

Research potential and priorities in Life Sciences

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Priority Research Areas

Sustainable building

Environmental and energy technologies

Sustainable transport

Mechatronics

Information and communication technologies

Economics engineering, management and communication

Fundamental research of materials and processes

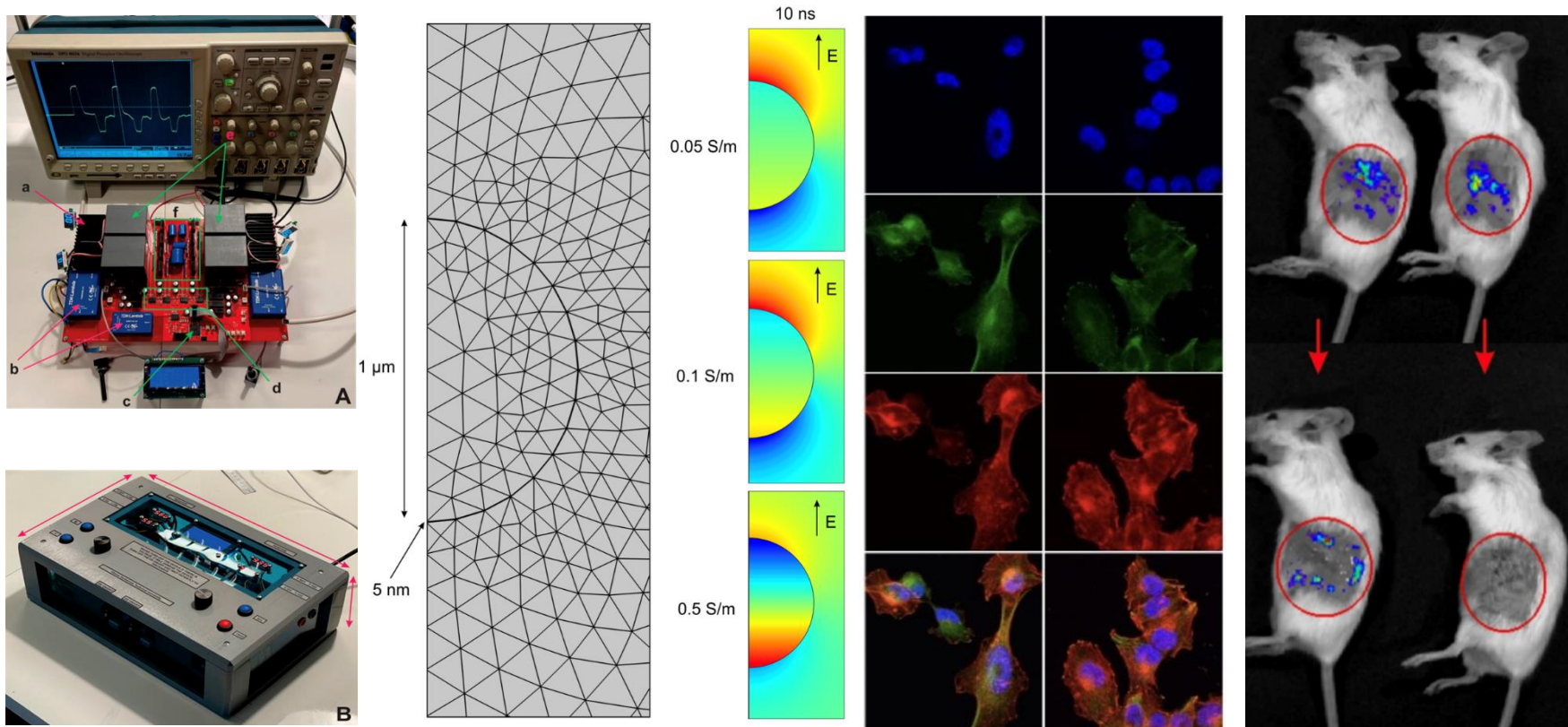
All list [click here](#)

Research fields directly related to Life Science

- ...
- Metamaterials and nano-structures
- Bionics and biomedical engineering systems
- Investigations on cells and their biologically active components
- Mathematical models
- ...



Applied Bioelectromagnetics and Electroporation-based Technologies



Prototyping
&
Development

Research of biological
effects *in silico*

Research
in vitro

Research
in vivo

Lead Prof Vitalij Novickij



Applied Bioelectromagnetics and Electroporation-based Technologies

Main research topics and potential:

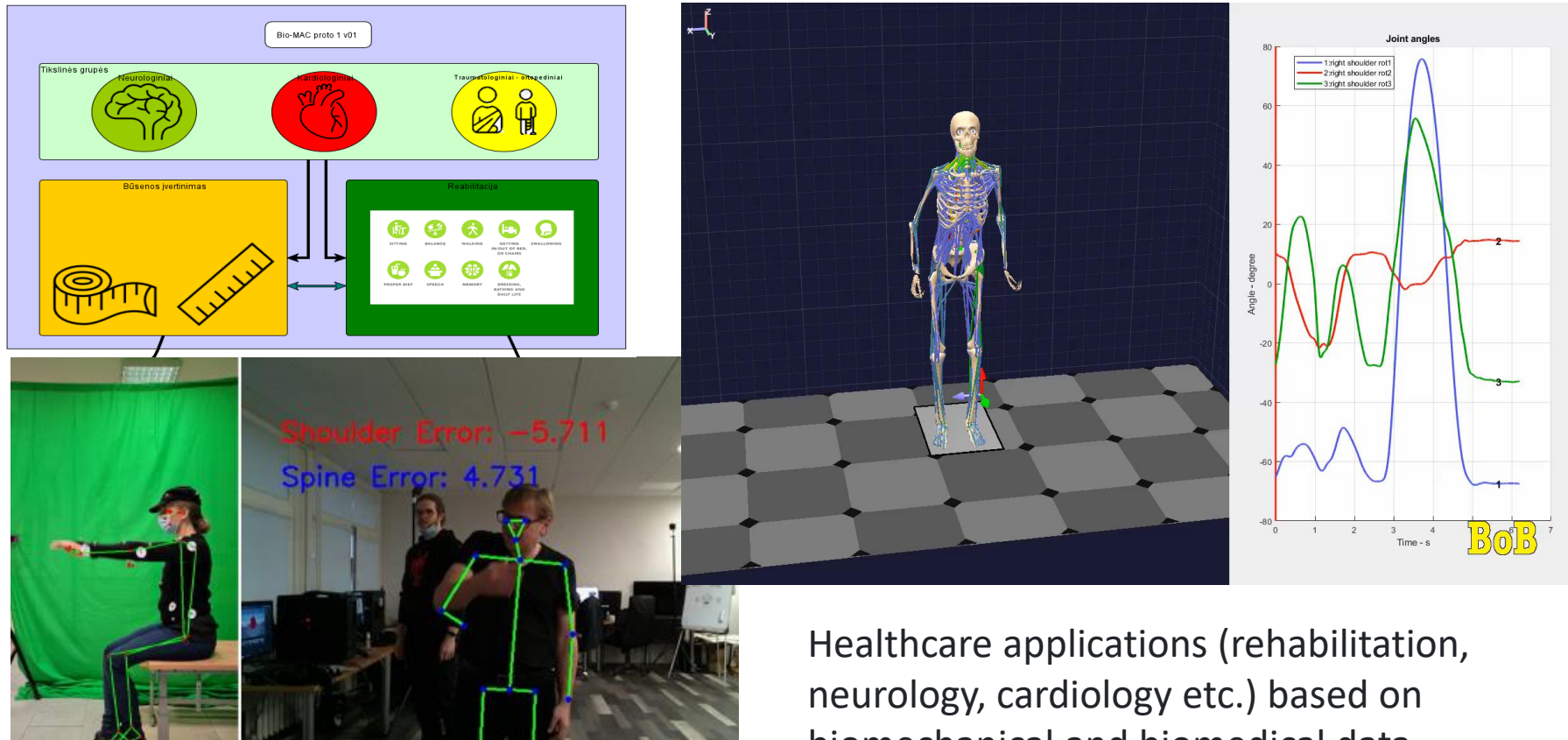
- **Wound sterilization** by electric and magnetic fields, combination with antimicrobial drugs and nanotechnology
- **Cancer treatment** using state-of-art electro-magneto-chemotherapies
- **Food processing** using pulsed electric and magnetic fields (bacterial inactivation, protein extraction, synergistic approaches)
- **Non-viral transfection** and **DNA transfer** using pulsed electric and magnetic fields
- **Stimulation of cells** with electric and magnetic fields (dendritic cells, stem cells, bacterial cells, etc.)
- **Development of power electronics** for biomedical applications

Achieved results:

- **80+** publications (CA WoS with IF)
- **5 PhD** thesis on the topic (2 PhD students ongoing)
- Collaboration network with **more than 10** national and international laboratories
- **3 national** and **2 international** bilateral scientific research projects
- **10+** pulsed power prototypes and devices for treatment of biological objects with pulsed electric and magnetic fields



Clinical Decision Support Systems Towards Medicine 4.0



Healthcare applications (rehabilitation, neurology, cardiology etc.) based on biomechanical and biomedical data collection, processing, and analysis

Clinical Decision Support Systems Towards Medicine 4.0

Main research topics and potential:

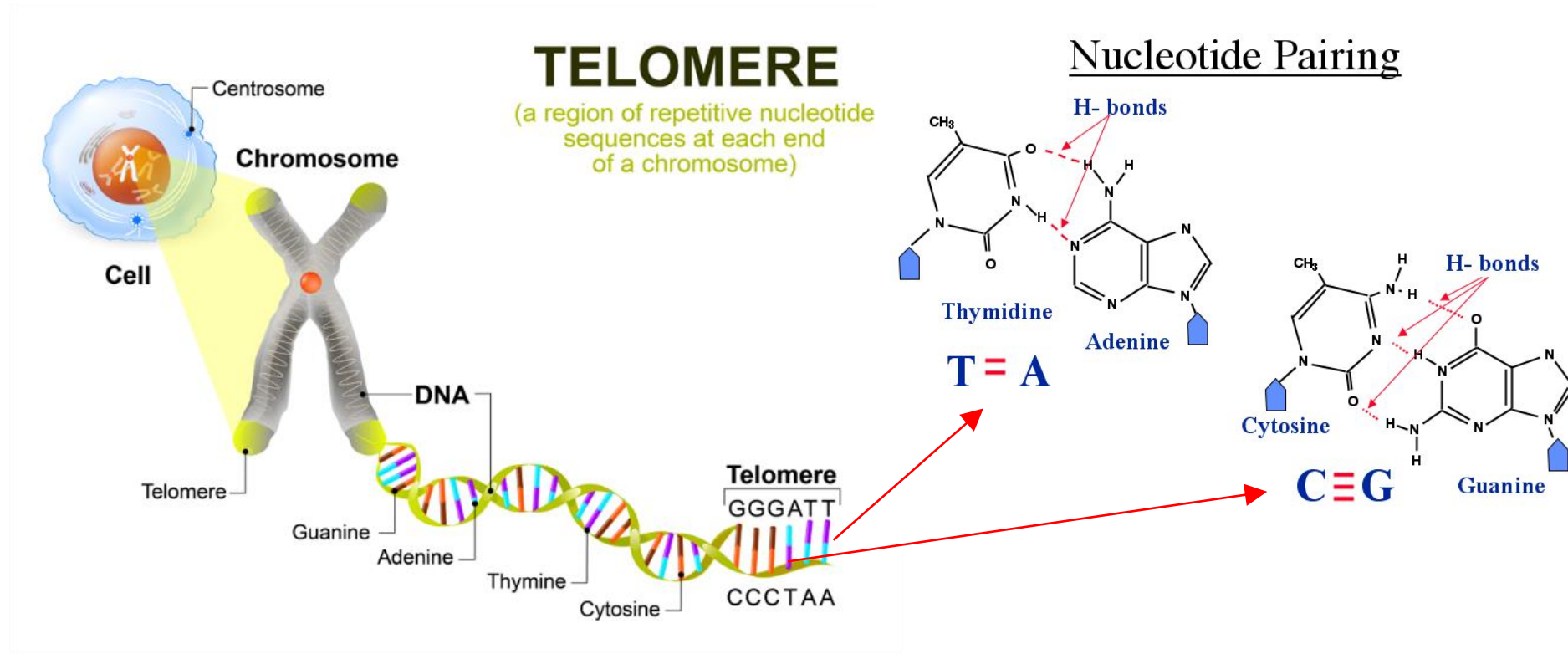
- Development of technological environment for **biofeedback measurements** making use of state-of-the-art **movement analysis**.
- Development of novel **biomechanical models** representing elderly. R&D using biofeedback augmented measures for active healthy ageing.
- **AI-based technologies** for data processing, numerical modeling and simulation of biological structures
- **Markerless motion detection** and classification, biofeedback technologies

Achieved results:

- **3 PhD** thesis defended in this topic and 3 PhD students currently working in this topic
- Ongoing research project (2020-2023) with **EU funding**



Mechanics of Ultrafine Objects



Mechanics of Bio-Objects

Mechanics of Ultrafine Objects

Main research topics and potential:

- **Interaction of ultrafine particles, droplets**
Transport of drugs in the human circulatory system.
- **Interaction of cells, viruses**
Coronavirus interaction (blood vessel; lung);
Blood clot formation (blood vessel; atrium).
- **Molecular interaction**
Gerontology (telomeres and aging);
DNA mechanics;
Nucleotide pairing.

Achieved results:

- **20** publications (CA WoS with IF).
- **1 PhD** student ongoing.
- **International project** with the Technical University of Berlin.



Next Generation Sequencing To Monitor The Microbial Community Composition and Dynamics

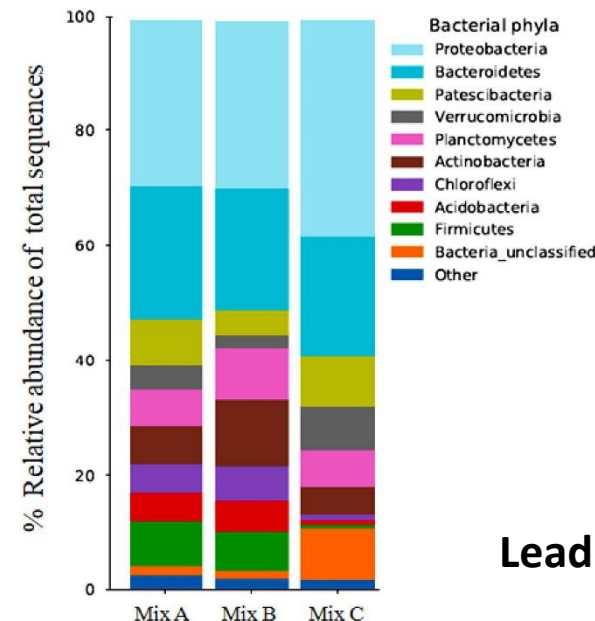
Main research topics and potential:

- Collection of the environmental samples and **DNA isolation**.
- **Next generation sequencing** and data analysis



Achieved results:

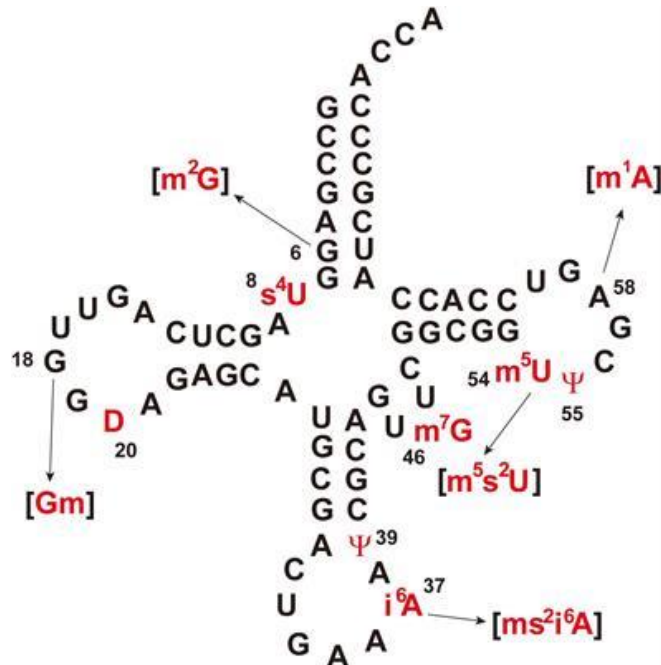
- **1 PhD** thesis defended and 1 PhD student currently working on this topic
- Ongoing **national scientific** research project (2019-2022)
- **International** scientific research project with national funding (2022-23)



Metabolism of the modified heterocyclic bases of tRNA

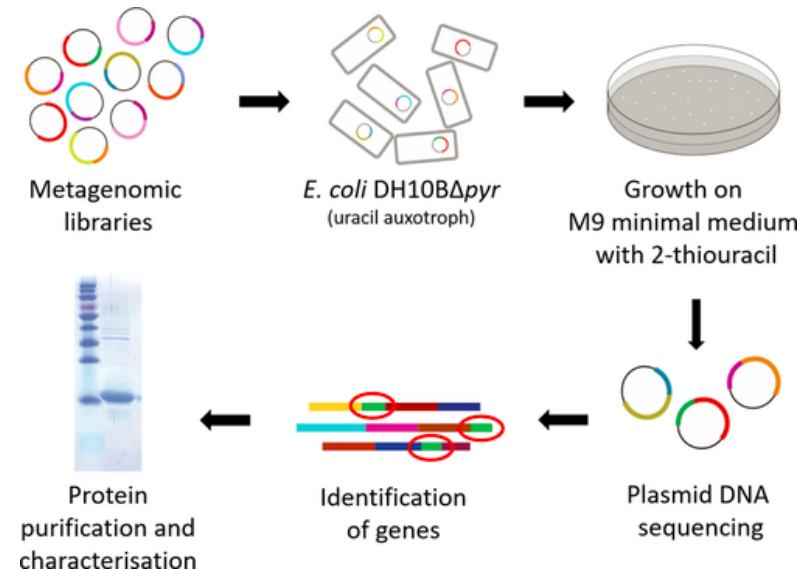
Main research topics and potential:

- Search for the **new genes** in the **environmental samples**.
- **Isolation and characterisation** of the corresponding **proteins**.



Achieved results:

- **1 PhD** thesis defended on this topic, **1 postdoc** on the topic
- National scientific research project starting soon (2022-2025)



Thank You

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