

3 Examples of Main Research Trends

University of Ostrava



1. Life Science Research Centre



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Research groups:

- **Genomics and evolution of protists**
 - **Molecular protozoology**
 - **Evolutionary zoology**
 - **Genomics and bioinformatics**
- › *four research groups united by using molecular biological and genomic approaches towards solving fundamental biological questions*
 - › *an international team engaged in a network of international collaborations*
 - › *established in 2012, so far over 20 publications in impact-factor journals*



Projects of the Life Science Research Centre

1. Sequencing and comparative analyses of genomes of phylogenetically important protist groups to illuminate the early evolution of eukaryotes
2. Exploring the biology of eustigmatophyte algae using genomics and transcriptomics
3. Mapping the diversity of unicellular algae and kinetoplastid parasites using molecular taxonomy
4. Reconstructing the evolutionary history of the Ras superfamily of GTPases as a model to understand the evolution of the eukaryotic cell
5. Defining the molecular mechanisms of virulence in *Leishmania* parasites



Projects of the Life Science Research Centre

6. Transcriptomic and genomic investigations of monoxenous trypanosomatids
7. Molecular phylogenetics of rotifers and dipteran insects
8. Origin and evolutionary significance of clonal and asexual vertebrates
9. Population genetics and speciation in model vertebrate groups
10. Human population and forensic genetics
11. Sequencing and analysis of ancient human DNA
12. Bioinformatic methods for genome assembly and annotation



2. Research of the impact of industrial technologies on environment



(Environmental Center of Faculty of Science)

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Research groups:

- **Division of Biology**
- **Division of Chemistry**
- **Division of Biophysics**

The main objective

Understanding of the causes and mechanisms of disruption of the natural equilibrium.

Proposal of procedures for the effective reduction of negative impacts on the individual components of the environment.



Projects of the Environmental Center of Faculty of Science

1. Assessment of toxic and genotoxic impact of contaminated environment on organisms
2. Study of impact of environment contamination on changes in biodiversity
3. The research of the impact of climate conditions changes on photosynthetic activity of plants
4. Adsorption of pollutants from liquid phase
5. Study of spontaneous combustion process of carbonaceous substances



Projects of the Environmental Center of Faculty of Science

6. The research of the impact of climate conditions changes on photosynthetic activity of plants
7. Adsorption of pollutants from liquid phase
8. Study of spontaneous combustion process of carbonaceous substances

Cooperation with members of consortium PROGRES 3

- ❑ **Uniwersytet Śląski v Katowicach** – *in area of ecology and specialized chemical analyses*
- ❑ **Akademia Techniczno-Humanistyczna w Bielsku Białej** – *in area of ecology*
- ❑ **Uniwersytet Opolski**- *in area of ecology*
- ❑ **Vysoká škola báňská-Technická univerzita Ostrava** - *in area of toxicology and nanotoxicology, genotoxicology, biodegradation, surface analyses*



3. Institute for Research and Applications of Fuzzy Modeling (IRAFM)



Head of research team: prof. Ing. Vilém Novák, DrSc.
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Basic facts

- Established in 1996
- 32 scientists (Czech, Spanish, Polish, Egyptian)
- Publications: total 930
of this: 391 papers in scientific journals
(2/3 are journals with IF)
6 monographs, 55 chapters in monographs,
478 contributions in international conferences
1 patent (Russia)
- Projects
Czech Republic: 5 large and 10 smaller
7 bilateral, 1 foreign (US Navy)



Research

Theory

Mathematical fuzzy logic, special algebraic structures, fuzzy (integral) transform, discrete dynamical systems, stochastic optimization

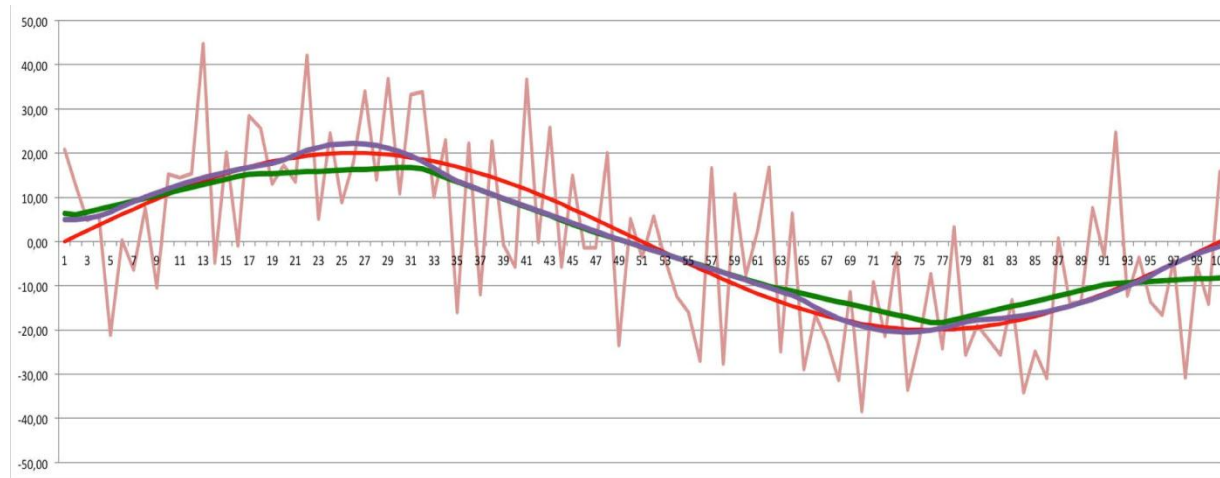
Applications

- *Image Processing*
Original techniques based on our theoretical results:
image compression, image fusion,
edge detection, noise reduction,
correction of distorted images, image reduction



- *Analysis and forecasting of time series*

Original method, based on combination of two techniques theoretically developed in IRAFM:
F-transform and Fuzzy Natural Logic.



- *Automatic control of technological processes*

Original method for linguistic control of processes whose behavior is not known precisely, or are too complicated, or subject to strong disturbances; precise mathematical description is too complex or unusable. The control is described by expert in natural language.

- *Data Analysis*

Original techniques for mining information from the data (associations formulated in natural language)