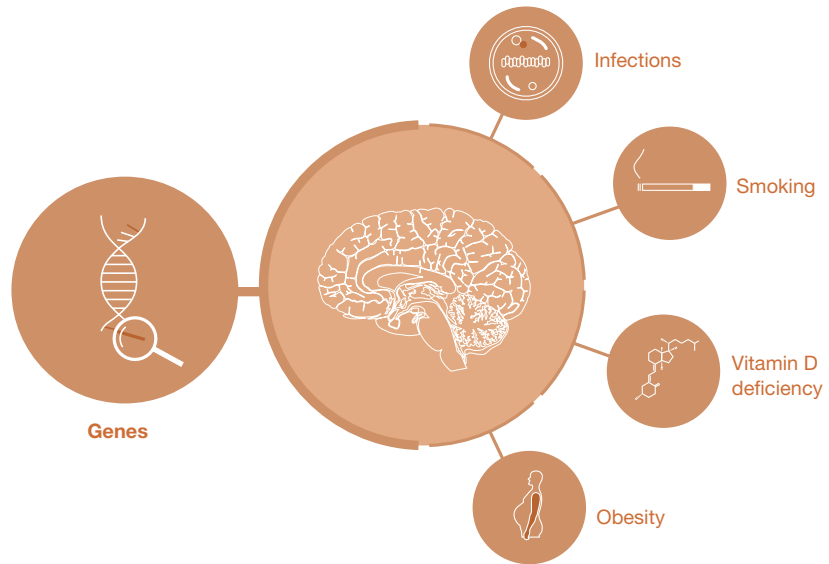


Multiple Sclerosis at a Glance

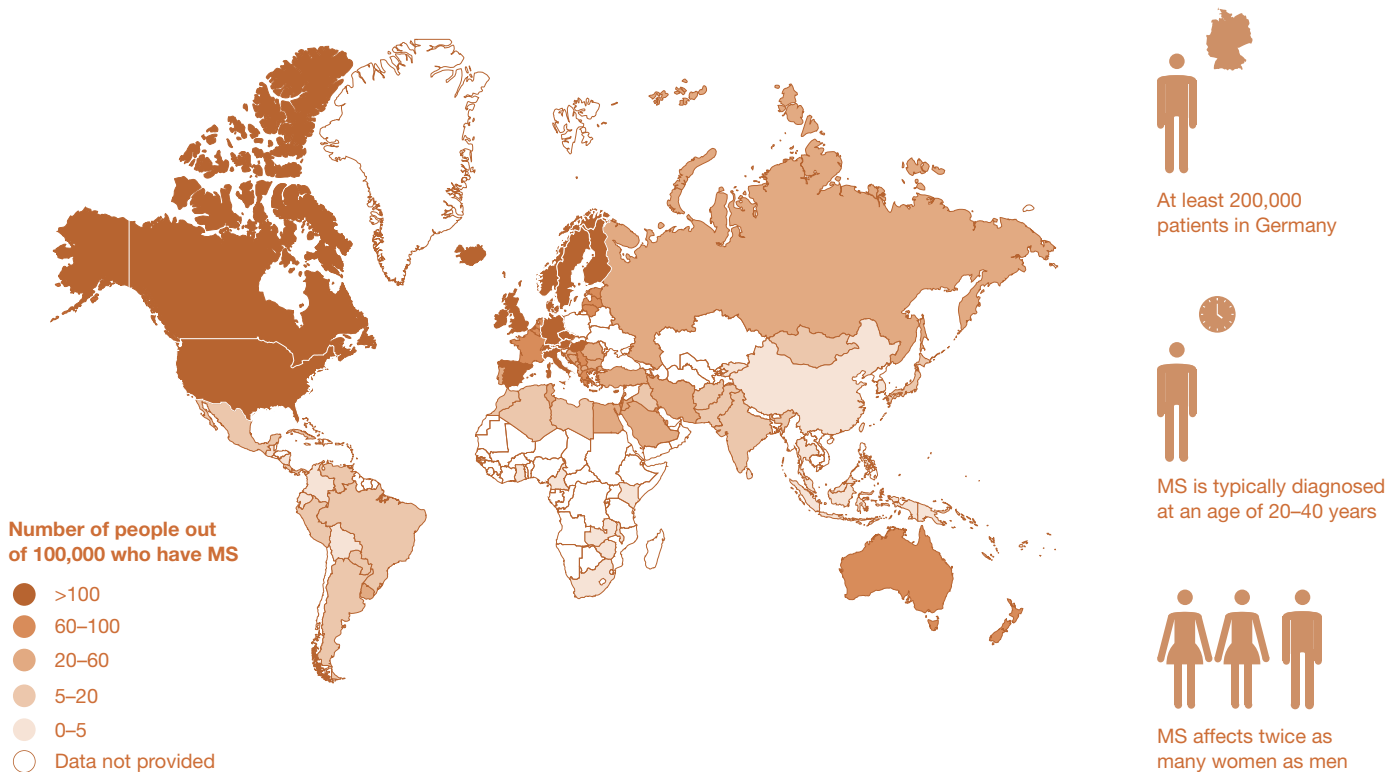
Risk factors for MS

Today, about 200 risk genes associated with MS are known. Various environmental influences are suspected to play a role in MS.



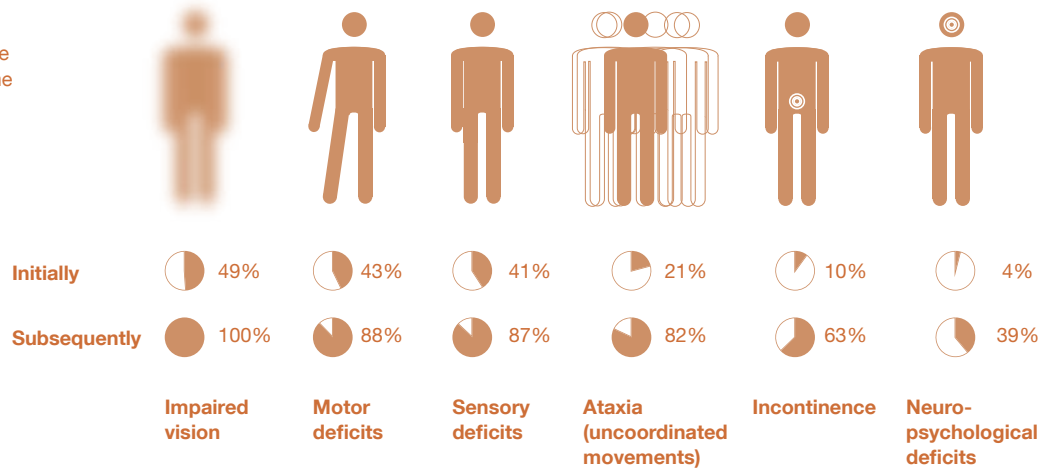
Worldwide

about 2.3 million people have MS



MS symptoms

Percentage of patients who experience the listed symptoms initially (at the time of diagnosis) and during the course of the disease.



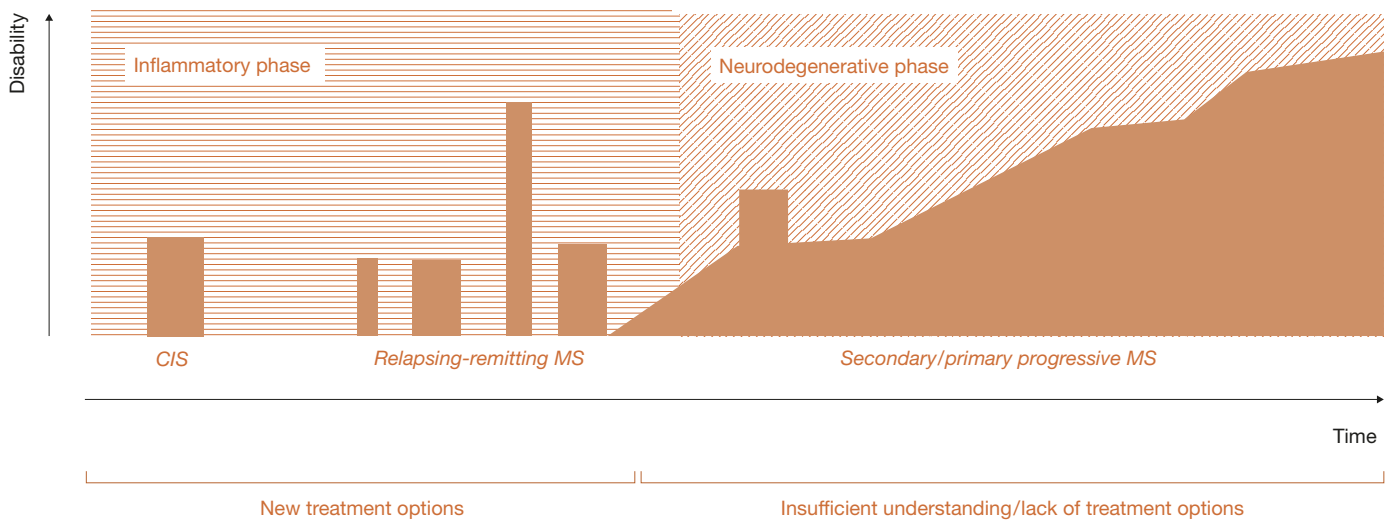
“Multiple sclerosis (MS) is one of the world’s most common neurological disorders. In many countries, it is the leading cause of non-traumatic disability in young adults.

While some people with MS experience little disability during their lifetime, as many as 60% may be unable to walk without assistance 20 years after onset.” *Atlas of MS 2013*

Course of MS

In about 90% of patients, MS starts a relapsing-remitting course with neurological symptoms that occur and fully or partly fade away. The majority of the patients will enter a secondary progressive course after 15 to 25 years with progression of

disability in the absence of relapse activity. In 10% of patients, usually when the disease starts at an older age, a primary progressive disease course is observed. In these patients disability progression occurs in the absence of any relapse activity.



Collaboration Hub for Clinicians and Basic Researchers

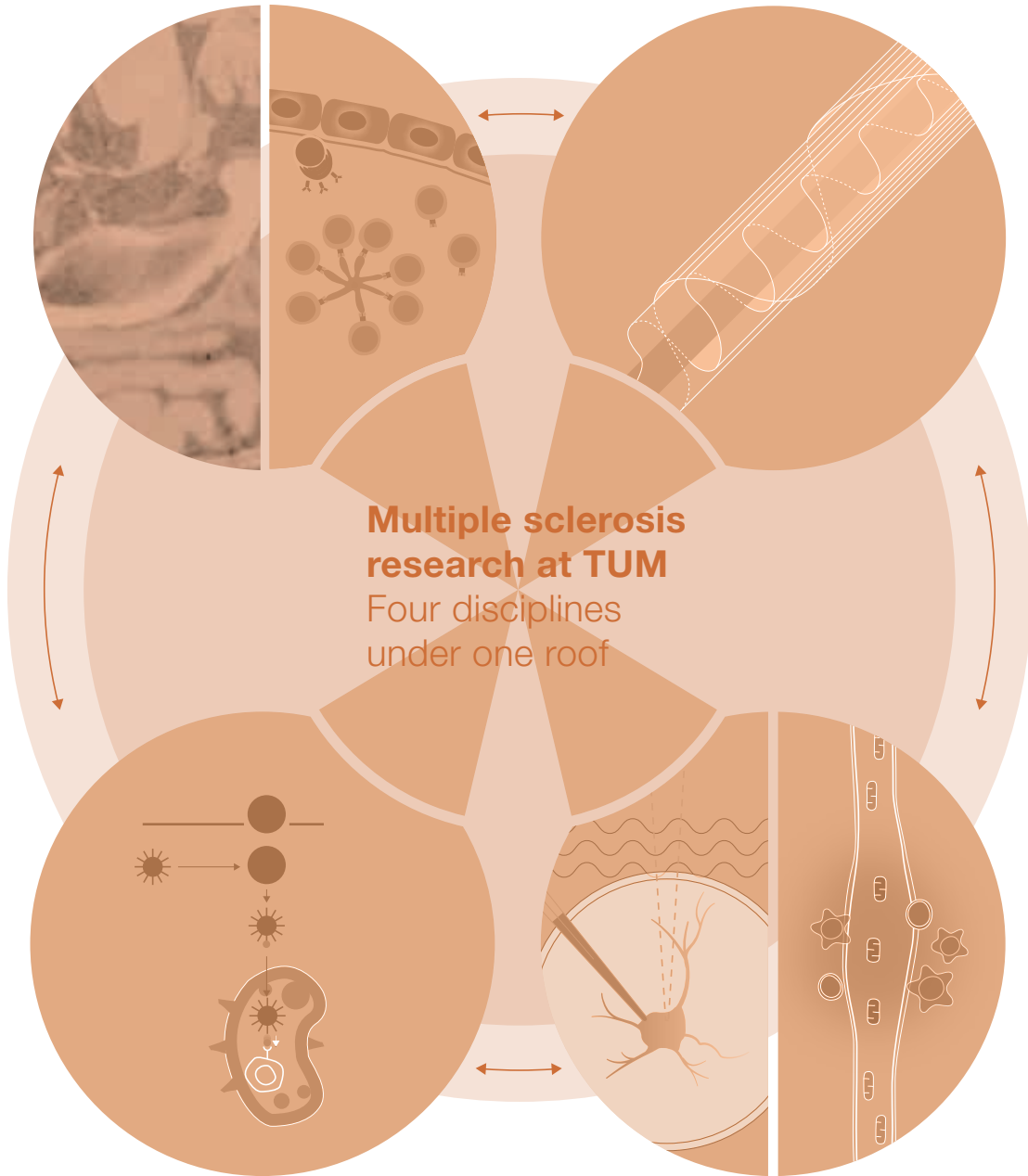
TUM is building a new research and treatment center for multiple sclerosis (TUM-MS) – at a cost of 35 million euros. The center will bring together the numerous research groups at TUM dedicated to this – as yet incurable – disease. Clinicians and basic researchers will work in close collaboration under one roof to ensure new findings are quickly translated into clinical trials. At present, TUM's university hospital, Klinikum rechts der Isar, already cares for 1,000 MS patients each year. This major project is made possible by a donation of 25 million euros from the Klaus Tschira Foundation, a German charity established by physicist Klaus Tschira, and by additional support from the Bavarian state.

Neurology

Prof. Mühlau Prof. Hemmer
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Glia/Myelin Biology

Prof. Simons
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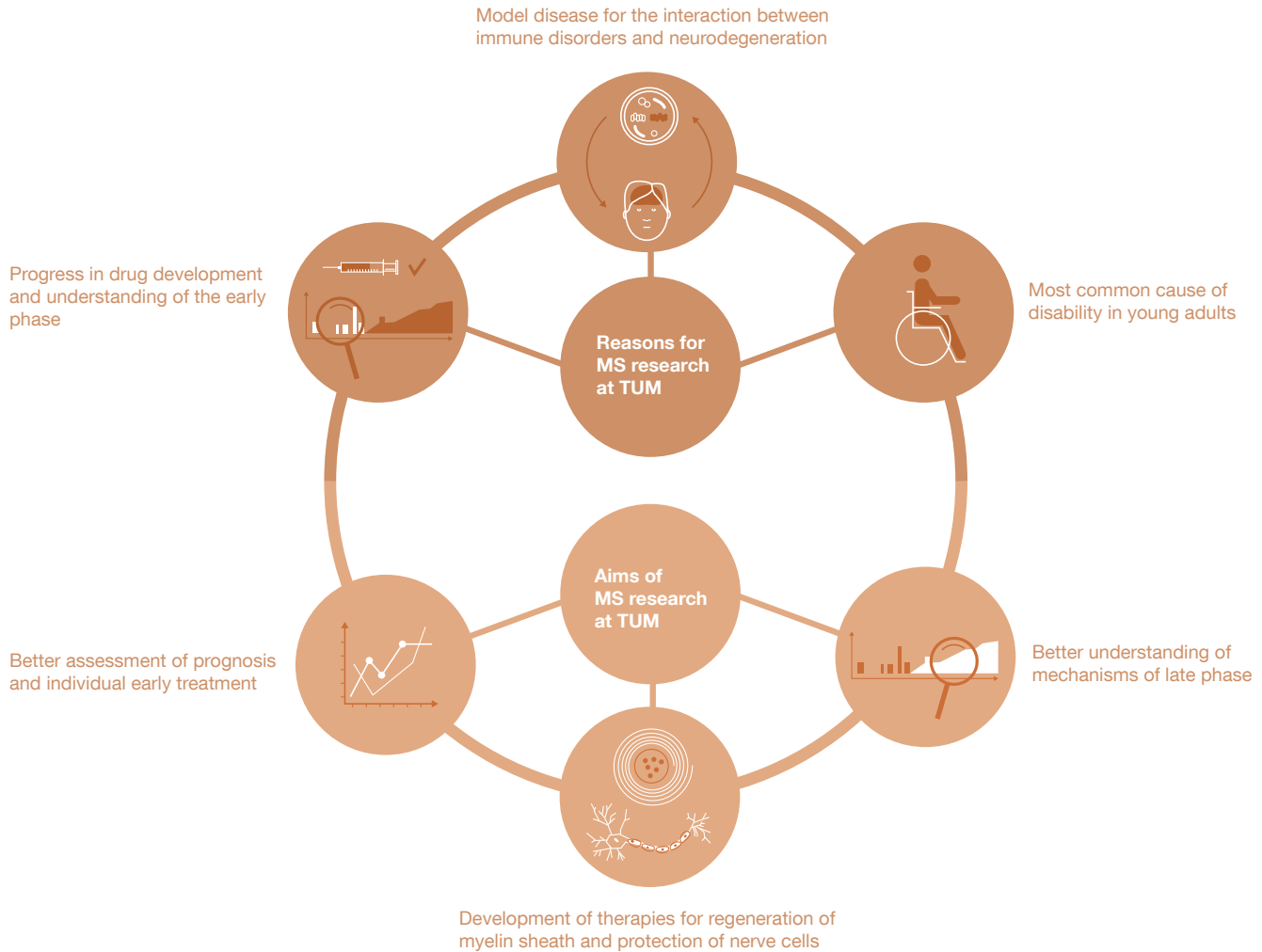


Neuroimmunology

Prof. Korn
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Neurobiology

Prof. Konnerth Prof. Misgeld
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“Our aim is to build bridges between clinical research, patient care and basic research. Technologies such as the latest in vivo imaging methods, which are not normally available at hospitals, now play a decisive role in major research breakthroughs,” is how Prof. Bernhard Hemmer, Director of the Department of Neurology at Klinikum rechts der Isar hospital, explains the need for the new MS center.

However, technology is not the only consideration for Hemmer and the other scientists. Their top priority is to bring basic research staff together with research physicians and specifically enable and promote “communication and interaction between the various disciplines and working groups.” The neurologist refers to translational medicine in this context, meaning that “the issues facing clinicians feed into basic research and, vice-versa, research findings are channeled into clinical practice.”

There is also another reason for establishing a research and treatment center for MS: Over the past few years, the TUM School of Medicine has stepped up its research in the fields of neuroscience and neuroinflammation, with the pathology

of multiple sclerosis becoming a central focus. This autoimmune disease affects the nervous system, with misdirected immune cells attacking brain and spinal cord. This research trajectory began with the establishment of TUM’s dedicated MS clinic, which participates in numerous therapeutic studies, both German and international.

Since then, this expertise at TUM’s university hospital has expanded to encompass MS-related areas such as molecular neuroimmunology, genetics, magnetic resonance imaging and biomarker research. TUM’s research in the field of neuroinflammation tackles the question of how autoimmune reactions occur and how these cause damage in the brain. This is flanked by outstanding basic neuroscience research at the Biederstein campus, also focusing on topics surrounding MS. Here the research focuses on the areas of neurotransmission (signal transfer between nerve cells), axonal degeneration (destruction of nerve fibers), and neuron-glia interaction (communication between nerve cells and the glial cells that form the protective tissue surrounding them). “With Professors Misgeld, Simons, Korn and Mühlau, plus their working groups, we believe we have put together the right team ▶



Bernhard Hemmer



Thomas Misgeld



Thomas Korn



Arthur Konnerth

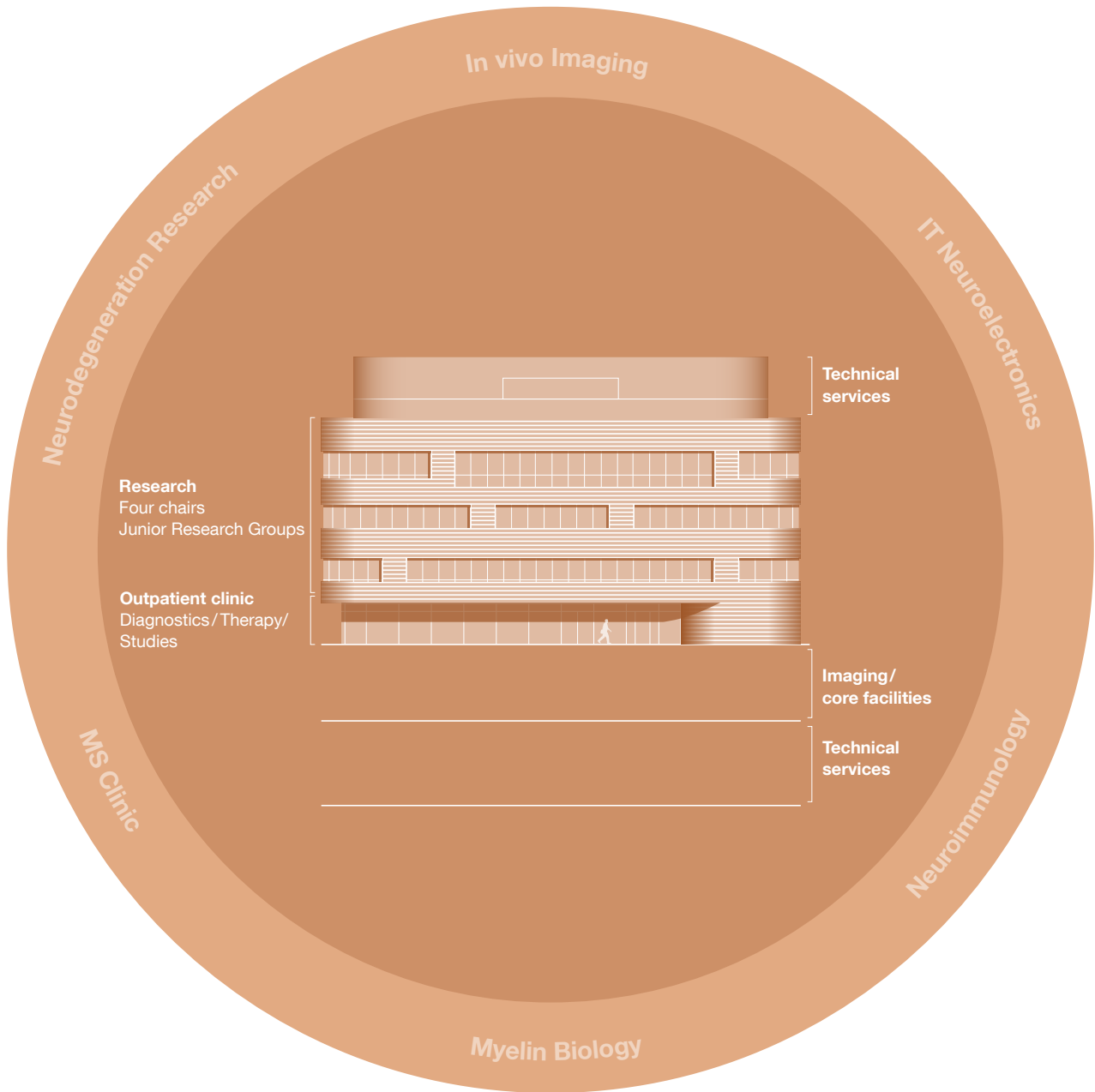


Mikael Simons



Mark Mühlau

Layout and concept of the new MS center



TUM's upcoming MS center will be located within the grounds of the university hospital, Klinikum rechts der Isar, and is set to open its doors in 2020. The architecture of the new building has been designed to accommodate an MS clinic housing the full range of diagnostic and treatment options along with research laboratories across the four floors above ground

level. The basements are reserved for medical imaging as well as infrastructure and technical services. The square building with its rounded corners will boast a total area of 4,600 square meters (sqm) and usable space of almost 2,700 sqm, ensuring room for six working groups of over 100 researchers and clinicians.

to advance our understanding and eventually the treatment of this disease at our upcoming MS center,” declares Hemmer with conviction.

Improved understanding of disease mechanisms

Driving all those involved is the determination to finally gain a better understanding of why the immune system attacks the body’s own nervous system, what mechanisms lie behind neurodegeneration, and how the disease can be predicted – or ideally even prevented.

Another question is how to halt or treat the condition in its chronic phase, when the nerves are already damaged. “Visualizing chronic disease progression is especially challenging. To date, systematically tracking neuronal atrophy also remains difficult beyond what we can directly examine in our patients. We need imaging techniques that allow us to view the degeneration process, or myelin destruction, as well as regeneration in its turn. And then we also need to get to grips with the factors that influence the process,” emphasizes Hemmer, who himself specializes in neuroimmunology.

What sets the research concept for TUM-MS apart is the fact that it brings together the full range of experts devoted to MS – extending from basic research right through to clinical practice. “Here we can develop therapies from bench to bedside – so if we discover a new pathomechanism, we can develop substances to target it, proof their effects in vitro and in vivo models and eventually test them in patients. As an academic center we are looking to develop new treatment strategies to the stage where they are attractive to pharma companies, which then initiate the necessary approval trials, since these are beyond our budget,” outlines Hemmer.

Flat hierarchies

The professors involved see it as their task to network their working groups, harness synergy effects and, above all, work

together to set and advance the research agenda. Maintaining flat hierarchies is particularly important to Hemmer, and he and his colleagues thus favor the department concept, with TUM-MS run by a committee rather than a single person. A team of clinical and basic researchers will be at the center’s helm, all on an equal footing and joining forces to move the field forward. This is intended to bridge the remaining divide between clinical practice and basic research. According to Hemmer, one reason why these two fields often do not interact as much as would be ideal, is that researchers and clinicians are often based in different locations and focus on different areas. Another is that communication between both communities on research is often suboptimal. “Our center will be striving to overcome that.”

TUM-MS will be one of several research centers devoted to MS research across Europe – so how will it position itself? “The integration of clinical and neurological research, along with the expertise TUM features on these areas, is unique in Germany or even Europe,” says Bernhard Hemmer. “Scientifically, our focus is clear: we will be tackling the role of inflammation in neurodegeneration and the consequences for neurons and glial cells. This means working hand in hand with the SyNergy excellence cluster (Munich Cluster for Systems Neurology), established in partnership with Munich’s LMU university,” explains Hemmer. The neuroimmunologist is convinced that the new MS center will become an attractive institution for young researchers and junior physicians: “Our center will bring together a critical mass of researchers and physicians, which will be well integrated into the Cluster of Excellence, as well as into other research networks within and across TUM and its faculties. The basic researchers will have direct access to key issues arising in clinical practice, as well as to biological material. And physicians can make MS the focus of their training, gaining contact to top basic researchers with a huge amount of expertise.”

Evdoxia Tsakiridou

“The integration of clinical and neurological research, along with the expertise TUM features on these areas, is unique in Germany or even Europe.”

Bernhard Hemmer