KNOWLEDGE TRANSFER
EMERGING ZONE

UNIVERSITY OF SZEGED

LABORATORY CAPACITIES AT THE UNIVERSITY OF SZEGED

3 UNIVERSITY LABORATORIES

SZTE UNIVERSITY OF SZEGED

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KNOWLEDGE TRANSFER
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ACCREDITED LABORATORIES

In the University of Szeged, there are three accredited laboratories, these are the following: a clinical diagnostic laboratory in the Institute of Clinical Microbiology, and two other accredited laboratories, one of them in the Institute of Clinical Microbiology and the second in the Faculty of Science and Informatics.

INSTITUTE OF CLINICAL MICROBIOLOGY

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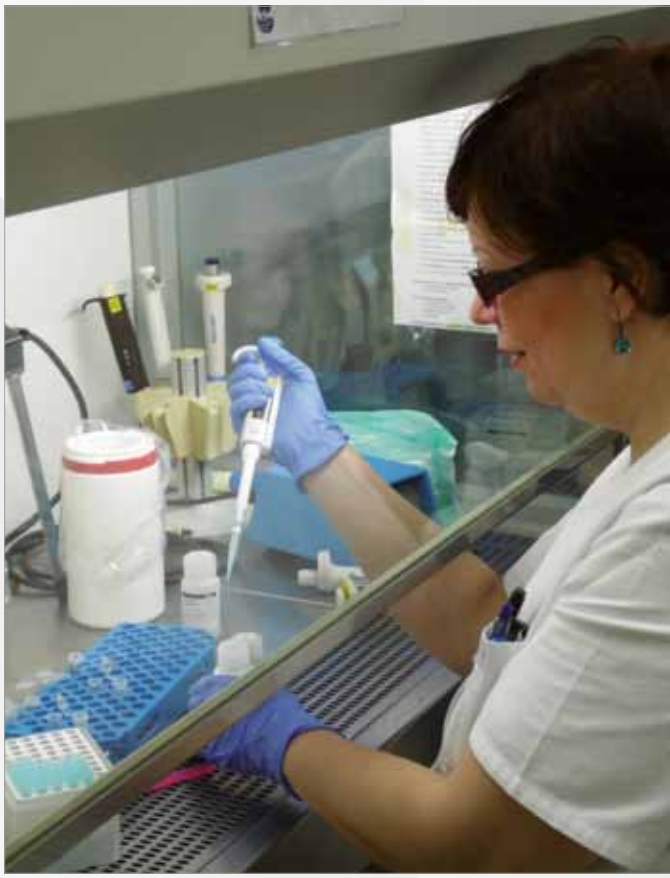
Head of the Institute:
Mrs. ZSOLDINÉ Dr. Edit URBÁN
associate professor



The Institute of Clinical Microbiology, Albert Szent-Györgyi Clinical Centre, University of Szeged was established in 1976 to provide routine service in the field of clinical microbiology for inpatients and outpatients of the University Hospital. Various laboratories of the Institute provide high level diagnostic service in bacteriology, virology, mycology, parasitology and serology using traditional and molecular genetic methods.

In 2004, the Institute was the first accredited clinical microbiology laboratory in Hungary, later in 2008 and in 2012, the re-accreditation processes were also successful. In 2009, the Institute was accepted as a Collaborative Centre of European Society of Clinical Microbiology and Infectious Diseases (ESCMID) and for observership program the Institute will accept visitors from various European countries.

CLINICAL DIAGNOSTIC LABORATORY

The Institute as accredited clinical diagnostic laboratory provides the following examinations:

- Bacteriological investigations: culture and identification of enteral pathogens, aerobic and anaerobic bacteria; antimicrobial susceptibility testing of the isolated bacteria; detection of bacterial toxins, bacterial antigens and bacteria specific antibodies
- Mycological investigations: culture, identification and antifungal susceptibility testing of various yeasts from human clinical specimens; detection of fungal antigens
- Virological investigations: detection of viral antigens and virus specific antibodies
- Parasitological investigations: direct detection and culture of various parasites from human clinical specimens; detection of parasite specific antigens and antibodies

In 2014, the above-mentioned investigations were accredited according to the requirements of MSZ EN ISO 15189:2007, while in 2015, according to the measurements of MSZ EN ISO 15189:2013. The current accreditation document is valid until 11.02. 2018.

Detailed accreditation document of the Institute is available on the following website: http://www.nat.hu/okiratok/NAT-1-1254-2014-01RO.pdf, here detailed document about the accredited investigations and methods are provided.

TESTING LABORATORY

Water microbiology laboratory of the Institute of Clinical Microbiology provide various microbiological and microscopic investigations to examine drinking water (tap-water and groundwater). The following accredited investigations are available:

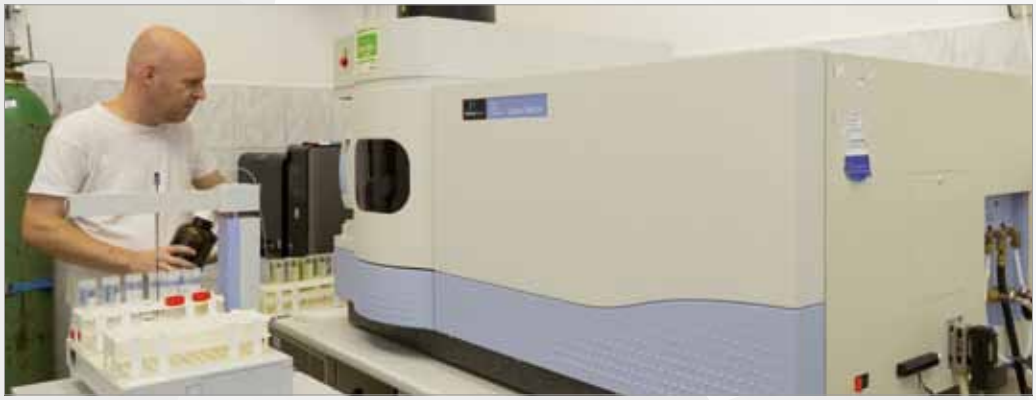
- Determination of colony forming unit at 22 °C (culture of various bacteria using poured plate method)
- Determination of colony forming unit at 37 °C (culture of various bacteria using poured plate method)
- Detection and enumeration of Escherichia coli using membrane filter method
- Detection and enumeration of fecal coliform bacteria using membrane filter method
- Enumeration of sulphite-reducing, anaerobe spore-forming rods (clostridia) (culture methods)
- Membrane filtration method for enumerating Pseudomonas aeruginosa
- Membrane filtration method for enumerating enterocci
    - *Microscopic investigations:*
    - *Volume of debris*
    - *Determination of volume*
    - *Quality of debris, number of unicellular or multicellular organisms*
    - *Iron and manganese bacteria, thiobacteria, indicator bacteria, cyanobacteria, algae, fungi, testate amoeba, other protozoa, nematodes, other helminths and invertebrates*

The above-mentioned investigations are accredited according to the requirements MSZ EN ISO 17025:2005.

Accreditation document is valid until 21.05.2017. Detailed document is available on this website: http://www.nat.hu/okiratok/NAT-1-1725-2013-03MRO2.pdf.

FACULTY OF SCIENCE & INFORMATICS–DEPARTMENT OF PHYSICAL GEOGRAPHY & GEOINFORMATICS

The Department has been a separate unit of the Institute of Geography and Geology since 1964. Its major Courses are the Bachelor of Geography, the Master of Geography and the Teacher of Geography and it significantly contributes to the education programme of the Bachelor and Master of Environmental Science and the Bachelor and Master of Environmental Engineer. The main research fields at the Department are applied geomorphology, geoinformatics and environmental sciences. Besides the accredited Soil and Water Testing Laboratory, Dendrological and Palynological Laboratory, Geochronological Laboratory, Remote Sensing and Spatial Analytical Laboratory, furthermore Hydromorphological and Shallow Geophysical Laboratory supports the educational and research activities.



SOIL & WATER TESTING LABORATORY

Address: Egyetem str. 2., H-6722 Szeged
Phone: +36 62 **544 195**
Fax: +36 62 **544 158**
Email: **farsang@geo.u-szeged.hu**
WEB: talaj.u-szeged.hu/
Laboratory Director: **Dr. Andrea FARSANG**

The Laboratory, meeting the requirements of the MSZ EN ISO/IEC 17025:2005, was registered by the National Accreditation Board in May 2006 and its continuous operation was permitted by the yearly audits.

The Laboratory attempts to maintain high quality sampling and measurements which ensure the confidence and satisfaction of the Partners, furthermore it improves continuously its quality management system and meets its requirements with a quality-oriented approach.

The Laboratory offers soil, sediment, surface and subsurface water sampling and measures the physical and chemical properties of the samples. Accredited measurements are available in the following fields:

- physical and chemical analysis of soil and sediment samples
- physical and chemical analysis of surface and subsurface waters
- in situ field measurement of surface and subsurface water quality
- sampling and sample preparation of soil samples, surface water and its sediments, subsurface water and groundwater samples

The following equipment is available at the Laboratory:

- Binder ED 115 universal drying oven
- Retsch S100 ball mill
- Anton Paar Multiwave 3000 sample preparation system (for high pressure and temperature digestion, evaporation, drying, hydrolysis and extraction of organic and inorganic samples)
- Gerhardt Kjeldatherm SMA 2000 digestion system with 8 digestion tubes
- Gerhardt Vapodest 20 Distillation System
- Scheibler calcimeter (for the measurement of $CaCO_3$ content of soil)
- UNICAM Helios spectrophotometer
- FOSS FIA STAR 500 Gamma UV-VIS spectrophotometer
- Eijkelkamp penetrometer
- WTW InoLab 720p for pH measurements in the laboratory
- Perkin Elmer Optima 7000DV ICP-OES Inductively coupled plasma optical emission spectrometer with automatic sample handling
- Perkin Elmer 3110 atomic absorption and atomic emission spectrometer
- OK-104 conductometer
- ENDECOTTS MINOR Sieve Shaker

The accreditation is valid until 26/11/2017. The documentation is available online at http://www.nat.hu/okiratok/NAT-1-1437-2013-01RO.pdf in which the details of the sampling, the sample preparation, the measurements and the measurement ranges can be found.

RESEARCH LABORATORIES

FACULTY OF MEDICINE

www.med.u-szeged.hu

DERMATOLOGY & ALLERGOLOGY CLINIC

PORPHYRIN LABORATORY

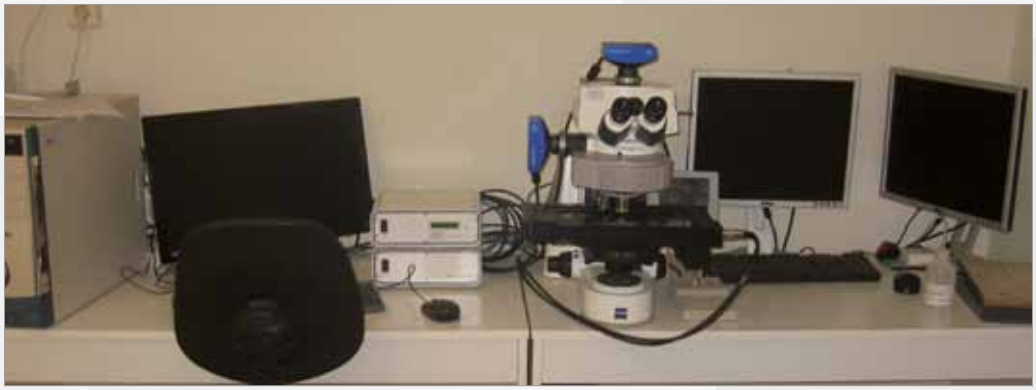
The porphyrin lab as part of the European Porphyrian Network is a well-known facility giving opportunity for the following experiments to be carried out:

Main tasks of the laboratory

- Lab routine work includes not only diagnostics of porphyrias but also manifests in participation in patient caring, information shearing and consultations
- Research: The effect of hereditary and acquired factors affecting porphyrin metabolism
- Education: giving specialized lectures as part of the undergraduate education program; postgraduate training and practice holding

Studies in the laboratory:

- Urinary measurements: delta-amino levulinic acid and porphobilinogen determination
- Measurements from urine, faeces, erythrocytes, blood plasma and occasionally other tissues: Determination of total porphyrin levels as well as measurement of a variety of porphyria and their isomers by HPLC separation
- Blood: porphobilinogen-deaminase activity measurement and depending on outcome uroporphyrinogen-decarboxylase activity measurement



HISTOLOGY LABORATORY

In the laboratory, histological diagnosis of all types of dermatological diseases (inflammatory, cancer, hereditary and autoimmune) are established by applying conventional histopathology, immunofluorescence, immunohistochemistry and if required other techniques like immunohistology or molecular techniques are also used. In selected cases the so-called frozen sections examination is done during surgery. Histological examination of the surgically removed tissues and biopsies from our clinic or from other institutions are part of the daily routine work of the lab. Each year about 5,000 tissue material is processed in our lab helping or determining the diagnosis.

FLOW CYTOMETRY LABORATORY

The main tasks of the laboratory are cell culturing, separation of cells (lymphocyte, monocyte) and examination of cell activation (lymphocytes, monocytes). In the laboratory the separation of blood derived (mononuclear cells and granulocytes), skin epidermal (kerainocytes or melanocytes) and dermal cells (fibroblasts) are done. These separated cells are either directly examined by the laboratory staff or breeding kept under suitable conditions and the cultured cells are used later on for experimental or diagnostic purpose.

COSMETOLOGICAL & SKIN-PHYSIOLOGICAL RESEARCH LABORATORY

Cosmetological and skin-physiological examinations and investigations are performed by highly trained and experienced professionals in line with the requirements of the GCP. Our state-of-the-art equipped laboratory allows to study several special aspects of the skin.

Today, cosmetics with the highest quality most be tested and proven as efficient product prior getting to the market to guarantee safety and the best choice for consumers. Our lab offers numerous sophisticated and objective scientific methods to measure and prove the effect of a given product.

Bellow please find a short list of some of the possibilities our laboratory can offer:

- Skin tolerance test
- Irritancy test: patch test and photo-irritancy test
- Users trials
- Skin sensitization tests
- Special tests: comedogenicity test

Efficiency testing:

- Dermatological assessment, visual evaluation, questionnaire assessment
- Moisturisation, moisture-retaining effect studies
- Skin-aging, fine lines and wrinkles monitoring during cosmetic treatment
- Skin greasiness measurements
- Skin fitness and elasticity determination
- Barrier function testing
- Examination of changes in skin color
- Sun protection measurements

MOLECULAR BIOLOGY LABORATORY

The technologies used in the laboratory are as follows:

- PCR (polymerase chain reaction)
- in vitro DNA techniques
- gel-electrophoresis
- genetic studies
- ELISA (Enzyme-linked immunosorbent assay)
- Western blot analysis

CELL BIOLOGY LABORATORY

The two main tasks in the laboratory are cell separation and cell culturing of several cell lines and primary cells for diagnostic reasons or for clinical research.

The list of applied cells:

- Primary cells: keratinocyte, melanocyte, fibroblast, lymphocyte
- Cell lines: SZ95 (sebocyte cell line), HaCaT (keratinocyte cell line), PK (vaginal epithelial cell line), SK MEL23 (melanoma cell line), HT-MEL (amelanotic melanoma cell line), RBL (rat basophilic leukemia cell line), MEWO (cell line containing melanin)

• The techniques used are the following:

- MTT Test (cell proliferation test)
- Immunohistochemistry
- Immunocytochemistry
- cell staining for flow cytometry
- NO determination (Greiss's)
- Development of ex vivo model
- L-DOPA staining
- UVB irradiation
- Direct measurement of melanin content
- Determination of Candida-killing
- Kemotaxis
- Cellular transfection
- LTT (Lymphocyte transformation test)

DEPARTMENT OF LABORATORY MEDICINE

The Department of Laboratory Medicine provides high quality diagnostic background for the clinics of the University of Szeged, for the physicians involed in the in- and outpatient healthcare system of Szeged, and the South-Eastern Hungarian Region. This 24-hours service includes fast, accurate and reliable results based on up-to-date tests and instrumentation. In addition, the laboratory offers the opportinity for consultation for physicians about the patients medical data in order to establish the best and cost effective screening, preventive and therapeutic strategies.

The laboratory accepts large scale of sample types for analysis including whole blood, serum, plasma, urine, faeces, cerebrospinal-, pleura- and ascites fluid. We offer a broad spectra of tests (over 250 tests) **in the field of classical clinical chemistry, immunochemistry, haematology, haemostasis, urine analysis, therapeutic drug monitoring, blood sedimentation, flow cytometry, allergology, autoimmun diseases, genetics etc. Almost all tests performed routinely are regularly monitored by internal controls and by independent national and international external quality control programs.**

In addition to routine laboratory work the followings are also belong to our main activities:

- Teaching of laboratory diagnostics for medical, pharmaceutical students (undergraduate courses) and for medical doctors, pharmacists, clinical biochemists specialised in laboratory (clinical) diagnostics (postgraduate courses)
- Offering opportunity for medical doctors, pharmacists, chemists and biologists to fulfil the theoretical and practical requirements for specialisation in laboratory medicine
- Critical evaluation of new laboratory instruments, reagents, kits and methods
- Active participation in clinical-pharmacological evaluation of new drugs or treatment combinations providing high quality laboratory background
- Research activity in the field of laboratory science (e.g. preanalytical requirements, factors influencing sample quality) and in clinical sciences such as endocrinology, diabetes, metabolic syndrome and ageing
- Cooperation with basic and clinical research groups in- and outside the University for successful application for national and interenational grants

DEPARTMENT OF NEUROLOGY

At the Department of Neurology clinical diagnostic and experimental laboratories can be found. The research interest of the Department includes headache and pain, extrapyramidal, neurodegenerative, and neuromuscular disorders, multiple sclerosis and other neuroinflammatory diseases, cerebrovascular disorders and epilepsy. The Department of Neurology acquired a prominent role in the field of tryptophan metabolism research, especially in the characterization and modulation of the kynurenine pathway in the above mentioned disorders.

Laboratories of the Department are the following:

- Neurophysiology laboratory (EEG, EPs, EMG, ENG)
- Cerebrospinal fluid diagnostic laboratory
- Research laboratories:
  - *Neurochemistry laboratory*
  - *Neuroimmunohistochemical laboratory*
  - *Molceular neurobiology laboratory*
  - *Behavioural pharmacology laboratory*
  - *Experimental neurophysiolgy laboratory*
  - *Biobank*

DEPARTMENT OF MEDICAL CHEMISTRY

RESEARCH LABORATORY OF NEURODEGENERATIVE DISEASES

The laboratory has several facilities: a peptide synthesis and analysis laboratory, a laboratory for protein chemistry and biochemistry, a cell- and tissue culture facility, a fluorescent microscopy laboratory, an animal house and a laboratory for learning and behaviour. The main objectives of the research are: elucidation of the molecular mechanisms of protein – misfolding neurodegenerative diseases (Alzheimer's and Parkinson's disease, amyotrophic lateral sclerosis) and design and synthesis of novel drug candidates for the treatment of these diseases.

Instrumentation

- Analytical HPLC instrument
- Preparative HPLC instrument
- FPLC instrument
- Computer cluster for drug design (80 units) with softwares
- Equipment for dynamic light scattering measurement (Zeta sizer)
- Fluorescent microscope
- Fluoro-plate-reader
- Gel Scanner instrument
- RT-PCR Instrument
- BLITZ™ instrument for non-invasive binding studies
- Mouse - cage system with individual ventilation
- Morris water maze appartuses (2 pieces)
- NOLDUS camera and software system
- Microscope equipped with a Pannoramic Mirax Midi section scanner + HistoQuant evaluation software

PEPTIDE CHEMISTRY LABORATORY

The major objectives of the research in the Peptide Chemistry Laboratory are synthesis of peptides and small proteins as well as development of new synthetic methods. The research group is interested in several different projects. One of the main areas is the synthesis of multiple disulfide bridge containing peptides and proteins. The structure of many biologically active peptides are stabilized by disulfide bridges. Among them there are different toxins, endothelins, insulins and antimicrobial miniproteins. Not only the regioselective synthesis but also verification of the structure is challenging for these peptides. Beside the synthesis of peptides or small proteins containing natural disulfide bond pattern, the goal of the research in the laboratory is verification of the disulfide connectivity and development of new, regioselective synthetic strategies. Another main area is the preparation of modified peptides. Post-translational modifications (such as glycosylation, phosphorylation, binding of metal ions or lipids to proteins, enzymatic alterations of amino acid side chains) have pivotal importance in biological recognition processes. Investigation of these processes require larger protein molecules, and also post-translationally modified peptides. The group members are mostly engaged in the synthesis of phosphorylated and glycosylated peptides, and the development of new synthetic strategies for their preparation. Besides, bioconjugates and neuropeptides are synthesized in the laboratory.

Instrumentation in the Peptide Chemistry Laboratory:

- Microwave-assisted peptide synthesizer (CEM, Liberty)
- Analytical HPLC instruments (Agilent)
- Preparative HPLC instruments (Shimadzu and Knauer)
- LC-MS instrument (Waters - Agilent)
- Lyophilizers (Christ)

LABORATORY FOR NEUROPROTEOMICS & LIPIDOMICS

The laboratory was established about 20 years ago for the analysis of amino acids, peptides and proteins. The infrastructure of the laboratory was continously developed. Chemists working here have over 35 years experiences in separation sciences, 20 years work in mass spectrometry and proteomics. The laboratory is one of the best workshop in these fields in Hungary.

Main research profile of the laboratory is the development of chromatographic, electrophoretic, mass spectrometric and bioinformatic methods for determination of the qualitative and quantitative changes of proteins playing role in neurodegenerative and psichiatric diseases. The laboratory provides proteomics background (protein identification, protein expression analysis, phosphorylation studies, etc.) for many of their cooperative partners. They are involved in drug research projects (treating and curing neurodegeneration and memory loss), biomarker research and pharmacokinetics studies. In recent years lipidomic methods were introduced for the analysis of phospholipids in biological samples.

The following methods are available in the laboratory:

- Amino acid analysis (derivatization, HPLC)
- Determination of molecular mass and purity of isolated and synthetic compounds by mass spectrometry or LC-MS
- Qualitative and quantitative analysis of peptides by LC-MS
- Pharmacokinetic analysis of new drug candidates by LC-MS
- Analysis of complex protein samples by 1D- and 2D gel-electrophoresis
- Preparation of peptides and proteins for mass spectrometric analysis
- Identification of proteins from solution or gel by nanoLC-MS and bioinformatics
- Identification of protein expression using 2D electrophoresis or LC-MS methods
- Proteomic analysis of phosphorilated proteins
- Extraction and qualitative/quantitative analysis of phospholipids in biological samples using LC-MS and bioinformatics

INSTITUTE FOR SURGICAL RESEARCH CENTER

The Institute of Surgical Research is dedicated to basic research in surgery and investigation of innovative therapeutic approaches in the areas of gastrointestinal diseases, trauma, sepsis, and surgical critical care and to bring the results of these experimental studies to the bedside. We foster collaboration and cooperation amongst faculty staff and surgical residents, as well as medical students and research groups of surgical departments at the Faculty of Medicine. Also, we offer cooperation with researchers and research groups that can make use of our expertise in experimental studies and methodology. In this respect, our researchers work together with hospital physicians from several county hospitals. The Institute offers limited financial support to new projects and research recruits to allow them to qualify for external financial support and research fellowships.

OPERATING THEATER FOR STUDENTS

The Institute has a state-of-the-art operating theatre for students, which is capable of providing support for up to 4 surgical teams at a time. This facility is used during our „Surgical techniques" courses for third-year medical students. It is used also to provide "Advanced Trauma and Life Support" (ATLS) training. Additionally, surgical residents have the opportunity to use this facility while participating in basic and advanced "Laparoscopic Surgical" training sessions which are held up to 4 times a year. Second year medical students also use this facility for "hands on" training in various laboratory procedures.

LABORATORY OF CIRCULATION RESEARCH

In this laboratory we have access to a large collection of basic and advanced scientific equipment such as respirators, blood gas analyzer, flowmeters, pressure, cardiac output monitors and computerized data-acquisition systems. A catheter-tip micromanometer and ultrasonic dimension crystals (connected to a sonomicrometer to measure the signal of the ventricular wall diameter) are used to evaluate left ventricular myocardial contractility (from the slope of the end-systolic pressure - diameter relationship with a computer program). The laboratory is capable of providing support for up to 2 surgical investigations at a time. Our experimental work has been and is focused on cardiovascular research, gastroenterological surgery, anaesthesiology and heart surgery. Most of our current research efforts are supported by multi-year grants awarded through external national research foundations like OTKA, ETT, NKFP and others.

Major research themes:

- Diagnosis and/or treatment of mesenteric ischaemia; small intestinal transplantation
- Intestinal preconditioning and its effects on intestinal motility changes
- Optimizing fluid resuscitation; improve primary treatment of hemorrhagic shock
- Development of rapid diagnostic devices determining intramucosal pHi changes, the extent of mucosal injury (viability/blood flow)
- Oxido-reductive stress in ischemia-reperfusion injury
- Understanding the role of mast cells in the advancement of heart diseases

LABORATORY OF RESPIRATION RESEARCH

The respiratory laboratory of the Institute works in close cooperation with the research group of the Institute of Medical Informatics (Prof. Z. Hantos). It has the expertise, resources, facilities, and environment to conduct in vitro and in vivo research on lung mechanics and pathophysiology. This research is truly multidisciplinary and includes investigators with specialties in surgery, computer sciences, physiology and pathology.

Major research themes:

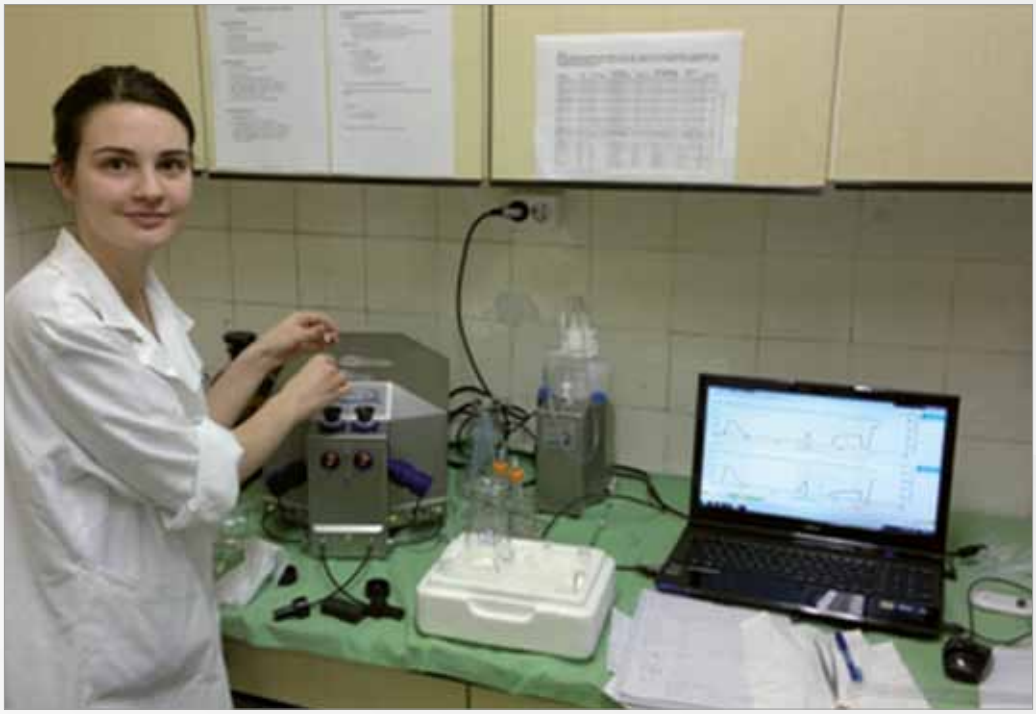
- To develop new models to study pulmonary emphysema
- To investigate lung mechanical consequences after mesenteric ischemia/reperfusion

LABORATORY OF MICROCIRCULATION RESEARCH

The microcirculatory studies require advanced imaging techniques. We use a Zeiss Axiotech fluorescence video-microscope and a Cytoscan A/R intravital microscope with orthogonal polarization spectral imaging technique to visualize and measure organ (gastrointestinal, muscle, periosteal) microcirculation.

Major research themes:

- To develop new methods of protecting tissues from ischemia/reperfusion injury
- To investigate ischemic preconditioning and to reverse ischemia/reperfusion injury in organ transplantation
- Periosteal microvascular changes after extremity injuries; treatments to prevent secondary ischemia-reperfusion damage after trauma injuries



MICROSURGICAL OPERATING ROOM

The Institute has a microsurgery operating room containing five Wild operating microscopes and supporting equipment. A wide variety of microsurgical instruments and expertise are available to provide training to interested individuals.

LABORATORY OF BIOCHEMICAL RESEARCH

Numerous methods are available for the measurement of several parameters which reflect the various interests of our investigators. Major laboratory equipments are spectophotometry, fluorometry and gas-chromatograpy. A wide range of enzyme activities (nitric oxide synthase, myeloperoxidase, xanthine oxidoreductase etc.), determination of plasma levels of vasoactive mediator molecules by ELISA tests (A and B types natriuretic peptides; endothelin-1), high energy phosphates, calcium homeostasis, and immune function studies as well as nitrite/nitrate and histamine measurements are just a sample of what biochemical support the laboratory can provide. The histology unit provides histology services including processing and sectioning of frozen and paraffin-embedded tissues and regular histological staining.

CELL CULTURE FACILITY & RADIATION STUDIES

The Institute has a fully equipped „C" level radiation laboratory. The facility is licensed for the use of all radionucleotides and has the necessary equipment (i.e. beta, gamma, and liquid scintillation counters) needed to successfully carry out these experiments.

Many of the present investigations rely heavily on cell culture technology. The Institute has a state of the art facility to accommodate such studies. Laminar flow hoods and cell culture incubators provide a non stop array of cell cultures (rat intestinal neurons, endothelial cells, primary forebrain astroglia and neuron cultures are just a small sample of the variety of cells which are supplied to investigators on a per need basis).

Major research themes:

- Free Radicals and Oxidants in Pathophysiology (chemiluminescence assay of free radicals in Packard Tri-CarbLiquid scintillation counter in out of coincidence mode)
- Endothelial Cell Biology (examination of early events of anoxia and ischemia in respect to free radical status of these cells)
- Thin-layer chromatographic ((TLC) and gas-chromatographic (GC) analysis of metabolic products in ischemia from urine and blood

FACULTY OF PHARMACY

www.**pharm.u-szeged.hu**

DEPARTMENT OF PHARMACOGNOSY

Department of Pharmacognosy is one of the internationally renowned research centre of Pharmacognosy. Main research areas:

ISOLATION & STRUCTURE DETERMINATION THE BIOLOGICALLY ACTIVE COMPOUNDS OF PLANTS

Our research area is the isolation and structure determination of biologically active compounds, especially terpenoids and phenolic compounds from plants (Euphorbiaceae, Asteraceae, Polygonaceae and Juncaceae families) and mushrooms (e.g. Collybia and Tricholoma species). The isolation of compounds is performed with the combination of different chromatographic techniques (CPC, VLC, TLC, RPC and HPLC). The structures of the components are elucidated by means of spectroscopic methods (NMR and MS). Pharmacological investigations are performed in the Department of Pharmacognosy (e.g. xanthine oxidase and ACE inhibitory activities) and in cooperation (e.g. antitumour and multidrug resistance reversing, antimicrobial activities).

PHYTOCHEMICAL QUALITY & SAFETY ANALYSIS OF PLANT-BASED PRODUCTS

Quality and safety of herbal products are cornerstones of modern phytotherapy. The research group focuses on the qualitative and quantitative analysis of active constituents, marker compounds and contaminants of herbal extracts and final products, using spectrometric and chromatographic methods as well as phytochemical analytical experiments related to toxicological and pharmacokinetic studies.

NATURAL & BIO-ORGANIC CHEMISTRY RESEARCH

The research group works on the isolation, structure elucidation, and bioactivity focused semi-synthetic modification of natural products, mainly ecdysteroids, flavonoids and other antioxidants. On the borderline of natural product chemistry and biology, we study the specific bioactivities of antioxidants' metabolites in order to find new leads for drug discovery. A large variety of preparative and analytical chromatographic techniques are utilized; bioactivities are tested through a wide international collaboration network.

DEPARTMENT OF PHARMACODYNAMICS & BIOPHARMACY

MOLECULAR PHARMACOLOGY LABORATORY

The Laboratory is involved in basic research on uterus pharmacology and tumor studies. The laboratory uses in vitro techniques to investigate mRNA and protein changes and drug targets.

To achieve this, we use:

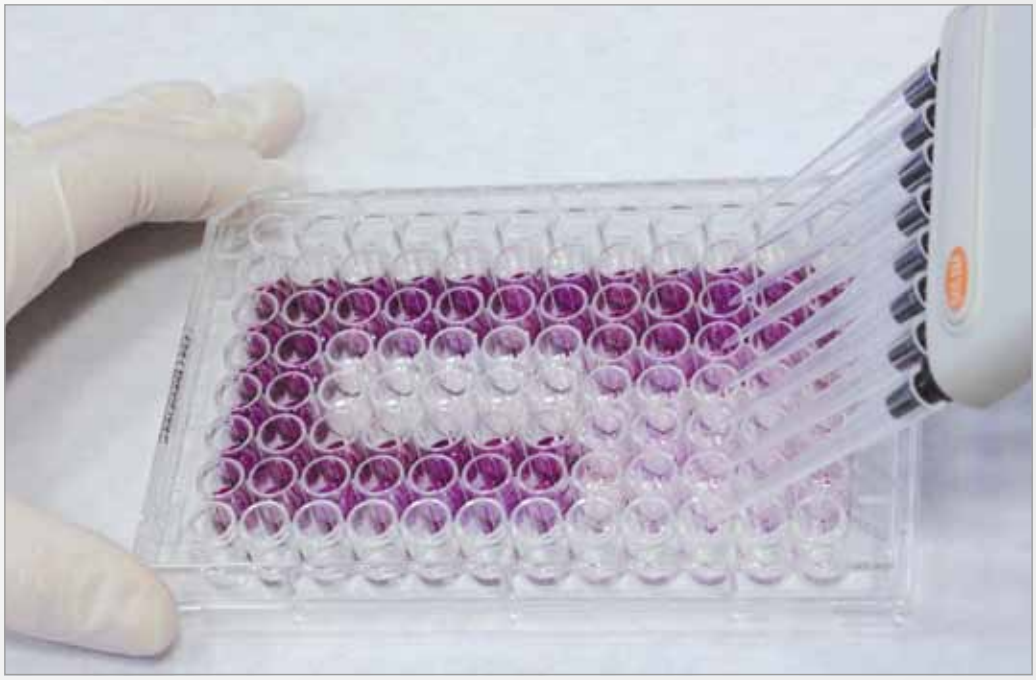
- polymerase and reverse transcription polymerase chain reactions (PCR, RT-PCR)
- real time PCR
- gel electrophoresis
- Western blot analyses
- antisense oligonucleotide techniques to produce knock-down transformed animals
- immunoassays (cAMP, cortisol, norepinephrine, etc.)

Current projects

- The changes in expression and regulation of aquaporins (AQPs) in the late-pregnant rat uterus
- Investigation of AQP5 expression in the hormonally and lipopolysaccharide-induced preterm delivery rat models
- Examination of AQP5 as a new candidate as a marker of term and preterm delivery
- Pharmacological influencing of the expression of AQPs
- Determination of the expressions of different mRNAs and proteins (KISS peptide, plexins and fetuin B) which exert effects on the uterus function

CELL CULTURE LABORATORY

The laboratory was founded within the Department of Pharmacodynamics and Biopharmacy in 2003 with the aim of promoting of collaboration between the preparative units of the University of Szeged. Within this framework, we are engaged in the investigation of the antiproliferative properties of plant extracts, natural compounds and their synthetic analogs.



The laboratory is well equipped with the essential instruments needed for cell-based methodologies, including viability, fluorescent microscopy, endpoint and kinetic microplate-based assays, determination of crucial cell cycle regulators and factors involved in apoptotic procedures. We utilize flow cytometry in order to obtain data concerning the mechanisms of action of tested compounds (cell cycle analysis and antibody-based assays).

These assays are performed primarily on gynecological cancer cell lines, including a breast cancer panel involving cells differing in biochemical background and a cervical cancer panel with cells of various pathological histories. The cancer selectivity characteristics of the tested agents are determined through the use of fibroblast or immortalized breast cancer cells.

ISOLATED ORGAN & IN VIVO LABORATORY

The research interests of the laboratory are smooth muscle studies and reproductive pharmacology. The laboratory is equipped with two multi-chamber tissue bath systems with sixteen bath units, an electromyographic system for in vivo studies and a computerized blood pressure monitor for rats.

In vitro contractility studies are carried out on rat myometrium, gastrointestinal muscles, trachea and vessels and human myometrial tissues.

The main areas of the studies are the following:

- effects agents on the pregnant myometrium (e.g. calcium or potassium channel blockers, α- and β-adrenergic receptor agonists and antagonists, antioxidants, neuropeptides and vitamin D)
- drugs acting on smooth muscles
- hormonally- and inflammation-induced preterm birth models
- androgenic, estrogenic or gestagenic effects in vivo (Hershberger assay, uterotrophic assay, pregnancy maintenance test)

The electromyographic system is designed for the measurement and analysis of gastrointestinal and myometrial muscle tones and electric signals in response to physiological, pathophysiological or pharmacological stimuli. The electromyographic studies are carried out on anesthetized or alert rats.

CONVENTIONAL ANIMAL FACILITY

The Conventional Animal Facility of our department has four separate rooms for laboratory animals and particularly rats, mice and rabbits. The animals are inspected daily (feeding, bedding and cleaning) by a well-qualified animal caretaker and regular veterinary control is also ensured. The required temperature, humidity, light-dark cycle and ventilation are maintained under automatic control. The high-quality food and bedding materials are provided by professional suppliers. We maintain a Sprague-Dawley breed for both research and sale within the University. Our environmental enrichment strategy (e.g. cocoon, music, corn and enhanced bedding substrate for delivery) enhances the well-being of the animals. The Animal Facility is suitable for short-, medium-, or long-term experiments, including toxicological, age or generation studies.

Our operating and breeding licences are regularly supervised by the Hungarian authorities.

DEPARTMENT OF PHARMACEUTICAL TECHNOLOGY

LABORATORY 1: DEVELOPMENT OF SOLID DOSAGE FORMS

- Systems administered through the oral administration route
- Development of ODT, FDDT preparations
- Formulation of medicated chewing gum tablets
- Formulation of bioadhesive films
- Preparation of matrix-type systems (granulates, tablets)
- Preparation of matrix-type multiparticulate systems with extrusion/spheronization
- Preparation of delayed and sustained release system (tablets, capsules)
- Film coating (perforated coating pan, fluidization)
- Formulation of multilayered and mini-tablets
- Formulation of pellets with different technologies (CF granulator, high-shear granulator, extrusion-spheronization, melt granulation)
- Formulation of coated multiparticulate systems with layering technology
- Paediatric preparations (e.g. SIP technology)

Implantation systems:

- Extrudates, pellets, tablets, degradable and non-degradable matrix systems

Use of protein-type materials in solid dosage forms

Use of nanostructured materials in solid dosage forms

- Processing of titanium nanotube systems
- Processing of other types of nanoproducts produced by others into solid dosage forms

Production and physico-chemical or biopharmaceutical analysis of solid dosage forms

- Phyico-chemical (Surface free energy, FTIR, NIR, RAMAN, SEM, XRD, PALS, MicroCT) and thermal analysis (DSC, TG-MS, kinetics)
- "Quality by Design", Design of Experiments, Artificial Neural Network based modelling

LABORATORY 2: DEVELOPMENT OF LIQUID & SEMISOLID DRUG DELIVERY SYSTEMS

Development of liquid, and semisolid preparations for dermal, transdermal, ocular and periodontal applications

- Investigation of drug release, structural properties, rheological parameters of lyotropic liquid crystals, microemulsions, creams, hydrogels (NIR, RAMAN, FT-IR, in vitro, ex vivo and in vivo studies)
- Preparation and investigation of solid lipid dispersions (SLN/NLC)
- Investigation of biocompatibile, bioadhesive polymers

LABORATORY 3: IMPROVEMENT OF BIOAVAILABILITY OF WATER INSOLUBLE DRUG MATERIALS

- modification of the physico-chemical properties of active ingredients by cyclodextrin inclusion complexation
- modification of the bioavailability of active ingredients by methods of pharmaceutical technology, solid solutions and solid dispersions with water soluble additives (PVP, PEG, mannitol), amorphization, spray-drying, lyophilization
- structure examination (DSC, DTG, FT-IR, XRPD)
- in vitro membrane diffusion, wettability study
- crystallization from solution, preparation and investigation of co-crystals, polymorph screening

LABORATORY 4: NANOTECHNOLOGY, NANOMEDICINE

Nanosized drug delivery systems, Drug delivery across artificial and biological barriers

- Particle engineering
- different preparation methods for particle size reduction (top down, bottom-up)
- micronization, nanonization and amorphization of drug crystals physico-chemical and chemical studies of crystalline, semi-crystalline and amorphous materials ((XRPD, NIRS, DSC, TG-MS, FT-IR, RAMAN)
- quantitative analysis of crystallinity degree (XRPD, NIRS, DSC)

Nanotechnology, nanomedicine

- development of nanocrystals and amorf-nanoparticles to improve the drug solubility
- development of nanosized drug delivery systems (nano-DDSs) for target therapy (liposomes, niosomes, nanocomposites, etc.)

Drug delivery across artificial and biological barriers

- in vitro, ex vivo and in vivo permeability studies
- studies of different systems/dosage forms with micro- and nanoparticles (liquid, semi-solid, solid)
- use of alternative administration routs (intranasal and pulmonary) to reach the blood circulation

FACULTY OF ENGINEERING

www.**mk.u-szeged.hu**

DEPARTMENT OF FOOD ENGINEERING

The Institute of Food Engineering has physical, chemical and microbiology laboratories for research and education. Beside of these the Institute possesses several other laboratories for the practical education of students and for making experiments necessary for their diploma work. Our laboratories are the followings:

FOOD ANALYSIS LABORATORY

Analysis of techno-functional properties and nutritive values of food. Including fat, protein and fiber content. Analysis of nutritive values and freezing point of milk samples. Practical education in food analysis and research.

FLOUR LABORATORIES

Application of classic and special flour analyzing instruments. Examination of the quality requirements specified in the standards. Analysis of techno-functional properties of flours. In the laboratory can be make amilolite status determination, wet and dry gluten content determination, determination of water absorption capacity grain milling products and the value of bakery, pastry deformation tests, rheological tests as well as baking experiments. Practical education of students and for making experiments necessary for their diploma work.

CONFECTIONERY LABORATORY

Manufacture and development of sugar and chocolate-based products. Practical education and research.

BAKING LABORATORY

Manufacture of bakery products, dough tests. Practical training, dissertation and thesis preparation.

LABORATORY FOR SPECTROSCOPY

Mainly for spectroscopy-based studies. Determination of nutritional values, analysis of particle size distribution of grain and grist. Practical education of students and for making experiments necessary for their diploma work.

LABORATORY FOR GRANULOMETRY

Grain cleaning operations with blow- sieve, gravity separator and disk separator. Scraping and peeling with laboratory equipment. Shredding experiments with different shredding equipment. Modelling of sieving and meal clean-up operations. Milling experiments with 1, 2 and 6 system lab mills. Practical education and research in connection with milling technology.

DAIRY LABORATORY

Basic milk handling and processing procedures. Laboratory-scale dairy production. Research, practical training and dissertation, thesis, undergraduate thesis preparation.

MEAT & POULTRY INDUSTRY WORKSHOP

The workshop is for small scale production of various meat products. Pasteurization, canning, processing meat products from any meat. The necessary equipment is available for meat processing. Practical education and research in connection with meat and poultry industry.

LABORATORY FOR SENSORY EVALUATION

Owing to the special design of the laboratory, is suitable for sensual judging of food. It is essential for some theses, undergraduate theses and dissertations preparation and also for research.

ANALYTICAL LABORATORY

The main profile of the laboratory education. Numerous theses, undergraduate thesis and dissertation is preparing here. There is a possibility of food ingredients testing, advanced food studies, conductometric, polarimetric, spectrophotometric, titrimetric, refraktometric measurements, pH, consistence and viscosity measurement.

BIOSENSOR LABORATORY

Development, application: manufacture, test and application of bio and physical sensors to measure and track parameters, selected with experimental systems and fermentation configurations. Analog, DSP and PC development and construction of the necessary driver electronics. Editing and writing operating software. Specific food safety issues and forgery investigation (possible) techniques (developing, testing). We do not do routine tests.

LABORATORY FOR MICROBIOLOGY

The laboratory's main profile is the practical training. as well as helping students to prepare their diploma and thesis research. Examination of the microbiological status of food samples specified in the standards. the most commonly observed parameters total plate count, coliform bacteria, E. coli, Salmonella, Listeria, Clostridium, spore-forming anaerobic and aerobic bacteria, enterococci, enterobacteria, molds and yeasts.

FACULTY OF SCIENCE AND INFORMATICS

www.**sci.u-szeged.hu**

DEPARTMENT OF BIOCHEMISTRY & MOLECULAR BIOLOGY

GENOMICS/SEQUENCING LAB

The genomics lab houses an Illumina MiSeq NGS sequencer suitable for various genomic and functional genomic applications. Various auxiliary equipment are also available.

MiSeq bench-top sequencers allow the longest sequencing read lengths (2 × 300 nucleotides) among the market leading Illumina sequencers. MiSeq supports paired-end sequencing; the maximum output per sequencing run is 15 Gb. Sequencing parameters, such as sequencing depth and read length can be set in wide ranges (1M – 25M sequencing reads per run and 2 × 50 – 2 × 300 nucleotides per read, respectively) by selecting suitable flow cells and reagent cartridges.

MiSeq is suitable for several genomic and functional genomic applications, such as:

- de novo bacterial genome sequencing
- targeted re-sequencing
- metagenomics (16S amplicon sequencing)
- SNP analysis
- RNA-sequencing / transcriptomics
- miRNA analysis
- ChIP-seq

Other auxiliary equipment in the lab:

- Covaris M220 ultrasonicator
- Agilent Bioanalyzer 2100 capillary electrophoresis equipment
- Thermo Scientific PikoReal 96 and ABI 7500 real-time PCR systems
- Qubit 2.0 fluorometer
- NanoDrop spectrophotometer
- SciGene Hybex Microsample Incubator
- Biosan MPS-1 Multiplate shaker
- Biosan UVT-B-AR PCR cabinet

DEPARTMENT OF IMAGE PROCESSING & COMPUTER GRAPHICS

The main task of the Department of Image Processing and Computer Graphics is research and education in the scientific fields regarding visual (image) information. Our members work in various fields of medical image processing and computer vision (e.g., image reconstruction, segmentation, registration and fusion, shape representation) in collaboration with national and international research groups, and industrial partners, and publish their results in leading forums. Topics of image processing and computer graphics is represented in all levels of our higher education curricula in the form of mandatory courses, elective and special courses, as well as a complete specialization block of courses and PhD research topics. Our laboratories mainly support teaching, but can be also used in research projects.

MOBIL IMAGE PROCESSING LABORATORY

The computing capacity, graphics, imaging, and sensor capabilities of current smartphones opened new horizons for the practical use of image processing. Since the creation of our mobile image processing laboratory in the fall of 2010, we continuously seek to follow the rapidly changing trends and keep our collection of devices up-to-date. Besides their use in the classroom, students can borrow devices for their work at home. Relevant facilities of the lab are: smartphones and tablets running Android and iOS systems, 2 MacBook Pro laptops, 2 autostereoscopic 3D devices with stereo cameras, Google Cardboard, specialized textbooks, possibility to join the Apple 'iOS Developer University Program'.

COMPUTER VISION LABORATORY

The devices found in our computer vision laboratory are mostly used in teaching, but could be also used in industrial applications. They can be used for visual inspection of small objects, e.g., shape inspection, visual measurements, inspection of surface defects. We also have special optics to connect to our industrial color image camera, such as a telecentric lens with minimal perspective distortion, a pericentric lens that can map the top and side surfaces of objects into a single image, a hole inspection lens, and a rigid borescope. For visual measurements and imaging we can use structured pattern projector, background lighting and a diffuse light for uniform illumination.

3D LABORATORY

In our 3D laboratory our students can learn about various 3D image acquisition techniques. Our lab has a MESA SR4000 time-of-flight camera, an example for a range-camera, which is the basis for the SLAM technology. This ToF camera can be used to "map" a smaller room or corridor. We also have a NextEngine 2020i 3D scanner that uses structured light to "digitize" in 360° objects fitting in a 20 × 20 × 20 cm volume. Both devices produce point cloud data that can be exported to various formats and thus can be further used in 3D modelling and/or CAD software. Our lab is also equipped with 3D monitors and glasses for 3D visualization to aid stereo perception and working with 3D objects.

DEPARTMENT OF EXPERIMENTAL PHYSICS

HIGH INTENSITY LASER LABORATORY

The High Intensity Laser Laboratory (HILL) at the Department of Experimental Physics (DEP), University of Szeged was founded by Sándor Szatmári who has been heading this laboratory since 1994. The HILL laboratory – due to its gradual developments over the last 20 years – became an internationally recognized user's facility providing not only fs light sources of unique parameters but also target areas with the corresponding detection and measurement systems for high-intensity laser-matter interaction and material's processing. HILL is the member of the LaserLab Europe; the consortium of major European laser research organisations.

HILL is one of the very few laboratories of the world which is involved in the research and development of high-intensity excimer lasers; its main goal is to generate high-intensity and high-contrast laser pulses suitable for plasma- and surface physics experiments.

Significant part of the research activity is concentrated on the development of the laser system, which includes discharge physics and ultrafast laser phenomenon as well. Another important activity targets the improvement of the temporal and spatial contrast of laser beams.

The interaction of laser pulses with solids plays an important role in many applications, such as laser processing and pulsed laser deposition, etc.

Research in the field of laser-plasma interactions is carried out in strong cooperation with the Wigner Research Centre of Physics.

The laser research activity of HILL is strongly connected to a long-standing and active research and development activity in the field of short-pulse excimer amplifier development. The associated technological background and knowledge is unique on an international level as well.

DEPARTMENT OF OPTICS& QUANTUM ELECTRONICS

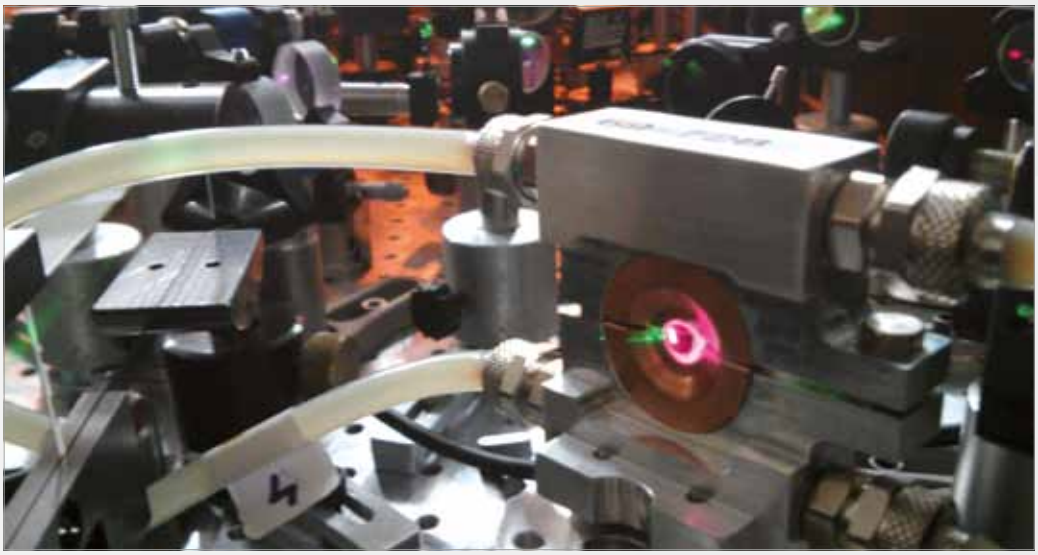
TEWATI & HELIOS FEMTOSECOND LASER LABORATORIES

The laser related research activities at the Departments of Physics of University of Szeged, the leading photonics-related higher education site in Hungary, have been at the international forefront since the seventies. The TeWaTi laser system built at the department of Optics and Quantum Electronics has been the very first - and only one - TW-class laser in Hungary since 2001. The whole infrastructure has been renewed between 2011 and 2014: we have created optical clean room better than ISO 7 in the laboratories, we have obtained <7fs CEP stabilized oscillator; we have built the first amplifier stage which has 1.5mJ energy, gives impulses shorter than 25fs and has 200 Hz repetition frequency; while the final amplifier delivers 4 TW peak power pulses.

In the last few years the focus of our scientific publications has been transferred from laser physics to laser-material interactions, such as linear and non-linear propagation of ultra-short impulses, time-resolved ultrafast spectroscopy, surface processing with lasers, and ionization physics including high harmonic generation.

TeWaTi participates in the ELI project since its beginning. Our major tasks are to develop diagnostics for the laser beams and to study high contrast amplification of laser pulses. We joined to LaserLab Europe II in 2009; within it TeWaTi also provides access to infrastructure for laser users.

Besides research, our further goal is to prepare students and young scientists for the lab work within ELI-ALPS while doing practices in high-tech infrastructure and diagnostic pool of the TeWaTi and hELIos laboratories. It is the specialty of the hELIos laboratory to provide a place to learn how to use ultrafast lasers in the ELI-ALPS or any other laser laboratory in the world.



DEPARTMENT OF PHYSICAL GEOGRAPHY & GEOINFORMATICS

The department operates 6 laboratories, from these the accredited Soil and Water Testing Laboratory will be introduced in a later cahpter.

DENDROLOGICAL & PALYNOLOGICAL LABORATORY

The dendrological laboratory was set up in 2007. Tree-ring measurements in the laboratory focus on the dating of past geomorphological and geo-ecological processes. Geomorphological applications cover the dating of landslides, estimation of river bank erosion, measurement of point-bar and island development. Geo-ecological research concentrates on e.g. heavy metal accumulation in the tree-rings or the effect of environmental pollution on tree-ring growth. Dendrology is also used to climate change research, with special emphasis on the drought sensitivity of different tree types.

The pollen analytical laboratory was founded in 2008. Palynology is applied in paleo-ecological studies and in geomorphological research to date the rate of active processes. Pollens are separated applying the Zólyomi-Erdtman Zn-Cl method. Pollen analysis have been applied in several paleo-ecological reconstructions (dating aeolian activity, role of human impact in vegetation changes), and in dating floodplain sediments using the pollen of invasive plant species.

Main instruments of the Laboratory:

- Increment borers
- LINTAB 5 Tree-ring measurement station and LEICA S4E stereo microscope
- TSAP software for tree-ring evaluation
- Leica palynological microscope
- Tilia and TiliaGraph software for palynological evaluations

GEOCHRONOLOGICAL LABORATORY

The Geochronological Laboratory of the University of Szeged is specialised in luminescence and radiocarbon dating. The luminescence dating unit was established in 2004, while the radiocarbon unit in 2014. The two methods hand in hand are adequate to tackle several fundamental and applied research questions in the field of earth and environmental sciences and archaeology.

The laboratory primarily undertakes measurements of scientific interest. However, commercial service is also available. Analyses are typically performed on different types of sediments, potteries, wood and bone remains, soils and peat. Furthermore, retrospective dosimetry, gamma spectroscopy, radiocarbon and tritium isotope geochemistry analyses are also possible with the available instrumentation.

The Laboratory has a broad international research cooperation network and has several references from Europe and the rest of the world. Key research areas are the investigation of fluvial and aeolian architecture, reconstruction of palaeo environments in various settings, geoarchaeology and archaeometry.

Main instruments of the Laboratory:

- Risø TL/OSL DA15 luminescence dating instrument
- Risø TL/OSL DA20 luminescence dating instrument
- Quantulus 1220™ LSC
- Atomkomplex Prylad custom developed benzene synthesis line
- Canberra type gamma spectrometer

REMOTE SENSING & SPATIAL ANALYTICAL LABORATORY

The research activity of the laboratory covers a wide range of remote sensing and spatial analytical applications. A small format aerial photography (SFAP) system is used for various environmental studies. The great advantage of the system is short installation time and real time control and display of the images. The system is suitable for making true and false colour and also thermal images. The satellite data collection system of the laboratory provides important data for environmental monitoring at high spatial and temporal resolution. Geodetic instruments enable high precision field surveys.

Spatial analyses are primarily focusing on land use/land cover assessment in different, such as urban or agricultural environments. Digital elevation model studies and vegetation monitoring are also key fields of fundamental and applied research in the laboratory.

Main instruments of the Laboratory:

- Leica Viva GS15 and Topcon HyperPro RTK GNSS systems
- Leica Builder 509 and Sokkia Set350RX Total Stations
- Leica digital theodolites
- Trimble Aerial Camera and DuncanTech MS 3100 Multispectral Camera
- Trimble Juno térinformatikai GPS
- EumetCast satellite data collection system
- Photogrammetry PC labor and GIS software (e.g. ArcGIS, Erdas, etc.)

SHALLOW GEOPHYSICAL LABORATORY

The available shallow geophysical instruments: ground penetrating radar (GPR), geomagnetic and geoelectric equipment are widely applied in earth sciences, heritage management, engineering, forensic science or military reconnaissance. With the help of shallow geophysics various information can be retrieved on underground geological, sedimentological structures or the presence and spatial extension of objects and cavities. We apply our system for complex applied investigations, such as the investigation of shallow geological structures and concrete. Furthermore we regularly undertake prior to excavation geophysical surveys on potential archeological sites and measurements to locate utilities in urban environment.

Main instruments of the Laboratory:

- GSSI SIR3000 GPR, antennae: 2000, 270, 1000 MHz
- Geomatrix ERT tomograph
- MagMapper geomagnetic system

HYDRO-MORPHOLOGICAL LABORATORY

The laboratory measures and analyse fluvial forms and processes. Fluvial research is supported by various field and laboratory equipment. Channel surveys are primarily focus on beadload transport (with a modified Helley-Smith bedload sampler), river discharge (ADCP, current meter), and high resolution river bed mapping (Lowrance HDS-5 GEN2 sonar). Indoor laboratory modelling is enabled by an Emriver EM2 geomodel. Within the laboratory the grain-size distribution of various sediments is also possible to assess by using a high precision laser instrument. Based on field and laboratory analyses hydrological models are generated with various softwares (e.g. Mike 11+SHE, HEC-RAS).

Main instruments in the Laboratory:

- Lowrance HDS-5 GEN2 sonar and structure scan
- Helley-Smith bedload sampler
- Emriver EM2 geomodel
- Fritsch Analysette 22 MicroTec plus

DEPARTMENT OF MINERALOGY, GEOCHEMISTRY & PETROLOGY

Services offered by GeoLab

Major goal of the GeoLab is to support pure and applied research activities related to members of the staff of the Department of Mineralogy, Geochemistry and Petrology. In addition, the GeoLab is able to provide measurement data, with or without professional evaluation on request, for both private and scientific partners. Tasks of the GeoLab cover a wide spectrum of pursuits from sample preparation to analytical procedures and data evaluation by different adequate softwares.

SAMPLE PREPARATION LAB

We have experience of producing samples prepared for mineralogical, petrographic and geochemical analyses from a wide range of materials including, rocks, minerals, fossils, concrete, ceramics, sands and soils.

The Sample Preparation Lab is able to offer the following:

- Rock cutting, grinding and polishing of surfaces
- Vacuum and pressure epoxy (clear or dyed) resin impregnation of friable material
- 30 µm thin sections and ultra-thin sections also with various sizes both covered and uncovered
- Standard or orientated, polished (single or double) for optical and electron microscopy, cathodoluminescence and fluid inclusion analysis
- Uncovered sections for carbonate staining and non-carbonate staining
- Mineral separation via magnetic and heavy liquid separation techniques
- Homogeneous powder or pellet production for X-ray analytics and other geochemical analyses

Devices:

- Struers Discoplan TS abrasive cutter
- Buehler Isomet low speed saw
- Buehler Petrothin grinder, Struers DP-U2 grinder
- Struers DP-10 polisher
- Fritsch Pulverisette mortar grinder
- CitoVac high capacity vacuum impregner
- Frantz Isodynamic magnetic separator
- Fluxana Vulcan sample fusion system
- Sieve systems
- Centrifuges, ultrasonic cleaner, ultrapure water distillator for analyses

PETROGRAPHY LAB

The Petrography Lab is able to perform mineralogical and microtextural analyses of different solid samples including rocks, minerals, sediments, soils, archaeological artefacts, artificial silicate products and other industrial materials. Standard procedures operate on prepared samples as standard thin sections, polished thin sections and slabs, separated minerals or aggregates, broken or etched non-planar surface specimens, both destructive and non-destructive methods are available. We have facilities in the field of optical and electron microscopy, phase analyses, petrographic image analysis and fluid inclusion investigation techniques.

Devices:

- Olympus SZX7 binocular microscope
- Olympus BX41 equipped with UV epifluorescence unit and Nikon Microphot FXA petrographic microscopes with digital cameras
- Linkam THMSG-600 heating-freezing stage
- Reliotron VII cold-cathode cathodoluminescence microscope (CL)
- OceanOptics USB2000 VIS-NIR spectrometer
- QUEPRO UV-VIS spectrometer
- Mitutoyo PJ-H3000F Profile Protector
- Softwares for Petrographic Image Analysis (PIA)
- THERMO DXR Raman microscope with laser sources of 532 and 785 nm
- Rigaku Ultima IV X-ray Diffractometer (XRD)
- Horiba Jobin Yvon XGT 5000 microfluorescence spectrophotometer
- Hitachi S-4700 FE-SEM Scanning Electron Microscope with secunder electron (SE) and backscattered electron (BSE) detectors, cathodoluminescence (CL) mode and energy dispersive spectrometer (EDS)
- Spindle and crashing stages

GEOCHEMISTRY LAB

The Geochemistry Lab activity focuses on determination of chemical composition of different solids (e.g. minerals, rocks, soils, archaeological artefacts, cements, concretes) and fluids (e.g. water, crude oils) and on subsequent data evaluation. Routine analyses run on prepared samples as pressed and fused pellets, thin sections, polished thin sections and slabs, separated minerals or aggregates, broken or etched non-planar surface specimens, solutions, suspensions. The obtained data can be used for explorations in the fields of igneous, metamorphic and sedimentary rock geochemistry, organic and environmental geochemistry as well.

Devices:

- Rigaku Supermini 100 Wavelength Dispersive X-ray Fluorescence Spectrometer (XRF)
- Horiba Jobin Yvon XGT 5000 Fluorescence Micro-Spectrophotometer
- Hitachi VWR 2000 High Performance Liquid Chromatograph
- THERMO DXR Raman microscope with laser sources
- Hitachi S-4700 FE-Scanning Electron Microscope (SE, BSE, EDS)
- Nuklex NP-420P single channel nuclear spectrometer available for field work
- Nuklex NP-424P multichannel nuclear spectrometer
- Hitachi LaChrom Elite L-2000 High Performance Liquide Chromatograph
- CONSORT C911 field and laboratory conductometer

HYDROGEOLOGY LAB

Complex hydrogeological projects can be performed by the equipment of the Hydrogeology Lab including investigations on active and planned wells and evaluation of geothermal capacity of a given area. We have experience in the field of hydrogeological field works, measurements for determination of porosity, hydraulic conductivity, flow and leakage characteristics, hydration capacity, degree and chemical composition of pore-filling phases and hydrodynamic and numeric heat transport modelling used by up-to-date softwares.

Devices:

- ALKO TBP 3300-7 tube pump
- ALKO SA-30 pump
- DATAQUA DA-S-LTRB 122 water table level register
- MiniDIVER water table level register (10–20–50 m)
- HT manual bubble-tube (15–50–100 m)
- CONSORT C911 field and laboratory conductometer
- Enslin instrument
- Flexible-wall permeabimeter
- Rigid-wall (Proctor) permeabimeters
- Colmatometer

Available softwares:

- Aquifer Test 4.2., Feflow 5.3
- PHREEQC for Windows 2.17.,
- Processing Modflow Pro. 7.0.17.
- Processing Shemat 4.1., RepSim 3.1

ARCHAEOMETRY LAB

In the case of archaeometrical investigations, the above mentioned mineralogical, petrographic and geochemical methods are applied during examinations of archaeological artefacts.

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EMERGING ZONE

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