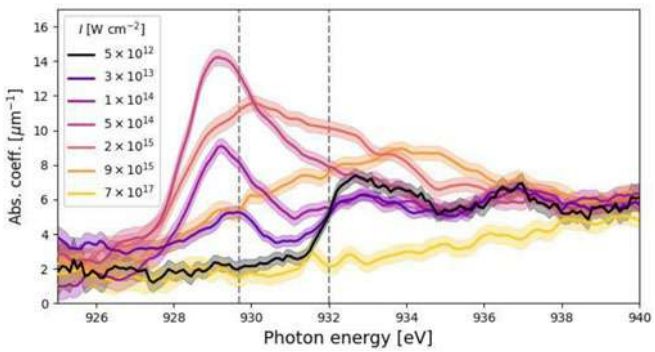


Review Article on European COST Collaboration EUTOPIA on Topological Effects

Remarkable advances in the understanding of topological constraints in biological and soft matter physics in the past few years stimulated the European COST collaboration EUTOPIA to write a comprehensive review paper on topological effects in systems ranging from DNA and genome organization to entangled proteins, polymeric materials, liquid crystals, and theoretical physics. The main aim of the review is to reduce the barriers between different subfields of soft and biological matter that are the consequence of the high specialization of practically all research fields, ranging from physics to chemistry and biology. Simon Čopar, Miha Ravnik, Primož Ziherl and Slobodan Žumer are researchers from the Jožef Stefan Institute and the Faculty of Mathematics and Physics of the University of Ljubljana who participate in the EUTOPIA project; together with other colleagues from the collaboration project, they published a review article entitled *Topology in Soft and Biological Matter* in Physics Reports.

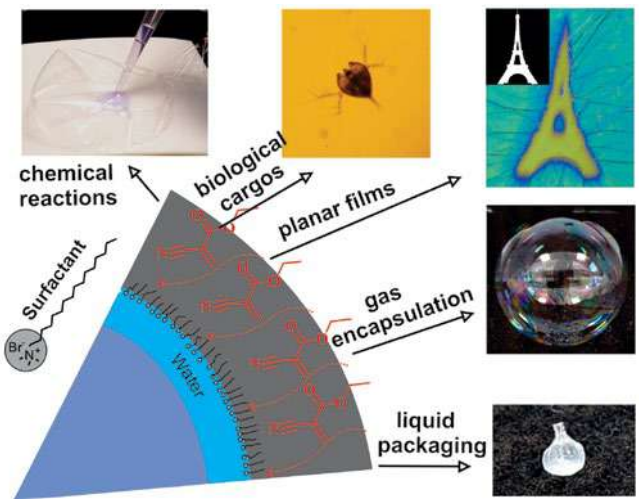
New Findings on Dependence of Absorption on Intensity of Incident X-Ray Light

Researchers from the Department of Low and Medium Energy Physics Dr Špela Krušič and Prof. Dr Matjaž Žitnik took part in the measurements and data analysis of an experiment conducted by an international group of experts at the SCS beamline of the free electron laser facility EuXFEL in Hamburg. They measured the absorption of short pulses (15 fs) of X-ray light with a wavelength of > 1.3 nm when passing through a 100 nm thick copper foil in the vicinity of the L3 edge. The results show an interesting dependence on the intensity of incident light, which is reported in an article published in Nature Physics. Up to 5 TW/cm², the absorption spectrum was the same as already known from previous measurements with weak light, and at higher intensities up to 200 TW/cm², a strong pre-peak appeared due to reversibly saturated absorption into an empty 3d orbital of copper. Above this threshold light intensity, the clear structures around the edge of L3 began to disappear, until they completely disappeared above 100 PW/cm² and practically nothing in the spectrum indicated the position of the L3 edge.



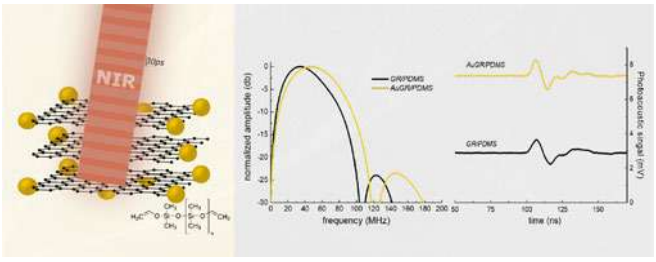
New Process for Water-Based Templating Nanoscale Thin Films

Researchers from the Department of Condensed Matter Physics Dr Venkata. S. R. Jampani, Dr Miha Škarabot and Dr Miha Ravnik in collaboration with colleagues from the Universities of Ljubljana, Sorbonne, Siegen and Luxembourg reported on the synthesis of water-templated nanoscale thin films in an article in Advanced Materials. These films are made from superglue (cyanoacrylate monomers) vapours and grow with a controlled rate of several nanometres per minute. Superglues (cyanoacrylate monomers) are otherwise well-known for their rapid reactivity, forming polycyanoacrylate chains that bond materials instantly. Contrastingly, the modulated polymerization of cyanoacrylates introduced in this report enables the controlled growth of thin polymer films. Furthermore, the shape and colour of the film are precisely controlled by the polymerization kinetics, wetting conditions, and/or exposure to patterned light. This study introduces a simple, versatile and eco-friendly approach analogous to existing chemical vapour deposition techniques. This approach facilitates the creation of water-templated films for gas encapsulation, liquid packaging, and in-situ chemical/biological cargo packaging.



Advantages of Graphene Decorated with Gold Nanoparticles

Researchers Mrzel, Vengust and Drnovšek from the Department of Thin Films and Surfaces and the Department of Complex Matter in collaboration with researchers from the Faculty of Mechanical Engineering of the University of Ljubljana and Coimbra University (Portugal) investigated in the picosecond excitation regime the photoacoustic (PA) response of composite material made of graphene or graphene decorated with gold nanoparticles (AuNP) and polydimethylsiloxane (PDMS). AuNP attached to graphene improve the dispersibility of the flakes in the polymer, increase the surface area in contact with the polymer, and prevent the re-adhesion. All of this leads to a better intercalation of the polymer with the graphene flakes and a more uniform and efficient generation of PA waves. By using picosecond excitation of the graphene-based composite, they measured PA waves with bandwidths of 70 MHz and 130 MHz at -6 dB and -20 dB. The peak pressures of the PA waves achieve values > 5 MPa. The bandwidth can be further increased to values of 85 MHz at -6 dB and 135 MHz at -20 dB by decorating the graphene with AuNP. The results of the research were published in the journal Nano Energy and a EU patent has been granted.



Articles in Journals with Impact Factor over 10

Jaka Vodeb, **Michele Diego**, **Yevhenii Vaskivsky**, **Leonard Logaric**, **Yaroslav Gerasimenko**, **Viktor Kabanov**, Benjamin Lipošek, Marko Topč, **Dragan Mihailović**: *Non-equilibrium quantum domain reconfiguration dynamics in a two-dimensional electronic crystal and a quantum annealer*, Nature Communications

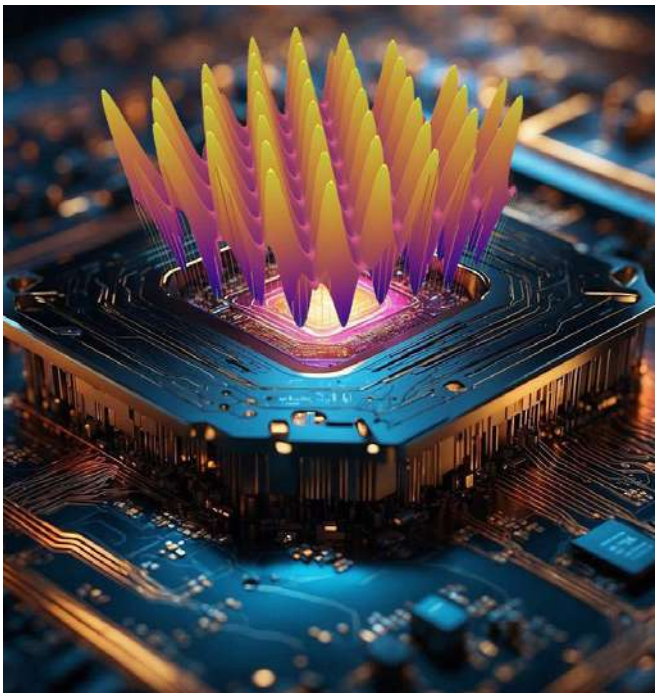
Ava Rajh, Matej Gabrijelčič, Blaž Tratnik, **Klemen Bučar**, **Iztok Arčon** , **Marko Petric**, Robert Dominko, Alen Vizintin, **Matjaž Kavčič**: *Structural and chemical analysis of hard carbon negative electrode for Na-ion battery with X-ray Raman scattering and solid-state NMR spectroscopy*, Carbon

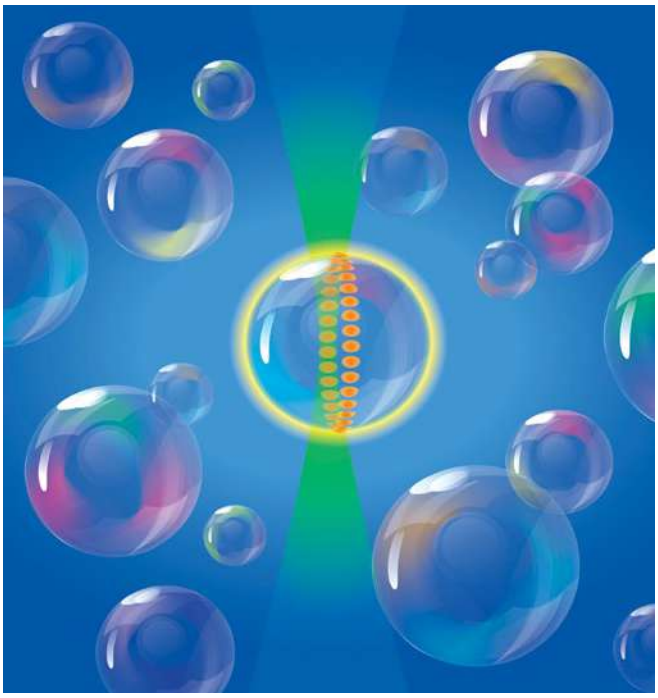
Juan Carlos Estrada Saldaña, **Alexandros Vekris**, **Luka Pavešič**, **Rok Žitko**, Kasper Grove-Rasmussen, Jesper Nygård: *Correlation between two distant quasiparticles in separate superconducting islands mediated by a single spin*, Nature Communications

Elena Tatarova, Ana Dias, Plamen Dankov, Jivko Kissovski, Ana Maria Botelho do Rego, Neli Bundaleska, Edgar Felizardo, Miroslav Abrashev, Ana Maria Ferraria, Thomas Strunskus, **Vasyl Shvalya**, **Neelakandan M. Santhosh**, Ivan Valeriev Ivanov, **Martin Košiček**, **Janez Zavašnik**, Luis Lemos Alves, Bruno Gonçalves, **Uroš Cvelbar**: *Plasma-driven tuning of dielectric permitivity in graphene*, Small

Anna Popkova, **Urška Andrenšek**, Sophie Pagnotta, **Primož Ziherl**, **Matej Krajnc** in Matteo Rauzi: *A mechanical wave travels along a genetic guide to drive the formation of an epithelial furrow during Drosophila gastrulation*, Development Cell

Zala Korenjak in **Matjaž Humar**: *Smectic and soap bubble optofluidic lasers*, Physical Review X

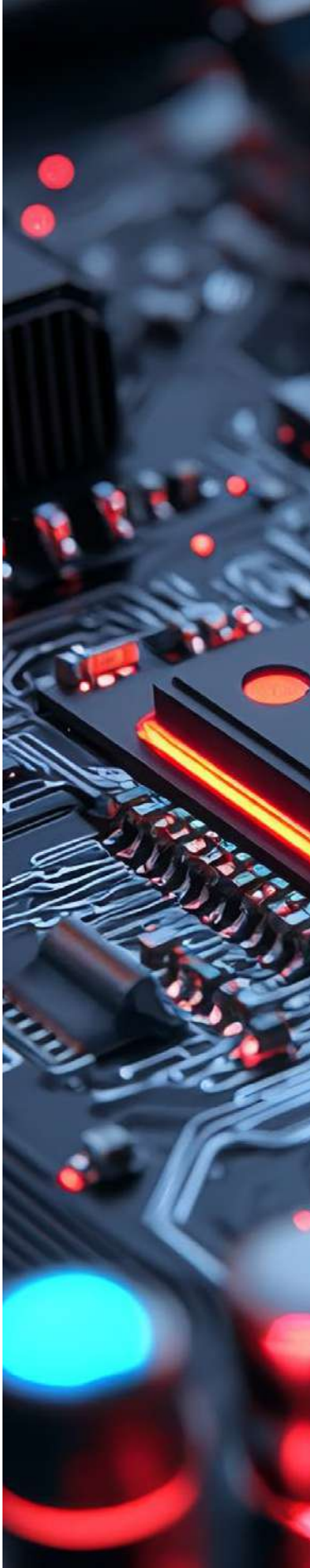


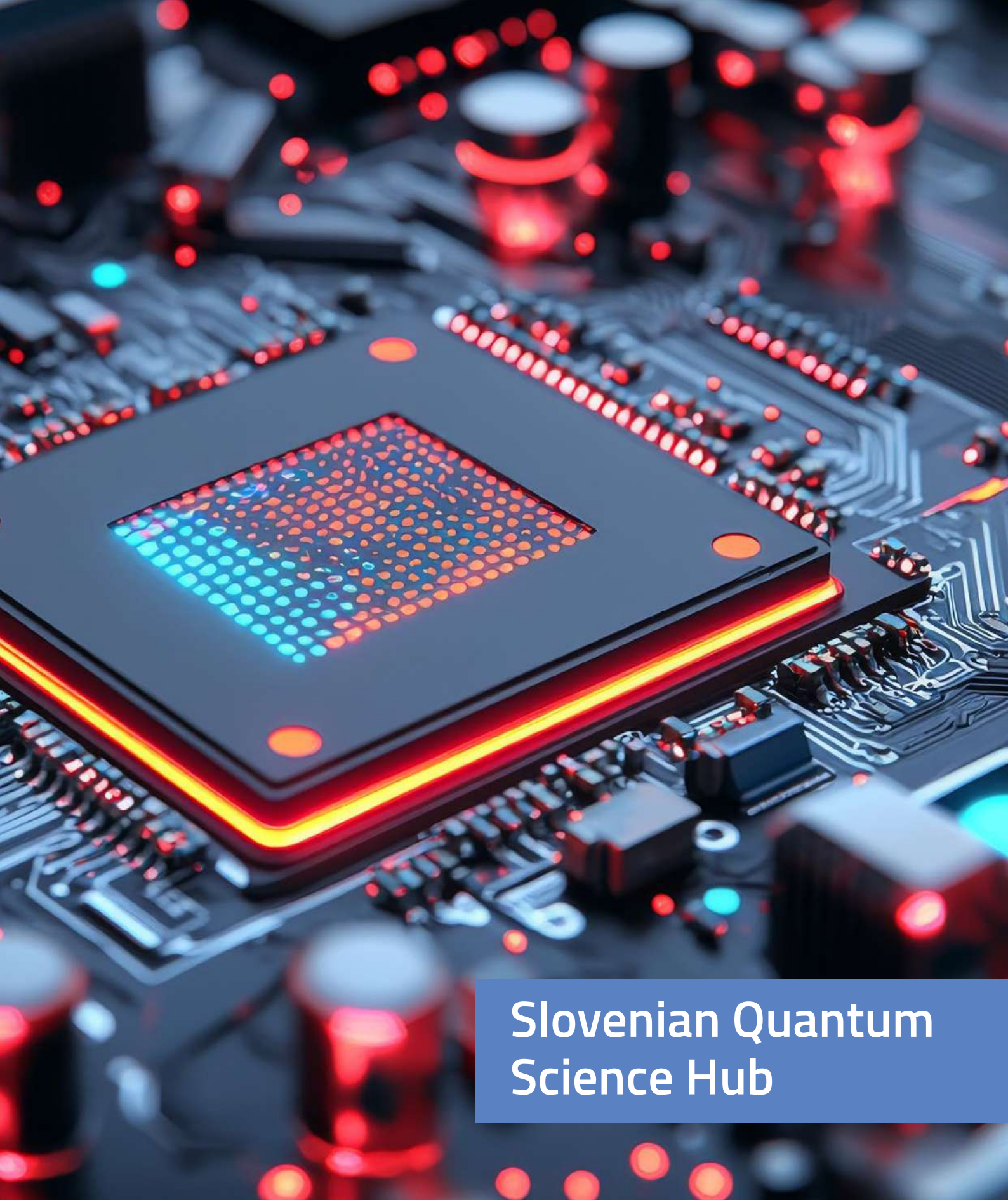


The use of quantum phenomena such as superposition of states and entanglement to create devices with improved properties has led to a rapid development of quantum technology with many products already on the market: devices for secure communication, precision gravimeters and the first quantum computers. Quantum science has a long tradition at JSI, meaning our researchers actively participate in this development. We are involved in the preparation of strategic documents on quantum technology at the European and national level and are further strengthening our research capabilities.

The European project *Slovenian Quantum Science Hub* (SQUASH) (MSCA Cofund, GA101177446) is an Institute project in the true sense, as it brings together various scientific and professional fields of the Institute and will contribute to the development of the organization in key areas, such as increased research capacity, increased international visibility and cooperation, improvement of the training and career development, and promotion of innovation. The project is based in the scientific field of quantum theories, materials and technologies, and will enable the Institute to acquire top research staff from abroad (postdoctoral fellows), conduct excellent science, improve the working environment, visibility, international competitiveness and own reputation. The acquisition of the project is the joint work of 13 research departments and several support services. The project, which will last a total of 5 years, is designed to be interdisciplinary, intersectoral and international and has a budget of €11,520,000.

In 2024, we were able to get funding for the project, allowing us to attract 40 post-doctoral scientists from all over the world with the goal to develop top skilled innovative experts in quantum research and technologies. In April 2024, the Laboratory for Quantum Entanglement was officially opened, which serves as the hub of the research network for quantum communication between FMF UL and JSI, as well as developing techniques to generate, detect and entangle photons with other quantum systems. Some of the most notable scientific achievements include the demonstration of quantum light generation in soft and biological sources (Aljaž Kavčič, Dr Nerea Sebastián, Doc. Dr Matjaž Humar et al.) and the development of the Ultrafast X-ray Spatial Light Modulator (Dr Igor Vaskivskyi, Dr Anže Mraz, Dr Rok Venturini, Gregor Jecl, Dr Yevhenii Vaskivskyi, Prof. Dr Dragan Mihailović et al.). The wider field of quantum science and technology was presented to the general public at Quantum Days: a quantum workshop for high school students and a series of lectures by publicist and consultant Olivier Ezratty. Similar events will take place in 2025, which has been declared the World Year of Quantum Science and Technology, marking the centenary of the beginning of the development of modern quantum theory.





Slovenian Quantum Science Hub

Electronics and Information Technologies

8
departments

- Automation, biocybernetics and robotics
- Systems and control
- Artificial intelligence
- Open systems and networks
- Communication systems
- Computer systems
- Knowledge technologies
- Intelligent systems

26 %
researchers are employed in the field of Electronics and Information Technologies

23 % 77 %

Stevanovska and Džeroski Used Machine Learning Methods to Develop INSRTR

Sintija Stevanoska and Prof. Dr Sašo Džeroski from the Department of Knowledge Technologies collaborated with researchers from the National Institute of Chemistry to discover and develop a new technology for regulating the action of different proteins called INSRTR. They used machine learning methods to facilitate the selection of the peptide insertion positions within this technology, allowing the selection to be tailored to the target protein. The INSRTR technology allows the regulation of the action of a protein via the insertion of short peptides similar to transistors in electronic circuits. This technology can be used to activate or inactivate selected protein functions, and even combine such functions to perform logical operations in living cells. The technology could have therapeutic and other biotechnological applications. It was showcased in human cells on several enzymes, proteins in cell signalling, DNA recognition and antibodies that guide cancer immunotherapy. The paper appears in Cell Discovery, a journal of the Nature group.

Workshop Machine Learning Modalities for Materials Science

The Jožef Stefan Institute hosted the Machine Learning Modalities for Materials Science 2024 (ML4MS 2024) workshop between 13 and 17 May 2024. In addition to the experts from the hosting institute and the National Institute of Chemistry, the event featured a number of world-renowned experts from various companies (Ekin Dogus Cubuk – Google, Tian Xie – Microsoft, Teodoro Laino – IBM Zurich), universities (Emma King-Smith – Cambridge University, Dr Christoph Koch – Humboldt University, Brenden Pelkie and Dr Lilo Pozzo – University of Washington, Helge Stein – Technical University of Munich) and institutes (Prof. Dr Jörg Neugebauer – Max Planck Institute). The ML4MS 2024 workshop's aim was to bridge the gap between two extremely important fields: artificial intelligence, including machine learning, and materials science. Both fields are exceptionally well represented scientific fields in Slovenia. The latest list of the two percent most renowned, i.e., quoted scientists at the global level features 172 Slovenian scientists, of those 20 in the field of materials science and 16 in artificial intelligence. The workshop facilitated the most up-to-date view of the unique intersection of artificial intelligence (with machine learning) and materials science.

Kocijan et al. Publish Terminological Dictionary of Automatic Control, Systems and Robotics

Automatic control has become an interdisciplinary science because of its systematic approach to problem-solving. Springer Publishing Company published the *Terminological Dictionary of Automatic Control, Systems and Robotics*, authored by Prof. Dr Juš Kocijan from the Department of Systems and Control from the Jožef Stefan Institute and co-authors Prof. Dr Rihard Karba, Prof. Dr Tadej Bajd, Dr Mojca Žagar Karer and Dr Gorazd Karer. The dictionary contains terms from the fields of automatic control, which include mathematical modelling, simulation of dynamic systems, automation technology with its corresponding elements, and robotics. The terminological dictionary is primarily aimed at experts and students dealing with control technology and dynamic systems in technical and non-technical domains. At least basic knowledge in this field is required to use the dictionary. The dictionary provides users with concise terminological definitions. Different terms may designate a concept; therefore, cross-references are used. The dictionary aims to collect and unify–at least to an achievable extent–terminology in automatic control, dynamic systems and robotics.

Slovenia in the Top Ten According to Robot Density

According to the latest data from the International Federation of Robotics (IFR), Slovenia ranks among the top ten countries in the world in robot density, demonstrating the country's significant technological advances and competitive edge of the economy. The new global average robot density reached a record 162 units per 10,000 employees in 2023 – more than double the number measured only seven years ago (74 units). The Jožef Stefan Institute has played a major part in this with its Department of Automatics, Biocybernetics and Robotics, where innovative automatization and robotics solutions are being developed, contributing to breakthroughs in robotization. Another important player is the Center of Research Innovation Partnership, which coordinates the technological fields of robotization and connects research institutions, companies and other stakeholders with the state to facilitate a faster digital transition and sustainable production. With its R&D achievements and strategic partnerships, such as the SRIP Factories of the Future, Slovenia continues to shore up its position as a leader in introducing advanced technologies to manufacturing processes.

SEEDS Project for Methodology for Offering Energy Flexibility Services

The Department of Knowledge Technologies and the Department of Intelligent Systems have kick-started the new year with work on the SEEDS project – *Cost-effective and replicable RES-integrated electrified heating and cooling systems for improved energy efficiency and demand response*. The project is funded within the EU Horizon Europe programme and brings together 26 partners from 8 different countries, with a total budget of €14.3 million, €0.75 million of which is shared between the two departments at JSI. The main focus within SEEDS is on creating a methodology for offering locally distributed energy flexibility services to various market players. These services play a crucial role in enhancing grid stability but come with challenges, such as dynamic resource allocation, aggregation, adherence to controllers and collaboration among numerous stakeholders. To address these complexities, they will employ advanced techniques and multi-criteria decision modelling. The solution will undergo testing at the Slovenian pilot site together with Petrol d.d. and Elektro Celje d.d., paving the way for large-scale implementation of these services.

Initiative to Establish a Cross-Border Hydrogen Ecosystem

The PMiS in collaboration with the Department of Systems and Control and the Department of Environmental Sciences group working under the Center of Research Innovation Partnership at the Jožef Stefan Institute has received a grant from the program I3 EISMEA called *North Adriatic Clean Hydrogen Investment Platform* (NACHIP) worth €7,636,142.84. The NACHIP consortium headed by the Jožef Stefan Institute comprises12 private and public organizations from Slovenia, Croatia and Friuli-Venezia Giulia, autonomous region of Italy. The three-year project is founded on the joint long-term initiative to establish a cross-border hydrogen ecosystem along with the project North Adriatic Hydrogen Valley. It also follows the goals of the Slovenian Sustainable Smart Specialisation Strategy S5, the European Green Deal and the European Hydrogen Strategy. Investments are foreseen in all three regions through the creation of value chains between key stakeholders in mobility (land and sea transport and logistics), in urban areas and in the manufacturing sector.

The past year has been strongly impacted by artificial intelligence (AI) and especially artificial intelligence in science. The fact that two Nobel Prizes were awarded in 2024 for scientific work in the field of AI and its applications in science had a resounding impact. The Nobel Prize in Physics was awarded to American scientist John J. Hopfield and British-Canadian scientist Geoffrey E. Hinton for their ground-breaking discoveries and inventions enabling machine learning with artificial neural networks, i.e., the development of artificial intelligence methods. The Nobel Prize in Chemistry was awarded to American scientist David Baker and British-American scientific duo Demis Hassabis and John Jumper for their work on protein structure prediction using artificial intelligence methods. Artificial intelligence has also had a distinct presence at JSI. We have been working on the topic for decades and are ahead of global trends. In 2024, we acted as coordinators to acquire a major national project entitled Artificial Intelligence for Science as part of ARIS' Gravitations financial instrument. The project develops advanced artificial intelligence methods, e.g., explainable artificial intelligence methods, foundation models, discovering the scientific principles and semantic technologies for open science. These are then used to solve problems in different scientific fields, including materials science and personalized medicine (e.g., planning gene therapies).

Various events about on AI in science seem to be proliferating all across the globe. The colleagues at the Department of Knowledge Technologies are constantly attending or even co-organizing them. In February 2024, Prof. Dr Sašo Džeroski actively participated in the 4th Nobel Turing Challenge Initiative Workshop in Tokyo, Japan. In May 2024, he and his colleagues at JSI organized the interdisciplinary event Machine Learning for Materials Science, which boasted a fascinating program and was very well attended. In November 2024, Džeroski co-organized a symposium in Arlington, USA, entitled Integrated Approaches to Computational Scientific Discovery as part of the Fall Symposium Series (FSS) event, organized by the Association for the Advancement of Artificial Intelligence (AAAI). The symposium welcomed the most participants of all seven symposia organized by AAAI FSS.

Finally, there have been noticeable shifts in the European Commission's (EC) strategy regarding AI, as it is increasingly investing in the field. An event was held in Brussels in December entitled High-level Roundtable: Advancing Science through AI & AI through Science. Prof. Dr Džeroski attended the event as one of 12 experts called upon by the European Commission to describe their vision of AI development in science. In addition to the experts, the event was attended by a number of high EC functionaries, i.e., EC Vice-President Henna Virkkunen, Commissioner responsible for start-ups, research and innovation Ekaterina Zaharieva, Director-General of the Directorate for Research and Innovation Marc Lemaitre, and the Director of the Artificial Intelligence and Digital Industry Office Lucille Sioli, indicating the priority status of the field for EC.

Artificial Intelligence in Science

Chemistry, biochemistry, materials and environment

10
departments

- Biochemistry, molecular and structural biology
- Molecular and biomedical sciences
- Biotechnology
- Inorganic chemistry and technology
- Physical and organic chemistry
- Electronic ceramics
- Nanostructured materials
- Synthesis of materials
- Advanced materials
- Environmental sciences

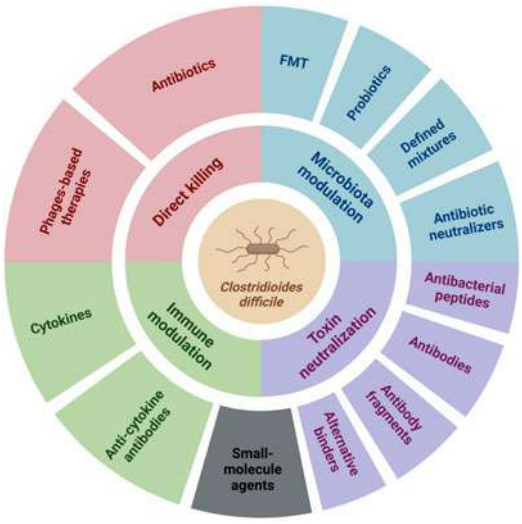
33 %
researchers are employed in the field of Chemistry, biochemistry, materials and environment

54 %

46 %

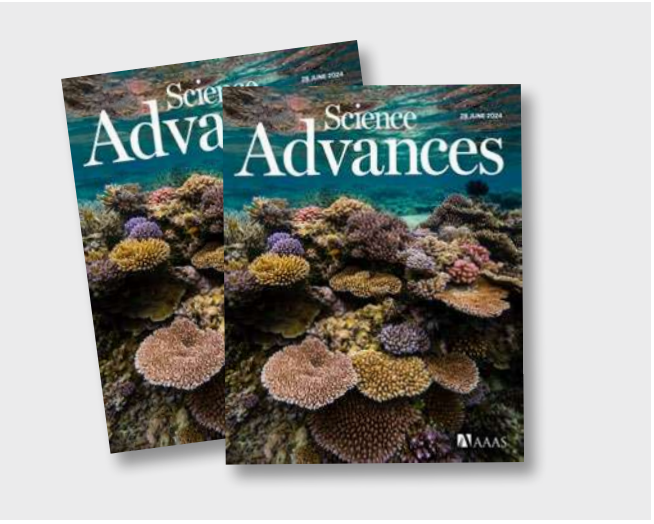
New Options for Treating Debilitating Intestinal Symptoms

Clostridioides difficile infections cause a host of debilitating intestinal symptoms that may be fatal. It is particularly problematic as a hospital-acquired infection. Identifying new treatment options is therefore crucial. Colleagues from the Department of Biotechnology Dr Abida Zahirović, Prof. Dr Borut Štrukelj and Prof. Dr Aleš Berlec collaborated with colleagues from the Faculty of Pharmacy of the University of Ljubljana and the National Laboratory of Health, Environment and Food have published an extensive article in renowned journal Gut Microbes on treatment options that do not include antibiotics or fecal microbiota transplantation. The new approaches include modulating the intestinal microbiota, the neutralization of *C. difficile* toxins, immunomodulation and direct killing of *C. difficile*. To achieve this, antibodies, defined microbial mixtures, bacteriophages and small-molecule agents excluding antibiotics are utilized. These agents are currently in various stages of development, while some monoclonal antibodies and defined microbial mixtures have already been registered as medical products.



Coherent Interpretation of Experimental Data Only by Combining Different Contributions

Researchers from the Department of Electronic Ceramics Matija Arzenšek, Urh Toš, Silvo Drnovšek, Assist. Prof. Dr Mirela Dragomir, Prof. Dr Hana Uršič, Assist. Prof. Dr Mojca Otoničar and Prof. Dr Tadej Rojac together with colleagues from the University of Vilnius published an article in the journal of Science Advances. The paper addresses the key question of the origin(s) of the unusually high piezoelectric responses in the PMN–PT ceramic system modified with samarium ions. While previously published studies report on various mechanisms, they usually do so in the context of the so-called "universal" mechanisms, which are typically focused on a single aspect of the material. Using a combination of nonlinear piezoelectric harmonic analysis and structural analysis over multiple length scales, the authors concluded that the high piezoelectric response cannot be attributed exclusively to a single mechanism. A coherent picture can only be achieved by combining various intrinsic and extrinsic dynamic contributions and by taking into account the complex influence of the samarium dopant on the local and average structure of the material. The paper also emphasizes the strong pressure in the research community to publish scientific papers with high-profile "universal" explanations.



New Projects on Permanent Magnets Research

The European Commission has endorsed two significant project proposals from the Jožef Stefan Institute's Nanostructured Materials Department with high marks, allocating €15.4 million for research on permanent magnets essential for the Green Transition. Leading the Single-Grain Re-Engineered Nd-Fe-B Permanent Magnets (Greene) project, Assoc. Prof. Dr Kristina Žužek will oversee the project coordination and efforts in developing high-energy Nd-Fe-B-based magnets, innovatively engineering them at the single grain level, with a funding of €2 million. This project includes setting up a demonstration line in Slovenia. The BEETHOWEN project *Substitutioni of Rare Earths for Advanced Novel Magnets in Energy and Transport Applications* with a €0.5 million contribution to the Institute, with Dr Petra Jenuš in the lead, aims to innovate magnet technology by replacing rare earth elements with high-entropy alloys, ferrite composites, and W-type ferrites.

Findings on Re-establishing Piezoelectric Response in Material Cooling

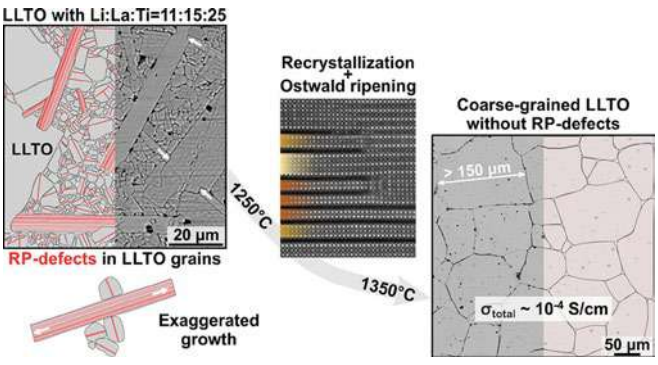
In collaboration with colleagues from China, Germany, Australia and Switzerland, Prof. Dr Tadej Rojac from the Electronic Ceramics Department has recently published a paper in the journal Advanced Functional Materials titled Piezoelectric Properties of $BiFeO_3$ Exposed to High Temperatures. The study reports on an unusual phenomenon in ferroelectric bismuth ferrite ($BiFeO_3$), which has been extensively studied in recent years due to its high Curie temperature (TC = 830 °C) and therefore its potential for high-temperature piezoelectric applications. The researchers discovered that the piezoelectric response, which disappeared at temperatures above ~400 °C, was recovered upon cooling of the material. In contrast to the commonly assumed explanation related to thermal depoling of the ceramics and thus permanent loss of piezoelectricity, in this case, it is a reversible phenomenon stemming from the thermally activated electrical conductivity of the ferrite. The discovery of this phenomenon has paved the way for optimizing the poling conditions of $BiFeO_3$, which may have a practical significance in the development of $BiFeO_3$-related environmentally friendly lead-free piezoceramics.

New Processes for Dismantling and Recovering Magnets

At the final meeting of the INSPIRES project (EIT RawMaterials), the members of the Nanostructured Materials Department (Dr Benjamin Podmiljšak, Dr Tomaž Tomše and Prof. Dr Spomenka Kobe) and the consortium of 11 partners reported on the goals achieved. We presented a successful example of a circular economy without waste in the RIS Slovenia region. We focused on motors in household appliances and developed new automated processes for dismantling and recovering magnets. Working with key industrial partners (Kolektor, Gorenje, Domel, ZEOS, Surovina), we established recycling processes and tested new circular economy pathways. We analysed their sustainable performance in terms of economic and environmental life cycles. In the Slovenian region, knowledge and technologies from non-RIS regions contributed to the refinement (the recycling technology was provided by the University of Pforzheim). Brussels-based partner CEPS (Centre for European Policy Studies) effectively communicated the project results to decision-makers for further action.

Explained Development of Coarse-Grained Ceramics under the Influence of Planar Defects

Doctoral student Petruša Borštnar from the Department for Advanced Materials at Jožef Stefan Institute, mentored by Assoc. Prof. Dr Nina Daneu and in collaboration with colleagues from the National Institute of Chemistry and Cheng Kung University in Taiwan, published a paper entitled Transient Ruddlesden–Popper-Type Defects and Their Influence on Grain Growth and Properties of Lithium Lanthanum Titanate Solid Electrolyte in the journal ACS Nano. The research describes the development of a coarse-grained microstructure in lithium lanthanum titanate (LLTO) ceramics under the influence of Ruddlesden-Popper-type planar defects. Based on quantitative high-resolution scanning transmission electron microscopy (HAADF-STEM) analyses, the authors explain the process from the formation of defects in the initial grain growth stage to the exaggerated growth of grains with RP-type defects and finally, to the recrystallization of the RP-type sequences to LLTO perovskite. The results are a contribution to the development of solid electrolytes for applications in lithium-ion batteries, where the total ionic conductivity is directly related to the number of highly resistive grain boundaries.



Highlighted Achievements in Additive Technologies

The Additive Manufacturing in Engineering and Biomedicine (AMEB2024) symposium was held at the Jožef Stefan Institute on 24 October 2024, organized by Prof. Dr Ingrid Milošev from the Department of Physical and Organic Chemistry and Prof. Dr Edvard Govekar from the Faculty of Mechanical Engineering of the University of Ljubljana. The symposium brought together industry experts, researchers and innovators for an in-depth presentation of the latest developments in additive technologies and manufacturing. In addition to offering an overview of the methods, post-processing and inline process monitoring, the event featured prominent topics, such as characterization and the corrosion of additively manufactured alloys, innovative uses for polymers and ceramics and additive manufacturing of custom-made medical implants. The discussion emphasized the practical applications of the breakthroughs with a specific focus on their potential to reshape the industrial field and biomedicine. With such a wide range of expertise in Slovenia, we are optimistic that more events like this will be held to stimulate further innovation in the field.

New Findings on Defects Induced in the Graphene by HfO_2 Deposition

Dr Urška Trstenjak from the Advanced Materials Department at the Jožef Stefan Institute has published a paper together with the Electronic Materials research group (PGI-7) entitled Heterogeneous Integration of Graphene and HfO_2 Memristors in Advanced Functional Materials. Using pulsed-laser deposition (PLD), the team successfully synthesized HfO_2 thin films on graphene/SiO_2/Si templates via quasi van der Waals growth. By analyzing the data obtained from Raman spectroscopy in detail, they found that the defects induced in the graphene by the HfO_2 deposition are predominantly sp^2-type and are formed due to the high kinetic energy of the plasma-plume particles. They showed that by replacing oxygen with argon during PLD growth of hafnia, the hafnia layer remains sufficiently oxidized, while the underlying graphene is well preserved and can be used as a bottom electrode for memristive devices. The findings of the study that graphene can be used for the heterogeneous integration of crystalline HfO_2 thin films can be utilized for the design of other graphene-containing electronic devices.

Launch of Magnetic Soft Matter for Robotics (MAESTRI) Project

On 4 March 2024, the kick-off meeting of the new European doctoral network *Magnetic Soft Matter for Robotics* (MAESTRI) took place at the East Bavarian Technical University (OTH) Regensburg. This doctoral network responds to the existing need to train a new generation of experts in the emerging subfield of soft robotics, which is based on the control of material properties through a magnetic field – magnetic soft robotics. The materials involved are elastomers and complementary fluids filled with micro- and nanometre-sized magnetic particles. The consortium consists of seven academic and two industrial partners in five countries (Denmark, Germany, Italy, Austria, Slovenia), who come from the fields of biology, materials science, physics and robotics. Another three associated partners from the USA, Germany and Slovenia (The Jožef Stefan International Postgraduate School) are involved in research and teaching transferable skills. Two colleagues from the Department for Materials Synthesis Prof. Darko Makovec and Prof. Darja Lisjak are responsible for synthesis of the magneto-responsive materials in the project.

InPlasTwin Project for a Collaboration in Micro- and Nanoplastics Analysis

In late October, the three-year InPlasTwin project officially started with a kick-off meeting, coordinated by Doc. Dr Janja Vidmar from the Department of Environmental Sciences. The InPlasTwin project is financed by the European Commission as part of the EU HORIZON programme and is worth € 1.5 million. It is a collaboration between renowned European institutions, such as the Flemish Institute for Technological Research (VITO, Belgium), the Institute of Marine Research (IMR, Norway) and the Technical University of Denmark (DTU, Denmark), enabling researchers from the Jožef Stefan Institute and the Agricultural University of Athens (AUA, Greece) access to state-of-the-art equipment, detailed training and knowledge exchange on micro-and nanoplastics (MNPs) analysis, including their extraction, identification, quantification and characterization and plastic additive analysis. The collaboration with FoodScale Hub, an NGO from Serbia, will further expand the impact of the project, with a focus on understanding the emergence of micro- and nanoplastics in agriculture and their impacts on the environment and food systems.

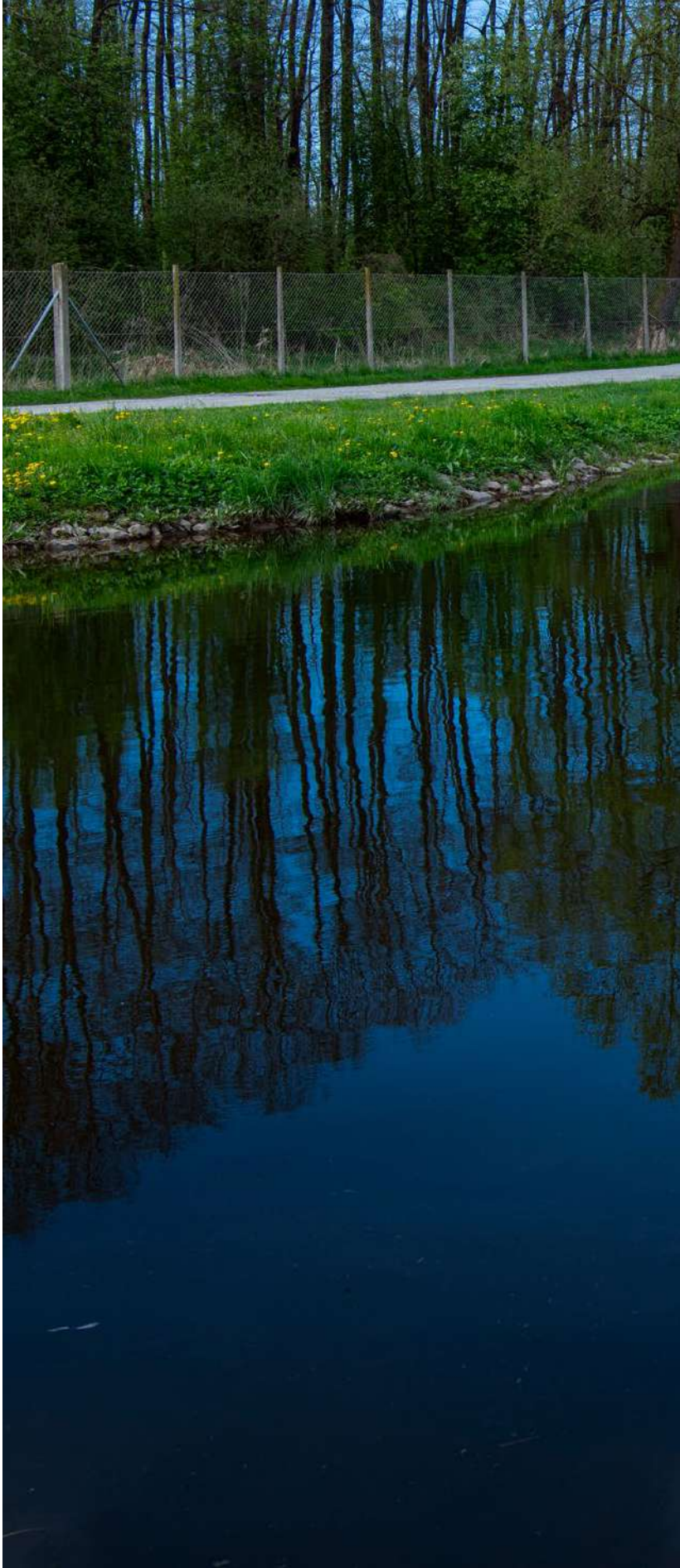
Climate change has a significant impact on the hydrological cycle, which in turn has far-reaching consequences for carbon circulation, pollutants being circulated between the atmosphere, the land and the oceans, and for ground processes. Colleagues at the Department of Environmental Sciences study how rising temperatures, changes in the precipitation patterns and the increasingly common extreme weather events affect the release and cycling of carbon, harmful compounds and nutrients.

Changes to land use like intensive agriculture, urbanization and deforestation combined with climate change are further increasing land pressure. Higher temperatures and changed precipitation regimes affect the biochemical processes in the ground, such as organic matter decomposition, greenhouse gas emissions (methane and carbon dioxide) and nutrient and pollutant leakage into the underground. Droughts are also affecting soil degradation by decreasing organic matter content, and even intensive rainfall causes erosion and pollutant washing into rivers and groundwater.

Research shows that floods wash out huge amounts of pollutants into rivers and oceans, seriously threatening marine ecosystems and affecting the quality of water used by millions of people. Similarly, land that has been impoverished due to overuse and degradation has less capacity to retain water and nutrients, which affects the water cycle and the long-term stability of ecosystems.

The Department of Environmental Sciences uses cutting-edge analysis methods to study these complex processes. We focus especially on quality of groundwater, a key source of drinking water, as well as the dynamics of pollutant leaching in hydrological systems. Furthermore, we examine the influence that changes to the land use have on biogeochemical cycles and soil's capacity to adapt to extreme conditions. Our results contribute to understanding these links and formulating effective policies to protect soil and water resources.

Understanding the impacts of climate change on soils, groundwater and aquatic ecosystems is key to adapting to new conditions and reducing adverse impacts on the environment and human health. Our research aims to contribute to the sustainable management of natural resources, protect soils and promote urgently needed action against climate change.



JSI and climate change

AWARDS AND RECOGNITIONS

"I have no special talents.
I am only passionately curious."

Albert Einstein

Total
124
awards

38	49	5	27	5
Zois awards	Zois prizes	Puh awards	Puh prizes	Ambassadors of science
18 % 82 %	27 % 73 %	20 % 80 %	11 % 89 %	40 % 60 %

***Data are for the period 2000–2024

Benčan Golob and Vidmar Received Zois Awards

Ljubljana, November 2024

The Gallus Hall of Cankarjev dom hosted the presentation of the year's highest national awards in the field of science on 28 November 2024. The keynote speaker was Prime Minister of the Republic of Slovenia Dr Robert Golob who stressed that Slovenians are an exceptional nation with outstanding individuals in sports, culture and science.

He underlined the importance of investing in science and development for social progress, "because it is science and development that make it possible to live longer, better and healthier lives." The group of fifteen recipients of the Zois and Puh Awards included two colleagues from the Jožef Stefan Institute: Prof. Dr Andreja Benčan Golob from the Electronic Ceramics Department, who was awarded the Zois Award for important achievements in the electron microscopy of environmentally friendly ferroelectrics, and Assoc. Prof. Dr Lev Vidmar from the Department of Theoretical Physics, who was awarded the Zois Award for the discovery of new patterns of behaviour in quantum many-body systems.

Prof. Dr Andreja Benčan Golob: "I was pleased and grateful to receive the award. I can divide my gratitude into two parts: first, that I was able to work with such excellent researchers in a top team for so many years, and second, that the committee recognized the value of my work. Of course, my research path would not have been possible without the support of my immediate and extended family."

Assoc. Prof. Dr Lev Vidmar: "The Zois Award seemed to come to me quite spontaneously, so I had not even been aware of how many people are involved in the smooth running of the process. This year's event seems to have been executed especially diligently and precisely. I would like pay tribute to everyone involved for a job well done. In that context, I regard this Zois Award as my honour to be able to contribute a stone to this mosaic and present the most prominent achievements from my field to the general and expert public. This is why I view the award as a privilege, but also an obligation to bring the beauty and importance of our work to people outside the walls of scientific institutions."

Golež, Sebastián Ugarteche and Muševič New Blinc Award Recipients

On 18 November 2024, the Jožef Stefan Institute and the Faculty of Mathematics and Physics of the University of Ljubljana presented the sixth Blinc Awards for research and professional work in the field of physics in the Brdo Congress Centre.

The Blinc Awards have been presented since 2019 in order to encourage and reward researchers in the Republic of Slovenia for their scientific research work in the field of physics and to preserve the memory of one of the most brilliant Slovenian scientists and a member of the Slovenian Academy of Science and Arts, Robert Blinc. The Blinc Award for a Physicist at the Beginning of their Career was awarded to Assist. Prof. Dr Denis Golež from the Jožef Stefan Institute and the Faculty of Mathematics and Physics of the University. The Blinc Award for outstanding unique achievements in the field of physics was awarded to Dr Nerea Sebastián Ugarteche from the Jožef Stefan Institute and the Blinc Lifetime Award was presented to Prof. Dr Igor Muševič from the Jožef Stefan Institute and the Faculty of Mathematics and Physics of the University of Ljubljana.

Assist. Prof. Dr Denis Golež is one of the country's most prolific young physicists. His scientific work focuses on the non-equilibrium dynamics of correlated electrons, namely developing theories to describe quantum many-body systems out of equilibrium using quantum field theory methods. In addition to their evident quantity, his works are also characterized by a distinct originality that is reflected in his innovative numerical approaches, development of new analytical methods and interlinking fundamental theoretical approaches with experimental predictions and observations. Despite the fact that his work falls under theoretical research, he has had ample success in collaborating with different experimental groups across the globe.

Dr Nerea Sebastián Ugarteche has played a pivotal role in broadening the scientific field with her article entitled Ferroelectric-Ferroelastic Phase Transition in a Nematic Liquid Crystal published in 2020 in Physical Review Letters. The article has proven to be one of the foundational works in the field of ferroelectric liquid crystals and has

presented the basis for numerous further studies of similar materials in research groups all over the world. The paper has been cited over 150 times and ranks among the top 1% of the most quoted articles in the field of physics published in 2020.

Prof. Dr Igor Muševič received the Blinc Lifetime Award for outstanding research achievements, creating new areas of research and mentoring top researchers. Prof. Igor Muševič is undoubtedly a top researcher in the field of liquid crystal physics and soft matter. He began his research career in the group for liquid crystals applications at the Department of Condensed Matter Physics, which developed one of the first digital osciloscipes in the work in collaboration with the company Iskra, then created automatic welding goggles, which led to many years of fruitful collaboration with subsidiary company Balder. This led him to start basic research, and he received his PhD in 1993 under the mentorship of Prof. Robert Blinc with a doctoral thesis entitled Elementary Excitations in Ferroelectric Liquid Crystals. He published a series of high-profile papers on chiral liquid crystal dynamics as well as wrote the book The Physics of Ferroelectric and Antiferroelectric Liquid Crystals together with professors Blinc and Žeks in 2000 published by World Scientific. During this period, he introduced the use of atomic force microscopy for measuring the structural forces in liquid crystals, which helped explain the formation of liquid crystals in boundary layers. Twenty years ago, he also introduced the use of optical tweezers to study the self-organization of colloidal particles in liquid crystals and their topological properties, which led to a number of ground-breaking articles, including two in Science journal with him as the as first author. He and his colleagues were the first to use liquid-crystal droplet microresonators and laser light sources, opening up an entirely new field of liquid crystal use. In 2017, he published an extensive monograph with Springer entitled Liquid Crystal Colloids. All of these studies led him to obtain the ERC project LOGOS, in which Prof. Muševič and his colleagues are creating light-operated logic circuits from photonic soft-matter.

Može, Smolkovič and Šuntajs Recipients of Jožef Stefan Golden Emblems

On 20 March 2024, the Jožef Stefan Institute awarded the Jožef Stefan Golden Emblems to the authors of the most outstanding doctoral theses in the fields of natural sciences, mathematics, engineering, medicine and biotechnology over the last three years. Dr Matic Može received the Jožef Stefan Golden Emblem for the high profile of his doctoral thesis Hybrid Structured Surfaces for Enhanced Nucleate Boiling Heat at the proposal of his mentor Prof. Dr Iztok Golobič from the Faculty of Mechanical Engineering of the University of Ljubljana and co-mentor Assist. Prof. Dr Matevž Zupančič. Dr Aleks Smolkovič received the Jožef Stefan Golden Emblem for his impactful doctoral thesis Probing the Flavor Structure of New Physics Models with Precision Observables at the proposal of his mentors Assoc. Prof. Dr Nejc Košnik and Prof. Dr Jernej Fesel Kamenik from the Jožef Stefan Institute. Dr Jan Šuntajs received the Jožef Stefan Golden Emblem for his outstanding doctoral thesis Nonequilibrium and Statistical Properties of Isolated Quantum Many-Body Systems at the proposal of his mentor Assoc. Prof. Dr Lev Vidmar from the Jožef Stefan Institute.

Arh and Čerček Win L'Oréal Scholarship for Women in Science

An event was held on the eve of the International Women's Day in the ZRC SAZU Atrium at which L'Oréal Adria and the UNESCO Slovenian National Committee awarded the 2024 scholarships for women in science. Two of the three recipients were colleagues from the Jožef Stefan Institute. Tina Arh from the Department of Condensed Matter Physics researches the magnetism of quantum materials, one of the most vibrant fields in modern solid-state physics, which could represent an important platform for the development of a new generation of quantum technologies, and today their understanding requires the use of state-of-the-art experimental and theoretical methods. Urša Čerček from the Department of Biotechnology is dedicated to researching neurodegenerative diseases amyotrophic lateral sclerosis (ALS) and frontotemporal dementia (FTD) with the goal of developing better therapies for the treatment of diseases that completely change the lives of the patient and their relatives and are a burden on the healthcare system. The L'Oréal scholarship was also awarded to chemist Tjaša Rijavec from the Faculty of Chemistry and Chemical Technology of the University of Ljubljana.

JSI Receives First Prize for Innovation at Symposium on Fusion Technology

The Fusion Materials Research Group from the Department for Nanostructured Materials at the Jožef Stefan Institute was awarded the First Prize at SOFT Innovation Prize 2024 at the 33rd Symposium on Fusion Technology (SOFT), which took place from September 22 to 27 in Dublin, Ireland. This was the first time in history that Slovenian researchers received this prize. Researchers from the Jožef Stefan Institute led by Dr Petra Jenuš Belec received the prize for their development of materials for the divertor, the thermally most loaded part of future fusion reactors. Dr Petra Jenuš Belec: "This prize is an important recognition for our research team and for the Slovenian Fusion Association. In an arena with significant competition, our material has been recognized as extremely promising with major innovation potential. This prize has placed us on the international fusion map." The prizes, funded by the EU's Euratom program, are awarded for ground-breaking projects that accelerate fusion research and promote collaboration between researchers and industry.


ni znanosti
dličnost,
prihodnost

Barbara Malič and Ingrid Milošev Receive International Awards

Prof. Barbara Malič, head of the Electronic Ceramics Department, received the International Award of Ferroelectric Materials and Their Applications at the 41st Meeting on Ferroelectric Materials and Their Applications that took place on 12–15 June 2024 in Kyoto, Japan, for her contribution to ferroelectric and piezoelectric materials. In her invited lecture, Prof. Malič reviewed the research on alkaline niobate-based ceramics. Prof. Dr Ingrid Milošev, the head of the Department of Physical and Organic Chemistry, was the year's recipient of the prestigious international H.H. Uhlig Award, awarded by the Electrochemical Society, a distinguished scholarly organization based in the USA. Established in 1973 in memory of renowned corrosion scientist Herbert H. Uhlig. The award recognizes Prof. Milošev for her outstanding achievements in corrosion science and technology, including her fundamental contributions to corrosion inhibition research, surface treatment and the study of biomaterial corrosion.

Zala Korenjak Receives the Dr Uroš Seljak Award for the Best Scientific Articles by Students

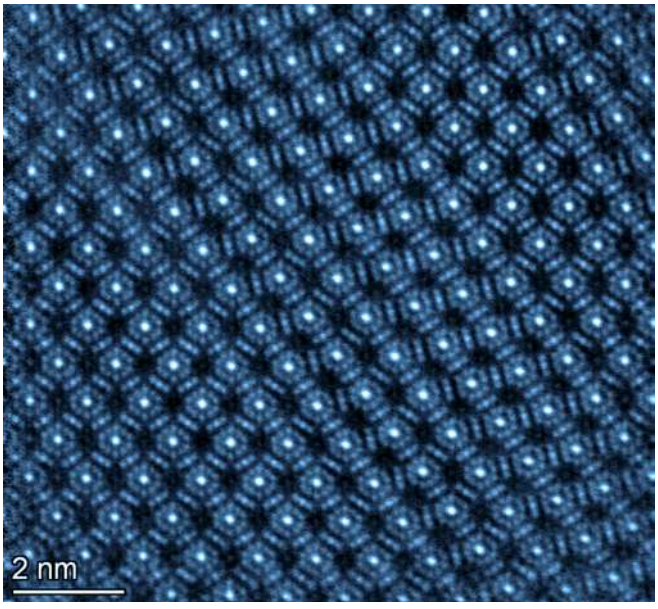
On 3 October 2024, the third annual Dr Uroš Seljak Awards ceremony was held at the University of Ljubljana, celebrating the best scientific articles by students in first- and second-level study programs in Slovenia. One of the three awards was presented to Zala Korenjak, a young researcher from the Department of Condensed Matter Physics. Zala Korenjak received the award for the scientific publication Smectic and Soap Bubble Optofluidic Lasers published in Physical Review X. Her mentor Assist. Prof. Dr Matjaž Humar, head of the Laboratory for Biological and Soft Photonics and Quantum Optics also received a mentorship plaque.

Tomše Received Prestigious Wutrich International Young Star Award

In October 2024, the Sustainable Industrial Processing Summit and Exhibition (SIPS 2024) was held in Crete, Greece, featuring plenary lectures by Nobel Laureates and multidisciplinary scientific symposia. Researchers from the Department of Nanostructured Materials presented invited lectures at the SISAM (Science of Intelligent & Sustainable Advanced Ferromagnetic and Superconducting Magnets) Symposium, dedicated to Prof. Dr Ludwig Schultz, Professor Emeritus at the Metallic Materials and Metal Physics Institute, TU Dresden. At the event, department member Dr Tomaž Tomše received the prestigious Wutrich International Young Star Award for outstanding scientific performance in the early stages of his career, awarded yearly by the FLOGEN Sustainability Network. Dr Tomše's work focuses on developing innovative manufacturing strategies for Nd-Fe-B permanent magnets, using rapid powder consolidation with reduced critical raw materials.

Best Microscopic Image by Sandra Drev

A competition was held at the 5th Slovene Microscopy Symposium (SDM24) for the best microscopic image. It is a complex microstructural study of welds of two high-strength Al alloys (Al-Cu-Mg and Al-Cu-Mg-Zr). The picture shows a detail of a crystal structural alloy with parallel defects, acquired in the HAADF technique on the new state-of-the-art scanning transmission electron microscope Spectra 300, installed in the new JSI premises. The microscope has an FEG electron source, spherical aberration corrector and a monochromator, enabling different transmission electron microscopy techniques. TEM preparation of the sample and analysis is the author's work of Dr Sandra Drev from the Center for Electron Microscopy and Microanalysis of the Jožef Stefan Institute in collaboration with the Faculty of Mechanical Engineering of the University of Ljubljana.




NIKON
SWISS MADE
PARIS
PARIS

Krka Awards for High School Student Research

On 27 September 2024, Krka held its 54th annual Krka Awards for high school research projects. Assist. Prof. Dr Peter Rodič from the Department of Physical and Organic Chemistry was the mentor of two Krka award recipients. One of the awards went to the research project Surface Protection of Magnesium Alloy for Applications in Biomedicine by Mija Kapun and mentors Assist. Prof. Dr Peter Rodič and Grega Celcar from the Jože Plečnik High School. Another awarded research project was Laser Structuring of the Aluminium Alloy Surface to Prepare the Superhydrophobic Surface by Maks Lah and Maj Horvat and mentors Assist. Prof. Dr Peter Rodič, Assist. Prof. Dr Matic Može from the FS UL and Grega Celcar from the Jože Plečnik High School. The research project by Maks and Maj was also presented at the symposium prior to the awards ceremony.

Information Society Conference Awards

The 27th international conference Information Society 2024, which was held at the Jožef Stefan Institute between 7 and 11 October 2024, held a conference awards ceremony for best achievements in 2023. The IS award for current work in information society went to Prof. Dr Sašo Džeroski, head of the Department of Knowledge Technologies. Prof. Džeroski is the most often quoted Slovenian-based Slovenian researcher in ICT. Last year's Michie-Turing Award for life achievements in Slovenian information society went to Prof. Dr Borut Žalik. The Information Strawberry, the award for best achievement in IS went to Tekmovanje ACM Slovenia.

Technology Transfer Conference Prizes

This year's prizes for innovations from public research organizations with the largest commercialization potential at the 17th International Technology Transfer Conference (ITTC) went to Assist. Prof. Dr Ita Junkar from the Jožef Stefan Institute for the new SugarHeal: Sweet Relief technology, which solves problems regarding chronic wound healing, and Prof. Dr Uroš Petrovič, also from the Jožef Stefan Institute, for the Novel Platform for Single-domain Antibody Generation in Microorganisms. Renowned Slovenian company Hidria received the WIPO national award for companies for its outstanding use of the intellectual property system and its strong emphasis on innovation. The WIPO national award for innovators went to JSI researcher Assist. Prof. Dr Gregor Primc. Over the past decade, Gregor Primc has secured several patents, demonstrating his consistent inventiveness and dedication to applied research.

Martina Modic Winner of ELES3000

Dr Martina Modic from the Department of Gaseous Electronics together with Luka Murovec and Brad Downey make up the winning team that won the concept design project ELES 3000: Creative Project in Public Space with its project Earth Wasn't Always Earth. The winning project has been made into a striking installation at the Ljubljana Zoo, bringing the visitors' attention directly to the element that we usually take for granted. The installation reminds the zoo visitors about all the invisible creatures and layers of their planet. Visitors will be able to learn more about the significance of three of the most common soil layers that once enabled different ecosystems to develop, as they provide different environments and sources for plants and microbiota.

Luzar Presents Winning Poster at ECMetAC Days Conference

In late November 2024, the Institute of Physics in Zagreb hosted the international conference ECMetAC Days 2024. Its general purpose is to provide comprehensive information on recent results achieved in the fields of new metallic alloys and compounds and the complexity in periodic and aperiodic metallic alloys and compounds within the current year and to discuss directions for future research. The conference was attended by Dr Jože Luzar from the Department of Condensed Matter Physics, who presented the poster entitled Physical Properties of Supersilent (GaNi) xCoCrFe High-Entropy Alloys. A committee of three scientists from Croatia, Poland and Germany selected Dr Luzar's poster as the best poster at the conference in the young scientist category. The presented research is the result of a collaboration of colleagues from the Department of Condensed Matter Physics F5 (Dr Jože Luzar, Dr Stanislav Vrtnik, Assist. Prof. Dr Primož Koželj, Dr Andreja Jelen, Julia Petrović, Peter Mihor and Prof. Dr Janez Dolinšek) in collaboration with Slovak scientist Dr Pavol Priputen from the Faculty of Materials Science and Technology of the University of Bratislava.

Best Poster Award for Sana Shaukat

Sana Shaukat from the Department for Nanostructured Materials of JSI was honoured with the Best Poster Award for her research presentation at the conference held at Université Toulouse III Paul Sabatier. Her poster titled *Spark Plasma Sintering Technique for Optimizing Magnetic Properties of Bulk Nanocrystalline Nd-Fe-B Magnet* highlighted innovative advancements in enhancing the performance of Nd-Fe-B magnets, which are crucial for renewable energy systems and electrical machinery. The research utilized the Spark Plasma Sintering (SPS) technique to rapidly consolidate nanostructured materials while preserving their fine grain structure, which is essential for superior magnetic properties. By optimizing SPS parameters, such as temperature and pressure, the study demonstrated notable improvements in magnetic performance without the use of heavy rare earth elements. This work emphasizes a cost-effective and efficient approach for developing high-performance magnets with improved thermal stability and coercivity, offering valuable solutions for next-generation energy and industrial applications.

SCIENCE AND ART

"The most beautiful thing we can experience is the mysterious. It is the source of all true art and science."

Albert Einstein

Gallery of the Jožef Stefan Institute

The Gallery of the Jožef Stefan Institute has been actively involved in developing and popularizing world-class artistic production. The basic guidelines of the JSI Gallery Council's programme policy are reflected in the key segments of the Gallery's rich exhibition history, and the topical emphases are established through profiled programme strands. Within these segments, JSI presents individual and group exhibitions from the Slovenian art scene.

The Gallery of the Jožef Stefan Institute is an extremely important space for presenting contemporary art exhibition projects, although the programme also presents historically important artists from whose roots new visual poetics were born. For this reason, it also includes collaborations with various artistic institutions. In order to present classical art from the history of Slovenian art, especially during Jožef Stefan Days, the gallery collaborates with institutions, such as: the Božidar Jakac Gallery, which operates as a museum of modern art in the former Cistercian monastery in Kostanjevica na Krki and is one of the largest Slovenian galleries; the Maribor Art Gallery, which is one of the fundamental museums for modern and contemporary Art in Slovenia; the Museum of Modern Art in Ljubljana, which also made possible an exhibition of the internationally renowned IRWIN group in our JSI Gallery in 2019; Nova Gorica City Art Gallery, one of the central exhibition spaces for contemporary visual art in the coastal region, featuring the opuses of predominantly younger and middle-generation artists; and occasionally with other galleries across Slovenia, such as the Piran Coastal Galleries, which is the central gallery space in Slovenian Istria and among the most renowned Slovenian galleries, and the Riko Debenjak Gallery in Kanal.

The gallery's highly professional production has enabled it to receive funds from the Ministry of Culture for its program for a number of years, during which time the gallery managers were able to form a special bond with the leadership of the Slovenian Association of Fine Arts Societies (ZDSLU), which has now delegated two artists in the program to exhibit in the JSI Gallery, who are selected for their quality production by the JSI Gallery Council.

In the past few decades, the program of the Gallery of the Jožef Stefan Institute has been particularly focusing on presenting prominent independent visual artists and group exhibition projects addressing various socially relevant current topics and encompasses both the extended field of classic visual media as well as the latest artistic practices.

Exhibitions in 2024:

Urška Stropnik Šonc	Wings in the heart
Ana Sluga	Hand made
Ante Trstenjak	A selection of works from the collection of the Maribor Art Gallery
Pšenica Kovačič	The seismology of entering space and time
Jadran Lenarčič	The garden of bliss
Marjan Drev, Matjaž Duh	Fine art spaces
Tomaž Velechovsky	My people of my world
Anka Krašna	Green, blue, red ...
Janez Korošin	Destruction, reconstruction, metamorphosis
Azad Karim	Quiet fields
Wilhelm Heiliger	The metaphysics of colour

Permanent Exhibition at the JSI Reactor

Following Marjan Verč's independent exhibition entitled Guardians of the Formula at the Gallery of the Jožef Stefan Institute on 6 November 2023, an amended photograph collection has been permanently placed in the premises of the reactor. Marjan Verč attended the filming of the film Guardians of the Formula by director and script writer Dragan Bjelogrlić, his professional duty leading him to take his camera and document this event, so pivotal for the Triga reactor. "Arrangements about filming the movie at the Triga reactor began a few months prior," recalled the head of PR at the Jožef Stefan Institute Polona Strnad. "The colleagues at the reactor were divided into three groups that were to accompany the team during filming, but some chose to stay even after their shift, because the filming was such an interesting and exciting occurrence – you just didn't want to miss it. In truth, I was surprized at the similarity of the work: the actors and the director are just as perfectionistic and repeat the work until they are completely happy with it as researchers studying a certain field until they reach the final result." This unique, probably once-in-a-lifetime experience along with the brilliant atmosphere highlighting the many common features of the researchers and the film crew, all of whom come from seemingly such different worlds, are presented in an exhibition of 28 selected photographs by Marjan Verč.

To mark the 70th anniversary of the Jožef Stefan Institute, Verč and his colleagues prepared a permanent exhibition entitled Impressions 1949–2019, which was awarded the Slovenian Science Foundation award Prometheus of Science for excellence in communication (2021). He has participated in a number of prominent group topical photography exhibitions and held independent exhibitions: Closed Circle (Sončna hiša Gallery organized by the Public Fund for Cultural Activities (JSKD) OI Logatec, 2024), Harmonious Trio (RRRudolf – Maribor Literary House organized by JSKD OI Maribor, KD Maribor and KD Maribor Literary Society, 2024) and Colours, Details and Three Bicycles (Šolt Gallery, Ljubljana, 2025). He has been employed at JSI since 1999. He is a member of the Fotoklub Ljubljana and the Društvo popotnih fotografov in fotoreporterjev.

Tatjana Pregl Kobe

Exhibition on 20 Years of Progress in Knowledge and Innovation to Celebrate the Anniversary of IPS

In the year 2024, the Jožef Stefan International Postgraduate School (IPS) celebrated 20 years of operation. The IPS was founded in 2004 as an independent higher education institution. The initiative for the establishment of IPS was spearheaded by the Jožef Stefan Institute (JSI), and it was strongly supported by industry (Gorenje, Kolektor, Alpacem) and an international network of cooperating universities and research institutes from the European Union, USA, Japan and many other countries. The Jožef Stefan Institute provides the central research and educational basis, while other partners, such as invited research institutes, industrial and other enterprises contribute their knowledge and innovation capacities for solving developmental problems. To celebrate this momentous anniversary, the exhibition 20 Years of Progress in Knowledge and Innovation was opened on 28 June 2024 on the Gallusovo nabrežje in Ljubljana. The exhibition presented photographs by renowned photographers Arne Hodalič and Katja Bidovec, highlighting some of the many achievements of the Jožef Stefan International Postgraduate School.

CleanTech Exhibition Presents Innovative Technologies for a More Sustainable World

At the Expano exhibition site in Murska Sobota, the *CleanTech: Can Technology Save the World?* exhibition was organized by the Swiss Embassy together with the pharmaceutical concern Sandoz Lek and the Jožef Stefan Institute. The exhibition presented various innovative technologies for a more sustainable world, including an AI-supported decision-making system for sustainable farming and a smart system for monitoring bee colonies developed by JSI, coordinated by Prof. Dr Marko Debeljak and Assist. Prof. Dr Anton Gradišek. The event also included a round table attended by JSI director Prof. Dr Boštjan Zalar, the CEO of Lek and director of Sandoz Slovenija Gregor Makuc and the co-founder of sustainable Swiss company Oxara, Gnanli Landrou.

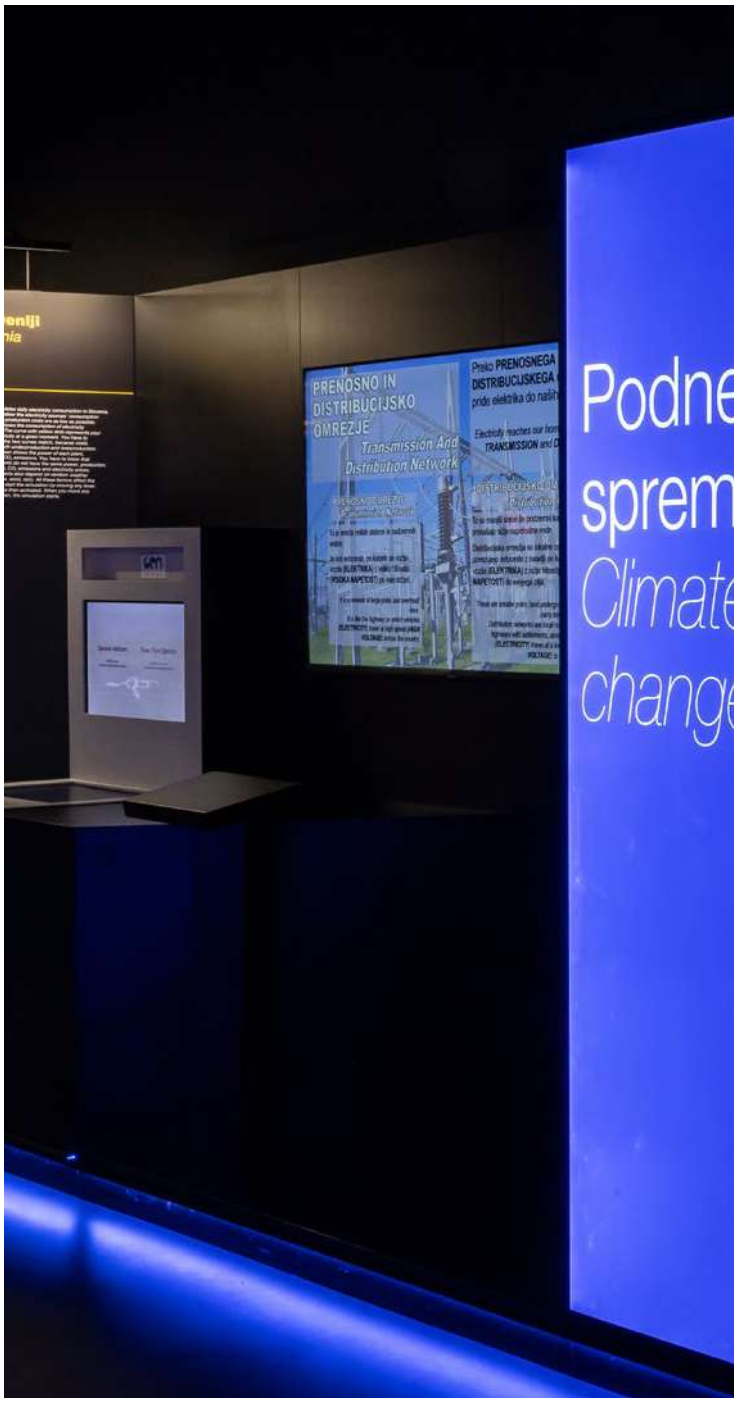
JSI FOR SOCIETY

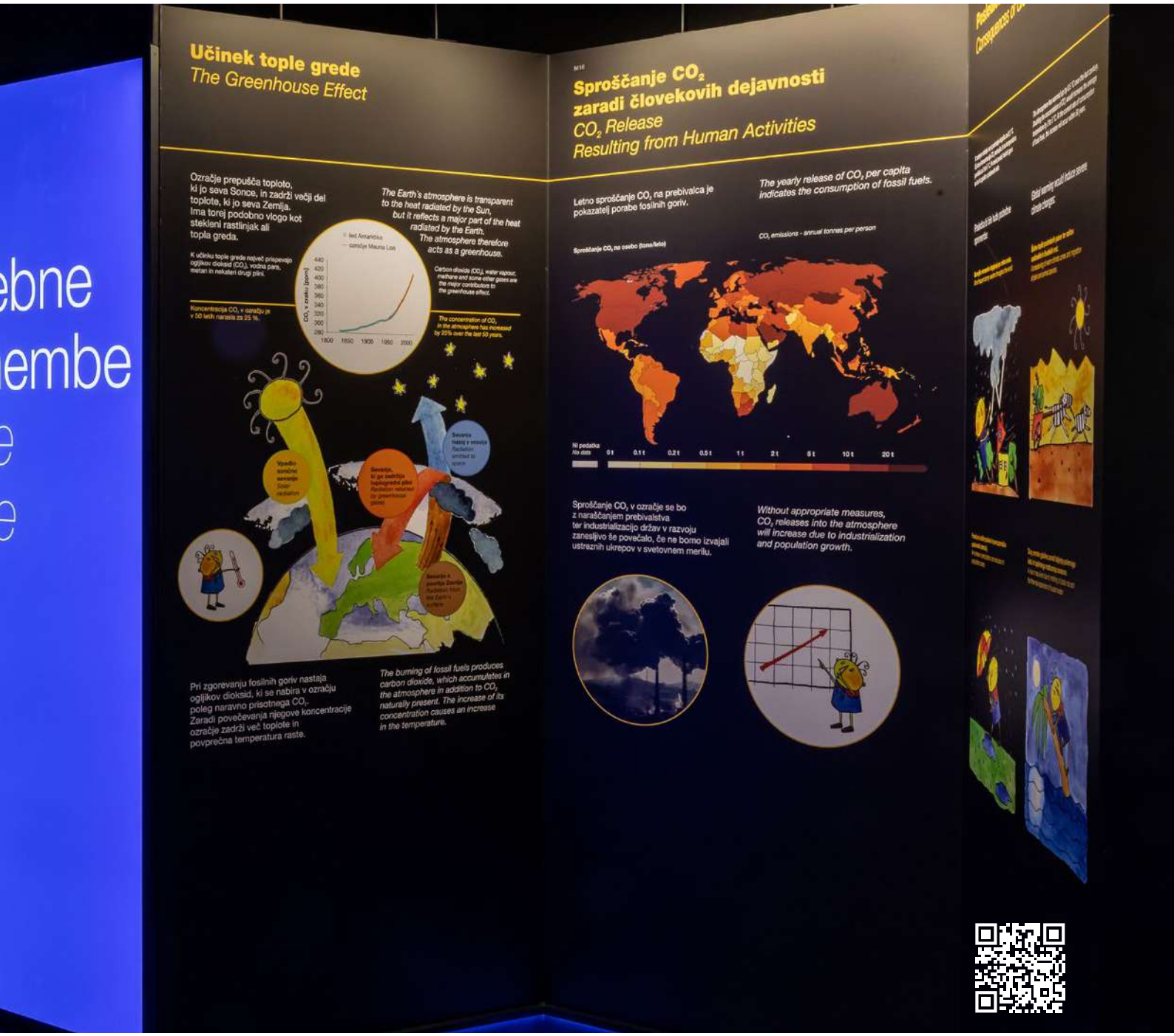
"Only a life lived for others is a life worthwhile."

Albert Einstein

21,700+
visitors

Events	
Colloquia	1,200
Gallery	9,450
School visits	1,070
Days of Jožef Stefan	1,000
Open Day	2,000
Nuclear Technology Training Centre	7,020




Učinek tople grede
The Greenhouse Effect
Ozračje prepušča toploto, ki jo seva Sonce, in zadrži večji del toplote, ki jo seva Zemlja. Ima torej podobno vlogo kot stekleni rastlinjak ali topla greda.
The Earth's atmosphere is transparent to the heat radiated by the Sun, but it reflects a major part of the heat radiated by the Earth. The atmosphere therefore acts as a greenhouse.
Pri zgorevanju fosilnih goriv nastaja ogljikov dioksid, ki se nabira v ozračju poleg naravno prisotnega CO_2. Zaradi povečevanja njegove koncentracije ozračje zadrži več toplote in povprečna temperatura raste.
The burning of fossil fuels produces carbon dioxide, which accumulates in the atmosphere in addition to CO_2 naturally present. The increase of its concentration causes an increase in the temperature.
Sproščanje CO_2 zaradi človekovih dejavnosti
CO_2 Release Resulting from Human Activities
Letno sproščanje CO_2 na prebivalca je pokazatelj porabe fosilnih goriv.
The yearly release of CO_2 per capita indicates the consumption of fossil fuels.
Sproščanje CO_2 v ozračje se bo z naraščanjem prebivalstva ter industrializacijo držav v razvoju zanesljivo še povečalo, če ne bomo izvajali ustreznih ukrepov v svetovnem merilu.
Without appropriate measures, CO_2 releases into the atmosphere will increase due to industrialization and population growth.

JSI Colloquia in 2024

The JSI Colloquia constitute the framework for the Institute to present its research work with the best lecturers, distinguishing the JSI Colloquia with an excellent reputation. As the head of the colloquia, my first priority is to maintain this reputation. To this end, three distinct sources for selecting speakers have been established in the three years since I have been chairing the colloquia.

The first source are visits from guest researchers at different departments of the Jožef Stefan Institute. In cases where the groups are hosting a top researcher, they tend to suggest them as lecturers for colloquia. These kinds of lectures take the least amount of work; the lecturers are usually honoured to be able to present their work, the lectures themselves are excellent, although they may be quite specialized, resulting in somewhat smaller audiences. The second source are Institute colleagues who have recently been promoted to higher scientific titles, like Scientific Councillor or Research Councillor, who are slated to present their research work in the colloquia. These lecturers generally require somewhat more time to prepare their lecture, as it is very important for them to give an impeccable lecture in front of their colleagues. A bit more coordination is therefore necessary, but all of the lectures are excellent and well attended. The third source are lecturers from domestic and foreign institutions who are invited as part of special events or when receiving important scientific awards. These cases demand the most organization, but the lectures are generally suitable for a wide audience and consequently extremely well attended or even packed.

In 2024, I organized 18 lectures with the assistance of specialist adviser Nataša Goševac, graphic designer Lenka Trdina, PR representative Polona Strnad and technical support staff Tomaž Krištofelc, Igor

You are invited to watch the lecture recordings at kolokviji.ijs.si:

11 December	**Nerea Sebastián Ugarteche**	Ferroelectric nematic liquids
13 November	**Anton Zeilinger**	Quantum entanglement, foundations and experiments
25 October	**Lorenzo Masia**	Augmenting human performance using wearable robotics and machine learning
18 September	**Peter Ponsaerts**	From stem cells to smart brains in the lab
26 June	**Pat Langley**	Artificial intelligence and scientific discovery: paradigms, progress and potential
19 June	**Aleš Lapanje**	Build a community with LEGO microbes
12 June	**Andrej Zorko**	Spectroscopy of quantum spin liquids
5 June	**Jonathan R. Ellis**	Physics at CERN: onward from the first 70 years
8 May	**Sebastian Riedel**	From lab oddities to technical applications: the chemistry of halogens and their compounds
10 April	**Francesca Ferlaino**	Advancing many-body quantum physics with dipolar quantum gases
3 April	**Tomaž Mertelj**	Ultrafast dynamics of electronically ordered states excited by femtosecond optical pulses
22 March	**Paul Attfield**	New materials from high pressure
21 March	**Igor Križaj**	Animal toxins – curse and blessing
20 March	**Nektarios Tavernarakis**	Autophagic mechanisms in ageing and neurodegeneration
19 March	**Danilo Zavrtanik**	Presentation of scientific achievements in the field of experimental physics and astrophysics of elementary particles
14 February	**Boris Rogelj**	New Molecular Mechanisms in Amyotrophic Lateral Sclerosis and Frontotemporal Dementia
24 January	**Dragan Damjanovic**	Defects, multi-properties coupling and giant electro-mechanical response in complex materials
10 January	**Andreja Benčan Golob**	World of structural defects in perovskite ferroelectrics

Djilas and Adis Kreč. Seven of the lecturers came from the first source, four were from the second and seven from the third source. A great example from the first group was a lecture by Prof. Dr Dragan Damjanović from the Institute of Materials, Ecole polytechnique fédérale de Lausanne (EPFL), Lausanne, Switzerland, who visited the Electronic Ceramics Department at JSI in January. His lecture on giant electromechanical response in complex materials was attended a packed Grand Lecture Hall at the Institute. In the second group, were given lectures by Institute colleagues Prof. Dr Andreja Benčan Golob, Assist. Prof. Dr Tomaž Mertelj, Assoc. Prof. Dr Andrej Zorko and Assoc. Prof. Dr Aleš Lapanje; all the lectures were very well received. From the third group, I would highlight the lecture in November by Nobel prize recipient in physics Prof. Dr Anton Zeilinger from the University of Vienna and the Austrian Academy of Sciences, who visited our institute while visiting the Slovenian Academy of Sciences and Arts at the initiative of our colleague, Acad. Prof. Dr Dragan Mihailović. There was so much interest in his lecture on quantum entanglement and quantum teleportation that the lecture had to be held in the great physics lecture hall at the Faculty of Mathematics and Physics of the University of Ljubljana and was attended by a Colloquia-record-breaking 400 people.

In 2024, the corporate graphic identity of the colloquia was overhauled in terms of the digital announcements, invitation posters and the website offering videos of all the lectures. These videos significantly increase the accessibility of the lectures, as they are subsequently viewed by tens to hundreds of people. A robust attendance is certainly an incentive for me to continue my efforts in organising lectures in the framework of the JSI Colloquia.

Martin Klanjšek

JSI and FMF UL Honoured to Host Nobel Laureate

On 13 November 2024, the Jožef Stefan Institute in collaboration with FMF UL hosted a recipient of the Nobel Prize in Physics at a colloquium in the packed Peterlin Pavillion. Prof. Anton Zeilinger gave a lecture entitled Quantum Entanglement, Foundations and Experiments addressing two quantum mechanics phenomena. The first is entanglement, the most fundamental quantum phenomenon, against which Alfred Einstein took so much issue. The second phenomenon comes to us straight from sci-fi literature and does not exist in the microscopic world, but it does exist at the quantum level: quantum teleportation. Prof. Zeilinger from the University of Vienna and the Austrian Academy of Sciences has greatly contributed to the experimental depiction of both phenomena. His body of work earned him the 2022 Nobel Prize in Physics for his work involving experiments with entangled photons, establishing the violation of Bell inequalities and pioneering quantum information science, which he shared with Alain Aspect and John F. Clauser.

Jožef Stefan Days

The 32nd Jožef Stefan Days were held between 18 and 23 March 2024 in honour of the memory of famous Slovenian physicist Jožef Stefan, born on March 24, and with the main aim to popularize science. Over the week, about 3,000 people attended 4 expert lectures, 3 panel discussions, a stand-up show of experiments, the Golden Emblem awards ceremony, an exhibition opening and an internal mixer party for young researchers.

32nd Jožef Stefan Days Program

Panel discussion:	Fun Science: The Big Bang Theory Slovenian-Style
	Science and (nuclear) energy
	Disruptiveness of New Technologies in the Context of Economic and Social Development
Exhibition opening:	Ante Trstenjak
Invited lecture:	Prof. Dr Danilo Zavrtanik (University of Nova Gorica, JSI): recipient of the Zois Lifetime Achievement Award in elementary particle physics and astrophysics: Presentation of scientific achievements in experimental physics and elementary particle astrophysics
	Prof. Dr Nektarios Tavernarakis (Medical School, University of Crete, Greece)
	Autophagy Mechanisms in Aging and Neurodegeneration
	Prof. Dr Igor Križaj (JSI): recipient of the Zois Award for important achievements in toxinology: Animal Venoms – A Blessing and a Curse
	Prof. Dr Paul Attfield (The University of Edinburgh, Great Britain): New Materials at High Pressures
Stand-up show of experiments:	Dr Evelin Gruden, Marko Jeran and Aleš Novak
Awards ceremony:	Jožef Stefan Golden Emblem
Mixer for young researchers	
JSI's open day 2024	


1000 mL
PELCO

Food for Thought Festival

Food and nutrition is an important research area at the Jožef Stefan Institute, leading us to collaborate with the University of Ljubljana and the National Institute of Chemistry to organize the Food for Thought Festival in April. Dr Bor Krajnc preformed splendidly at the Science Slam with his presentation *Juice from a Cloud: You've Got to Be Kidding Me*. Prof. Dr Barbara Koroušić Seljak from the Computer Systems Department participated in the panel discussion *Conceptualizing Sustainable and Healthy Nutrition in Times of Agro-Industrial Innovations, Climate Challenges and Heated Debates on Alternative Food Sources and Diets*, while Prof. Dr Nives Ogrinc from the Department of Environmental Sciences presented our work at JSI at the panel discussion *What Have We Cooked Up Now? Seeking Stable Food Systems in a World of Limited Resources and Instability.*

Slovenian-Indian Day of Science and Innovations

Spearheaded by the Ministry of Foreign and European Affairs, various high-tech companies, centres of excellence and research institutes, the Slovenian Science Foundation and the Jožef Stefan Institute collaborated with the Indian Embassy in Ljubljana to organize the first Slovenian-Indian Day of Science and Innovations, held at the Jožef Stefan Institute on 6 February 2024. The first Slovenian-Indian Day of Science and Innovations aimed to increase knowledge and understanding of different approaches to research and technological creativity, showcase specific achievements in scientific research and technological development and explore scientific innovations in creativity that have the potential to be developed into innovations. The presentations focused on natural sciences, engineering and biotechnology. The participants agreed that innovation is key for the progress of national economies and their competitiveness in the international market.

SRIP ToP at the IFAM International Trade Fair

Last year's International Trade Fair for Automation & Mechatornic (IFAM) was held from 13 to 15 February 2024 at Gospodarsko razstavišče in Ljubljana. Once again, SRIP Factories of the Future (SRIP ToP) coordinated by the Jožef Stefan Institute had a booth at the fair. In addition to the SRIP ToP activities, it featured the achievements of Department of Automatics, Biocybernetics and Robotics, the Faculty of Electrical Engineering of the University of Ljubljana, Rudolfovo - Science and Technology Centre Novo mesto, EIT Manufacturing and the EIT Manufacturing RIS HUB in Slovenia, company Albatros PRO and representatives of the HyBReED program. SRIP ToP also organized two business forums as part of the trade fair. The first was a presentation of the RRI program Digital Transformation of Rrobot-Supported Factories of the Future (DIGITOP) coordinated by Prof. Dr Aleš Ude. The second forum was dedicated to the HyBReED program coordinated by the Institute of Chemistry in which JSI is a partner. The exhibition space was visited by many visitors and even the Minister of Innovation and Growth of the Republic of Bulgaria got a tour.

International Day of Women and Girls in Science

To mark the International day of Women and Girls in Science, two distinguished researchers at the Jožef Stefan Institute Assist. Dr Tanja Goričanec and Prof. Dr Barbara Koroušić Seljak took part in the panel discussion *Women in Science and for Science*. Equal opportunities and/or gender equality in science: this topic has become quite relevant and we seem to talk about it and consider it at length. But is it really that self-evident? It is in some parts of the world and not (yet) in others. According to the United Nations, only 12% of members of national science academies worldwide are women. In Slovenia, only 12.8% of the 179 members of the Slovenian Academy of Sciences and Arts (SAZU) are women, to put it in numbers: only 23 out of 179 members are women. This is quite revealing and indicates the need to discuss the topic and raise awareness on the issue. Most importantly, young girls need to be introduced and encouraged to choose a career in science, development and innovation. The researchers at the panel discussion organized by the University of Ljubljana, the Institute of Chemistry and the Jožef Stefan Institute discussed the devotion, passion, bravery and above all the tenaciousness as characteristics that pay off and are also indispensable to guide one on the path from a young researcher to an established, internationally renowned researcher and woman in science.

Show of Experiments: What's (the) Matter?

Researchers from the Department of Theoretical Physics collaborated with their colleagues from the Office for Project Informatics, Organization of Thematic Events and Conferences to organize a show of experiments in physics to the audience in Ljubljana. Two performances were attended by a packed Kosovel Hall at Cankarjev dom. The show about the physics of elementary particles included 28 live demonstrational experiments and was intended for the general public to get a fun introduction to the basic concepts of the physics of elementary particles, including the discovery of the Higgs boson.

JSI NANO Brainroom

In April 2024, the JSI NANO Brainroom project, which was developed in collaboration with BAAM Architects in the years 2021–2022, was displayed at the Department for Nanostructured Materials as part of the 2024 Open House Slovenia festival. The JSI NANO Brainroom or Brainstorming space is a multifunctional space that adapts to the needs of the researchers of high-tech nano materials and can be anything from a kitchen with a dining room, a classroom with office desks, a meeting room, a reading corner with a library and at the same time a central space where 40 employees can gather. The tables can be placed to suit the occasion: retractable benches for larger gatherings, two tables combined for meetings and a desk for individual work. The festival's central theme was Architecture of New Opportunities, highlighting the issue of inclusivity of all people and interest groups in the built and designed spaces. As part of the festival, architects guided selected groups of people through the spaces and introduced them to the process, concept and idea of designing a space, thus spreading the values of quality designed spaces and introducing the profession to the wider public.

JSI at the 56th MOS Trade Fair in Celje

The 56th International Trade and Entrepreneurship Fair held from 18 to 22 September 2024 in Celje once again showcased the project of the Ministry of Higher Education, Science and Innovation called Hub of Science and Economy. Cutting-edge technologies, innovations and products in fields as diverse as mechatronics, automation, robotics, professional electronics, energy, information technology, bionics, nanotechnology, space technologies and more were showcased in one place, with presentations of new technologies and technological processes, high-tech innovations, modern professions and modern education programmes. The hub received a lot of interest, especially from university and high school students. The Jožef Stefan Institute is one of the over 20 participating institutions and companies.

ELME Participated in LOKS Emergency Drill

On 30 November 2024, the Ecological Laboratory with a Mobile Unit (ELME) participated in the LOKS 2024 Emergency Drill organized by the firefighters from the Ljubljana Fire Department. The drill was held in LOKS warehouses along Letališka Road in the eastern part of the City Municipality of Ljubljana. The drill assumption was that a storm had damaged several buildings and a fire had broken out in one of them due to a lightning strike. The scenario stipulated that a few people were injured and that a suspicious package containing radioactive matter was found during the intervention, which activated the ELME Mobile Radiology Laboratory with three members and one vehicle. ELME carried out the contamination evaluation of the intervention staff and the injured people, measured the radiation in the immediate vicinity of the radioactive source, estimated the danger level and helped in the decontamination and removal of the radiation source. The emergency team at the drill consisted of Boštjan Črnič, Thomas Breznik, Dr Anže Jazbec and Assist. Prof. Dr Miha Mihovilovič.

10 November – World Science Day for Peace and Development

In 2024, the Jožef Stefan Institute marked World Science Day for Peace and Development with two panel discussions. The panel discussion *How to Ignite the Spark of a Scientific Breakthrough?* hosted by Dr Romana Jordan, included Dr Zala Lenarčič, Prof. Dr Dragan Mihailović, Prof. Dr Igor Muševič, Prof. Dr Tomaž Prosen and Prof. Dr Lev Vidmar, presenting the path and the ways to get from a research idea to acquiring a project.

Three of the largest research institutions in Slovenia–the University of Ljubljana, the Jožef Stefan Institute and the Institute of Chemistry–organized the panel discussion *Opportunities and Challenges of the Slovenian Research Ecosystem: How to Achieve an Innovative and Competitive Slovenia*. Guests at the panel included Minister of higher education, science and innovation Dr Igor Papič, Rector of the University of Ljubljana Prof. Dr Gregor Majdič, Director of the Institute of Chemistry Prof. Dr Gregor Anderluh, JSI Director Prof. Dr Boštjan Zalar and Executive Director for strategic development and internationalization of the Slovenian Chamber of Commerce Marjana Majerič.

The panellists agreed that despite Slovenia's solid research ecosystem, the problem of transferring innovations into the economy remains. Director of the Jožef Stefan Institute Prof. Boštjan Zalar said that the key to the success of Slovenia's research ecosystem is cooperation between research institutions and the economy along with a clear strategic direction. "Instead of financing just about anything, we should pick a few niche areas in which we truly excel." In his opinion, the country's key task is to increase investment in the creation of more technologically-oriented companies that could contribute to research being transferred to practical innovation.

Dr Zala Lenarčič at TEDx

Dr Zala Lenarčič from the Department of Theoretical Physics participated in a TEDx event, which features inspiring talks by people from various fields (finances, leadership, poetry, linguistics, criminology, science, climate change …) as well as a rich accompanying program. Zala took the packed audience of the Gallus Hall in Cankarjev dom on a fascinating journey to the intersection of science and life: "In its essence, life is actually not in equilibrium, it is run by so many different influences and all of us try to preserve it in some kind of stable state – some of us use lasers and complicated equations, while others use yoga or pedalling our bicycles."

CURRENT PROJECTS

"Try not to become a man of success, but rather a man of value."

Albert Einstein

World Quantum Day

The Jožef Stefan Institute and the Faculty of Mathematics and Physics of the University of Ljubljana marked the 14th annual World Quantum Day on 14 April. Prof. Dr Francesca Ferlaino presented the physics with dipolar quantum gases in a JSI Colloquium, while Olivier Ezratty held a series of lectures explaining the scientific and technical challenges in quantum computers and other quantum devices. The workshop introduced students to the basic principles of quantum physics and several laboratories. A panel discussion for the general public took place alongside the events, with guests Minister for Digital Transformation Dr Emilija Stojmenova Duh, director of the Science and Innovation Directorate Dr Tomaž Boh, representatives of public research organizations and universities, the industry and quantum consultant Olivier Ezratty. The participants exchanged views on the state of the development of quantum computing and quantum technologies, common European efforts and goals, opportunities and challenges for Slovenia and the national quantum strategy.

JSI and CERN: Half a Century Together

2024 saw a number of impressive anniversaries further linking the Jožef Stefan Institute and CERN. The Institute's 75th anniversary, the 70th anniversary of CERN and the 50th anniversary of collaboration between them are occasions marking the growth and immense success of both institutions. Half a century together marks the long period of fruitful collaboration that has given rise to the development of particle physics in Slovenia, our scientists working with world-renowned top research institutions as well as the joint knowledge being transferred to technological development and the industry.

Slovenian scientists have contributed to CERN by taking part in the establishment and measurement at several highly successful experiments, most recently the discovery of the Higgs boson in 2012, and they continue to carry out top measurements in particle physics to this day. They use the knowledge gained at CERN to participate in other particle physics and particle astrophysics experiments, such as Belle II in KEK Laboratory in Japan and the Pierre Auger experiment in Argentina. The top indirect result of CERN developing science and technologies continues to be the creation of the world wide web, while technological solutions conceived during collaborations at the Large Hadron Collider (LHC) in CERN are used, for example, in the largest Slovenian supercomputer Vega.

JSI organized a series of events to honour the 70th anniversary of CERN, the 75th anniversary of JSI and the 50th anniversary of their collaboration. On 28 May 2024, the head of the Slovenian group at CERN Prof. Dr Marko Mikuž gave a lecture, which was followed by the opening of a travelling exhibit in the JSI Gallery entitled *CERN in Photographs and Proton Football.* On 31 May 2024, CERN's Director for Accelerators and Technology Dr Mike Lamont gave a lecture in ROG Center entitled *From Subatomic to Superheroes: Particle Physics and Possibilities.* On 1 and 2 June 2024, the CERN in Photographs and Proton Football exhibit was showcased in the right atrium of the Ljubljana City Hall. On 5 June 2024, physicist Prof. Dr John Ellis from King's College London gave a lecture as part of JSI Colloquia entitled *Physics at CERN: Onward from the First 70 Years.*

For half a century, scientists at the Jožef Stefan Institute have been actively participating in CERN's efforts to discover what the universe is made of and how it works. CERN's anniversary is therefore also an anniversary of our efforts. 2024 was also marked by the final steps to finalize Slovenia's membership in CERN. To this end, a high-level delegation from CERN visited JSI on 19 February 2024 to evaluate the country's preparedness. They met with Institute Director Prof. Dr Boštjan Zalar, Rector of the University of Nova Gorica Prof. Dr Boštjan Golob, Vice-Rector of the University of Ljubljana Prof. Dr Anton Ramšak, Dean of the Faculty of Mathematics and Physics of the University of Ljubljana Prof. Dr Janez Bonča and other colleagues. CERN Director of Research and Computing Prof. Dr Joachim Mnich gave a lecture at FMF UL presenting the future of particle physics. It seems Slovenia meets all the conditions for full membership in CERN.

Series of Events: Talking Openly about Nuclear Energy

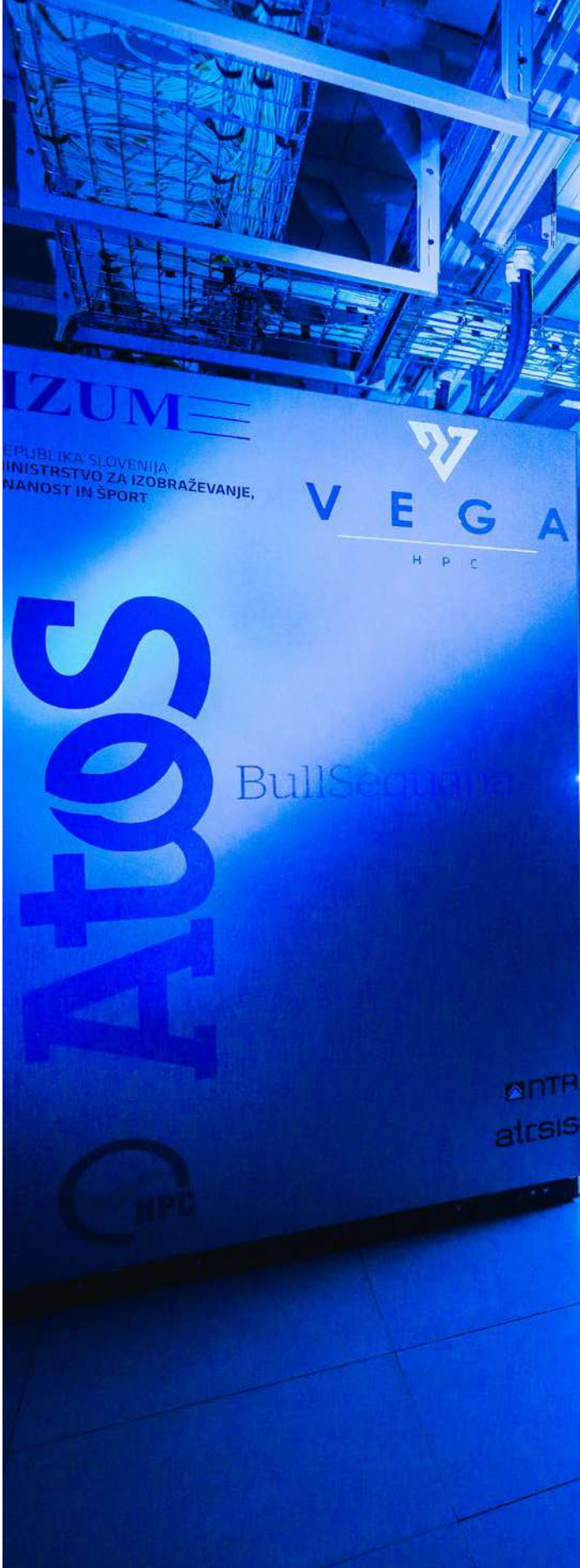
Between 19 September and 7 November 2024, the Jožef Stefan Institute organized a series of events to raise awareness among the general public about the use of nuclear energy and alternative energy sources ahead of the announced consultative referendum about the JEK2 project. The referendum, which was to be held in November, was cancelled a month prior to its execution, but the Jožef Stefan Institute completed the series of events.

The events were spread over a month and a half and featured six experts on nuclear energy. Prof. Dr Luka Snoj presented research on nuclear energy in everyday life, Dr Tanja Goričanec explained radioactivity and radiation, Dr Janez Kokalj presented how a nuclear plant works, Dr Igor Lengar discussed the possibilities and opportunities of low-carbon energy sources, Prof. Dr Leon Cizelj talked about nuclear safety, and Jan Malec considered the price of nuclear energy and possible alternatives. Alongside the lectures, a panel discussion was held entitled Science: the Foundation of (Future) Nuclear Technologies and Talent. The event attendees had the opportunity to tour the TRIGA nuclear reactor and see the educational exhibition on nuclear technology.

The series of events *Talking Openly about Nuclear Energy* was a chance for the Jožef Stefan Institute to make the most comprehensive presentation possible of the professional knowledge of Institute colleagues, while also demonstrating the high level of our technical production, as most of the events were held in the lecture hall of the Nuclear Training Center. Tomaž Krištofelc, Igor Djilas and Adis Krečo had a challenging task to prepare, broadcast and record each event, and they did an impeccable job.

High-Performance Computing

The Jožef Stefan Institute once again actively participated in organizing events on supercomputers. 18 October 2024 was the traditional Open Day for supercomputer centres across Slovenia, when organized groups and individuals were able to tour the JSI supercomputer center on Teslova; the second largest supercomputer in Slovenia, HPC Arnes, is also located there in addition to JSI systems. Visitors could attend a lecture by Ariela Herček (Arnes), Pavel Tomšič (Faculty of Engineering, UL) and Jan Jona Javoršek (Networking Infrastructure Centre, JSI).
The JSI Networking Infrastructure Center also participated in the EuroHPC Summit (Barbara Krašovec in a panel discussion on economic supercomputer use), an international summer school in Japan (Dr Alja Prah), a program of SLING Days as part of Arnes' Network of Knowledge (panel discussion Women in Supercomputing with Dr Alja Prah) and in the organization of the Austrian-Slovenian International High-Performance Computing Conference ASHPC in Grundlsee, Austria.

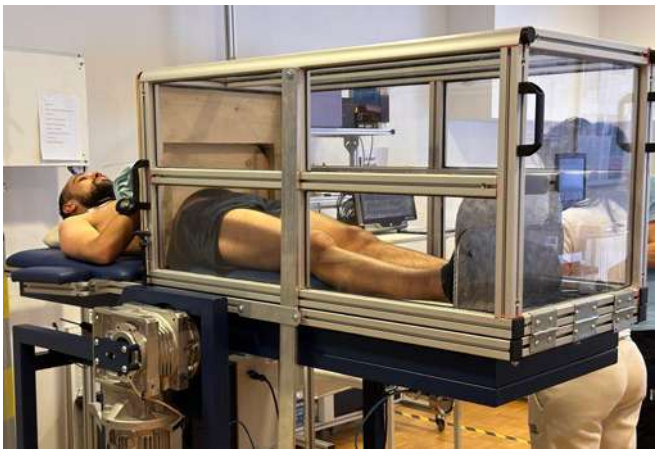



VEGA
Atos
PUE 1.05
BEST ENERGY EFFICIENCY
NTR


SCOTT
Slovenija
Ana Drev, Torino 2006
FINAPRES

Planica Campus

Since the establishment of the Planica Laboratory in the Planica Olympics Sports Centre in 2007, a number of studies have been carried out under the leadership of Prof. Dr Igor Mekjavić: hypoxic adaptation for climbers, elevation training for athletes, elevation preparation for members of the Slovenian Armed Services prior to embarking on peace missions to Asian mountains, cross adaptation to hypoxia and heat, hypoxic anorexia in climbers and patients with excess weight, etc. Of clinical significance is "Planica Protocol", the development of a protocol for frostbite management which was partially based on results from experiments in Planica. Since 2011, the Planica Laboratory has hosted numerous research groups from Slovenia and other European countries taking part in planetary habitat simulations. In the study, the subjects were reclined for longer periods of time (10 to 21 days) in a horizontal position in a normotoxic or hypotoxic environment, and the researchers measured the responses of their physiological systems, especially the response of the musculoskeletal system. In 2024, the Planica Laboratory executed the first part of the study *Effect of Whole-Body Vibration Training during Hypoxic Inactivity* for the European Space Agency (ESA). 12 subjects were in the hands of the researchers at the Jožef Stefan Institute for 90 days, the first and last 15 of which were intended for different measurements, while the intervening 60 days were spent in bed and doing whole-body training on a vibration pad. The goal of the study is to determine whether artificial gravity could improve the effects of the training that the astronauts are already doing on the International Space Station. One group in Planica was doing the training on a stationary device, while the other trained while in a human centrifuge.



JSI on TikTok

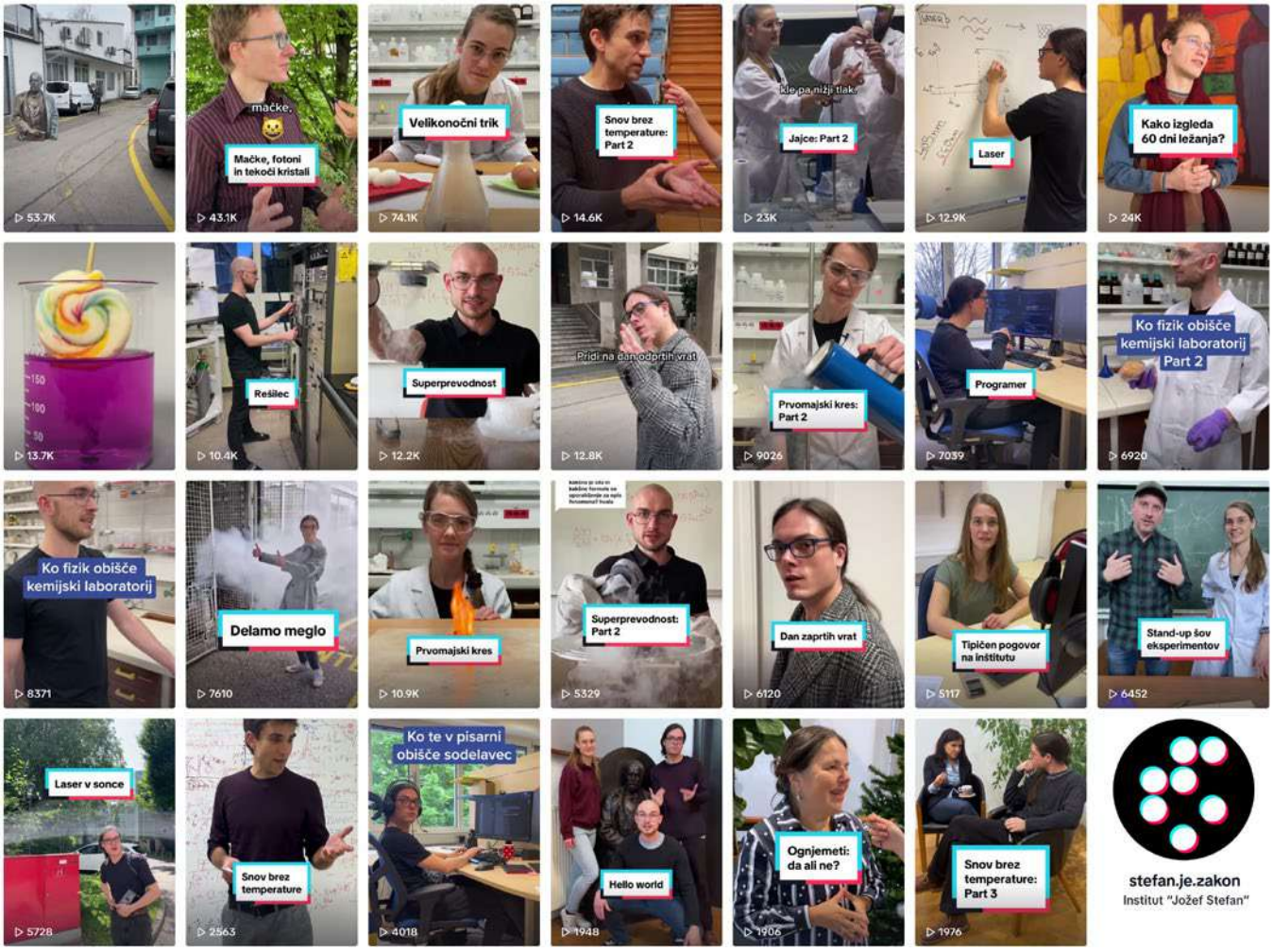
In the scientific research community, there is always a dilemma about the choice of methods and presentation of content when it comes to promoting science. Nevertheless, it seems that the basic dilemma 'Social networks: yes or no?' has been overcome. That is why, in addition to the already established platforms Facebook, Instagram, Twitter (X) and LinkedIn, we at the Jožef Stefan Institute have also decided to use TikTok with the @stefan.je.zakon profile in 2024.

The main reason for choosing TikTok is to target the teenager and young adult (13–24 years old) audience. We appointed three representatives, Evelin Gruden for chemistry, Maja Smerkol for electronics and Žan Gostenčnik for physics, and the TikTok video expert Igor Djilas. First, there were meetings and brainstormings on interesting topics, scenarios and recordings, which soon took shape in the form of short videos: from invitations to events and explanations of some scientific phenomena to interviews with JSI researchers who had had exceptional achievements during this period or had relevant information regarding current events. In the interviews, we had to go beyond the mere informativeness and professionalism of the content, towards the more entertaining way while remaining on the side of science and the promotion of knowledge.

In addition to Evelin, Žan, Maj and Igor, the videos also featured colleagues Marko Jeran, Matjaž Humar, Lev Vidmar, Maja Remškar and Polona Strnad, and the films *Velikonočni trik, Kje je Jožef, Mačke, Fotoni in tekoči kristali* and *Snov brez temperature*, received the most views. Interestingly, the video *Ognjemeti: da ali ne?* received 1,600+ views on TikTok, and as many as 51,000 on Facebook. In its own way, Matjaž Humar's video on Instagram also proved to be a success in 2024, increasing the number of followers of the JSI profile by a third.

In addition to all the performers, who also played an important role in all the script meetings and the birth of ideas, our audio-video experts Igor Djilas, Tomaž Krištofelc and Adis Krečo also did a great job; without them and their ideas on implementation, no TikTok video would have seen the light of day.

We recently surpassed the milestone of 10 thousand likes for all our videos in total on TikTok, and we will soon also break through the milestone of 1,000 followers. @stefan.je.zakon has certainly found its circle of followers, and what is even more pleasing is the realization that it encourages researchers to reflect on a more understandable image of science, which is necessary in today's information-saturated society.


mačke.
Mačke, fotoni in tekoči kristali
Velikonočni trik
Snov brez temperature: Part 2
Jajce: Part 2
Laser
Kako izgleda 60 dni ležanja?
Rešilec
Superprevodnost
Pridi na dan odprtih vrat
Prvomajski kres: Part 2
Programer
Ko fizik obišče kemijski laboratorij Part 2
Ko fizik obišče kemijski laboratorij
Delamo meglo
Prvomajski kres
Superprevodnost: Part 2
Dan zaprtih vrat
Tipičen pogovor na inštitutu
Stand-up šov eksperimentov
Laser v sonce
Snov brez temperature
Ko te v pisarni obišče sodelavec
Hello world
Ognjemeti: da ali ne?
Snov brez temperature: Part 3
stefan.je.zakon
Institut "Jožef Stefan"

MAYOR DEVELOPMENT PROJECTS

"Imagination is the highest form of research."

Albert Einstein

Healthy Lifestyle

In 2024, we joined the Bike to Work project, encouraging our employees to opt to cycle to work if they were able as an environmentally friendly and healthy mode of transport.
The project was set up as a challenge encouraging employees to leave their cars at home and cycle to work. By participating in the weekly challenges, they were entered into the draw for the weekly and main prizes.
22 active cyclists chose to participate in the project and the challenge. With the right strategy and encouraging our staff, we believe we can reach even more participants.
We have two bicycles at the Institute for short-distance trips. In this way, we enable our employees to be physically active even during working hours. Cycling in the city also means we can avoid traffic jams, have a positive impact on the environment and not least, reduce costs.
The strategy of the Occupational Safety and Health Service, with the participation of the Institute's management, is to continuously improve healthy working conditions and the well-being of employees, and thus their loyalty and pride in the organisation.

POLNI ZAGONA
KOLESARIMO V SLUŽBO

JSI for a Sustainable Future

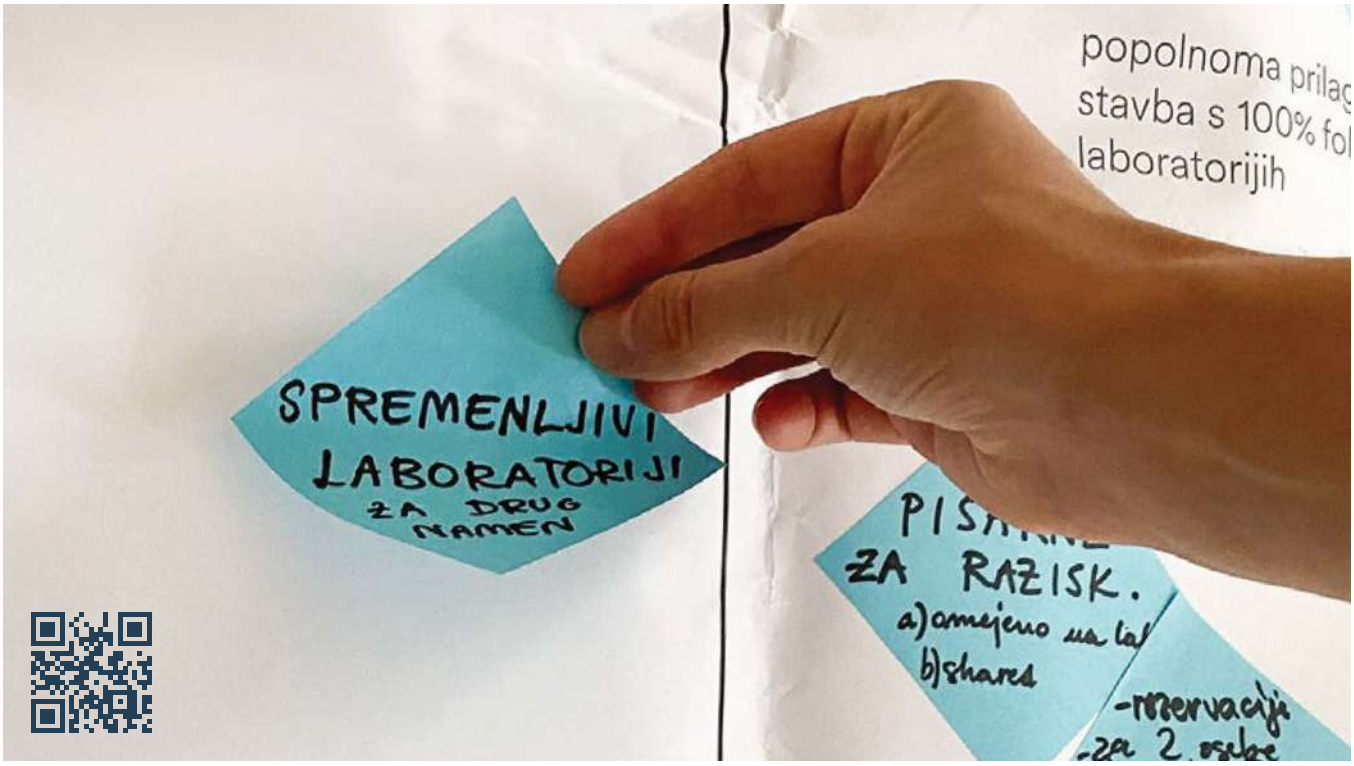
The Jožef Stefan Institute follows the principles of sustainable development and includes it in all aspects of its operation. We are aware that sustainable development requires meeting the needs of today's generation without endangering future ones, and the most crucial elements to accomplish this are to coordinate economic growth, social justice and environmental protection.
The Institute encourages its employees to proactively think, learn and act in the field of sustainability so that sustainable development may become a central part of our culture. We strive for scientific and research excellence by implementing a sustainable vision, optimizing resources, organizing sustainable events, digitizing our operations, facilitating the co-use of equipment and facilities, sustainably oriented purchasing, cooperation and awareness raising. We also actively encourage dialogue and education on sustainable practices in our Institute and beyond.
At the Jožef Stefan Institute, we believe that through research, innovation and responsible behaviour, we can contribute to creating a more sustainable future for all.

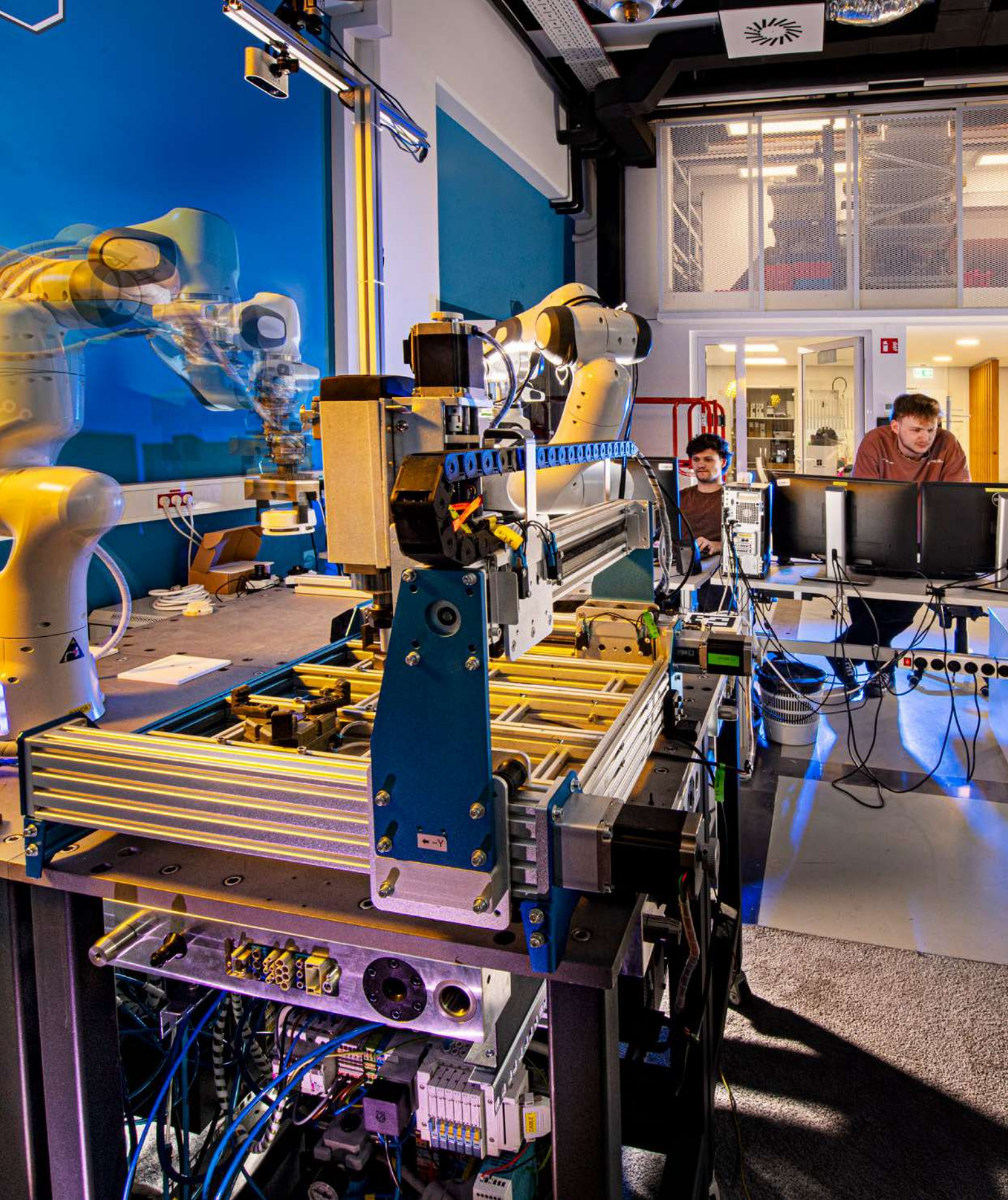
JSIplus

The future of the Jožef Stefan Institute lies in focusing on the most current areas of natural sciences, such as quantum technologies and artificial intelligence. We believe that basic science co-shapes the future and crucially contributes to increasing productivity and innovation. In practice, this progress is reflected in new high-tech products and solutions that enable the industry to create new high-value added jobs. Research has a pivotal role in solving global challenges relating to climate change, ecology and energy needs. Through scientific excellence, the Jožef Stefan Institute actively contributes to the realisation of the vision of a green future. Through breakthrough innovations and technologies, we support the national economy and strengthen Slovenia's international competitiveness.

In 2024, we carried out and completed an extensive user study and a co-creation process to prepare an architectural brief. This process involved four basic phases: first, we conducted a stakeholder survey with interviews and collected written opinions to gather the diverse views, needs and perceived barriers by different groups. This was followed by a synthesis of the information gathered, where the data was organised into thematic clusters that enabled effective workshops. In the third phase, the project's starting points were formulated through a process of co-creation, balancing needs with constraints and seeking compromises between different perspectives in order to create a common starting point. Finally, we documented all the project baselines, creating a clear record of user requirements that will guide the designers and allow them to measure the success of the project.

The data will directly affect the project documentation for a modern research centre and ensure that the centre effectively supports scientific activities with flexible facilities and equipment, state-of-the-art laboratories for experimental work, an attractive working environment for top-quality staff and a stimulating environment for the development and implementation of new projects.






SupraSolv®
n-Hexane
for gas chromatography
n-Hexan
n-Hexano
n-Esano
n-hexaan
J.T.Baker
SUPELCO

Young Talent at JSI

At JSI there are 838 researchers, 226 employees are within 12 years after their PhD, 157 young researchers, and 196 foreign employees–figures that underscore the importance of young and international staff in shaping the future of the Institute. With this in mind, the Council of Early Career Researchers (acronym SZK from Slovenian "Svet raziskovalk in raziskovalcev na Začetku Kariere") was established in 2022. The council, composed of seven young researchers elected among peers within 12 years of their first doctoral defence, serves as a consulting body to the Director, representing early-career researchers and actively fostering communication between them and the working bodies of the Institute. Additionally, the SZK provides support and guidance to the early-career research community.
The vision of SZK is clear: the young research community at JSI is a driving force of innovation, energy, and fresh perspectives. Their contributions - whether through groundbreaking research, technological advancements, or fresh methodologies - play a crucial role in the institute's success. The JSI achievements stem from their efforts, as they are not just the future of research but an essential part of its present, and as such should be heard and valued. By investing in and empowering the next generation of researchers, JSI reinforces its leading role in scientific excellence.

Strategic days

On 5 and 6 November 2024, JSI Strategic Days were held in Portorož, purpose of which was both business and socializing. At the two-day meeting, attendees presented current issues, achievements and plans within the Jožef Stefan Institute. After the welcoming address by JSI director, Prof. Dr. Boštjan Zalar, opportunities in Europe were presented by Dr. Draško Veselinovič, president of the Slovenian Business & Research Association SBRA, and his thoughts also stimulated discussion among members of the Institute's Management Board. Younger researchers, united in the Council of Early Career Researchers, presented their experiences, opinions and wishes, and the more than 100 participants of the meeting dedicated special attention to the importance of communication. Through interesting discussions with special guests Andraž Zorko, partner at Valicon company, and Robert Ilovar, brand identity consultant, the participants reinforced their belief in the importance of a coordinated and unified presentation in terms of both content and visual image.


EL BERNARDIN


analiza vidne pojavnosti
Jožef Stefan in njegovih

ČasopIJS
The Jožef Stefan Institute in 2024, no. 3
ISSN 2820-5804

Publisher:	Jožef Stefan Institute
Editorial Board:	Polona Strnad (editor) Tomaž Krištofelc (technical editor) Marjeta Trobec Marjan Verč Polona Umek Duško Odić
Design:	Lenka Trdina
Illustration:	Manca Žitnik
Photographs:	Marjan Verč, Radojko Jačimović, Arne Hodalič and Katja Bidovec, Bor Slana/STA, Adobe Stock and JSI archive
Lector:	Špela Komac
Print:	Collegium Graphicum d. o. o.
Place and year of publication:	Ljubljana, 2025
Circulation:	500 copies
Price:	free of charge

casopijs@ijs.si
www.ijs.si

Education

Total

243

faculty members who are lecturers

36 %
Assistant Professor, PhD

28 %
Associate Professor, PhD

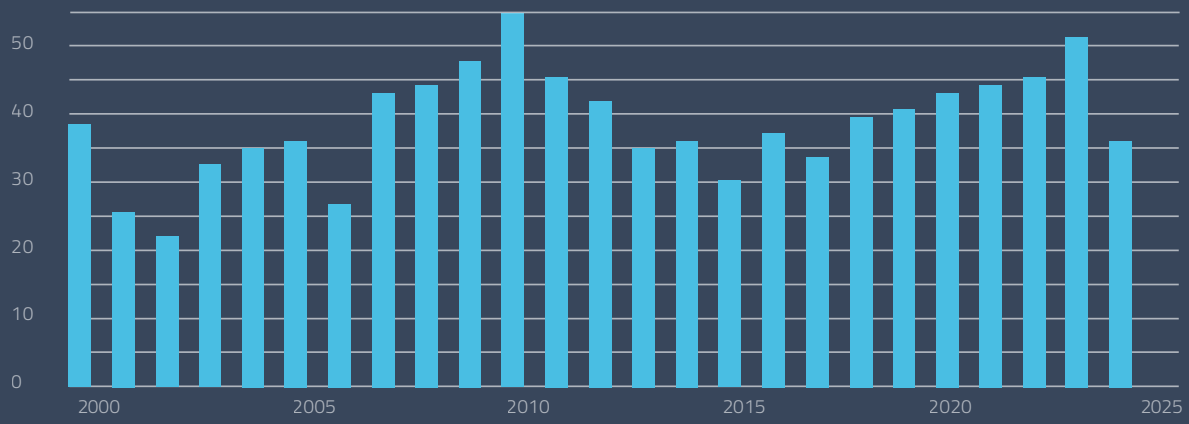
35 %
Full Professor, PhD

Young researchers

Total

835

young researchers funded by ARRS funding in the period 2000-2024



Projects

Total
769
projects

295
projects financed by the national agency **ARIS**

160
projects financed by different **European Union schemes**

157
market projects: domestic

157
market projects: international

Appearance in the media

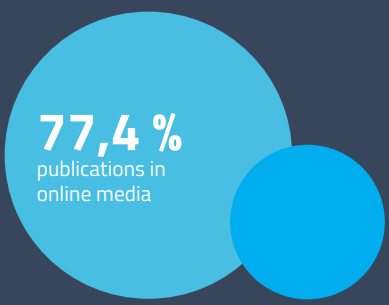
Total
2,894
media releases

Media that covered JSI the most:

1. novice.najdi.si
2. sta.si
3. Delo
4. megafon.si
5. rtvslo.si

Authors that covered JSI the most:

1. STA
2. Saša Senica
3. Marko Medvešček
4. Branko Janjič
5. G.C.



22,6 %
posts in print media

The Institute in Numbers

1,060+
published articles**

60,751
citations*

13
ERC projects

769
projects**

124
awards***

2,894
media releases**

21,700+
visitors**

*Data collected on 31. 12. 2024
**Data are for 2024
***Data for 2000–2024

Jožef Stefan
Institute
Ljubljana, Slovenia