

# Faculty of Environment J.E. Purkyně University in Ústí nad Labem

## Main research areas

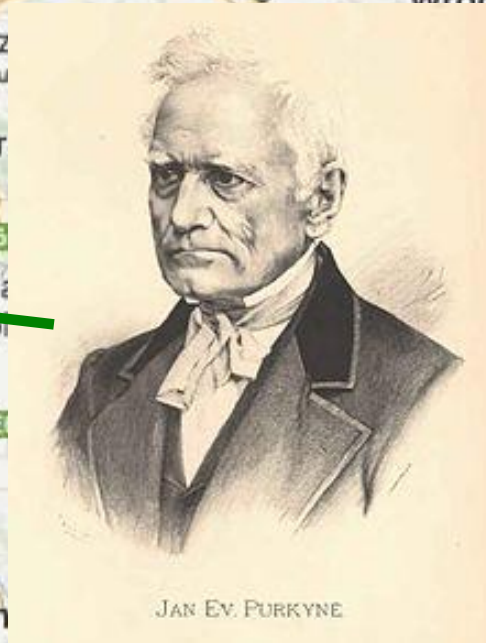
Josef Trögl, vice-dean for research

Králova Výšina 3132/7  
400 96 Ústí nad Labem  
Czech Republic  
tel. +420 475 284 153  
mobil. +420 608 168 848  
[josef.trogl@ujep.cz](mailto:josef.trogl@ujep.cz)



Ústí nad Labem









## Jan Evangelista Purkyně

(1787-1869),

Born in Libochovice town, Czech Republic

One of the founders of biology, embryology, histology, pharmacology, anatomy, anthropology, famous in physiology

# UJEP

- ~9 000 students, ~900 academic staff
- 8 Faculties, wide range of disciplines
  - Faculty of Social and Economic Studies
  - Faculty of Art and Design
  - Faculty of Mechanical Engineering
  - Faculty of Environment
  - Faculty of Philosophy
  - Faculty of Education
  - Faculty of Science
  - Faculty of Health Studies

# Faculty of Environment

- **~800 students, ~80 academic staff**
- **7 field of studies**
  - **2 BSc**
    - Ecology and environmental protection
    - Applied geoinformatics
  - **3 MSc.**
    - Waste management
    - Landscape reclamation
    - Environmental analytical chemistry and toxicology
  - **1 PhD.**
    - Environmental chemistry and technology

# Faculty of Environment

- **Close to preserved nature**
  - Two protected areas
  - National park „Czech-Saxonian Switzerland“
  - Smaller nature parks in Ore Mountains
- **Close to damaged nature**
  - area of surface browncoal mining
  - related industry (chemical, petrochemical, energetic...)
  - high pollution
  - **ongoing land reclamation**



# Protected area České středohoří





# Protected area

## České středohoří







# Protected area Děčínské stěny



# National park Czech-Saxonian Switzerland





# Surface brown-coal mine





# Ústí n.L. - city of chemistry





# Ústí n.L. - city of chemistry





# UJEP research areas

- **Materials and technologies for environmental protection and quality of life (MATEQ) - <http://smart-mateq.cz/>**
- **Resources and energy**
- Smart city, smart region, smart society
- Identity – history and culture of the region



# UJEP doctoral schools

- **Polytechnic doctoral school**
- **Humanities doctoral school**
- **Behavioral and didactic doctoral school**



# Faculty research areas

- Applied ecology
  - Ecosystems and their functions and services – focus on disturbed, local ecosystems affected by brown coal surface mining
  - Landscape reclamation and revitalization – after mining, spoil/heaps...
  - Social, economic, ecosystemic... aspects





# Faculty research areas

- Natural and anthropogenic factors supporting the biodiversity
- research of the plant and animal communities structure
- monitoring of the factors affecting species distribution
- revitalization measures proposal supporting the biodiversity
- monitoring of invasive species



# Faculty research areas

- Socio-economic research: Integrating socio-economic systems with ecosystems
  - Natural autotrophic ecosystems create all basic life-supporting conditions for humans and other heterotrops
  - Standard mainstream economics remains separated from environment through:  
the unilateral utilitarian concept of economic value  
the system of national accounting (added value)

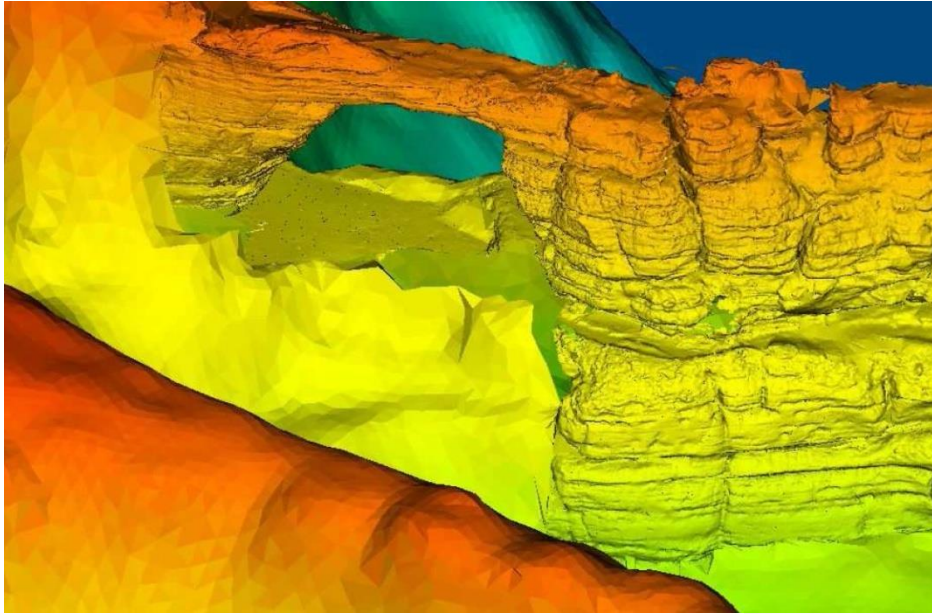
# Faculty research areas

- Geographic information systems
  - Methods for landscape reconstruction
  - 3D visualizations
  - web information services
  - collection of 3D data using innovative techniques





# GIS



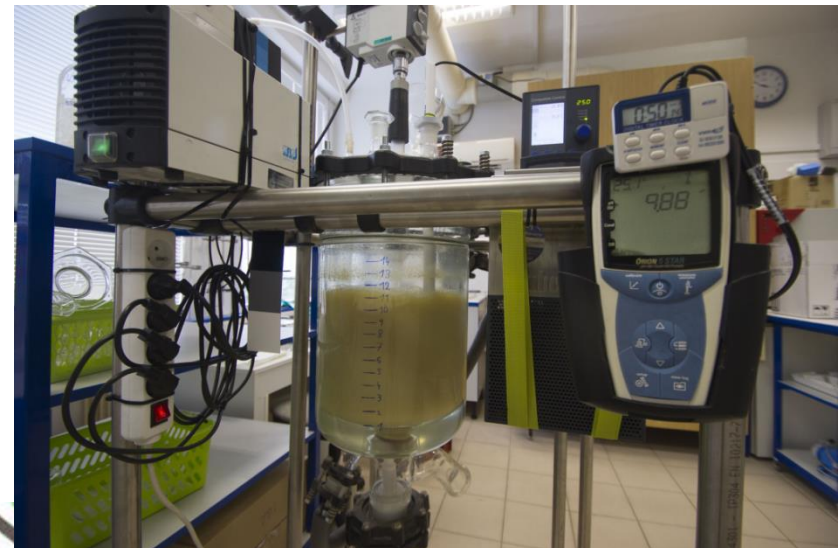
- Terrestrial laser scanning
- Analyses and visualization of 3D data

- Unmanned Aerial Vehicle photography – orthophotomapping, digital models of landscape, 3D models of objects, thermoscanning, multispectral photography



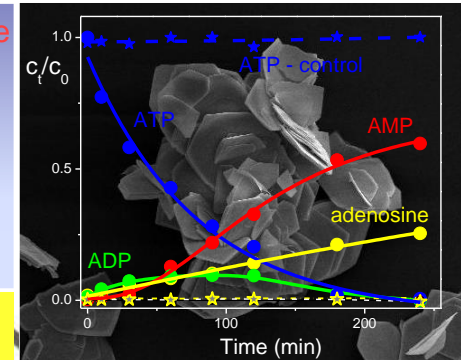
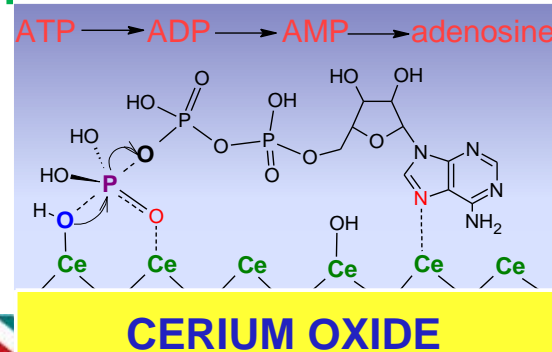
# Faculty research areas

- Pollutants in environment - „Pollution and solutions“
  - Analytical determinations of pollutants in various environmental samples – distribution, binding...
  - Novell approaches to (waste) water treatment – sorption on cheap sorbents, photocatalysis, biotechnologies with immobilized microorganisms
  - Soil bioremediation
  - Technological solutions
  - Ecotoxicology



# Main research areas

- Novel materials and technologies for environment
  - Reactive sorbents – decomposition of warfare agents, pesticides, cytostatics...
  - New materials for photocatalysis
  - Microbicide nanofilters
  - Gassification of biomass for cogeneration
  - Waste management and recycling
  - 2nd gen. Biofuel crops
  - ...





# Environmental biotechnology

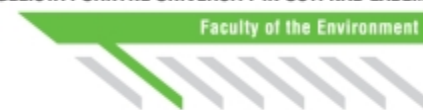
- Waste-water treatment using encapsulated microorganisms
- Bioremediation and phytoremediation
- Environmental biosensors



# Waste management

- Waste-water treatment
- Innovative approaches to material recycling
- Pyrolysis / thermolysis of wastes
- Faculty of Environment is a member of the **Wasten** cluster of innovative companies and research institutions and **Czech association for circular economy**





- UJEP is part of the Research Infrastructure **NanoEnviCz** – Nanomaterials and Nanotechnologies for Environmental Protection and Sustainable Future ([www.nanoenvicz.cz](http://www.nanoenvicz.cz))
- **Aim:** Providing research services in the field of nanomaterials and nanotechnology
  - Polymeric nanofiber textiles
  - Functional surfaces
  - Metal-oxide based nanocomposites
  - Reactive sorbents for decomposition of hazardous substances
  - Characterization of materials
  - Environmental analytical chemistry



# Laboratories

- **Analytical chemistry**
- **Photochemistry**
- **Biotechnology and microbiology**
  - constant temperature  $\sim 25^{\circ}\text{C}$
- **Pedology**
- **GIS**
- **New building in 06/2020**





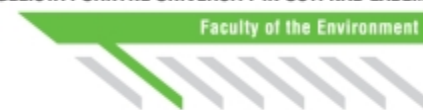
# Faculty journals

- **Studia Oecologica**
  - <http://fzp.ujep.cz/Veda/Edice/StudiaOecologica.php>
  - under process is indexation in Scopus
  - Czech / Slovak / English
  - All environmental topic
  - Editor-in-chief **prof. Pavel Janoš**

# Transfer of technologies

- **Center for Technology Transfer (CTT)**
  - <http://ctt.ujep.cz>
  - helps with practical application of ideas into companies
  - helps with intellectual property rights and protection
  - seeks for funding of these activities
- **Innovation Center of Usti Region (ICUK)**
  - <https://icuk.cz/>
  - joint center of Usti region, UJEP and Regional Chamber of Commerce of the Usti Region
  - bringing existing capacities and subjects together and identifying complementarities and synergies
  - helps with funding





- Research center for advance organic analyses in environment
  - <http://fzp.ujep.cz/KTV/lab/LaboratorC.php>
- Joint center of Faculty of Environment UJEP and Health institute in Ústí nad Labem
- Analyses of environmental samples
  - Pesticides, pharmaceuticals, dyes, endocrine disruptors, drugs, aliphatic and aromatic hydrocarbons, PLFA, PCBs, dioxines...



# Equipment

- **Chromatography** – GC x GC –MS (hi-res), GC-FID, LC-MS (hi-res), HPLC, IC ...
- **Spectrometry** – plate reader, UV-VIS, ICP-OES, ICP-MS
- **Portable** – Raman spectrometer, XRF, multimeter...
- **Sample pretreatment** – shakers, ultrasound, heat/microwave decomposition, annealing...
- **Photochemistry** – microreactors to semi/pilot
- **GIS** – HW and SW for GIS, map server, total stations and geodetic GPS, laserscan, Unmanned Aerial Vehicle + termo- and multispectral camera
- ...



# Research collaboration

- **Universities** – TU Liberec, UCT Prague, TU Ostrava, Brno University of Technology, University of Pardubice, TU BA Freiberg, University of Lund, University of st. Cyrillus and Methodius Trnava, Kazan Technological University, University of Tennessee Knoxville, Kansas State University, NULES Kiiv, NU Lvivska Polytechnika, ...
- **Research organization** – Czech Academy of Sciences (esp. Institute of Inorganic Chemistry), Health institute in Ústí (joint center CADORAN), UNICRE, Military Institute Brno
- **Companies** – TOSEDA, Nanovia, Mikrochem, D.S.K., LentiKat's, Humatex...



**Thank you for your  
attention**

