

Center for Translational Imaging at Ulm University "From Molecule to Man" (MoMAN)

The Center for Translational Imaging is headlined "From Molecule to Man" (MoMAN) and aims at supporting, advancing and extending research projects in the field of biomedical translational imaging at Ulm University and Medical Center.

For this ambitious research initiative the center provides a variety of outstanding imaging techniques, which range from **cellular imaging** to small **animal imaging** and finally applications in **humans** and provides support for its users in all aspects of translational imaging. The long-term goal of MoMAN is to bundle the activities of the multitude of research units and core facilities by establishing a central contact platform and to further promote synergies between the institutes in order to facilitate the access to advanced biomedical imaging infrastructure for interested users. Furthermore, regular seminars and hands-on workshops are organized to offer efficient framework conditions for excellent interdisciplinary research in the field of translational imaging.

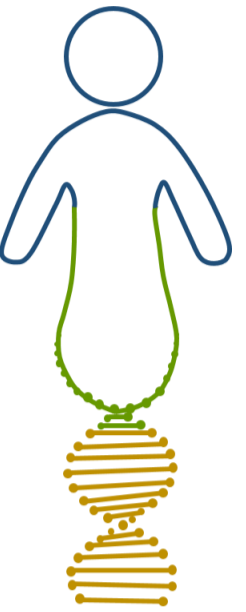
Contact

Dr. Julia Nagy
☎ 0731 500 33635
✉ julia.nagy@uni-ulm.de

Ulm University
Center for Translational Imaging
Albert-Einstein-Allee 23
89081 Ulm



more
information



Infrastructure

Confocal and Multiphoton Microscopy

- inverted confocal microscope
- intravital microscope
- fs-pulsed Ti:Sa Laser
- spectrally resolved laser scanning microscope
- high-throughput-screening microscope
- time-correlated single photon counting microscope
- cell culture facility

Methods

- phosphorescence/fluorescence lifetime
- Förster resonance energy transfer
- fluorescence recovery after photobleaching

Electron Microscopy

- transmission electron microscopes (TEM): JEOL1400, JEOL 2100F with cryo stage, Zeiss 912 with energy filter
- scanning electron microscopes (SEM): Hitachi S-5200 with cryo stage and X-ray detector, Zeiss 962 with X-ray detector

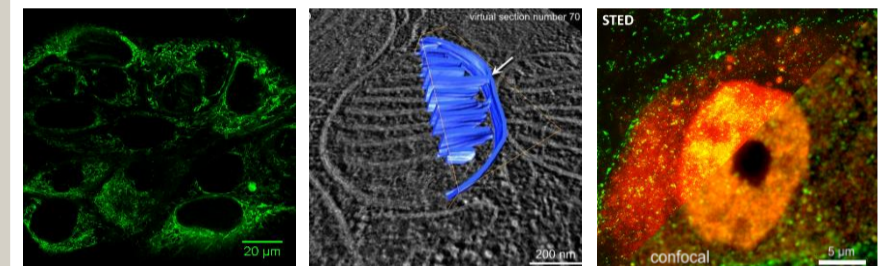
- high-pressure freezing
- ultrathin sectioning
- electron tomography
- cryo-TEM, cryo-SEM

Super-resolution Microscopy

- stimulated emission depletion (STED) microscope
- stochastic optical reconstruction microscopy (STORM)
- photo-activated localization microscopy (PALM)
- reflected light sheet microscope
- ultrafast atomic force microscope

- live cell imaging
- single-molecule localization microscopy
- time-correlated single photon counting
- fluorescence correlation spectroscopy

Applications



Exemplary applications:

- functional imaging of molecular interactions
- imaging of cell metabolism, oxygen imaging
- subcellular structures down to about 3 nm
- 3D reconstruction of subcellular volumes
- subcellular multi-protein localization down to 10 nm
- live cell single-molecule tracking
- time-resolved binding kinetic measurements
- conformational studies of proteins

Cellular Imaging

Infrastructure

11.7T Magnetic Resonance (MR) Imaging & Spectroscopy

- ^1H , ^{13}C , ^{19}F , ^{23}Na and ^{31}P
- soft tissue imaging (< 100 μm spatial resolution)
- metabolic quantification (2 μL volume)

Computed Tomography (μCT)

- bone, lung imaging (resolution down to < 10 μm)

Positron Emission Tomography (μPET)

- molecular imaging with radiotracers (spatial resolution of 1.3 mm, high sensitivity down to sub-picomolar level)

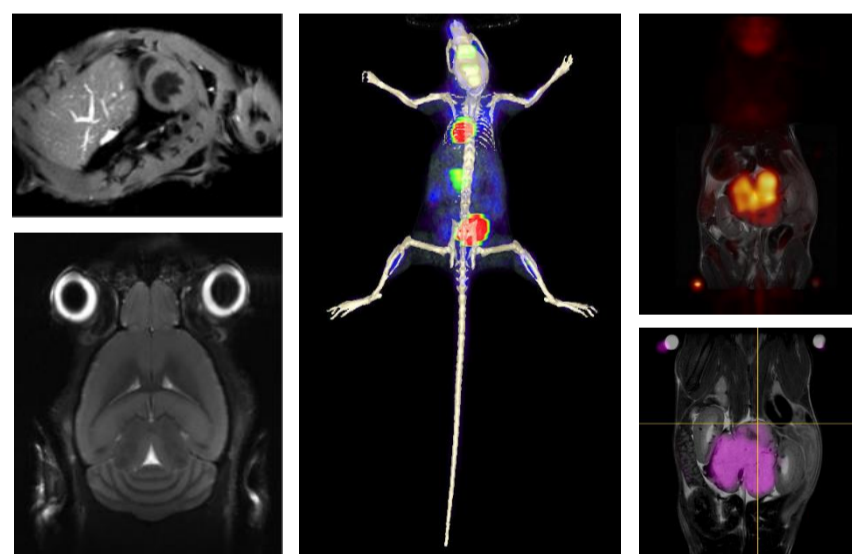
In Vivo Imaging System (IVIS)

- molecular fluorescence or bioluminescence imaging (resolution down to 20 μm)

PET/MR/CT image fusion

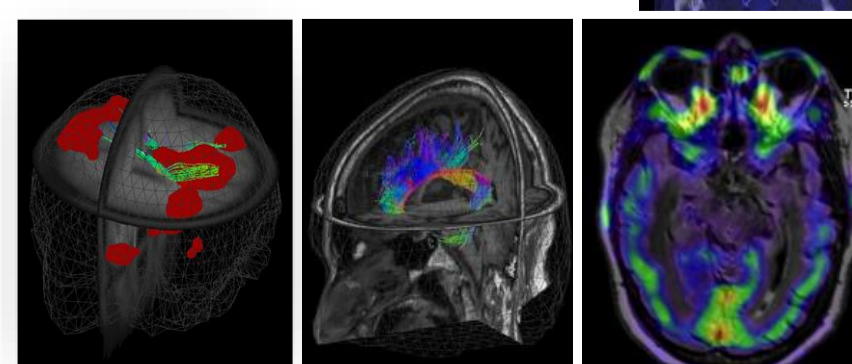
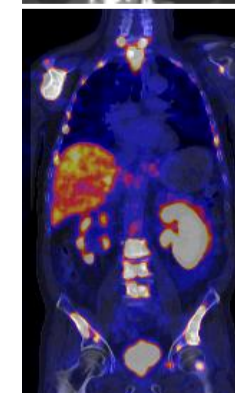
Animal keeping facility for longitudinal studies

Applications



Exemplary applications:

- structural and functional imaging and connectivity analysis
- non-invasive detailed anatomical information about structure and function
- non-destructive histology
- longitudinal monitoring
- functional and metabolic quantification
- radiotracer distribution in tissue section
- non-invasive perfusion/diffusion measurements, fibre tracking
- 3D surface topography
- particle tracking
- volumetric quantification
- graph-theoretical analysis of the structural and functional connectome



Services

In the field of translational imaging, MoMAN

- serves as initial information and contact platform
- offers comprehensive technical and scientific support in planning, developing and performing research projects
- combines the state-of-the-art imaging facilities of Ulm University and Hospital with the expertise of an international research team
- facilitates and optimizes the access to advanced biomedical imaging infrastructure
- discusses potential new projects and identifies experts within the center
- aims at establishing a unified infrastructure by defining standard operational procedures
- provides an efficient scheduling, documentation and finance management software
- offers application support for ethical and animal welfare boards
- organizes hands-on workshops and regular events for scientific exchange

Contributors

- Core Facility for Confocal and Multiphoton Microscopy (Dr. A. Rück)
- Central Facility for Electron Microscopy (Prof. P. Walther)
- Core Facility for Small Animal Imaging (Prof. V. Rasche)
- Core Facility for 3T Whole-Body MRI (Prof. G. Grön, Prof. J. Kassubek)
- Department of Nuclear Medicine (Prof. A. Beer)
- Department of Radiology (Prof. M. Beer)
- Department of Neurology (Prof. A. Ludolph)
- Department of Internal Medicine II (Prof. W. Rottbauer)
- Institute of Biophysics (Prof. J. Michaelis, Prof. C. Gebhardt)
- Institute of Physiological Chemistry (Prof. T. Wirth)
- Institute of Comparative Molecular Endocrinology (Prof. J. Tuckermann)

Animal Imaging

Human Imaging

Infrastructure

Whole body MR scanners (1.5T and 3T)

- ^1H , ^{19}F , ^{23}Na and ^{31}P
- equipment for neuronal, thoracic and cardiovascular imaging (< 100 μm spatial resolution)
- technical systems for visual, acoustic and sensory stimulation

Whole body PET/CT system

- molecular imaging with radiotracers (spatial resolution of around 4 mm (PET) and up to 500 μm (CT))

Whole body X-ray & CT systems