



Saint-Petersburg
State University
Research Park

READY FOR JOINT PROJECTS

www.spbu.ru



Research development is one of the top priorities for St. Petersburg University. A network of resource centres was launched in 2010 to create cutting-edge research infrastructure. More than four billion roubles have already been invested in scientific equipment for 21 resource centres. These funds enhance the traditions of SPbU schools of thought maintained in the resource centres by experienced researchers and young scientists. The intellectual heritage is the University's major asset. It is the strong schools of thought that attract top-ranking international researchers to SPbU. The development of these schools facilitates the progress of global science, therefore we are happy to provide the resource centres' capacity to our research partners. The resource centres network is augmented by SPbU postdoctoral programmes and mega-grants provided to establish laboratories headed by world's leading researchers. The University supports academic mobility, hosts research events and does other steps to ensure fruitful work of active scientists. St. Petersburg University is open for cooperation, and we will be most delighted to welcome you here!

Rector Nikolay Kropachev

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Resource Centres

Resource centres as essential components of research infrastructure have been established in St. Petersburg University since 1998 till present time. The centers are equipped with unique cutting-edge facilities which enable innovations, development of educational programs and science. The centers contribute to generation of intellectual and creative potential of SPbU to meet the challenges of scientific, technical and socio-economic development of the University. The resource centers also contribute to the goals of the Program for the Development of SPbU till 2020 aimed at making SPbU one of the world class universities and providing academic and scientific support of state policy for Russia's innovative development.

An outstanding intellectual and academic environment, experience, knowledge and scientific proceedings of the oldest Russian university, SPbU, are the basis for organization and development of 21 resource centers. Scientific activity of each centre corresponds to four priority fields of research as follows:

- Nanotechnology and Material Science
- Biomedicine and Human Health
- Information Systems and Technology
- Ecology and Rational Nature Management

Research within the field of nanotechnology and material science can be conducted in ten resource centers of SPbU: Centre for Magnetic Resonance Research, Centre for X-ray Diffraction Studies, Centre for Chemical Analysis and Materials Research, Centre for Optical and Laser Materials Research, Centre for Physical Methods of Surface Investigation, Centre for Thermogravimetric and Calorimetric Research, Centre for Nanofabrication of Photoactive Materials, Centre for Innovative Technologies of Composite Nanomaterials, Nanotechnology Interdisciplinary Center, Educational Resource Centre for Physics.

Six resource centers work in the field of biomedicine and human health: Centre for Diagnostics of Functional Materials for Medicine, Pharmacology and Nanoelectronics, Centre for Molecular and Cell Technologies, Centre for Culture Collection of Microorganisms, Chromas Core Facility, Centre for Microscopy and Microanalysis, Educational Resource Centre for Chemistry.

Three resource centers function in the field of ecology and rational nature management: Observatory of Environmental Safety, Centre for Space and Geoinformation Technologies, Centre for Geo-Environmental Research and Modelling (GEOMODEL).

The last, but not the least, two resource centers work in the field of information systems and technology: Computing Centre of SPbU, Centre for Sociological and Internet Research.

In the Russian Federation and in SPbU as well high importance is attached to modernization of the system of training graduates, conduction of current scientific projects of high quality and generation of research and creative potential of SPbU in the abovementioned priority fields. Competitiveness of the Russian Federation on the world stage depends on its scientific and technological development, that's why organization of breakthrough research activity is highly important for SPbU.

Today we are strongly convinced that the system of resource centers has been successfully established in a way which fully corresponds to SPbU Development Program 2020 and provides opportunities for organization interdisciplinary research.

The resource centers function according to the principle of equal access for everyone notwithstanding their affiliation with SPbU. We believe that equal access is an important step to facilitate scientific collaboration which implies conduction of joint research projects by representatives of creative and intellectual elite. Joint scientific collaboration and intellectual activity of researchers with different scientific background promote creative approach to innovations and the most effective results as well. Resource centers are a platform for researchers to exchange experience and knowledge which is a basis for creation joint intellectual products.

Through the system of resource centers SPbU affirms its status of a unique research and development centre with the mission of innovative development, modernization and diversification of economy and academic environment, increase of industrial efficiency and implementation of Russia's global competitive advantages.

One of the most important goals of the resource centers is training of experts who could implement effective research projects and create innovation products using the unique cutting-edge equipment.

Innovative modernization is a priority for modern Russia and can be achieved by creative professionals working at SPbU resource centers.

Resource Center for Magnetic Resonance

Research Resource Centre for Magnetic Resonance is an interdepartmental and interdisciplinary facility that provides an access to instrumentation, expertise and infrastructure to carry out and support chemical, physical and biological research using NMR, NQR and EPR spectroscopy as well as magnetic resonance microimaging.

Complexity of experiments that can be performed in the centre could vary from the most basic ones, so called routine measurements, to the most advanced ones, requiring an extended work schedule and a combination of various magnetic resonance techniques. The centre provides a set of modern spectrometers to work with samples in liquid, amorphous and crystalline phases in the temperature range from 110 °K (4 °K for EPR) to 870 °K, depending on the spectrometer and technique used.

The equipment of the centre allows one to organize theoretical and practical courses, classes and seminars for students and employees of the St. Petersburg State University in order to strengthen the curriculum in the area of magnetic resonance spectroscopy and in order to train qualified users of modern spectral methods. For external academic organizations (institutes, universities) research conduction is possible on the basis of scientific cooperation. All services of the centre can be provided on commercial basis to external users, such as medical, pharmacological and forensic organisations, as well as museums, technological and research centers, industry etc.

Unique and rare techniques available in Centre for Magnetic Resonance

- Wide NMR frequency range: from ^1H to ^{109}Ag .
- Diffusion measurements (DOSY etc.) at temperatures up to 470 °K. Diffusion coefficients down to $10^{-13} \text{ cm}^2/\text{s}$.
- UV irradiation of EPR samples in the range 200–2000 nm. Combined NMR/UV-vis spectroscopy.
- Long low- and high-temperature NMR measurements: from 120 °K to 870 °K



500 MHz
+ three channels
+ liquids at 110 °K



400 MHz (WB)
+ high T (800 °K)
+ diffusion
+ microtomography



400 MHz (2×)
+ ^1H to ^{109}Ag

- NMR measurements in liquefied gases as solvents.
- Microtomography of object up to 30 mm in linear size (living organisms with heartbeat and pulse monitoring).
- EPR in the temperature range from 3.7 °K to 500 °K
- NMR of magnetically-ordered materials (^{11}B , ^{57}Fe , ^{59}Co , ^{61}Ni etc. nuclei) in zero magnetic field.
- NQR spectra of ^7Li , ^{27}Al , ^{35}Cl , $^{63,65}\text{Cu}$, ^{75}As , ^{93}Nb , ^{183}Ta etc nuclei.

Centre of X-ray diffraction studies

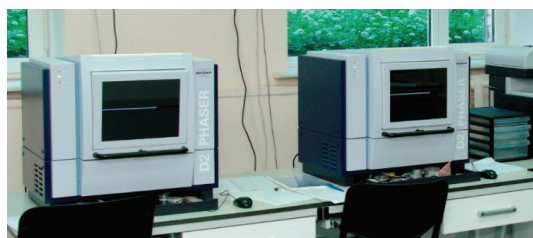
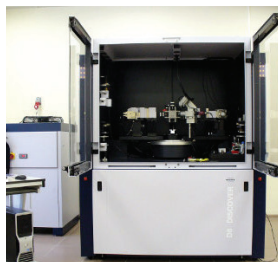
X-Ray Diffraction Centre of Saint-Petersburg State University possesses a range of brand-new instruments that allows to perform unique studies of crystal structures of novel materials and compounds of natural and artificial origin. In particular, novel single-crystal diffractometers equipped with rotating-anode generators, microfocus X-ray tubes and high-sensitive detectors of X-rays can be used to study single crystals with up to 5 μm in size. Powder diffractometers are equipped with low- and high-temperature attachments, which makes possible to study behaviour of crystalline materials in the temperature range from -100 to 1200 $^{\circ}\text{C}$. The XRD Centre has also several instruments and elaborated methodologies to investigate defect structure of real crystals, thin films and composites. The set of diffraction instruments concentrated in one place makes SPBU XRD Centre one of the most advanced and well-equipped X-Ray diffraction centres in the world.



Single crystal X-ray diffraction analysis. Refinement of the crystal structure.
Equipment: R-Axis RAPID II from Rigaku, Kappa APEX II DUO from Bruker-AXS, SuperNova and Xcalibur from Agilent Technologies



Thermal X-ray analysis equipment:
 Ultima IV from Rigaku



Powder X-ray diffraction analysis equipment:
 D2 Phaser from Bruker-AXS, MiniFlex II Ultima IV from Rigaku

X-ray diffraction defectoscopy equipment:
 D8 DISCOVER from Bruker-AXS

Thermogravimetric and Calorimetric Research Center

Purpose of the centre is to support basic and applied research requiring thermal analysis, thermochemical investigation and determination of thermodynamic properties of substances and materials. The scope covers investigations of chemical and physicochemical processes such as chemical reactions, phase transitions, formation of solutions, dissolution, sorption, adsorption, polymerization. The second focus of the centre is to educate bachelors, masters and PhD students specializing in thermal analysis methods.



TA Instruments TGA Q5000SA Water Vapor Sorption Analyzer

The Q5000 SA is a compact, benchtop instrument that delivers the performance and reliability required in a leading sorption analyzer designed for the study of materials under controlled conditions of temperature and relative humidity. Its modern, user-friendly design features a high sensitivity, temperature-controlled thermobalance, an innovative humidity generation system, a 10-position autosampler, and imposing software.



NETZSCH TMA 402 F1 Hyperion Thermomechanical Analyzer

NETZSCH TMA 402 F1 provides research variability: from single pulse in rectangular or ramp form to continuous modulation with a freely selectable frequency (up to 1 Hz), every possibility is covered. This analyzer is particularly well-suited for determining visco-elastic material properties such as elasticity and creep modulus.



Specially designed furnaces allow fast heating and cooling rates as well as a highly precise temperature control. The instruments are highly suitable for thermal composition, thermal stability and oxidation studies, coupling device for Evolved Gas Analysis, such as Quadrupole Mass Spectrometer or Fourier Transform Infrared Spectrometer.

Centre for chemical analysis and materials research

Created at the St. Petersburg State University for research in the field of analytical chemistry and analytical support for research, development and industrial — innovation works carried out in the concerned organizations.

Key areas of the centre are: gas chromatography; chromatography-mass spectrometry; liquid chromatography; atomic absorption and emission; optical methods; optical spectroscopy; X-ray methods; elemental analysis of organic compounds.

For molecular analysis centre is equipped by:

- Shimadzu LC-20 and LC-30 based liquid chromatographs and mass spectrometers with a wide range of detectors
- Shimadzu GC-2010Plus gas chromatographs with a wide range of detectors and GCMS-QP2010Ultra/GCMS-QP2010SE mass spectrometers
- Bruker Daltonik ultra high-resolution TOF mass spectrometer "MaXis"
- Shimadzu MALDI mass spectrometer AXIMA Resonance
- Shimadzu FT-IR spectrometers IRPrestige-21, IRAffinity-1
- Shimadzu UV-visible-NIR UV-3600, UV-visible UV-1800 spectrophotometers
- Horiba compact spectrofluorimeter Fluoromax-4P
- Horiba LabRAM UV-Visible-NIR Raman spectrometer

For elemental analysis centre is equipped by:

- Shimadzu wavelength dispersive X-Ray fluorescence spectrometer LAB CENTER XRF-1800
- Anton Paar small angle X-ray scattering system with a generator based on the X-ray tube vacuum SAXSess mc²
- benchtop total reflection X-ray Fluorescence (TXRF) spectrometer Rigaku Nanohunter
- Shimadzu energy dispersive X-ray fluorescence spectrometer EDX-800P



Ultra high resolution TOF MS "MaXis"



Lab Center XRF-1800



Small angle X-ray scattering system SAXSess mc²

AXIMA Resonance — MALDI QIT TOF MS features:

- Advanced MSn Performance —
The unique combination of MALDI and QIT allows generation of ions using a number of different matrices; switching between positive and negative ionization modes in seconds; incorporating a TOF analyzer promotes high resolution and high mass accuracy for all ions generated regardless of their origin
- Excellent Precursor Ion Selection — Allows ions from complex mixtures or closely associated neighboring isotopic envelopes to be easily isolated and subsequently fragmented
- High Sensitivity/Resolution —
Near axis laser irradiation provides enhanced ion transmission and sensitivity in all modes of operation
- Low Sample Consumption —
Allows many more MS/MS experiments to be performed on the same sample spot
- Unparalleled Flexibility — Ideal for a wide range of applications, not just proteomics.



Innovative Technologies of Composite Nanomaterials

Resource Centre «Innovative Technologies of Composite Nanomaterials» («Nanocomposite») of St. Petersburg State University is founded in 2013 to provide technological support of investigations in the field of materials science. The centre equipment can be used for synthesis of thin films, dispersed, ceramic, polymeric and other composite materials and for research their physical and chemical properties.

- Method of atomic layer deposition (ALD) for precision synthesis of thin films of various compounds on the surface of flat, 3-D and porous substrates
- Deposition of uniform thin films on flat substrates by spin coating
- Hydro(solvo)thermal synthesis of nanodispersed materials
- Ceramics production by hot pressing
- Composites production based on polymeric matrixes
- Template-directed synthesis of grafted organic compounds
- Equipment for hydro(solvo)thermal synthesis of dispersed materials:
 - High-pressure reactor Berghoff BR-300 (a temperature up to 300 °C and a pressure up to 300 bar, possibility of sampling, inert atmosphere, control of pressure, temperature and stirrer rotation rate)
 - Microwave station ETHOS 1 (Milestone Inc.) (a temperature up to 300 °C, a pressure up to 100 bar, 10 pc PTFE reactors, 100 ml each).
- Spin coating equipment WS-650Mz-23NPP (Laurell Technologies Corp.) for films deposition by spraying a solution on rotating substrate (substrate diameter up to 150 mm, rotation rate up to 12,000 rpm)
- Equipment for investigation of element composition, surface area, voids and particles dimensions, mechanical, electrical, optical and thermal properties of materials.

Installations “Nanosurf”, “Solar-MN” for synthesis of films of different chemical compounds (oxides, sulfides, nitrides and other compounds) by atomic layer deposition



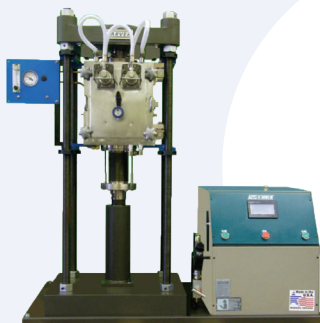
Fully automatic peptide synthesizer Endeavor 90-1 (Aaptec LLC) for Fmoc- and Boc-peptide synthesis on a solid-phase carrier using up to 4 amino acids.



HAAKE Minilab II microcompounder-extruder for producing composite materials based on polymer matrixes



The hot pressing FR210-30T-A-200-EVC (OXY-GON Industries) installation for producing ceramic materials at a pressure up to 27 tons and temperature up to 20000 °C

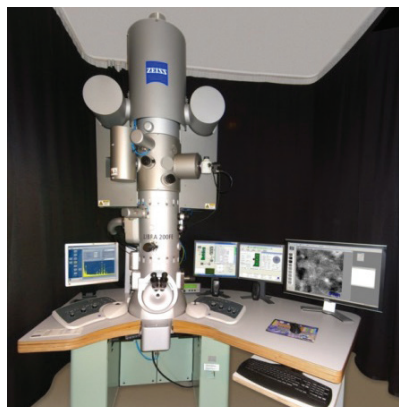


Interdisciplinary Resource centre for Nanotechnology

Interdisciplinary Resource Centre for Nanotechnology (IRC-NT) is one of the biggest electron and ion microscopy facilities in Russia. IRC-NT combines modern scientific equipment with eminently qualified research staff. Here University researchers, post docs, students and external users can investigate their samples with the help of the IRC personnel. More than about 50 paper are published by IRC-NT users annually.

Leading research branches are:

- Analytical electron and ion microscopy
- Electron and ion lithography
- Precise sample preparation for microscopy investigations



Zeiss Libra 200FE

Transmission Electron Microscope with high-efficient field emission cathode, Energy Omega-filter and Koehler illumination system (patented by Carl Zeiss SMT).



Zeiss Merlin

Zeiss Merlin — scanning electron microscope with field emission gun and GEMINI-II electron column. Analytical capabilities of Merlin are extended with Oxford Instruments Inca X-Act EDX spectrometer, Channel 5 EBSD and STEM detectors



Zeiss ORION

The only one in Russia Scanning Helium Ion incorporates both Focused Ion Beam and Scanning Electron Microscopy approaches. Being a very surface tool due to the origin of ion beam with solid interaction it is also the first scanning microscope with a subnanometer resolution.



Zeiss Supra 40VP

Zeiss Supra 40VP is a Scanning Electron Microscope with Field Emission cathode, GEMINI electron-optics column and variable pressure (VP) operating mode. Analytical capabilities are extended with Gatan MonoCL3+ Spectrometer, and Gatan SmartEBIC electron beam induced current (EBIC) registration system. Cooling of the sample to 6K is available with Gatan cryo stage.



Auriga Laser System

Cross-beam SEM-FIB workstation equipped with laser chamber and Raith lithography system. Kleidiek Nanotechnik micromanipulators are able to contact and modify nanostructures with real-time process monitoring.

Culture Collection of Microorganisms (CCM)

Centre of Core Facilities «Culture Collection of Microorganisms (CCM)» provides equipment and skilled staff for maintenance of living cultures of eukaryotic microorganisms, cyanobacteria and small aquatic invertebrates. CCM was formed on the basis of three main «precursory» collections being maintained for many years at several departments of the Faculty of Biology and Soil Science of St. Petersburg State University:

- Collection of algae of Leningrad University (CALU), including cyanobacteria, microalgae, and algae parasites (~ 1500 stocks);
- Collection of ciliates and their symbionts (~ 4500 strains);
- Collection of amoebae, heliozoa and other heterotrophic protists (~400 strains).

Technical facilities of CCM includes six isolated rooms with individual fully programmable climate control temperature, humidity and lighting intended for long-term maintenance of culture collections. Stability of functioning of these rooms is guaranteed by triple backup protection system. Several laboratory rooms available at CCM are equipped by all facilities for maintenance, feeding, cleaning and other procedures necessary to maintain cultures. Equipment of these rooms include laminar boxes, fume cupboards, different kinds of centrifuges, local climate cabinets to maintain cultures under special conditions, high-level dissection, upright and inverted microscopes and other necessary hardware. Special room is dedicated to prepare culture media and sterilize glassware. CCM provides technical positions for specially trained professional stuff to maintain basic collections of the centre and help user in work with their local collections kept in CCM in the status of running projects.

CCM also provides facilities to investigate living organisms kept in the collections which cannot be transported to other laboratories by main methods of light microscopy (transmission light, phase contrast, integrated modulation contrast, Nomarsky contrast, fluorescent microscopy).

Centrifuge Eppendorf

The Centrifuge 5418 is a compact 18-place centrifuge designed for labs. Product specifications of this microcentrifuge cover all the application in todays' labs.



Leica DM 2500

With its powerful 100W illumination, high-quality optical performance and state of the art accessories, the Leica DM2500 is especially well suited for challenging goals in pathology or biomedicine that require differential interference contrast or high-performance fluorescence.



Leica M 250C

The modular Leica M205 C, the world's first stereo microscope to offer 20.5:1 zoom, resolves structural detail down to 476 nm.



LeicaDM3000

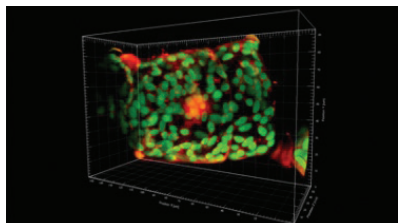
The Leica DM3000 microscope for pathology, cytology, haematology and many other applications feature a motorized nosepiece, condenser head, automated light intensity adjustment, and optional foot pedal. These intuitive microscopes improve workflows significantly.



Chromas

Resource centre «Chromas» is focused on innovative research projects in cell biology, molecular genetics, developmental biology, microbiology and other fields of bio-medical research.

The centre specializes in bioimaging, high resolution fluorescence and confocal laser scanning microscopy, including real-time microscopy. In addition, the Centre has facilities for experimental research in comparative genomics, molecular cytogenetics and immunocytochemistry. Our centre equipment is permanently updating due to the long-lasting close cooperation with Leica Microsystems GmbH (Germany), the world leader company in innovative microscopy and scientific instruments.



High performance computers and software for image processing (Adobe Photoshop, Bitplane Imaris, Autoquant X3, Huygens Professional) for performing bioimaging: 3D-reconstruction, deconvolution and statistical analysis.



Complex of high-resolution light microscopy includes laser scanning microscope Leica TCS SP5, automated Leica fluorescence microscopes, equipped with high resolution monochromatic and color digital cameras, cube filters for wide range of fluorochromes and lenses for phase- and DIC-contrast. Complex also includes stereomicroscopes for microsurgery and preparation.



Laser scanning microscope Leica TCS SP5 for True Confocal (inverted) equipped with resonant scanner. The device can accommodate specimens labeled with all fluorophores including ultra violet. High-speed imaging supplies the data for a wide range of integrated analytical techniques.



Molecular and cell biology equipment complex contains various devices, such as centrifuges, electrophoresis set, gel detector, PCR thermocyclers, hybridizers, microinjector Nanoject II, spectrophotometer, PCR and laminar boxes and cryotome-cryostat.

Nanophotonics

RC "Nanophotonics" objectives

Fabrication of functional nanocomposite materials and elements for:

- Optical and quantum supercomputers
- Nano-electronics and micromechanics
- Solar energy conversion and heterogeneous photocatalysis
- Photoactive nano-coatings and chemical sensors

Basic technologies

- Molecular beam epitaxy
- Technology of fabrication of nanocomposite materials by ion beam sputtering and plasma-induced dispersion
- Technology of molecular layer deposition
- Nanolithography
- Nanoimprinting
- Technology of thermochemical and microwave synthesis of dispersed nanocomposite materials
- Sol-gel technologies of nanocomposite coating formation (dip-coating, spin-coating, spray-coating)
- Technology of (photo)electrochemical synthesis and modification of nanocomposite materials



Ion-beam etching
Oxford IonFab 300



Molecular beam epitaxy SVTA



Photolithography
Heidelberg uPG 101



Optical testing stands

Centre for sociological and Internet research

In March 2013 Saint-Petersburg State University opened Resource Centre "Centre for sociological and Internet research"

The Resource Centre is interdepartmental and multidisciplinary facility that offers a complete service to conduct and support research in social science.

Scientific goals:

The goal is to develop and implement cutting edge internet technologies to carry out sociological research, to build unique software for sociological research in the field of social and humanitarian knowledge. Design tools for sociological research of public opinions.

Internet research is up-to-date way to collect relevant social information for research in social science and humanitarian knowledge, which allows the use of quantitative and qualitative methods, unique software and to receive and process large empirical data in real time.

Resource centre uses cutting edge systems CATI and CAWI.

- CAWI (Computer Assisted Web Interviewing)
- CATI (Computer Assisted Telephone Interviewing)

Up-to-date servers and unique software allow using the following quantitative and qualitative methods.

Quantitative methods:

- Internet polling which uses an online self-administered questionnaire, allowing at the time of filling in to check for mutually exclusive responses and control sampling of respondents according to specified parameters
- Telephone poll includes complete programming and hosting services, powered by leading edge survey technology to enable even most complex of interviews to be conducted

and control sampling of respondents according to the specified parameters.

Qualitative methods:

- Monitoring of social media content
- Focus groups

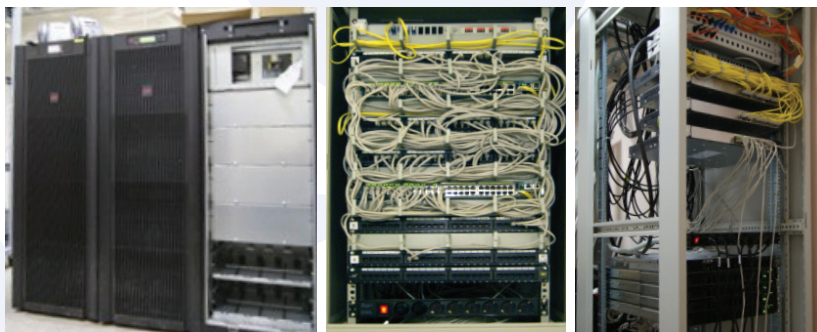
The Centre is constantly working on the development of a nationwide panel to construct a representative sampling.

We are currently managing an expert panel that consists of professionals from a variety of scientific fields.



Software application to perform social network analysis

The collection of sophisticated software applications is used for social network analysis and data visualization. The team is continuously evaluating new tools for research in social science



Net infrastructure and data center

Modern Data Center, built on powerful hardware, provides secure and reliable storage and access to the data collected for the research



Computer Assisted Telephone Interviewing (CATI)

System includes telephone station and 20 workspaces for interviewer-operators. Telephone polling with automatic dials and using an online self-administered questionnaire to provide faster data collection, elimination of possible mistakes and control sampling of respondents.



Focus Group Studio

Equipped studio with viewing room includes a one-way mirror and comfortable work setting which allows to conduct and record focus interviews with present participant.

The Space and Geoinformation Technologies Resource Center

Space and Geoinformation Technologies Resource Centre (RC) was created for solving problems of the Russian north-west region monitoring, provide information, new technologies and spatial data for the educational and research projects of the SPbU.

The uniqueness of the RC is its ability to collect information from a variety of remote sensing satellites using the UniScan-24 receiving station with the parallel obtaining of precise ground control points coordinates and atmospheric parameters using a network of ground base stations. In the first stage of RC activity data receiving from 6 satellites (Terra, Aqua, SPOT-4, SPOT-5, EROS A, RADARSAT-1) was started. Ground base stations network consists of 3 stations.

Goals:

- Information support of SPbU programs and projects that focused on monitoring and development of the Northwest region of Russia;
- Production of training materials and learners guides;
- Etalons development of the satellite data thematic processing;
- Training in spatial data digital processing;
- Software development for the satellite data processing;
- GLONASS parameters analysis to determine the reliability of its information;
- Using ground base stations network increase the accuracy of geodetic surveys and satellite imagery georeferencing;
- Development of the geographic objects deformation control methodics.



UniScan-24

UniScan™ stations allow receiving both optical and all-weather round-the-clock radar images with a spatial resolution from 1 km to 0.7 m, thus making it possible to resolve a wide range of applied tasks.

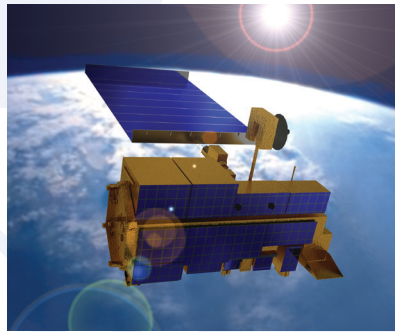
SPOT 4

Installed on the satellite equipment providing imaging the earth's surface with a spatial resolution of 10 m in panchromatic and 20 m in multispectral mode, the band width of 60–120 km. Great coverage snapshots allows data SPOT 4 satellite for environmental monitoring areas of forest management, agriculture and many other applications.



EROS A

EROS A is equipped with a camera whose focal plane of CCD (Charge Coupled Device) detectors produces a standard image resolution of 1.9 meters with a swath of 14 km at Nadir (perpendicular to the surface) at an altitude of ~500 km. The data transmission rate is 70 Mbit/s.



Terra

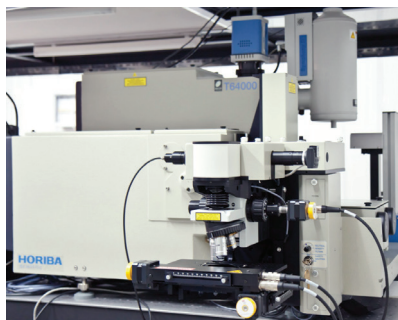
Transnational research satellite into a sun-synchronous orbit around the Earth, under the authority of the agency NASA. The spacecraft weighing 4864 kg was placed in a polar sun-synchronous orbit at an altitude of 705 km. Among other instruments, Terra carries a radiometer MODIS, a leading survey in 36 regions of the spectrum, with a wavelength of 0.4 microns to 14.4 microns and a resolution of 250 m to 1 km. The device is designed to monitor the global dynamics of the Earth, which includes changes in cloud cover, radiation budget, and the processes occurring in the oceans, on land, and in the lower atmosphere.

Centre for optical and laser materials research

The main direction of the "Centre for Optical and Laser materials research" activity is the implementation of a wide range of experimental studies both determining the composition, optical and physico-chemical properties of substances and materials, and studying a range of physical phenomena in the interaction of radiation with matter.

Centre equipment is formally divided into two blocks:

The first block represents devices for a wide range of research problems and "current" measurements (spectrometers, spectrophotometers, spectrofluorimeters etc.).



Research-grade Raman spectrometer T64000 (Horiba)

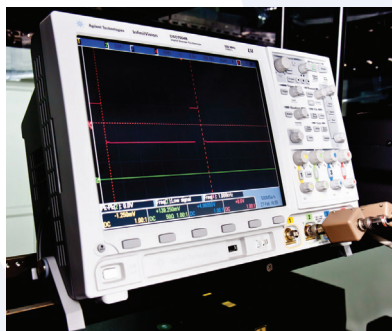
The T64000 system is designed to provide a versatile platform for Raman analysis. It has an integrated triple spectrometer design for unprecedented optical stability. The optical coupling is efficient and throughput is limited only by theoretical considerations.



Research system microscope BX-51 (Olympus)

The BX51 research microscope features a unique two-component frame design which optimizes mechanical and thermal stability for the most sophisticated microscopy and imaging tasks.

Second block consists of the high-standard complexes with unique characteristics for a wide application. One of the basic underlying ideas in the device set of the second unit is to provide flexibility in configuring the experimental complexes to solve both standard and unique tasks and to perform the experiments on substances in different aggregate states and under different conditions.



**Oscilloscope 4-channel 1 GHz
DSO 9104A (Agilent Technologies)**

Get three instruments in one

- Scope: The powerful features of our Infiniium Series oscilloscopes with InfiniiScan advanced triggering, coupled with superior specifications give you precise signal representation
- Logic Analyzer: 16 fast, deep-memory digital channels allow you to see critical data values and timing relationships.
- Protocol analyzer: Choose integrated protocol viewers to quickly drill down into packets and time correlate between protocol and physical layers.



**Semi-automatic grinding and
polishing machine Tegramin-25**

The Tegramin preparation system elegantly combines ease of use with advanced functionality. Innovative solutions improve preparation results and help you deal with a variety of specimens or materials, or high specimen volume. Used for treatment (grinding and polishing) of solid samples for optical studies.

Centre for diagnostics of functional materials in medicine, pharmacology and nanoelectronics

Centre is mainly focused on diagnostics and studies of new functional materials for medicine and medical technology, pharmacology, microelectronics and nanoengineering. Centre is divided into two departments. Equipment of the centre allows studying a wide range of physical properties of polymers, biopolymers, disperse systems, liquid crystals, nanostructured composites and nanocomplexes in solution and solid state.

Equipment of the Department "Molecular hydrodynamics, optics and spectroscopy"

Main methods:

- dielectric spectroscopy
- dc and ac magnetometry
- heat capacity and resistance in magnetic field
- NMR
- porosimetry

Features:

- measurements of:
- magnetic and
- spin characteristics of polymers, biopolymers and nanocomposites of different nature,
- measurements of porosity
- analysis of pore size distribution

Equipment of the Department "Radiospectroscopy and magnetometry"

Main methods:

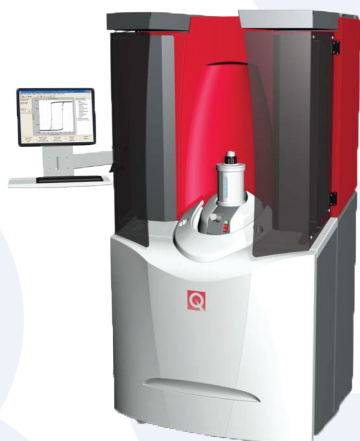
- veolocity sedimentation
- photon correlation spectroscopy
- IR and UV spectroscopy
- spectroscopy of optical rotation and dichroism
- rheology

Features:

- analysis of the chemical structure,
- determination of the size of molecules and particles of the dispersed phase
- determination of the molecular-mass characteristics of polymers and biopolymers
- study of the optical activity of polymers and liquid crystals in solutions and melts.

NMR spectrometer Bruker AVANCE IIIITM 400 MHz

Bruker AVANCE IIIITM 400 MHz delivers high productivity and highest-quality NMR information for pharmaceutical and industrial chemists, for academic research and teaching, as well as for food analysis, diagnostics research and other small molecule applications.



SQUID VSM DC

magnetometer (Superconducting Quantum Interference Vibrating sample magnetometer), 1.8–1000 °K.



PPMS- Phys.

The Quantum Design PPMS represents a unique concept in laboratory equipment: an open architecture, variable temperature-field system, designed to perform a variety of automated measurements. Use the PPMS with our specially-designed measurement options, or easily adapt it to your own experiments. Sample environment controls with fields ± 9 tesla and temperature range of 1.9–1000 °K.

Educational Resource Centre of Microscopy and Microanalysis

Educational Resource Centre of Microscopy and Microanalysis is an interdisciplinary educational centre with modern laboratory equipment. The main activity of the resource centre is instrumental provision of educational programs for bachelors, masters, postgraduate students of St. Petersburg State University. Students, postgraduate students, university staff and external users are able to conduct independent research using the equipment of the center.

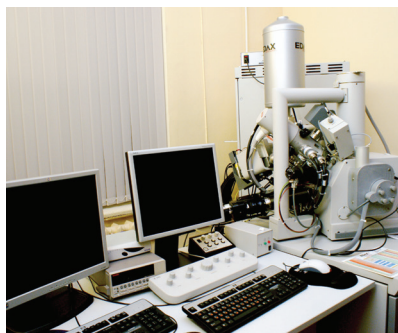
Main areas of research:

- Atomic force microscopy
- Analytical electron microscopy and electron-probe microanalysis.
- Laser scanning confocal microscopy.



Scanning electron microscope SEM -501

Scanning electron microscope SEM -501 B is designed to study the surface of the solid vacuum-materials. Analytical complex WEDAX-2A consists of spectral energy dispersive X-ray analyzer and EDAX 9100 X-ray spectral analyzer with wavelength dispersive WDX-2A.



Quanta 200 3D

Quanta 200 3D is a multifunctional scanning electron microscope with an integrated focused ion beam. The combination of conventional scanning electron microscope (SEM) and focused ion beam (FIB) in a single device allows to complete three-dimensional analysis of research material objects at nano level.



Microscope TM3000

Microscope TM3000 is extremely easy to operate and has a very compact size, making it ideal for educational institutions. Low vacuum mode allows you to explore non-conductive samples without spraying. Simple graphical user interface and ease of maintenance allow its use in the educational process. The device is equipped with energy dispersive microanalysis attachment OXFORD, which greatly expands the range of tasks.



Leica TCS SPE

Leica TCS SPE is a point scanning confocal system with spectral fluorescence detector for registration spatial structure of living and fixed objects. As a source of light lasers with high intensity and monochromatic radiation are used. The system includes four solid state lasers with a wavelength of 405, 488, 532, and 635 nm.

The method of confocal microscopy is widely used in the fields of biology, medicine, biophysics, molecular and cell biology. It allows you to explore tissue at the cellular level in a state of physiological activity.

Geo Environmental Research Centre “Geomodel”

Geo Environmental Research Centre “Geomodel” of the Saint-Petersburg State University was founded to consolidate and expand current analytical expertise in-situ and nano- to macro-scale analysis, and to initiate new scientific and education projects. The long-term goal is a comprehensive numerical Earth system model to be realized by modular integration of additional components focusing on land surface and biosphere processes. The need for progress in Earth system science is not just about climate change, but about how the Earth as a whole works and about the magnitude and rates of change that humans are causing.

Mission Statement

- To conduct ethical and innovative research in both experimental and theoretical aspects of Earth Science.
- To provide high-quality and timely publications of our research results.
- To encourage interested and qualified students to become involved in research projects
- To act in accordance with contract and grant regulations.

Bruker's IFS 125M spectrometer

IFS 125M spectrometer is a mobile high resolution FT-IR spectrometer, specifically designed for analysis of greenhouse gases in the atmosphere.



The SkyScan 2011 X-ray nanotomograph (The 2011 nano-CT)

The SkyScan 2011 is a laboratory nano-CT scanner with spatial resolution in the range of hundreds of nanometers. This spatial resolution in volume terms is equal to or better than that of synchrotron tomography. For the first time true sub-micron tomographic imaging is available in a laboratory instrument.



System microscope Olympus BX53F with cryocell Linkam THMSG600

The given system is specially designed to conduct ice nucleation activity of the bioaerosol particles (fungal spores, pollen, bacteria). The cell coupled with microscope allows to determine freezing temperature of the bio aerosol sample.



Horiba Jobin-Yvon LabRam HR 800

Horiba Jobin-Yvon LabRam HR 800 provides non destructive identification and qualitative analysis of geological samples and their synthetic analogs, in particular of inclusions in minerals.



Research resource Centre for molecular and cell technologies

Research resource centre for molecular and cell technologies is a biomedical analytical centre aimed at the investigation of the pressing issues in biology and medicine, such as patterns and mechanisms of immune responses, regenerative medicine, biology of aging, cancer, neurodegenerative diseases, etc.

The goal of the RRC MCT is to provide users with the modern biomedical equipment along with the technologies and methods developed on its basis in order to carry out scientific research projects in different fields of biomedicine. Services and technologies provided by the centre are available to internal scientists from SPbU, researchers from other Russian and foreign universities, research institutes and to commercial enterprises (on the contractual basis) as well. Specialists of the centre support users with an integral methodological base starting with help in development of experimental design of scientific research projects and finishing with processing of the results obtained. The equipment base of the centre has more than 50 units of main analytical instruments and sufficient number of standard laboratory equipment for the sample preparation. Equipment is assembled in 3 different units: electron microscopy unit, advanced light microscopy and cytofluorometry unit and molecular biology unit.



Scanning confocal microscope with multi-photon excitation Leica TCS SP5 MP

Study cells in vivo! — The Leica TCS SP5 MP combined with the resonant scanner enables fast imaging at high z-resolution and dynamic measurements at high speed. Profit from imaging rates up to 8000 lines/sec unidirectional and 16.000 lines /sec bidirectional.

Deeper penetration due to lower scattering

Reduced phototoxicity by concentration on the focal plane

Watch the dynamics of life! — The Leica TCS SP5 MP is the dedicated tool for uncaging, photoactivation or photobleaching experiments and combines the essential advantages in one system: imaging at video rate and high resolution



Jeol JEM-1400

Transmission Electron Microscope

The JEM-1400 is a high performance, high contrast, 120kV TEM with excellent imaging and analytical capabilities in one compact, easy-to-use instrument. With an acceleration voltage of 40 to 120kV, the JEM-1400 is suitable for biological, polymer and materials science applications.



Jeol JEM-2100

Transmission Electron Microscope

The JEM-2100 features a high-stability goniometer stage specifically tuned for high tilt tomographic applications. The optional JEOL TEMography™ software system automatically acquires and registers images, automatically calculates the 3-D reconstruction, and provides 3-D visualization software to display and rotate an image on a variety of axes. An x/y piezo stage is available option.

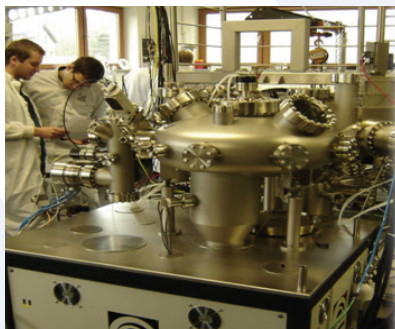
Research Resource Centre “Physical Methods of Surface Investigation”

Research resource centre “Physical Methods of Surface Investigation” is assigned for scientific ultrahigh vacuum investigations devoted to research of formation processes of surface nanostructures and composite materials, analysis of their features of electron energy and spin structure by methods of X-ray, Auger and Ultraviolet Photoelectron Spectroscopy with angular and spin resolution and also of the local atomic structure and morphology by ultrahigh vacuum scanning tunneling and atomic force microscopies. The research topics of the PMSI centre cut across the disciplines of chemistry, physics, biology and materials science. One of the goals of the centre is to achieve nanoscale control, design and assembly. One of the major strengths of the PMSI centre is its excellent equipment base, constituting over 10 sophisticated spectroscopic and imaging techniques that allow surface events to be mapped at the nanoscale level.

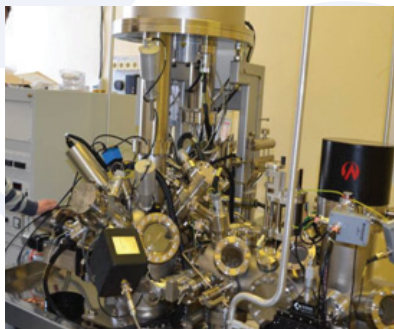
Main equipment of the centre is the following:

- Research modular platform Nanolab consisting of several interconnected ultrahigh vacuum modules, including:
 - Module of X-ray and Ultraviolet Photoelectron Spectroscopy equipped with hemispherical analyzer VG Scienta R4000 and 3D Mott spin detector, with 6 axis Prevac manipulator with liquid helium cooling, X-ray source MX 650 and helium discharge source of ultraviolet radiation VUV 5k with corresponding systems of monochromatization and LEED/Auger optics of OCI BDL800IR spectrometer.
 - Module of scanning tunneling and atomic force microscopy Omicron VT AFM XA 50/500 with Omicron LEED/Auger optics;
 - Modules of synthesis and preparation of samples;
- Combined Auger, X-ray and Ultraviolet Photoelectron spectrometer Thermo Fisher Scientific ESCALab 250Xi with high resolution quantitative imaging of elements distribution along the sample surface and ion depth profiling of elements concentrations combined with a chamber of the sample preparation and LEED optics.
- ESCALab 250Xi spectrometer is considered as a modern complex of electron spectroscopic equipment that can solve most of the diagnostic-type tasks of the synthesized organic and inorganic materials.
- X-ray and Auger spectrometers VG ESCALab 5 and Kratos XSAM800 provided by modern computer programs of measurement and data processing.

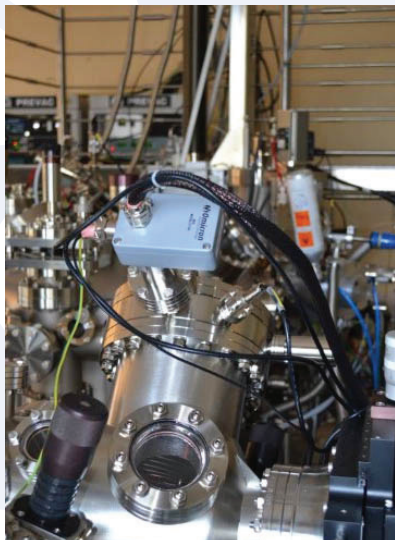
This research platform will allow to solve synthesis and nanodiagnostic problems of nano-objects with description of processes at atomic level and analysis of fine features of the electronic energy and spin structure of nano-objects facilitating creation of cutting-edge technologies and research in most of the modern and relevant areas of nanoelectronics (including graphene) and spintronics.



Nanolab



ESCALab 250Xi



Omicron SPECTALEED



VT XA Series

Resource Centre "SPbSU Observatory of Environmental Safety"

Provision of environmental safety is to be among the geostrategic goals of sustainable socioeconomic development of modern civilization.

Number of natural and man-made disasters and extreme weather events accompanied by human and economic losses and huge environmental damages is on the rise worldwide. That is the reason why issues of environmental safety have recently become increasingly topical.

Data processing is carried out at the Situational Centre of the research and educational model of the international system of environmental safety in the Eco-mathematical complex of the RC.

Purpose

Establish an integrated education & research system in the field of environmental safety and sustainable development of regions

Tasks:

- Environmental monitoring and diagnostics
- Identification of ecological risk zones
- Modelling scenarios of possible environmental hazards
- Compiling and regular updating situational map-schemes which show the environmental safety status of areas under observation.
- Providing all the interested scientific and pedagogical staff, master and doctoral students of the St. Petersburg State University with an opportunity to carry out research work using the equipment available at the Resource Center.
- Providing technical support to implementation of scientific research and educational programs.

Keyence VHX1000 digital microscope will be used to explore biological components and morphological structures, including biological contamination, developmental abnormalities and microbial level in aquatic ecosystems.



iCE3500 atomic absorption spectrometer will be used to identify trace substances and “heavy metals” in water bodies, mainly in natural waters owing to its ultra-high sensitivity.



Thermo Fisher Scientific ISQ chromato-mass-spectrometric complex will be used for screening and identification of low molecular weight compounds of different nature in water bodies.



Computing Centre

The Computing Centre of St. Petersburg University provides wide access to expensive laboratory equipment and scientific software required for education and research. The premises are open to the University's employees as well as third-party researches. The Centre's resources are actively employed to make research results commercially attractive.



High-Performance Systems

The high-performance computing cluster includes virtual servers, data storage systems, data storage and transfer networks, and software solutions that enable research in Physics, Chemistry, Biology and other spheres that require large processing power. The systems' peak performance exceeds 60 TFLOPS.



The High-Performance Resources Access Room

The Access Room is open to University-based users. The premises are used to hold classes, seminars and conferences. The Access Room hosts training sessions for the Recourse Centre's staff and other University's employees.

The Computing Complex

The Computing Complex is based on Hewlett-Packard computing technologies and solutions. It provides virtual dedicated servers to academic and administrative departments of St. Petersburg University.

The Complex includes a cloud computing cluster (virtual servers), data storage systems, data storage and transfer networks, and software solutions that enable to temporally allocate virtual servers with user-defined characteristics to academic and research units of the University. More than a thousand virtual servers are currently operating in SPbU.



The Data Processing Centre (general view)

The Data Processing Centre hosts high-performance server and computing equipment required for teaching activities and research. The Centre meets TIA-942 requirements and makes use of 28 server racks which power consumption equals 350 kVA. The necessary power is produced by a diesel generator (801 kVA Prime Power).

Educational Resource Centre of Chemistry

Educational Resource Centre of Chemistry allows you to get basic skills to work in a lab, M.Sc. in Chemistry. On the base of the Resource Centre training course, program of professional development and unified system of long-term courses can be organized.

Areas of research:

- Laboratories for organic and inorganic synthesis of chemicals and materials
- Quantitative chemical analysis laboratories
- Specialized laboratories for instrumental research methods:
- Atomic spectroscopy
- Molecular spectroscopy
- Chromatography
- Thermal methods of analysis
- Electrochemical methods of analysis

Equipment:

Equipment for the reactions in an inert atmosphere (vacuum equipment, Schlenk line, inert gas supply system) and equipment for high-temperature and ceramic synthesis

Equipment for separation and concentration of multicomponent systems (distillation unit, columns, hubs)

Equipment for preparation of material for chemical analysis (microwave systems, microwave sample preparation system, installation of solid-phase extraction)

Analytical equipment for monitoring chemical systems using the following methods:

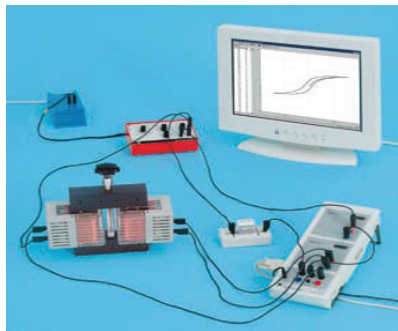
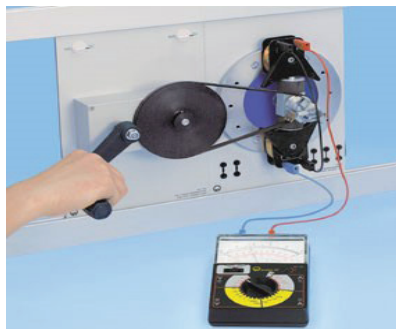
- Atomic emission spectroscopy (AES ICP)
- Atomic absorption spectroscopy (flame/ electro thermal atomization/ pre-hydride generation)
- X-ray fluorescence analysis
- Absorption spectroscopy and luminescence in the range of 200–1100 nm
- Infrared spectroscopy
- Gas chromatography (chromatographic complexes with detectors: TCD, PID, FID, NPD, ECD)
- Gas Chromatography-mass spectroscopy
- High performance liquid chromatography and Ion chromatography
- Capillary Electrophoresis System
- Differential scanning calorimetry, differential thermal analysis, thermogravimetry
- pH-metry, potentiometry, ionometry, conductometry, coulometry, voltamperometry (cyclic, inversion), impedancemetry

Educational Resource Centre of Physics

The Educational Resource Centre of Physics is equipped with modern teaching laboratory equipment and performs logistical and methodological support of major educational programmes of St. Petersburg University, including Physics, Radio, Applied Physics and Mathematics at the Faculty of Physics, Applied Physics and Mathematics at the Faculty of Applied Mathematics and Control Processes, Astronomy at the Faculty of Mathematics and Mechanics. The laboratory training is based on modules which include various combinations of standard components allowing to solve an impressively wide range of tasks: from practical tours of school competitions in physics up to research works at undergraduate and graduate levels.

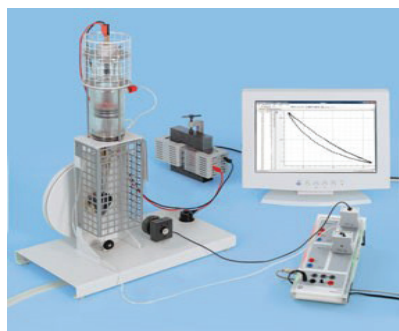
List of possible experiments:

- Investigation of the interaction of forces of rotors and stators
- Simple experiments with electromagnetic induction rotors and stators
- Generation of AC voltage by a rotating field generator and a stationary field generator
- Generating DC voltage by a stationary field generator
- AC voltage generation by a generator with a rotating electromagnetic pole
- Voltage generation by an AC/DC generator
- Voltage generation by self-excited oscillators
- Experiments with a DC motor with a two-pole rotor
- Experiments with a DC motor with a three-pole rotor
- Experiments with a universal motor connected in series or in parallel
- Assembling a synchronous AC motor



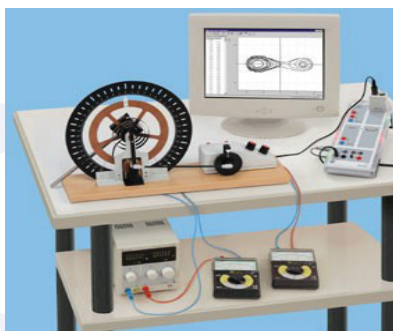
List of possible experiments:

Recording the initial magnetisation curve and the hysteresis loop of a ferromagnet



List of possible experiments:

- Frictional losses in a hot air engine (heat measurement)
- Determination of effectiveness of a hot air engine as a heat engine
- Determination of effectiveness of a hot air engine as a refrigerator
- pV diagram of a hot air engine



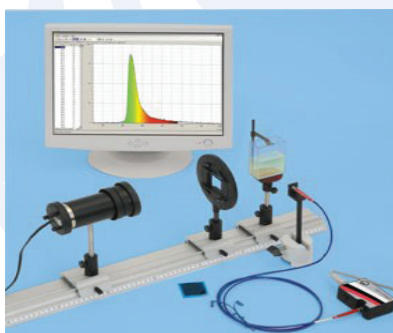
List of possible experiments:

- Free torsional vibrations
- Study of the phenomenon of resonance
- Forced harmonic and random torsional vibrations



List of possible experiments:

- Fluorescence of a phosphor screen under X-rays
- X-rays' effect on a film
- X-rays registration with an ionization chamber
- Determination of the ionization dose for an X-ray tube with a molybdenum anode
- Study of implants
- Effect of contrast media on X-rays absorption

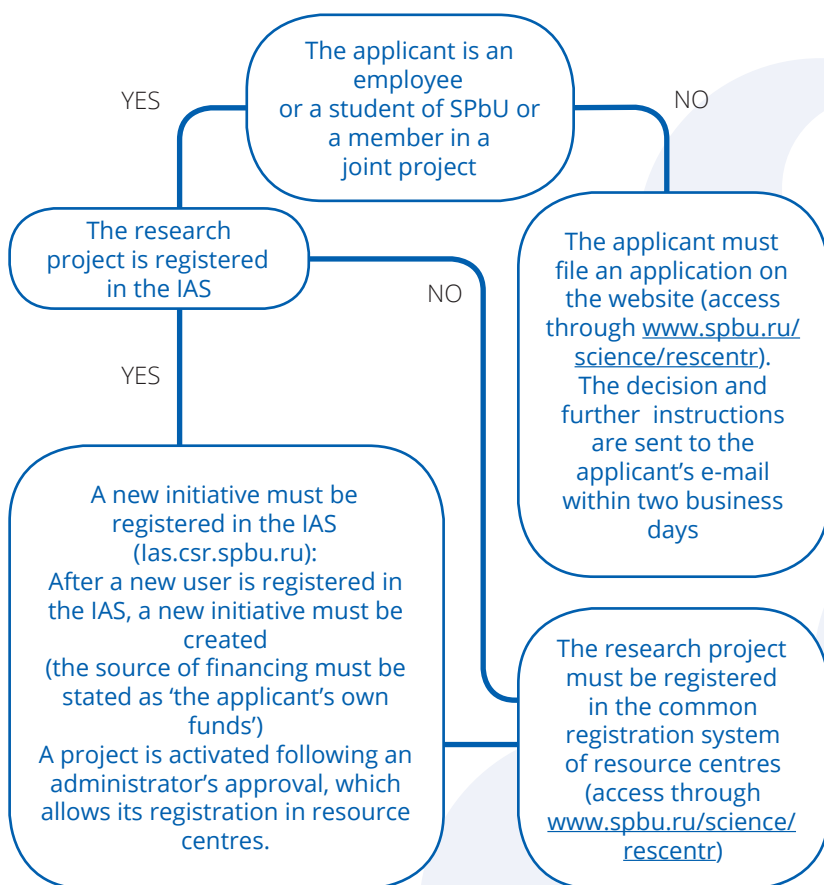


List of possible experiments:

- Absorption of light by tinted glass
- Absorption spectra of coloured liquids
- Absorption and fluorescence spectral analysis (based on colour filters)

How to apply for research studies

The resource centres work according to the principle of equal access. This means they are open to any interested persons notwithstanding their affiliation with SPbU, provided the regulations of the resource centres are obeyed. SPbU employees or students who are willing to use the resource centres' equipment must register their research projects in the Information and Analytical System (IAS) (www.ias.csr.spbu.ru). After a user is registered in the IAS, a new initiative can be launched with 'applicant's own funds' value selected. A project is activated following an administrator's approval, which allows its registration at resource centres through the resource centres' common registration system (www.spbu.ru/science/rescentr). If a research project has already been registered in the IAS, the user only needs to register such project in the common registration system.





READY FOR JOINT PROJECTS