

*Dear TUM friends and associates,*

**Neuroscience is a domain of excellence on our medical research agenda. At TUM, basic and clinical research are close companions rather than poles apart. As a technical university offering a highly differentiated range of subjects, we look to the future by networking neuroscience with other disciplines such as informatics and engineering, thus enabling a holistic approach to research. This concept also resonated with the international experts commissioned by the Klaus Tschira Foundation to consider funding for a multiple sclerosis research center: their decision was a clear vote in favor of TUM. As a result, we are now investing their donation of 25 million euros in a brand new building to house our research into this autoimmune disease, which has such a complex impact on the nervous system.**

This edition of our magazine introduces four scientists who are each investigating different aspects of multiple sclerosis (MS). Mikael Simons is researching the molecular processes underlying formation and degeneration of the myelin sheath – the protective coating around our nerve fibers that plays a central role in MS. For Thomas Korn, the aim is to understand exactly what happens to the immune system of MS patients – why misdirected immune cells penetrate the brain and then target the body’s own tissue. The role of specific immune cells, B lymphocytes, and resulting therapeutic targets are the focus of Bernhard Hemmer, whose institute has been involved in demonstrating the efficacy of an innovative B cell therapy for MS. And Thomas Misgeld looks at the degeneration of nerve fibers, discovering that – contrary to previous assumptions – axons can also die off when the myelin sheath is intact. Since this degeneration process is reversible in the early stages, this finding also holds promise.

Arthur Konnerth developed pioneering techniques for observing individual nerve cells in living organisms. He and his team have succeeded in gaining valuable insights into brain activity, which have helped advance research into conditions such as Alzheimer’s disease.

This issue then takes you behind closed doors at TUM’s Neuroimaging Center. Here, scientists from a wide variety of fields work together to advance research and application of the latest imaging techniques in neurology.

In partnership with colleagues in the US, leading international robotics expert Gordon Cheng has successfully demonstrated that people with paraplegia can regain conscious control of their legs by training with an exoskeleton. He is now working



with neurologists at TUM to explore how MS patients can benefit from this approach. Turning to medical informatics, specialist Klaus A. Kuhn explains what neuroscience stands to gain from big data analytics and outlines the technical hurdles that are yet to be overcome.

Close collaboration between basic researchers and clinicians is vital to accelerate the development of new drugs and therapies. Taking four doctors as our case studies, we zoom in for a closer look at this translational approach. Keeping the spotlight on neuroscience, we also examine TUM’s efforts to counter the shortage of upcoming medical researchers, which is a topic of widespread concern.

In short, this issue of Faszination Forschung transports you to the cutting edge of world-class research – on each and every page. When reading these articles, you will quickly see how TUM spares no effort to secure its leadership in neuroscience – ensuring we are equal to even the most formidable challenge. I trust the enthusiasm of our neuroscientists will prove infectious, and their vigor in tackling the major neurological issues of our time will make for a truly compelling read.

*Wolfgang A. Herrmann*

Prof. Wolfgang A. Herrmann