# People and Facilities

## Elite-Master Program Biomedical Neuroscience

## Speakers

### Prof. Dr. med. Pascal Berberat

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TUM Medical Education Center (TUM MEC)

The TUM Medical Education Center organizes the education at the faculty of medicine. We are active in two research areas. In the field of instruction and teacher research our focus lies on a better understanding of teaching and learning processes in order to optimize evidence based didactic methods and to systematically analyze the attitude, motivation and behavior of medical doctors as lecturers and tutors. In our second research area we concentrate on medical educational biographies with the main focus on so called 'non-rational' dimensions, such as handling existential borderline experiences (suffering, dying and death) und tolerating uncertainty.

### Prof. Dr. Thomas Misgeld

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TUM Institute of Neuronal Cell Biology | Misgeld Lab

The Misgeld lab studies axon changes in the healthy and in the sick nervous system of living animals. Axons are the long neuronal processes that form synapses and thus interconnect different parts of the nervous system. Obviously, to properly establish wiring in the brain, myriads of axons have to find their targets, or otherwise, axons that connect incorrectly need to be removed. We are interested in the latter process – not only because such axon dismantling contributes fundamentally to brain development and to the adaptation of our neural circuits to the environment, but also because axons are highly susceptible to pathology. Many common neurological diseases are characterized by early loss of axonal connections – including motor neuron disease, spinal cord injury and multiple sclerosis, all of which we study. By better understanding axon dismantling in development and disease we hope to gain insight into what causes axons to disintegrate in disease.

## Faculty

### Prof. Dr. Helmuth Adelsberger

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TUM Institute of Neuroscience

We develop and use systems based on CCD-cameras and optic fibers for the fluorometric detection of population calcium signals. Such signals are generated by synchronous activity of large numbers of neurons organized in networks. Our recording systems are applied for studying basic brain function and the processing of sensory information as well as for the detection of impairments in mouse models of Alzheimer´s disease. Another focus is the analysis of behavioral impairments in different transgenic mouse models such as models of Alzheimer´s disease or mice with cell-type specific knock-outs in cerebellar Purkinje cells. Furthermore, we analyze the effects of drug treatments in our disease mouse models.

## Prof. Dr. Arthur Konnerth

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TUM Institute of Neuroscience | Konnerth Lab

Cellular mechanisms of cortical function in vivo: We use two-photon calcium imaging in different areas of the mouse cortex (visual, auditory, sensorymotor) combined with targeted patch-clamp recordings to study electrical signaling and plasticity of specific types of neurons in behaviorally-defined conditions. Cerebellar function and plasticity: We are interested in synaptic mechanisms, including the roles of mGlu receptors, TRPC channels, calcium signaling as well as in cerebellar sensory integration. Dendritic signaling in vivo: Our major aim is the visualization and mapping of sensory-evoked signals on the level of individual synaptic inputs in defined neurons of the mouse cortex. In vivo neurophysiology of Alzheimer's disease. We focus on the impairments in synaptic signaling of cortical and hippocampal neurons in mouse models of Alzheimer's disease. Development of imaging technology: We develop and implement two-photon imaging devices with a high spatial and temporal resolution for the functional analysis of networks, cells and subcelullar compartments in vitro and in vivo.

## Dr. Florence Bareyre

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Neuroimmunology Munich | Bareyre Lab

Traumatic, ischemic and inflammatory lesions to the spinal cord lead to the transection of descending and ascending axonal tract systems. If these lesions are complete – i.e. if all axons in the spinal cord are transected – severe and persistent functional deficits ensue. If however the lesions are incomplete and some axonal tracts are spared, some recovery of function can be observed. We are studying the anatomical, functional and molecular mechanisms underlying the recovery process in an attempt to develop new therapeutic strategies that can support spinal cord repair in neurological disease caused by trauma, ischemia or inflammation. Our lab is currently investigating the regulation of synapse formation and elimination following spinal cord injury, the activity-dependent regulation of axonal plasticity following spinal cord injury as well as the neuronal regulation of inflammation following spinal cord injury. In addition to spinal cord injury, we are also interested in the acute and long term effects of mild repetitive traumatic brain injury.

## Prof. Dr. Alena Buyx

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IGEM Institut für Geschichte und Ethik der Medizin

The Institute for the History and Ethics of Medicine works on the ethical, historical and cultural dimensions of medicine. In medical ethics, we focus on questions of responsible development and ethical integration of new biomedical technologies into research and clinical practice. Current examples are data-driven technologies such as biomarkers, applications in embodied AI/robotics, or neurostimulation in children. Further focal points are new concepts of solidarity in medicine as well as issues in neuroethics, research ethics and public health ethics. The ethics group at the Institute takes an interdisciplinary approach. We conduct various mixed-methods studies (qualitative, quantitative and theoretical methods) and we strive for an embedded approach to developing and 'co-creating' novel biomedical innovations, where clinicians, engineers, programmers etc. and ethicists and social scientists work side by side to embed ethical and social considerations into the development process. We also take an active interest in public engagement about ethical and social issues in biomedicine, through public events, consulting for large research consortia, or by advising policy-makers (WHO, German Ethics Council etc.).

## Prof. Dr. Janine Diehl-Schmid

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Janine Diehl-Schmid, MD, is a board certified psychiatrist and psychotherapist. She is employed at the Department of Psychiatry and Psychotherapy of Technical University of Munich, where she serves as a senior consultant and is co-heading the Center for Cognitive Disorders. Her particular research interests include frontotemporal dementia, young onset dementia and, more recently, palliative care in dementia. She has authored and co-authored more than 140 peer-reviewed articles with a cumulative Impact Factor of app. 500.

## PD Dr. Thomas Fenzl

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Research Group Neurobiology Sleep and Anesthesiology

We are interested in interactions between sleep and anesthesia within the mammalian brain. Does sleep influence particular states of anesthesia, does anesthesia interfere with subsequent sleep, does anesthesia impair memory consolidation during sleep, does sleep decrease potential cognitive deficits after anesthesia and, as a very fundamental question, what happens within the brain at a systemic level when this organ switches between sleep, anesthesia and wakefulness? Our newly established lab applies highly sophisticated methods in computer programming, behavioral biology and in vivo electrophysiology and combines the knowledge of biologists/neuroscientists, computer experts and clinicians under one roof.

## Dr. Leanne Godinho

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Institute of Neuronal Cell Biology | Godinho Lab

We are interested in understanding how the vertebrate central nervous system (CNS) is assembled during development and exploit the retina, an accessible part of the CNS to do so. We use zebrafish, highly visual vertebrates that develop ex utero and are largely translucent during development, to study retinal development in real time in vivo. We probe the mechanisms that underlie the generation of diverse cell-types, their differentiation and integration into synaptic circuits. By combining genetic tools and in vivo time-lapse imaging, we can follow the developmental trajectories of cells from the time of their 'birth' to their arrival at their definitive locations, and their integration into the local circuitry

## Prof. Dr. Simon Jacob

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Translational NeuroTechnology Laboratory | Jacob Lab

The Jacob laboratory at the Department of Neurosurgery studies the cellular mechanisms underlying higher cognitive functions. We are particularly interested in how various brain regions interact to enable intelligent, goal-directed behavior. Our current focus is the role of subcortical neuromodulators such as dopamine in regulating cortical circuits that are involved in perception and decision-making. Disrupted neuromodulator signaling is heavily involved in the generation of neuropsychiatric disorders, and we work towards a better understanding of the cellular basis of many mental diseases. We use a variety of techniques in awake trained mice, including behavioral analyses, large-scale extracellular recordings, optogenetic manipulation of defined cell types and networks, fluorescent imaging and computational modeling. In a special translational approach, we are also recording from individual neurons in human neurosurgical patients.

## Prof. Dr. med. Jan Kirschke

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Neuroradiology | deep spine

Jan Kirschke is attending radiologist at the department of neuroradiology at the Technische Universität München (TUM) in Munich, Germany. He is working on quantitative imaging biomarkers for spine and neuro applications. Within his ERC-funded spine research group, he works on multimodal imaging approaches combined with biomechanical modeling and machine learning to predict fragility fractures and back pain. This includes data science research to handle huge datasets and create structured medical data. He also investigates imaging biomarkers to assess local brain tissue properties in brain tumors and MS for objective and accurate disease assessment and prediction.

## Prof. Dr. Kathrin Koch

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Neuroimaging Center (TUM-NIC)

We investigate normal and altered brain function in healthy humans and neuropsychiatric patients. In this context we are mainly interested in the effects of different interventions (e.g., cognitive training, mindfulness training, tDCS) on functional activation as well as functional and structural connectivity in healthy people and in finding out more about functional and structural alterations going along with psychiatric disorders such as obsessive-compulsive disorder (OCD). To this aim, we combine different imaging methods including DTI, functional MRI and PET to study white matter brain structure, brain function in the resting state and during task as well as brain metabolism and their changes following specific interventions or in association with psychiatric symptoms and conditions.

## Prof. Dr. Thomas Korn

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Experimental Neuroimmunology (ENI) | Korn Lab

Fate decisions of T cell in vivo: Our major focus is the functional phenotype of T cells in vivo. T cells are key organizers of immune responses to foreign and self antigens. They determine the specificity of an immune response but also the quality and strength of the inflammation that accompanies an immune response. T cells are very motile cells characterized by long range trafficking across multiple compartments. We want to understand the cues that trigger differentiation processes and effector functions of T cells and the downstream molecular pathways. Our particular interest is to analyze to whom and in what language T cells talk in distinct non-lymphoid microenvironments. Our main preclinical model systems focus on autoimmune inflammatory desease paradigms (Multiple Sclerosis and Neuromyelitis optica), but our approaches are also applicable to chronic inflammation and tumor immunity

## Dr. rer. nat. Matthias Kreuzer

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The Neuromonitoring Lab

With our research we are interested in the perioperative characteristics of the patients' electroencephalogram (EEG). A better understanding of the EEG can help to optimize monitoring which can lead to the avoidance or reduction of complications such as intraoperative awareness or postoperative neurocognitive disorders. We further try to evaluate the capability of commercially available EEG-based monitoring devices to support the anesthesiologist with the relevant information from the EEG. Our research is conducted in close collaboration with clinical experts.

## PD Dr. Monika Leischner-Brill

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TUM Institute of Neuronal Cell Biology | Misgeld Lab

We are interested in the cell biology of synapse elimination, a developmental process where exuberant connections are removed to ultimately form a precisely wired neural circuit. As a model, we look at murine motor axons and sensory neurons, combining genetic tools and time-lapse imaging in nerve-muscle explants. When axons are pruned back, the cytoskeleton needs to be dismantled, while it stabilizes in branches, which are maintained life-long. We study changes of the cytoskeleton during the synapse elimination process, especially microtubule, as organelles and vesicles are transported along them with the help of molecular motors. We focus on microtubule dynamics and their post-translational modification profile, which can be added and removed enzymatically and changes in pruning axons. One post-translational modification attracts spastin, a microtubule severing enzyme and genetic ablation of spastin leads to microtubular stabilization. Spastin mutation in humans lead to the neurodegenerative disease hereditary spastic paraplegia (HSP), where neurons with long axons are prone to degeneration. To transfer our findings from mouse motor axons to humans, we recently started to look at human skin biopsies from HSP-patients.

## Prof. Dr. Stefan Lichtenthaler

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DNZE, Neuroproteomics

We study how Alzheimer's disease develops in the brain on the molecular and cellular level. The aim of our research is to better understand the disease causes and to develop new diagnostic, therapeutic and preventive approaches. Additionally, we want to predict possible side effects of Alzheimer-targeted drugs and, thus, make drug development safer. For our interdisciplinary research we use a variety of modern methods from biochemistry, proteomics, molecular, cellular and neurobiology as well as in vitro and in vivo models of Alzheimer's disease. The focus of our research is on the molecular scissors (proteases) ADAM10 (alpha-secretase), BACE1 (beta-secretase) und gamma-secretase as well as microglia-dependent inflammatory processes in the brain. These molecules and processes have a central role in Alzheimer's pathogenesis. We investigate their physiological function in the healthy brains and develop ways to specifically target them for a treatment of Alzheimer's disease. Additionally, we develop proteomic methods for a faster and more detailed study of these proteases, but also of the brain's cerebrospinal fluid. This will not only allow a better understanding of the brain, but also help to develop new diagnostics for evaluating whether patients respond well to a drug.

## Prof. Dr. Arthur Liesz

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LMU Institute for Stroke and Dementia Research (ISD) | Liesz Lab

We are interested in the interplay between the brain and the immune system after stroke. Acute brain lesions disturb the well-balanced interconnection between both systems. Hence, our research focuses on both directions of brain-immune interaction: The impact of immune mechanisms on neuronal damage and recovery and the systemic immunomodulation after stroke. Our methodological spectrum covers diverse brain ischemia models, transgenic animal models, a broad spectrum of cutting-edge immunological techniques as well as histological, biomolecular and behavioral analysis tools. The lab has a strong translational research focus with the ultimate goal to develop novel diagnostic tools, therapies and mechanistic insights on the highly complex disease which stroke represents. In order to achieve this, a premise of our work is to address key unmet needs of stroke patients and make use of translationally relevant tools.

## Prof. Dr. Paul Lingor

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TUM MRI Neurology

Being a clinical neurologist, the motivation of my work is derived from clinical problems in the diagnosis and treatment of neurodegenerative disorders, particularly Parkinson's disease (PD) and Amyotrophic lateral sclerosis (ALS). My group uses basic neurobiological techniques to understand the mechanisms of the underlying pathophysiology in degenerative CNS disorders, i.e. synapto-axonal degeneration or iron-mediated neurotoxicity. Body fluids, such as CSF, blood or tear fluid are collected and used by our group to identify novel biomarkers for better diagnosis and subgroup stratification. In a translational approach, we develop novel therapeutic strategies for neurodegenerative disorders bridging the gap from animal studies to human clinical trials.

## Prof. Dr. Dominik Paquet

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LMU Institute for Stroke and Dementia Research (ISD) | Paquet Lab

We are interested in the molecular and cellular mechanisms leading to neuronal death and cognitive decline in patients with neuropsychiatric disorders (e.g. Alzheimer's disease and Frontotemporal dementia) and neurovascular impairments (stroke and vascular cognitive impairment). Our main focus is to use human induced pluripotent stem cells (iPSCs) to build brain tissue models recapitulating these diseases. We have recently developed efficient technologies to introduce and remove patient mutations in iPSCs using the CRISPR/Cas9 gene editing system and have also developed protocols for the optimized differentiation of all major cell types of the human brain. We apply these technologies to generate human cortical neurons and other brain cells with mutations in disease-associated genes (such as APP, PSEN or TAU) and isogenic controls, and then combine these cells into human brain tissue models to elicit disease-relevant phenotypes and reveal molecular disease mechanisms.

## Prof. Dr. Markus Ploner

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TUM Pain Lab Munich

We investigate how the human brain subserves the experience of pain. To this end, we use electroencephalography to record brain activity in healthy human participants and patients suffering from chronic pain. As we are particularly interested in the functional significance of neuronal oscillations and neuronal communication we perform complex time-frequency and connectivity analyses of brain activity. Moreover, we use non-invasive brain stimulation and neurofeedback to modulate neuronal oscillations. The ultimate goal of our work is to further the understanding, diagnosis and therapy of chronic pain.

## PD Dr. Christine Preibisch

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Neuroscientific MR-Physics

The Magnetic Resonance (MR) Physics group at the Department of Neuroradiology at the Technische Universität München (TUM) is interested in exploiting a variety of different MR contrast mechanisms to obtain functionally relevant physiological parameters via magnetic resonance imaging (MRI). Core areas of research comprise quantification of blood oxygenation and perfusion and application of those techniques in multimodal MRI studies. Currently, we are expanding our methodological portfolio towards quantitative structural MRI and simulation techniques. The overarching goal of our work is to elucidate physiological mechanisms of brain function in health and disease and their interplay with structural and functional impairments.

## PD Dr. Valentin Riedl

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Neuroenergetics of the human brain

Neuroenergetics research group: Neuronal communication among highly connected brain regions is the main driver of the brain's energy demands. While we know much about the macroscopic organization of the human brain in specialized regions and brain networks, the energy budget of brain function is still unclear. Moreover, brain metabolism is heavily disturbed in several neuropsychiatric disorders but the relationship to brain network communication is also unknown. In my research group, we measure the brain's energy consumption and relate these to common measures of brain organization. Methods: We simultaneously acquire energy metabolism and brain connectivity measures on an integrated PET/MR scanner. We measure inhibitory and excitatory neurotransmitter levels using 1H-Magnetic Resonance Spectroscopy (MRS) and modulate brain function using non-invasive, stereotactic transcranial magnetic stimulation (TMS). Research projects: - Develop new approaches to integrate brain profiles of energy metabolism and network connectivity. - Study the energy metabolism of brain networks during memory consolidation and modulate this process with non-invasive brain stimulation. - Link brain energetics with nutrition and body metabolism. - Uncover deficient metabolic brain profiles in patients with neuropsychiatric disorders.

## Dr. Martina Fetting

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DZNE Electron Microscopy Hub

The Nanoscale hub collaborates with different neurobiology research groups by applying Electron Microscopy (EM) and focuses on technical developments. Ultrastructural analysis not only provides unprecedented resolution but reveals reveal additional, non-hypothesis-driven insights. Typical examples comprise the characterization of neuronal, organellar, myelin, fibril or blood vessel morphologies or their context within tissue, including pathological states like MS, AD and stroke. Currently, model organisms include mouse, zebrafish and human biopsies. The hub provides room temperature Transmission (TEM) and Scanning EM (SEM) covering all steps from sample processing, image acquisition to image analysis. Advanced methods like Correlative Light and Electron Microscopy (CLEM) and Volume EM (FIB-SEM, ATUM) are tailor-made and further developed.

## Dr. Barbara Schormair

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Precision Neuromedicine | Winkelmann/Schormair Lab

Barbara Schormair studied molecular biology and focused on human genetics during her PhD thesis. She is deputy director of the Institute of Neurogenomics (ING) at the Helmholtz Zentrum München. Her main research interest is the application of genomic technologies to understand the genetic basis of Restless Legs Syndrome, one of the most common neurological disorders. The ING is dedicated towards deciphering the underlying genetic basis of movement disorders and turning this knowledge into improved patient care by combining classical wet lab work, high-throughput omics technologies, and computational approaches.

## Moritz Schumm

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TUM Medical Education Center (TUM MEC)

The Medical Humanities Education at TUM Medical School aims at stimulating, encouraging and supporting medical students to develop and cultivate a personal professional identity that is based on a far-reaching critical understanding of what medicine and life sciences can and/or have to be concerning the different dimensions of the human subject. To achieve this we seek to incorporate humanities, literature, film and arts into our curriculum and develop custom-made lectures, courses and workshops.

## PD Dr. Christian Sorg

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Neuropsychiatry and Neuroimaging Lab

The *Neuropsychiatry and Neuroimaging Lab* studies large-scale brain systems in healthy humans and neuropsychiatric patients by the use of multi-modal imaging techniques. Main focus is on neurodevelopmental disorders such as schizophrenia and premature birth. Key method is functional MRI extended by EEG, perfusion-based MRI, and PET. We are interested in how blood oxygenation fluctuates – i.e. the main functional MRI signal -, how these fluctuations link with both neural oscillations and blood perfusion, how they spread across the cortex, and how these processes are impaired in developmental disorders. Therefore, we use simultaneous in-vivo imaging of ongoing brain processes at rest in humans together with a modelling approach on processes of interest.

## PD Dr. med. Benedikt Wiestler

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Computational Imaging @ TUM

Advances in AI have fostered the development of machine learning models able to master medical image analysis tasks that were previously thought unsolvable for computers. Within our working group "Computational Imaging" we develop such models in close interdisciplinary collaboration between medicine and computer science. Focusing on two model brain diseases (Multiple Sclerosis and Gliomas), our research spans the entire imaging workflow, from image synthesis to segmentation and modelling of disease. Ultimately, we are aiming to make the wealth of information about a patient's disease, which is hidden in medical imaging data, available for improved patient care.

## Dr. Fabiana Perocchi

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Systems biology of mitochondrial signalling and metabolism; Functional genomics, Biochemistry, Bioenergetics

## Prof. Dr. rer. nat. Angelika Harbauer

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MPI Neurometabolism

Mechanisms of mitochondrial homeostasis in neurons (local protein translation, import and degradation, mitophagy, cellular signalling); in vitro organellar assays and live cell microscopy in primary neurons.

## PD Dr. med. Stefanie Pilge

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TUM MRI Anesthesiology

Being a clinician, a senior anesthesiologist, the focus of my research is on clinical studies in the perioperative setting. In close collaboration with experts of our department, we are interested in anesthetic induced modulation of conscious conception, e.g., the transitions between consciousness and unconsciousness, and the possible consequences of an individual too light (awareness) or too deep anesthesia (perioperative neurocognitive disorders). With the EEG, we are able to track changes in a timely manner. A better understanding of perioperative characteristics may help to develop a more individualized monitoring approach. Further, perioperative factors (e.g., age, preoperative cognitive condition, severity of illness/surgery/complications) may individually contribute to a short or longterm postoperative cognitive decline. Among the most common postoperative complications of aged patients is postoperative delirium – with high medical and socioeconomic impact. Raw EEG characteristics from a preoperative EEG baseline (during wakefulness) or from intraoperative EEG signatures may help to identify patients at-risk. Routinely used EEG monitoring parameters may capture these differences as well, potentially allowing a transfer of our research findings to clinical settings.

## Prof. Dr. Dr. med. univ. Elisabeth Binder

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Max-Plank-Institute for Psychiatry | Binder Lab

Gene x environment interactions and their contribution to the risk for psychiatric disorders, with a focus on early adversity. Understanding the molecular, cellular and systemic factors contributing to these interactions. We use various omics techniques, including single cell sequencing, DNA methylation analysis, cerebral organoids and human cohort studies.

## Prof. Dr. Juliane Winkelmann

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Precision Neuromedicine | Winkelmann/Schormair Lab

Genetic architecture and mechanism of Neurological disease (common complex diseases and rare diseases) with focus on Movement and Sleep Disorders. Large scale sequencing and other Omics technologies with the aim to improve a better prediction and prevention of disease and precise therapy.

## Prof. Dr. med. Josef Priller

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Psychiatry and Psychotherapy MRI

Neuropsychiatry; neuroimmunology; neurodegenerative diseases; regenerative medicine; cell and gene therapy

## Prof. Dr. med. Gerhard Schneider

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Anesthesiology MRI

Cognition and anesthesia; awareness during anesthesia, brain correlates of consciousness, mechanisms of anesthesia-induced unconsciousness; postoperative cognitive decline, delirium; brain monitoring; Methods: EEG, evoked brain responses, fMRT; linear and non-linear analysis of biosignals.

## Prof. Dr. med. Mikael Simons

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TUM Institute of Neuronal Cell Biology | Simons Lab

Biology of glia in development of disease (Multiple Sclerosis, aging, Alzheimer' disease). Mechanisms of myelin biogenesis and regeneration in zebrafish and mice.

## Prof. Dr. Simon Schäfer

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TUM Center for Organoid Systems & Department of Psychiatry | Schafer Lab

The Schafer lab focuses on advancing novel stem cell-based technologies to generate three-dimensional models that recapitulate the structural and functional organization of the human brain. We leverage these technologies to push the boundaries for personalized research on human-specific brain disorders and to identify strategies for facilitating brain repair.
We are particularly interested to decode the communication that occurs between the human brain and the immune system and to understand how a derailment of such interactions can lead to disease. Model systems to study these intricate and dynamic interactions in a human-specific setting have been severely limited. We are thus developing novel platforms that allow us to study how immune cells communicate with the human brain in health and disease contexts. Using these platforms, we establish personalized human disease models to investigate different disorders that affect the central nervous system.

## Prof. Dr. Marcello Ienca

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TUM Institute for History and Ethics of Medicine | Ethics of AI & Neuroscience

The Ethics of AI & Neuroscience Group examines how emerging technologies—from artificial intelligence (AI) to neurotechnologies—are reshaping neuroscience, healthcare, and society. Our work focuses on the ethical, legal, and social implications of technologies that interface with the brain, process neural data, or augment human cognition. We investigate topics such as neurorights, mental privacy, responsible AI in medicine, brain–machine interfaces, and the governance of neural data.
By combining philosophical analysis with empirical research and policy engagement, we aim to ensure that innovation at the brain–technology interface supports human autonomy, dignity, and justice. Our research informs international organizations, contributes to technology policy, and supports the responsible development of neurotechnology and AI in both clinical and research settings. In addition to research, we teach ethics across multiple domains, including neuroethics, AI ethics, and medical ethics, equipping students to critically engage with the societal impact of neuroscience and digital innovation.

## Dr. Regina Feederle

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Core Facility Monoclonal Antibodies at Helmholtz Munich and DZNE Munich

The Core Facility Monoclonal Antibodies is specialized in the production of custom monoclonal antibodies, large-scale antibody manufacturing, antibody modification and antibody sequencing and cloning. Protein analysis and epitope design for vaccination as well as thorough antibody validation are crucial for successful projects and are a central part of our service. We perform antibody validation using automated multiplex high-throughput flow cytometry, ELISA and western blot screening. We specialize in the production of antibodies against difficult targets such as cell surface receptors. Using cells expressing the target of interest as immunogens on the cell surface, we identify novel biomarkers and generate functional antibodies that can be used as a basis for therapeutic applications. We are open for internal and external partners from academia and industry. A wide range of validated antibodies can be ordered from us or from our licensing partners.

## Dr. Shima Safaiyan

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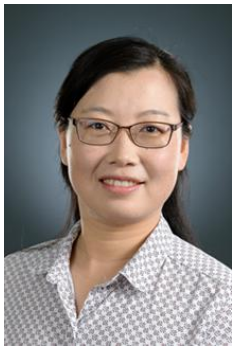
TUM Klinikum Rechts der Isar, Department of Psychiatry and Psychotherapy

Our team studies the role of microglial cells in maintaining brain homeostasis with the focus on their role in preserving and regulating the neurovascular unit (NVU) during aging. By investigating how microglia interact with and regulate the NVU across the aging process, we aim to identify cellular and molecular mechanisms that bridge immune regulation, vascular integrity, and brain health. Understanding these interactions will not only advance our knowledge of normal brain aging but also shed light on how microglial dysfunction may contribute to the pathogenesis of age-related brain diseases critically dependent on vascular health.




## Dr. Qihui Zhou

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DZNE, Adaptive immunity and Neurodegeneration


Protein aggregation and neuroinflammation are two hallmarks of neurodegenerative diseases. Accumulating data indicate that peripheral immunity multifaceted interact with central nervous system (CNS) during disease pathogenesis and progression. We have observed a potential neurotoxic role of brain-infiltrating T cells in association with disease progression in a *C9orf72* ALS/FTD animal model. However, the detailed function of these brain-infiltrating T cells and their multifaceted interactions with microglia and neurons in CNS are largely unknown. My group aim to a) characterize brain-infiltrating T cells, b) reveal alternation of their function and crosstalk with CNS resident cells such as microglia and neurons, and c) explore the therapeutical potential in the context of *C9orf72* ALS/FTD using cutting edge flow cytometry analysis, cell culture models and transgenic animal models.

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