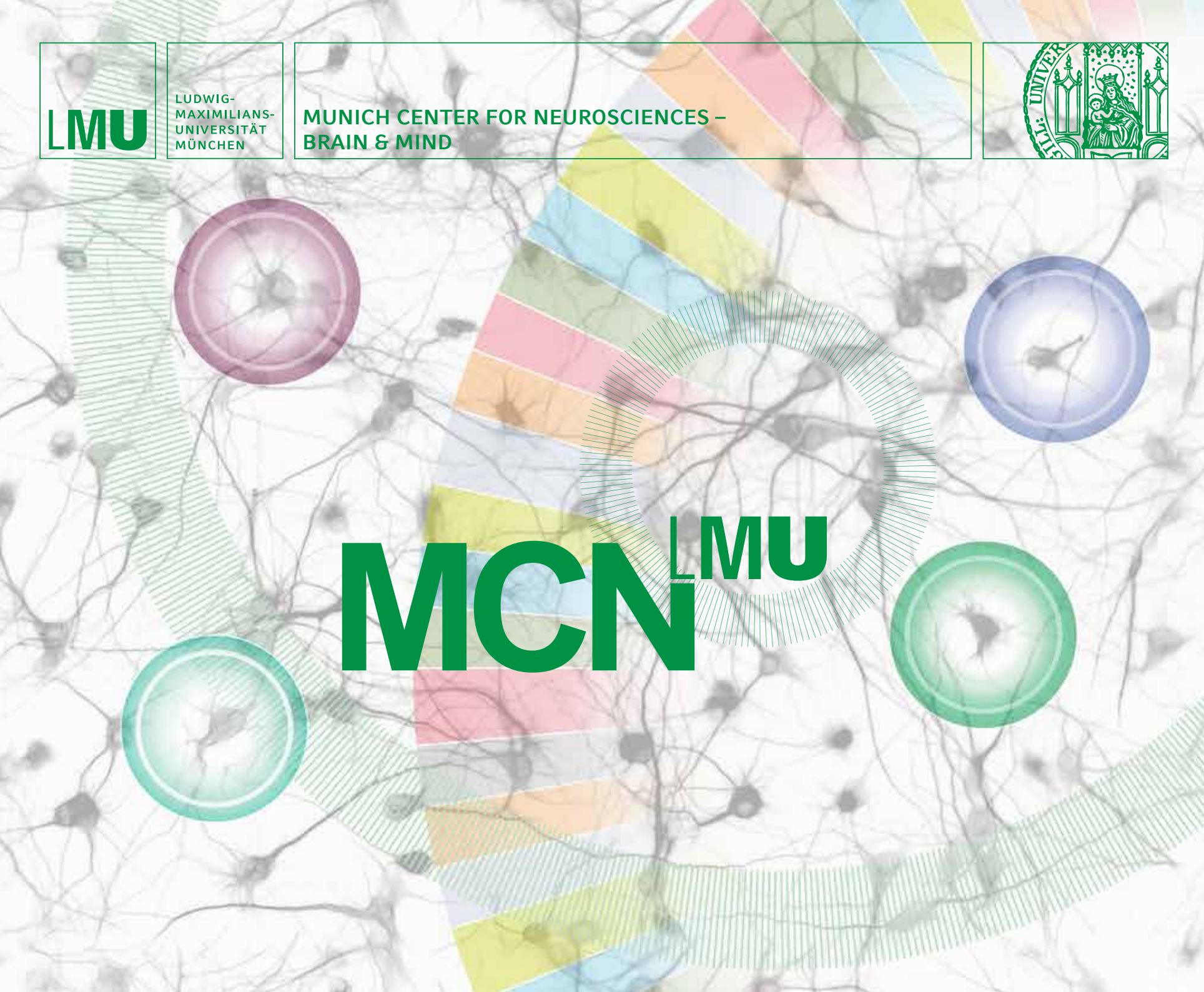
LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

MUNICH CENTER FOR NEUROSCIENCES –
BRAIN & MIND



Figures

211
GSN[LMU]/ENB Students
157 PhD
41 Fast-track PhD
13 MSc

81
Male Students

130
Female Students

Over 20
International & National Collaborations

134
Graduates
77 PhD
11 Fast-track PhD
46 MSc

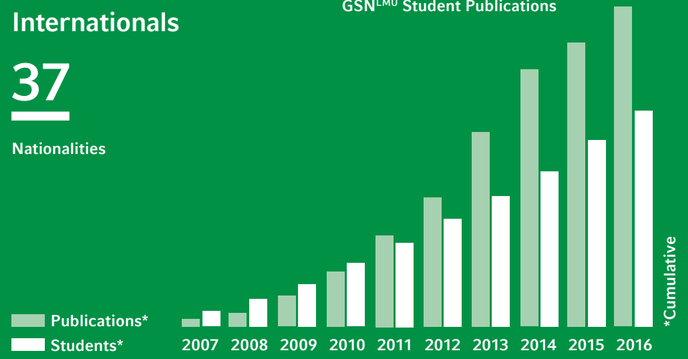
104
MCN[LMU] Members

56%
Internationals

Over 500
GSN[LMU] Student Publications

133
GSN[LMU] Faculty Members

37
Nationalities



7
Teaching Sections

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Dr. Ludwig Spaenle
Bavarian State Minister for
Education, Science and the Arts

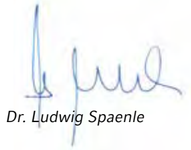
The State of Bavaria is nationally and internationally recognised for its rich research environment. Nine state universities constitute the heart of a network of altogether 75 major university and non-university research institutions. Among them, the Ludwig-Maximilians-Universität and the Technische Universität in Munich have proven to be outstandingly successful in both research and education, harvesting the benefits of a profound interdisciplinary exchange across virtually all fields of science.

The "Munich Center for Neurosciences – Brain and Mind" stands for that exchange across the local neurosciences, embracing all research entities and institutions involved in the field while efficiently connecting the Munich community with a far-reaching scientific network. By fostering many vibrant interactions between the participating institutions and its members the Center very successfully promotes the distribution of the latest knowledge and the establishment of state-of-the-art collaborations at local, national and international levels.

Moreover, within the framework of the Munich Center for Neurosciences and the associated Graduate School of Systemic Neurosciences scientists and students gain access to top-notch research equipment. At the same time, the associated Graduate School of Systemic Neurosciences provides a maximum level of quality control in education and research and has consequently set new standards for neurosciences.

Over the last 10 years, the "Munich Center for Neurosciences – Brain and Mind" has developed into a major asset of the Munich neuroscience community, and I would like to offer my sincere congratulations and thanks to all of the people engaged in the remarkable and ongoing success of the Center.

With best wishes for your future endeavours,



Dr. Ludwig Spaenle

Prof. Dr. Bernd Huber
President
Ludwig-Maximilians-Universität
München

Ludwig-Maximilians-Universität München is one of the leading research intensive universities worldwide, with a more than 500-year-long tradition. It is LMU's mission to combine excellent research with outstanding teaching, to conduct basic research and tackle the grand challenges of our time. The extraordinary research output of the university is based on the exceptional achievements of our researchers and scientists. This is proved by our success in the first two rounds of the Excellence Initiative in 2006 and 2012. In addition to that, LMU also offers the best possible education for its currently 51,000 students with degree programs in 185 subjects and thus ideally prepares young people for a career in academia or outside university.

One of LMU's very successful institutions is the "Munich Center for Neurosciences – Brain and Mind (MCN[LMU])". Since 2006, when it was founded, MCN[LMU] continues to contribute essentially to LMU's top position within the life sciences. MCN[LMU] created a network of groups and disciplines with interest in questions of neurobiology, cognition, and "brain and mind". With its interdisciplinary approach, MCN[LMU] successfully brought together various research fields at LMU ranging from the natural sciences to the humanities. Scientists from the field of experimental and theoretical neurosciences, philosophy and psychology do research and teach in the numerous projects and programs within the MCN[LMU].

The Center is an excellent example for transferring new and broad knowledge in an emerging field of science to the new student generations: The two specialized Master programs in Neurosciences and Neuro-Cognitive Psychology, funded by the Elite Network of Bavaria, and the Graduate School of Systemic Neurosciences GSN[LMU], which is funded within the German Excellence Initiative, evolved into a world wide visible integrated teaching framework. During the last 10 years the GSN[LMU] became a prime example for innovative and interdisciplinary teaching and career development.

One essential requirement for the success of the MCN[LMU] is the intense cooperation with its partners, the Technische Universität München, different Max Planck Institutes, the Helmholtz Zentrum München and the Bernstein Center for Computational Neuroscience. It also maintains close ties to renowned international partners in Europe, the United States and Australia and thus creates an important global network for the exchange of knowledge.

This brochure, reedited on the occasion of the tenth anniversary, offers interesting insights into the Munich Center for Neurosciences – Brain and Mind, its research projects and teaching programs as well as an overview of the excellent researchers who are working at the MCN[LMU]. The multiplicity, interdisciplinarity and internationality of this top-class institution strongly contribute to LMU's vision to address the key areas of research and innovation of the 21st century.

Prof. Dr. Bernd Huber

Prof. Dr. Benedikt Grothe
MCN[LMU] Chair of the Board of Directors

Dear Reader,

Modern sciences increasingly depend on the ability of crossing disciplinary boarders as well as collaborations that allow sharing expertise and infrastructure. This holds particularly true for an area like neuroscience.

The structure and function of the human brain and the question of how its activity relates to our concepts of the mind cannot be studied in isolation, but only through extensive networking and a combination of interdisciplinary bottom-up and top-down approaches. The *Munich Center for Neurosciences – Brain and Mind* (MCN[LMU]), generously funded by LMU*innovativ*, was founded to create a local network in and around Munich that connects all groups and disciplines with interests related to questions of neurobiology, cognition, and "brain and mind". Since its foundation 10 years ago it continued to provide a platform for interdisciplinary interactions and to support the establishment of new collaborative research programs. The success of the DFG funded Collaborative Research Center CRC 870 *Assembly and Function of Neuronal Circuits*, for instance, resulted from scientific interactions of many members of the MCN[LMU]. That also holds for the more recently established DFG Research Unit FOR 2293 *Active Perception*.

In addition, the MCN[LMU] successfully established training programs attracting excellent students at all levels of education. The programs *MSc Neurosciences and MSc Neuro-Cognitive Psychology* (both amply funded by the Elite Network of Bavaria for a period of 10 years) and the *PhD* program of the *Graduate School of Systemic Neurosciences* (GSN[LMU]; funded by the German Excellence Initiative) are offspring of, or governed by the MCN[LMU] and were firmly integrated into its teaching concept (see page 46). GSN[LMU] in particular, provides a platform for, and coordinates teaching across, all neuroscience related research areas in Munich. This can be exemplified by the newly established graduate program DFG RTG 2175 *Perception in Context and its Neural Basis* that is fully embedded in MCN[LMU] and GSN[LMU]. Here and elsewhere, GSN[LMU] closely collaborates with the International Max Planck Research Schools in Munich.

This only begins to exemplify how MCN[LMU] fosters Munich as an internationally attractive site for training and research in the neurosciences. In Munich, research related to the neurosciences spans a wide spectrum of current areas of investigation, ranging from neural stem cells and the molecular mechanisms of early brain development, via cellular and systems neurobiology (including neurology), neurocognition (including "theory of mind") and behaviour, to epistemology, philosophy of science, logic, and ethics. It involves numerous research groups working in various institutes and departments of the LMU (in particular at the faculties of biology, medicine, philosophy, psychology and veterinary medicine). Most of them operate in close collaboration with either Max Planck institutes (neurobiology, psychiatry, ornithology), institutes of the Helmholtz Zentrum München (stem cell research, developmental genetics), departments at the Technical University of Munich (electrical engineering, medicine, physics, life sciences) or the computer industry.

MCN[LMU] was implemented to help make Munich, with its multitude of expertise, not only one of the real "hot spots" in the neurosciences, but also one of the few neuroscience hubs where a bridge from experimental neurobiology to the philosophy of brain and mind can be built successfully.

Many thanks to all members and supporters who have contributed to this venture over the last 10 years!

Prof. Dr. Benedikt Grothe

Prof. Dr. Oliver Behrend
MCN[LMU] Managing Director

Dear Reader,

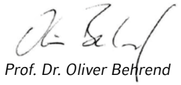
A first MCN[LMU] compendium had been compiled in 2011 in order to present Munich's multi-layered neuroscientific landscape in a comprehensible and tangible format. The primary goal: getting junior and senior researchers informed and interested in each other's work. By bringing them in touch and cultivating their interactions, we seek to unlock synergies and make way for innovative avenues of research. The current brochure follows in this tradition.

In 2005, the Munich Center for Neurosciences (MCN[LMU]) had been conceived as a multi-faculty, inter-institutional initiative promoting scientific collaborations across the wider Munich area. The MCN[LMU] aims at making the most of the wealth of local expertise in terms of implementing research and fostering scientific insight ever since. By 2017, the scope of research conducted within the framework of the MCN[LMU] allows, on a routine basis, establishing fundamental consortia that link molecular and cellular studies to large scale systemic and behavioural research. In many ways, but not necessarily, attention is directed to the translational potential of theoretical, technical, and biomedical approaches applied.

The MCN[LMU] has shown to be an efficient tool administering science and teaching, and alleviating local deficits in infrastructure and staffing: by promoting applications for urgently needed facilities as well as for collaborative research initiatives, by supporting targeted appointments in affiliated institutions and by providing bridging positions when necessary. Research-coordinated teaching at the Center's associated Graduate School of Systemic Neurosciences makes sure junior researchers directly benefit from the rich scientific environment. Regular national and international exchanges established with first-rate institutions connect both junior and senior levels with their peers beyond the Munich area.

All in all, the MCN[LMU] has contributed significantly to the development of the neurosciences in Munich. However, success comes at a price: the growing lack of sufficient space and infrastructure for new initiatives means sustainability is a pressing issue for projects to come.

Kind regards,



Prof. Dr. Oliver Behrend

Introduction

Over many decades, Munich has developed into one of the leading hubs for research in life sciences and medicine. The history of neurosciences, neurology, and psychiatry in Munich dates back to the 19th century. However, initially, its fame came for another reason than scientific achievement: on June 13, 1886 Bernhard Aloys von Gudden was found dead close to shore in the waters of the Würmsee (today known as Starnberger See), together with the corpse of King Ludwig II of Bavaria, known also as the "dreaming king". Von Gudden had been appointed professor at LMU and director of the *Oberbayerischen Kreisirrenanstalt* München (the psychiatric clinic) in 1873. He was the responsible author on the medical report that diagnosed Ludwig with paranoia and being "incapable of ruling" – although neither von Gudden nor his co-authors had ever met Ludwig in person before handing in the report. Only after Ludwig was detained at Schloss Berg on June 12 did von Gudden meet him in person. The day after, both went for an evening walk. What happened then and their death remains a mystery until today.

Despite his questionable role in the affair of King Ludwig II, von Gudden deserves credit not only for revolutionizing and humanizing the treatment of the mentally ill by proper training of his staff, but also for his significant contributions to research on the anatomy of the human brain. Although he himself did not publish (his son in law later published a substantial body of his work), von Gudden described several neuronal connections in the human brain and developed new methods for cutting nervous tissue. Most importantly, he started a legacy in Munich neurosciences by attracting important neuroscientists who came as students, assistants, or to work as colleagues at his side including Auguste-Henri Forel, Franz Nissl, and, most importantly for Munich's subsequent scientific reputation, Emil Kraepelin.

Kraepelin joined van Gudden 1878-82 after he got his PhD. He was a professor at LMU from 1903 to 1926 and, since 1917, founding Director of the *Deutsche Forschungsanstalt für Psychiatrie (German Institute for Psychiatric Research)*, the world's first privately financed, independent brain research institute. In 1924, it became a *Kaiser Wilhelm Institute* (predecessor of the *Max Planck Institute* (MPI)) *of Psychiatry*. Kraepelin turned Munich into one of the world-wide recognized hubs of neurosciences. Korbinian Brodmann, who had studied at LMU, worked for several years as a Neurologist at the psychiatric hospital in Munich and returned in his last year in 1918 to join Kraepelin's new institute. Alois Alzheimer did his Habilitation (post doctoral qualification) in Munich and was head of the anatomy section at the LMU psychiatric hospital under Kraepelin, where he analyzed the brain of Auguste Deter in 1906, the first person diagnosed with what was later named Alzheimer's disease. Finally, Friedrich Jacob Heinrich Lewy (later, after leaving Germany in 1933, Frederic Henry Lewey), famous for his discovery of the "Lewy bodies", intracellular aggregates of proteins, indicative for Parkinson's disease and a specific form of dementia, spent a significant amount of time in Kraepelin's group at LMU. This brochure illustrates that, among a multitude of other efforts, work on the basis of mental diseases (including various forms of dementia) and their treatment is still a main focus of neuroscience research in Munich (see *Deutsches Zentrum für Neurodegenerative Erkrankungen* (DZNE) page 28, *Institute for Stroke and Dementia Reasearch* (ISD) page 32, *Excellence Cluster Systems Neurology* (SyNergy) page 40).

At the same time, the differentiation into modern psychiatry and neurology as independent disciplines helped to establish other, continuously flourishing areas of research in Munich, like that of vestibular function and disorders, or multiple sclerosis.

Additionally, other important neuroscience research outside of translational and clinical departments and institutions were established in and around Munich. Karl von Frisch, successor of Richard Hertwig, the founder of modern developmental biology, as chair of zoology at LMU, not only discovered hearing in fish but also showed via ablation studies that the inner ear was the basis for it. He became famous (and a Nobel laureate in 1973), however, for his comprehensive interpretation of the bee dance. His successor Hansjochem Autrum, most famous for his descriptions of light induced adaptation in photoreceptors, made seminal discoveries related to mechanosensation, including vibration sensitivity in insects and, most importantly, that of the pressure difference receiver (the basis for hearing in many insects as well as in non-mammalian tetrapods including birds). Comparative sensory neurobiology continued with his successor, Gerhard Neuweiler, who established a worldwide leading group working on bat echolocation. The structural and functional basis of sensory processing, including audition, remains a main focus of the Division of Neurobiology at LMU and the Collaborative Research Center (CRC) 870 (page 22) to this day.

In 1954, Erich Walther von Holst and soon also Horst Mittelstaedt started research groups in Seewiesen and developed and also presented proof for the "reafference principle" as the basis for organisms to separate self-generated (reafferent) from externally generated (exafferent) sensory stimulation. Their work pioneered the field of "neuroethology" and still reverberates in the CRC 870 and in the Deutsches Schwindel- und Gleichgewichtszentrum (DSGZ; page 26).

Four years later, Konrad Lorenz joined the then newly established Max Planck Institute of Behavioral Physiology. His most significant contributions to the development of a new discipline "ethology" were the – undisputed – description of imprinting in geese and – highly controversial – the psychohydraulic model of motivation. Interestingly, Walter

Heiligenberg (who died much too early in 1994), also in Seewiesen, produced evidence contrary to Lorenz's latter theory by studying aggression in cichlid fish. Dietrich Schneider, first working at the Zoological Institute at LMU with Hansjochem Autrum, later joined the MPI in Seewiesen (1991-2008) where he established research on olfaction by means of electrophysiology and pioneered the field of sexual communication via pheromones. In 2004, the MPI was renamed MPI of Ornithology, in part still continuing the research tradition in neuroethology, by concentrating on vocal communication in songbirds.

The MPI of Psychiatry, at least partially, also evolved into a basic research institute, as increasingly more researchers, not so much driven by clinical, but rather basic neurosciences, were moving to the institute. Otto Detlev Creutzfeldt and Hans Thoenen exemplify this trend. Creutzfeldt joined the Max Planck Institute for Psychiatry from 1962 to 1971 and obtained a degree in clinical neurophysiology at LMU. He worked on basic aspects of cerebral cortex anatomy and physiology and attracted a number of later famous young scientists, Bert Sackmann (Nobel Prize 1991) and Wolf Singer among them. Hans Thoenen, who significantly contributed to the fact that in 1998 the MPI of Neurobiology in Martinsried was founded as a spin-off of the MPI of Psychiatry, discovered that nerve growth factors (NGF) can be taken up presynaptically and, transported retrogradely, regulate gene expression in the cell soma. He contributed significantly to the general understanding of neuro-modulators, their expression and release. Development and plasticity of neuronal circuits remain major areas of research at the MPI in Martinsried until today.

These – admittedly erratic and incomplete – notes exemplify the long, rich, and colourful history of neurosciences in Munich. For a long period of time collaborations of local institutions remained less than ideal though. The Nobel Prize jointly awarded in 1973 to the LMU chair of zoology Karl von Frisch and the MPI director Konrad Lorenz (together with Nikolaas Tinbergen) *"for their discoveries concerning organization and elicitation of individual and social behaviour patterns"*, appears to show otherwise. However, students at LMU almost never saw MPI directors, common overarching teaching concepts were unheard of, official collaborations across institutions, e.g. universities and MPIs, where basically non-existent, and joint publications rare exceptions. In retrospect, something seemed to be missing.

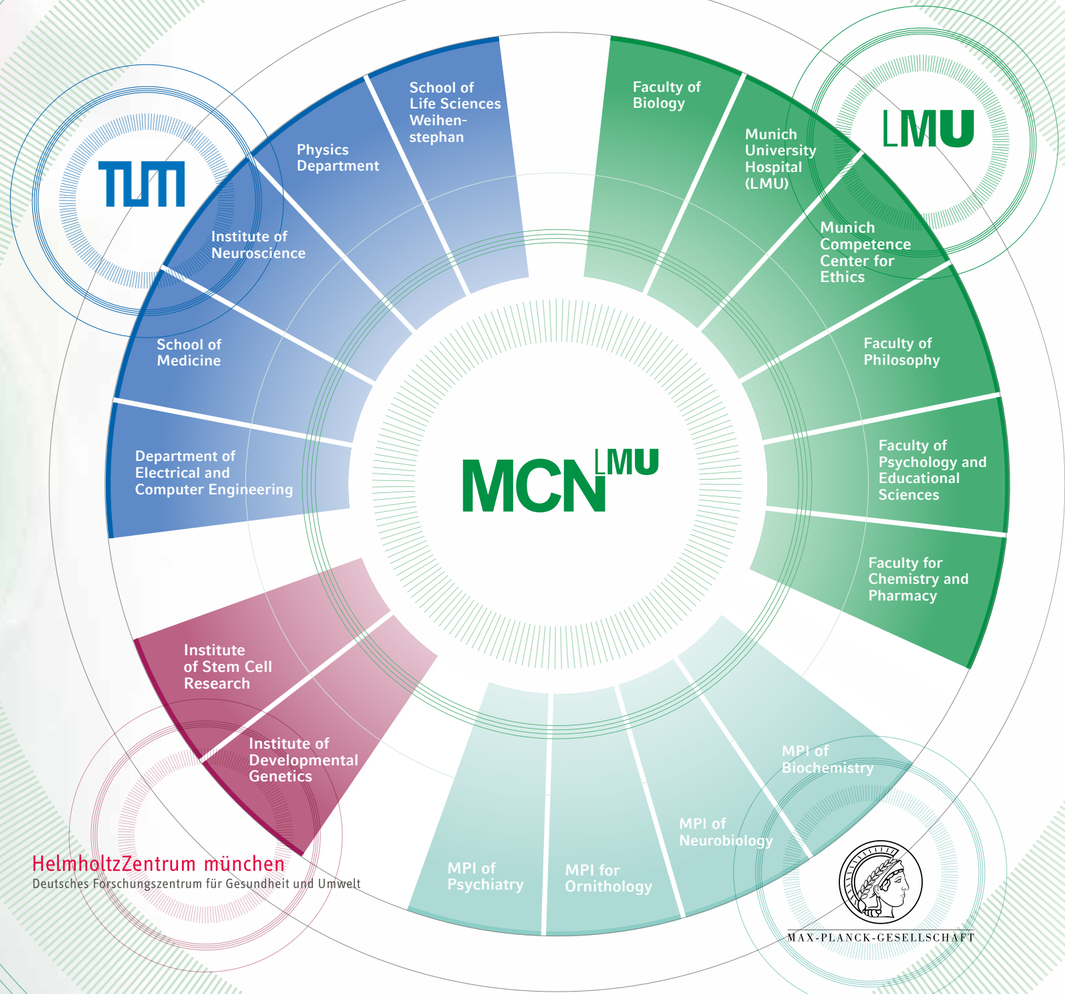
Of course, the *Zeitgeist* has changed directing many places towards closer interactions across institutions, and the pressure to collaborate is mounting. The concentration of life science institutes in Großhadern-Martinsried (MPI, LMU, Helmholtz and recently groups of the Technical University of Munich (TUM)) – politically motivated by rather financial reasons than strategic plans – nevertheless helps in bringing people and labs closer together, as does personal friendship among researchers that continues to be a major asset for a real neuroscience "community". Yet in 2005, one process can be singled out that definitely helped forming and strengthening a community and carrying it to a different level: LMU defined a handful of main focus areas via an internal competition based on an external review process. The joint application of four faculties (Biology, Medicine, Philosophy, Psychology) for the platform MCN^{LMU}, including LMU, TUM, Helmholtz and Max Planck institutes convinced the jury.

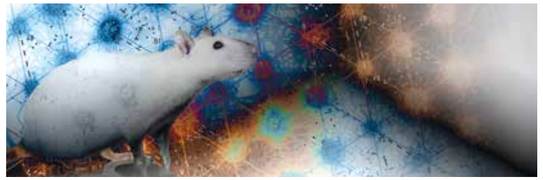
As a virtual center, MCN^{LMU} provided generous funding, strategic appointments (like *computational neurosciences and neurophilosophy*), new teaching concepts ever since, and – most importantly – stipulated new collaborative research initiatives between LMU and its partners. So what happened within the MCN^{LMU} and GSN^{LMU} during the last ten years appears to be more than just circumstances. But, dear reader, see for yourself and enjoy reading this brochure.

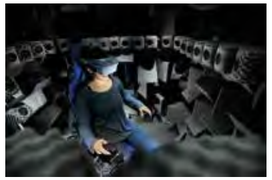
Research Network

Research Network

The current MCN[LMU] network comprises local nodes at the Technical University of Munich, Helmholtz and Max Planck institutes, as well as subsidiaries of large pharmaceutical companies like Roche and Amgen. Among others, international partners like the Brain Center Rudolf Magnus of the Utrecht University, the École Neuroscience Paris Île-de-France, the Harvard Center for Brain Sciences, the Hotchkiss Brain Institute of the University of Calgary and the Queensland Brain Institute of the University of Queensland round out the local and national reach of the MCN[LMU].







BCCN

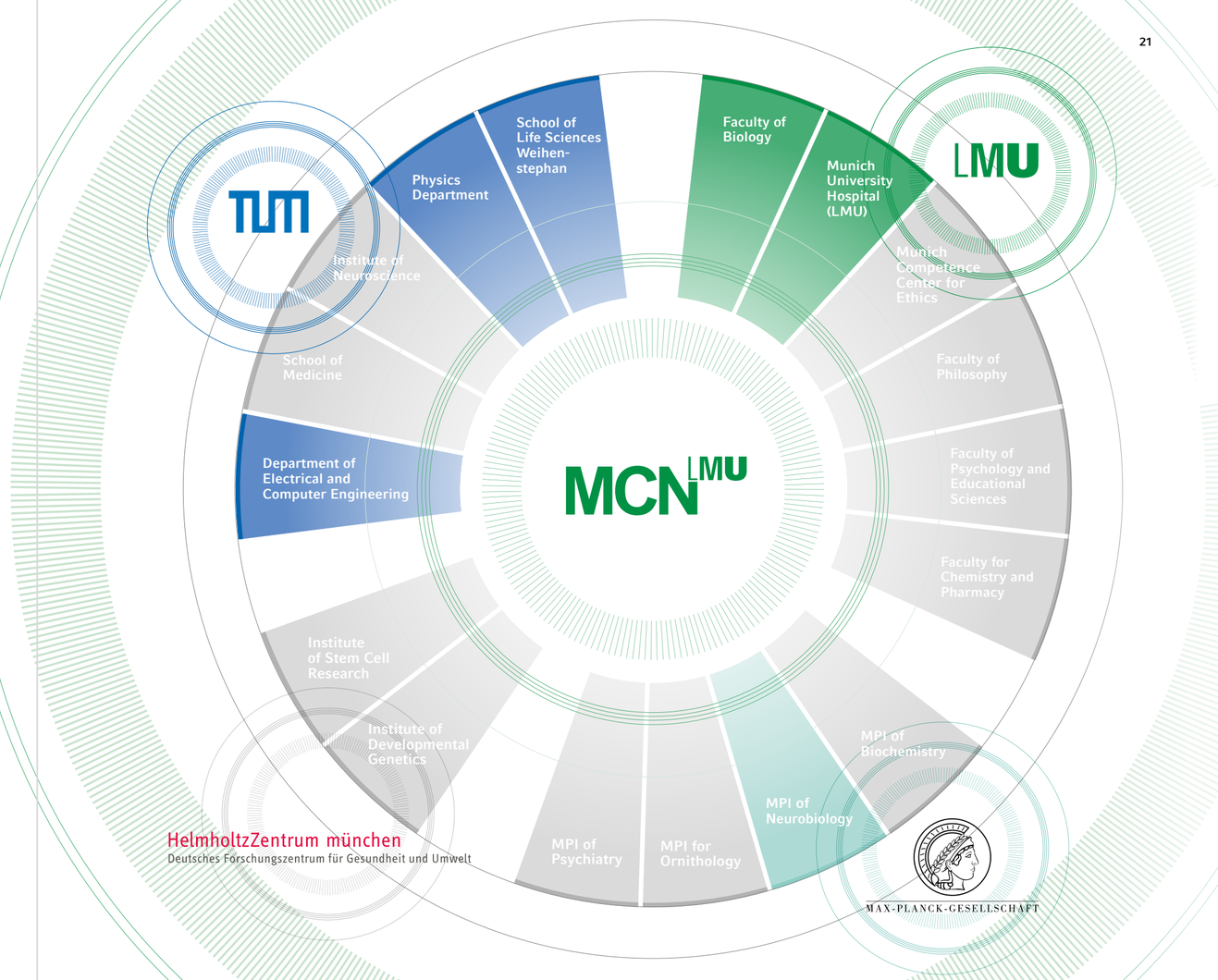
Bernstein Center for Computational Neuroscience Munich

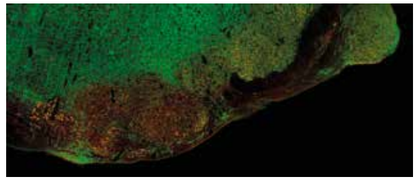
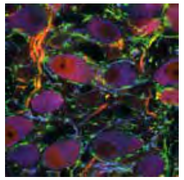
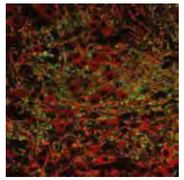
Coordinator: Prof. Dr. Andreas V.M. Herz

Computational Neuroscience combines experimental neuroscience with advanced data-analysis, computer simulation, and mathematical modeling. On the basis of well-defined theoretical concepts, Computational Neuroscience provides a unifying scientific language and methodology that can be used across disciplines, ranging from neurobiology to cognitive science, systems biology, and information technology.

Computational Neuroscience has made great strides in the last years, and shapes the way we think about neuronal dynamics and information processing. This concerns in particular the joint research topic of the Bernstein Center for Computational Neuroscience Munich – "Neural Representations of Space and Time". These representations are of key importance for many computations and cognitive processes – from the localization of objects by auditory and visual cues to the planning and neuronal control of future movements.

The center is part of National Bernstein Network for Computational Neuroscience (www.nncn.de) and was founded in 2005 with support from the Federal Ministry of Education and Research (BMBF). Within the last 10 years, five faculty positions have been newly created within the Bernstein Center: Prof. Dr. Werner Hemmert (Bio-inspired Information Processing, TUM), Prof. Dr. Christian Leibold (Collective Computation and Learning, LMU Munich), Prof. Dr. Bernhard Seeber (Audio Information Processing, TUM), Prof. Dr. Anton Sirota (Cognition and Neuronal Plasticity, LMU Munich), and Prof. Dr. Bernhard Wolfrum (Neuroelectronics, TUM).



SFB 870
Neuronal Circuits

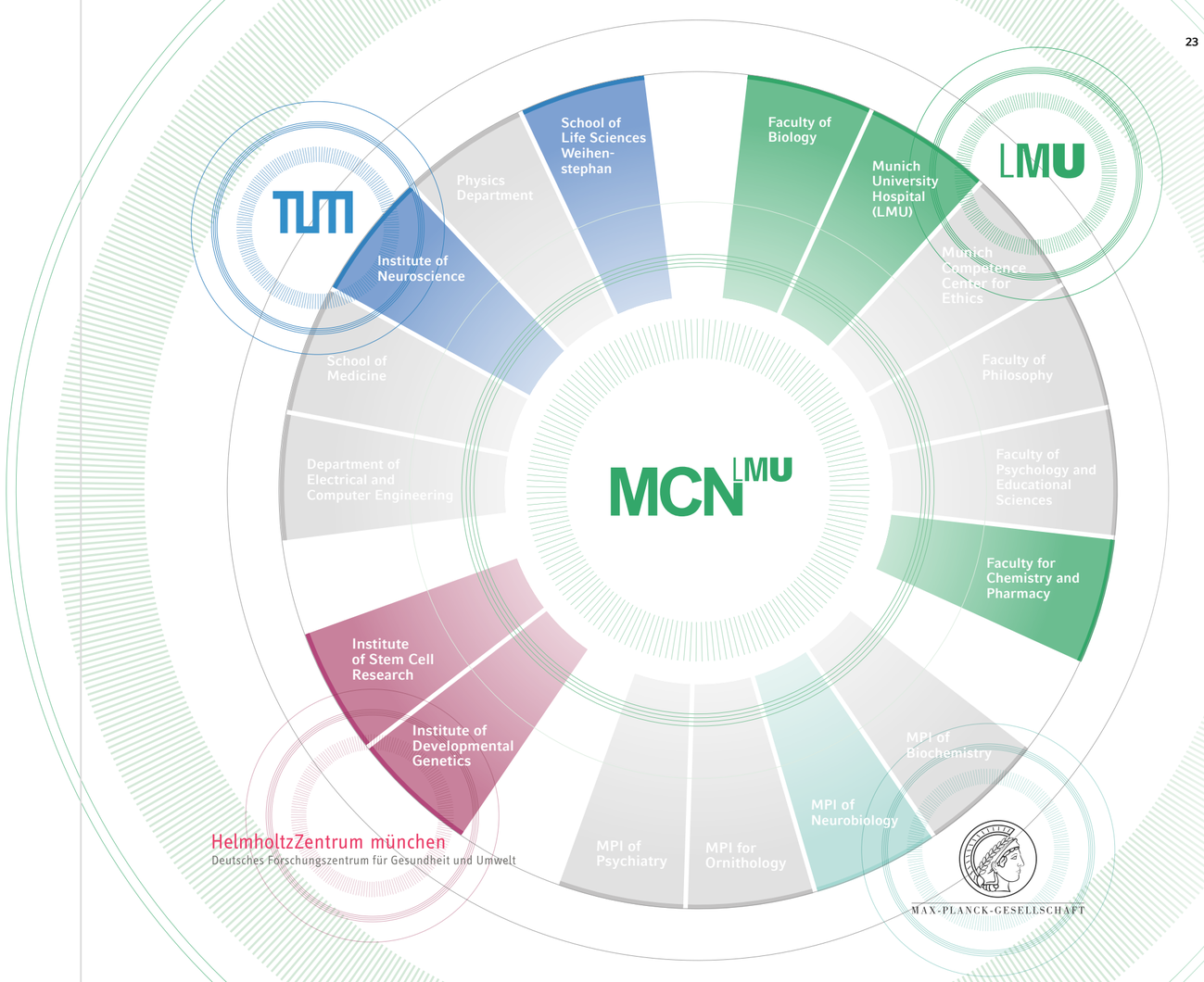
CRC 870

Assembly and Function of Neuronal Circuits
Spokesperson: Prof. Dr. Benedikt Grothe

The long-range goal of scientists working in the CRC 870 is to bridge the gap between our understanding of molecular / cellular mechanisms and higher brain functions. To this end the CRC researchers study the structure-function relationship, assembly, and plasticity of anatomically and functionally well-defined neuronal circuits. During the 1st funding period, sensory systems were the main subject of research for almost all projects. In the 2nd funding period sensory systems remain at the core of the CRC 870, however, studies consider a wider range of neuronal systems and functions.

The behavioral relevance of sensory systems is immediately apparent, and the parameter space of physical cues for visual or auditory processing, for instance, is well-defined and under exquisite experimental control. The retina and the auditory brainstem, for example, allow for highly specific experimental approaches to study their development, the relation between their structure and function, as well as the influence of sensory experience and context on both neuronal processes and circuit anatomy. How cues not available at the receptor level *per se* (e.g. motion in vision, space in the auditory system) can be computed and neuronally represented is of particular interest.

Meanwhile, also motor systems and circuits for sensory-motor interactions have gained much more interest within the past years. Many CRC 870 labs have therefore widened their focus towards these systems and include, e.g., analysis of circuitry in disease models, such as Parkinson's disease, research on sensory-motor interactions, and on the integration of neurons in adult cortical tissue *in vivo*. By adding research on motor systems and sensory-motor interactions in circuits similarly well-defined as sensory circuits, the conceptual framework of the CRC 870 has become significantly augmented. In view of its ambitious goal the CRC 870 remains prepared to broaden its scope by incorporating new model systems and concepts in line with joint research advances. In 2017 the CRC 870 aims at rounding out its range of approaches with PIs applying for a 3rd funding period that comprehensively concludes the Center's research agenda and inspires more collaborative efforts in the future.



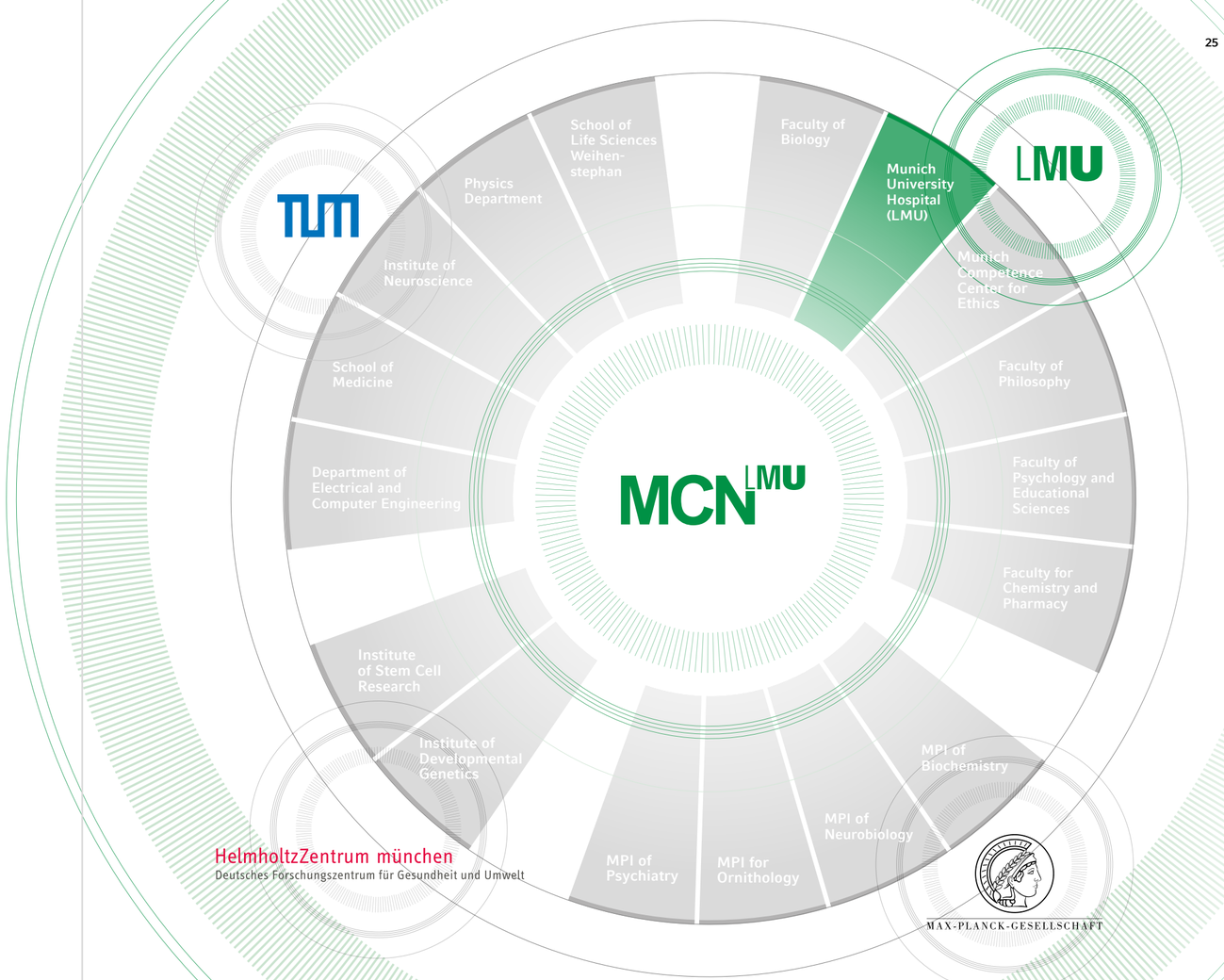
PsyCourse
www.psycourse.de

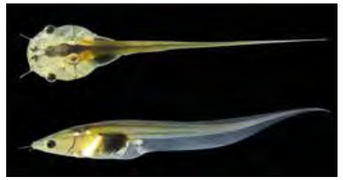
CRG 241

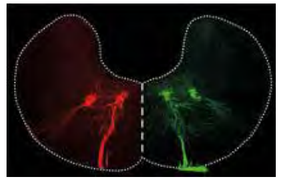
Clinical Research Group 241: Genotype-phenotype relationships and neurobiology of the longitudinal course of psychosis

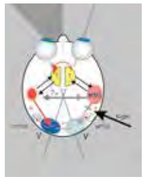
Spokesperson: Prof. Dr. Peter Falkai / Prof. Dr. Thomas G. Schulze

The overarching theme of the Clinical Research Group 241 and its successor consortium PsyCourse (www.psycourse.de) consists of delivering clues to our understanding of the complex biological basis of the longitudinal course of affective and non-affective psychosis, namely schizophrenia, bipolar disorder, and unipolar depression. Measures of the longitudinal course along with dimensional aspects are supposed to inform future classification systems in psychiatry. The Clinical Research Group 241 and PsyCourse are poised to propel these efforts through biological research in large cohorts with a phenotype of interest that is longitudinal in nature and also includes information on functional parameters and environmental factors. Building on a vast body of already available knowledge and longstanding own experience in the fields of psychiatric genetics and neurobiology, we currently implement a research framework comprising phenomics, genomics,pharmacogenomics,epigenomics-neurobiology, brain imaging, predictive modeling, and the study of environment. Our findings will substantially contribute to a better understanding of the molecular biological determinants of the longitudinal course of psychosis and their complex interactions with the environment. This in turn will hopefully contribute to the development of therapies improving the longterm outcomes of psychosis.









DSGZ

DSGZ

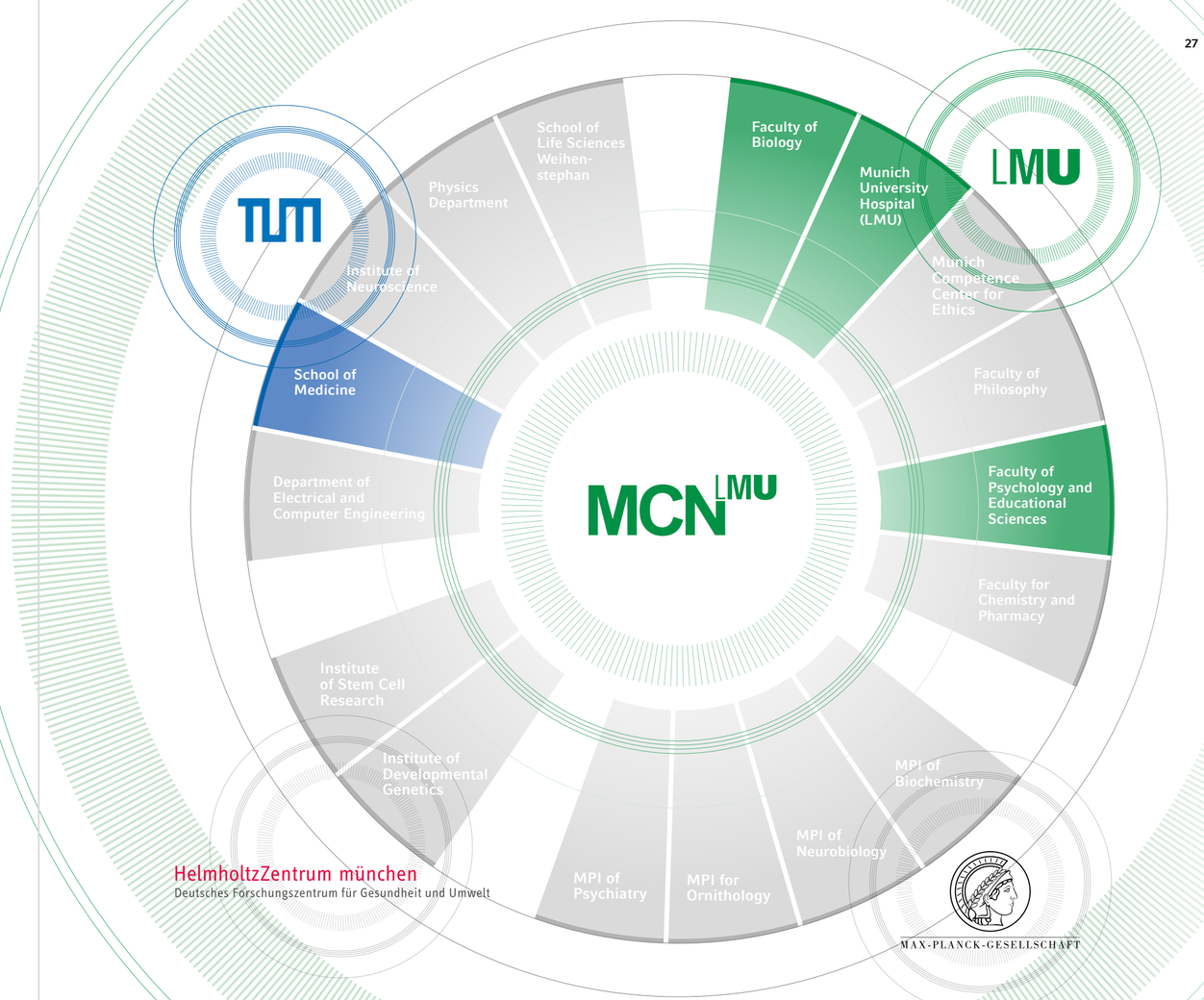
German Center for Vertigo and Balance Disorders (Deutsches Schwindel- und Gleichgewichtszentrum)

Director: Prof. Dr. Dr. Thomas Brandt

The objectives of the German Center for Vertigo and Balance Disorders are the following:

- Create an independent patient-oriented clinical research center under the auspices of the Medical Faculty but with autonomous administration and budget;
- Overcome existing clinical and academic barriers separating the traditional specializations;
- Standardize an interdisciplinary longitudinal and transversal network at one site for managing patients. This should professionalize both management and international recruitment of patients (integrated care, telemedicine);
- Organize the study infrastructure for prospective multicenter clinical studies as well as to free clinical scientists from administrative tasks;
- Promote translational research with a focus on the innovative topics of molecular, functional and structural imaging; experimental and clinical pharmacotherapy; vertigo and balance disorders; mathematical modelling; interaction between biological and technical systems (robotics), and functionality and quality of life;
- Offer new attractive educational paths and career images in clinical research for medical doctors, students of the natural sciences, and engineers;
- Supplement the existing excellence with groups of young scientists and professorships (tenure track). This should also be seen as an incentive that will attract the best young scientists;
- Incorporate the German Center for Vertigo and Balance Disorders (DSGZ) competence into the existing medical and biological graduate schools.

A European network for management of dizzy patients as well as for vertigo and balance research – "Dizzynet"– was founded in 2014.



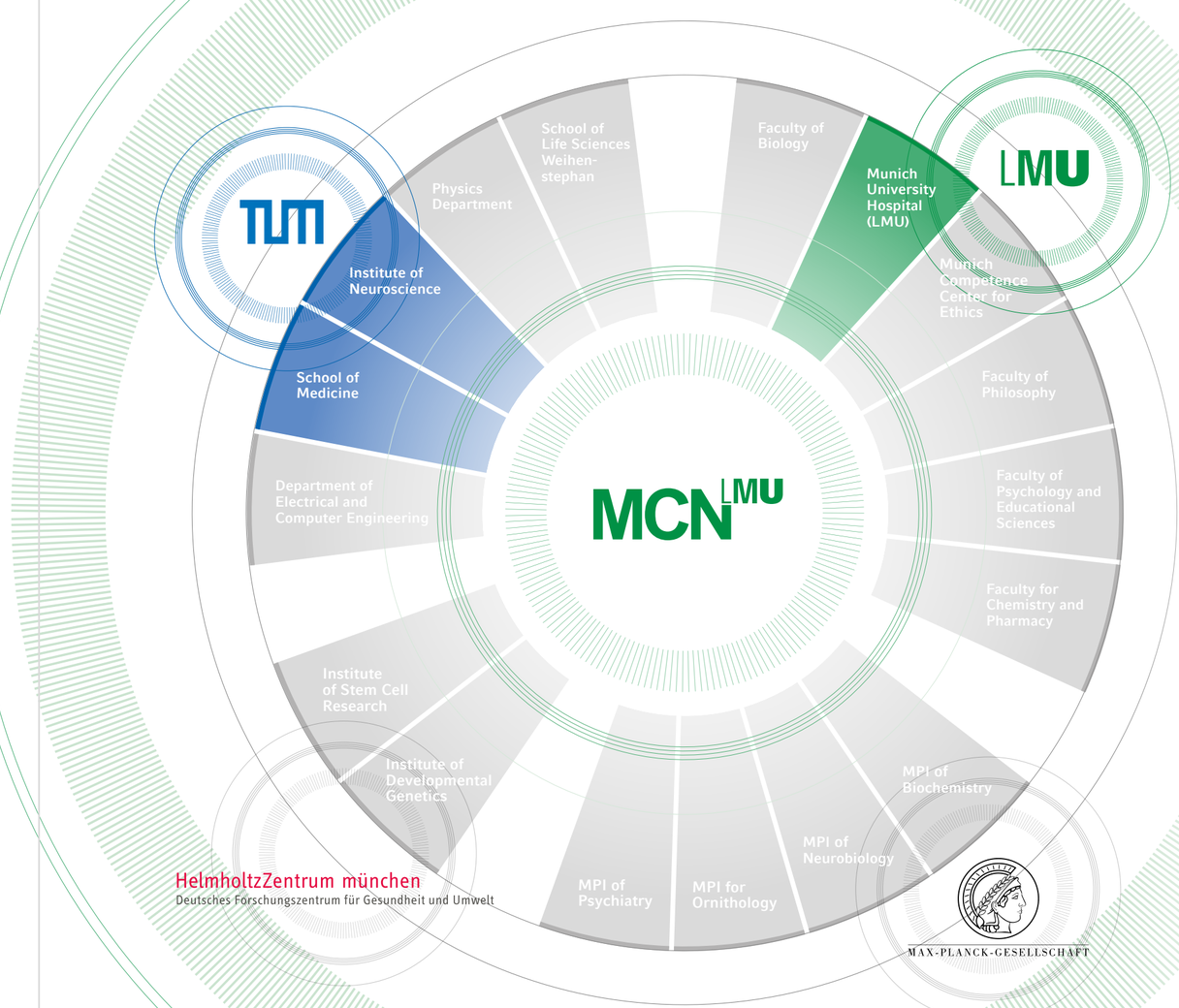
DZNE
Deutsches Zentrum für Neurodegenerative Erkrankungen in der Helmholtz-Gemeinschaft

DZNE

Deutsches Zentrum für Neurodegenerative Erkrankungen

Spokesperson: Prof. Dr. Dr. Christian Haass

The DZNE Munich was initiated in September 2009 with the idea to strengthen and increase the existing research efforts of both Universities (LMU Munich and Technical University of Munich) in the fields of neurobiology and neurodegeneration. To provide optimal research conditions the state of Bavaria decided to set up a new research building on the hightech campus of the LMU. This new research building will not only host all Munich-based DZNE groups, but will be complemented by the entire Department of Biochemistry. Moreover, the LMU received a major endowment for stroke and dementia research. This enabled the Medical Faculty to set up a new Institute for Stroke and Dementia Research (ISD see page 32), which will have approximately the same number of faculty as the DZNE Munich. Both institutes, the DZNE and the ISD, as well as the Department of Biochemistry are integrated into the new research building. This opened up completely novel interdisciplinary research strategies reaching from biophysics to patient oriented research.

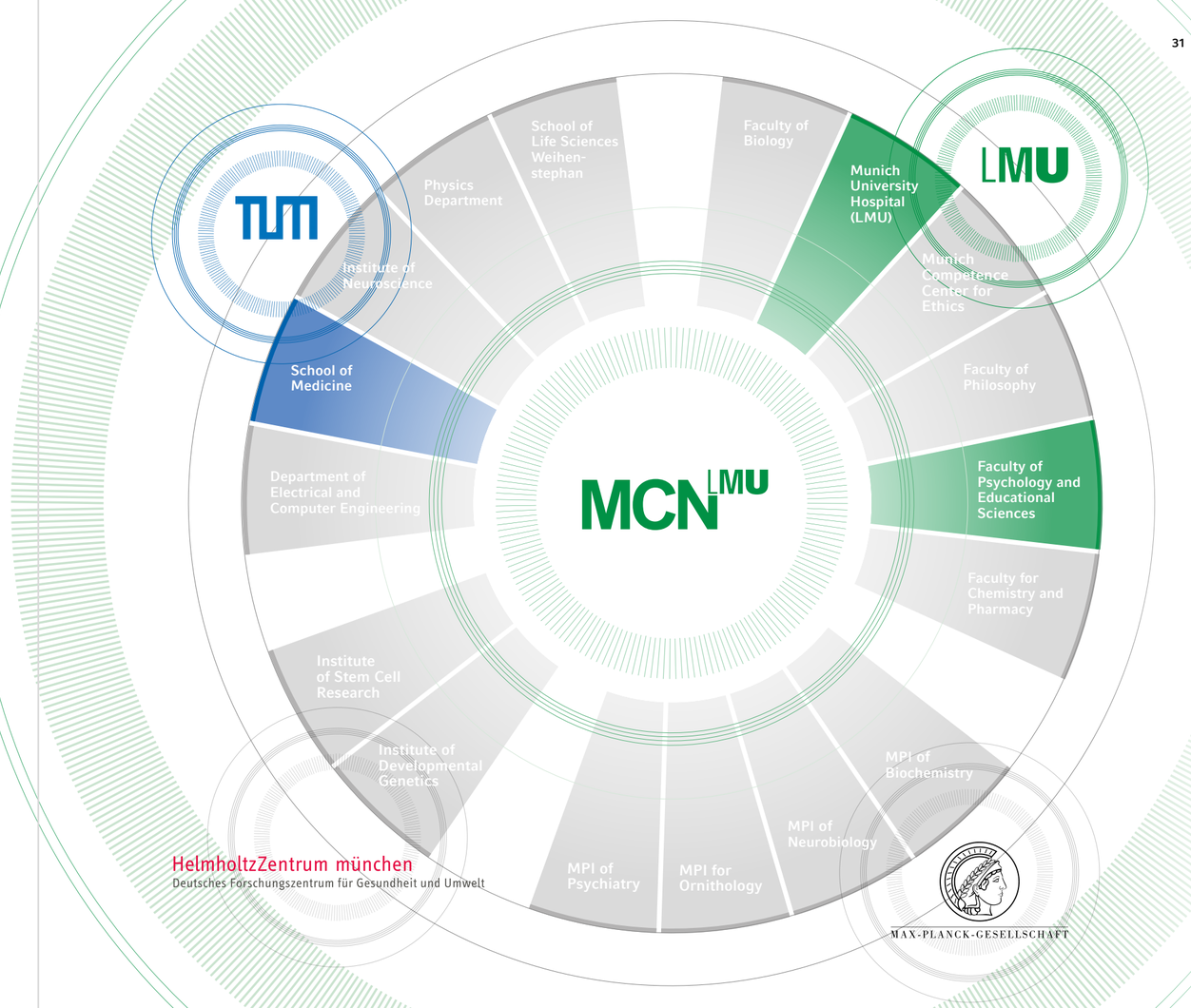


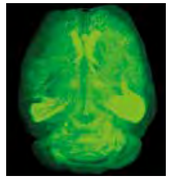


FOR 2293

Research Unit: Active Perception FOR 2293
Spokesperson: Prof. Dr. Hermann J. Müller

In contrast to traditional approaches to perception, "Active Perception" implies that perceptual processing does not simply lead to action, but is itself influenced by action-related processing – in a continuous exchange with the environment, involving adaptation to the statistical regularities in the environment *(priors)*. In the past two decades, there have been several new developments in the conceptualization of perception: (i) causal influence of action on perception, (ii) predictive coding, (iii) *situatedness* of the agent, and (iv) *utility* of an action alternative given the state of the external world. The thrust of the DFG research unit "Active Perception" (RU-AP) is to integrate these developments, which have hitherto been treated largely separately, into a coherent, unifying framework. Particular strands of work to be pursued within this framework encompass the whole perception-cognition-action loop, in particular: predictive, memory-based effects in visual processing (e.g., dimension weighting, contextual cueing, intentional binding); dynamic allocation of attention, and anticipatory receptive-field re-mapping, prior to saccadic eye movements and manual (e.g., grasping) actions, multi-modal perception and action, and the mathematical modeling of predictive perceptual processing. The N=11 individual projects are interdisciplinary by design, and use a variety of neuroscience techniques, besides behavioral approaches: EEG, fMRI, TMS, neuropsychological assessment.





Institute for Stroke and Dementia Research (ISD)

ISD

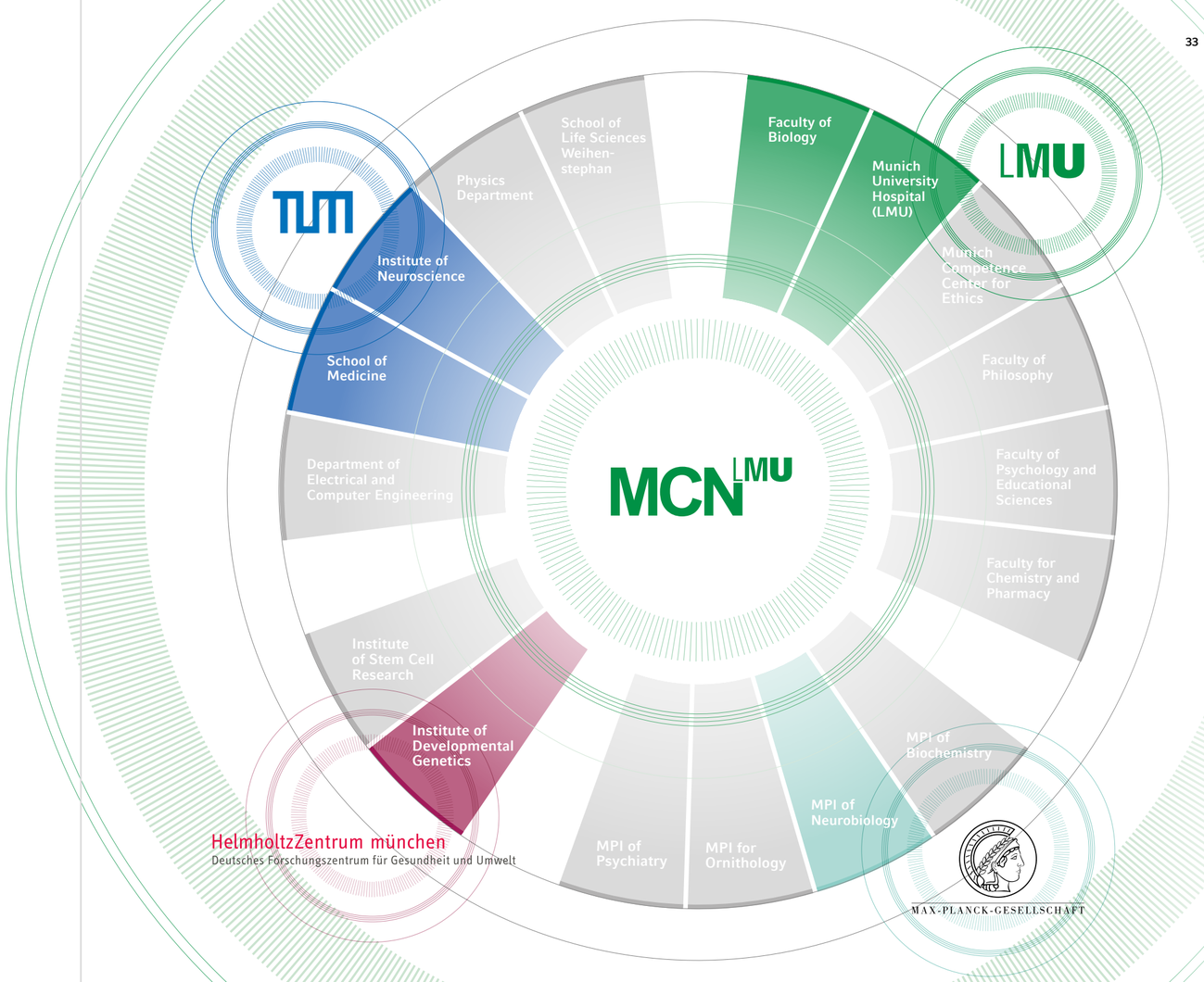
Institute for Stroke and Dementia Research
Director: Prof. Dr. Martin Dichgans

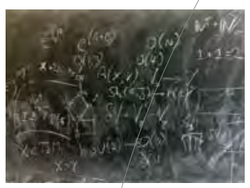
Stroke and dementia rank among the most pressing health issues in Europe. The Institute for Stroke and Dementia Research (ISD) is committed to improve options in early recognition, prevention, diagnosis and treatment of stroke and dementia. Our focus is on disease mechanisms and prevention while integrating basic and patient-oriented research.

A major research area is the identification of novel targets for stroke and dementia. The group aims to identify common and rare genetic variants for stroke through genome-wide approaches. Following the identification of susceptibility loci for atherosclerotic stroke we are now moving to exome chip analyses and whole exome sequencing as well as meta-analyses through our involvement in the METASTROKE consortium .

A second major focus of our work is small vessel disease (SVD). We aim to identify key mechanisms common to multiple SVDs. We further aim to understand how structural and dynamic changes in small arteries and microvessels contribute to the occurrence of brain lesions and are studying this in animal models of CADASIL and CARASIL.

We are further interested in the mechanisms of vascular cognitive impairment (VCI). Using new imaging techniques such as tract-based spatial statistics and voxel based morphometry the group aims to understand how vascular lesions in single or multiple brain regions contribute to deficits in distinct cognitive domains and how vascular and neurodegenerative pathology intersect in causing cognitive decline.



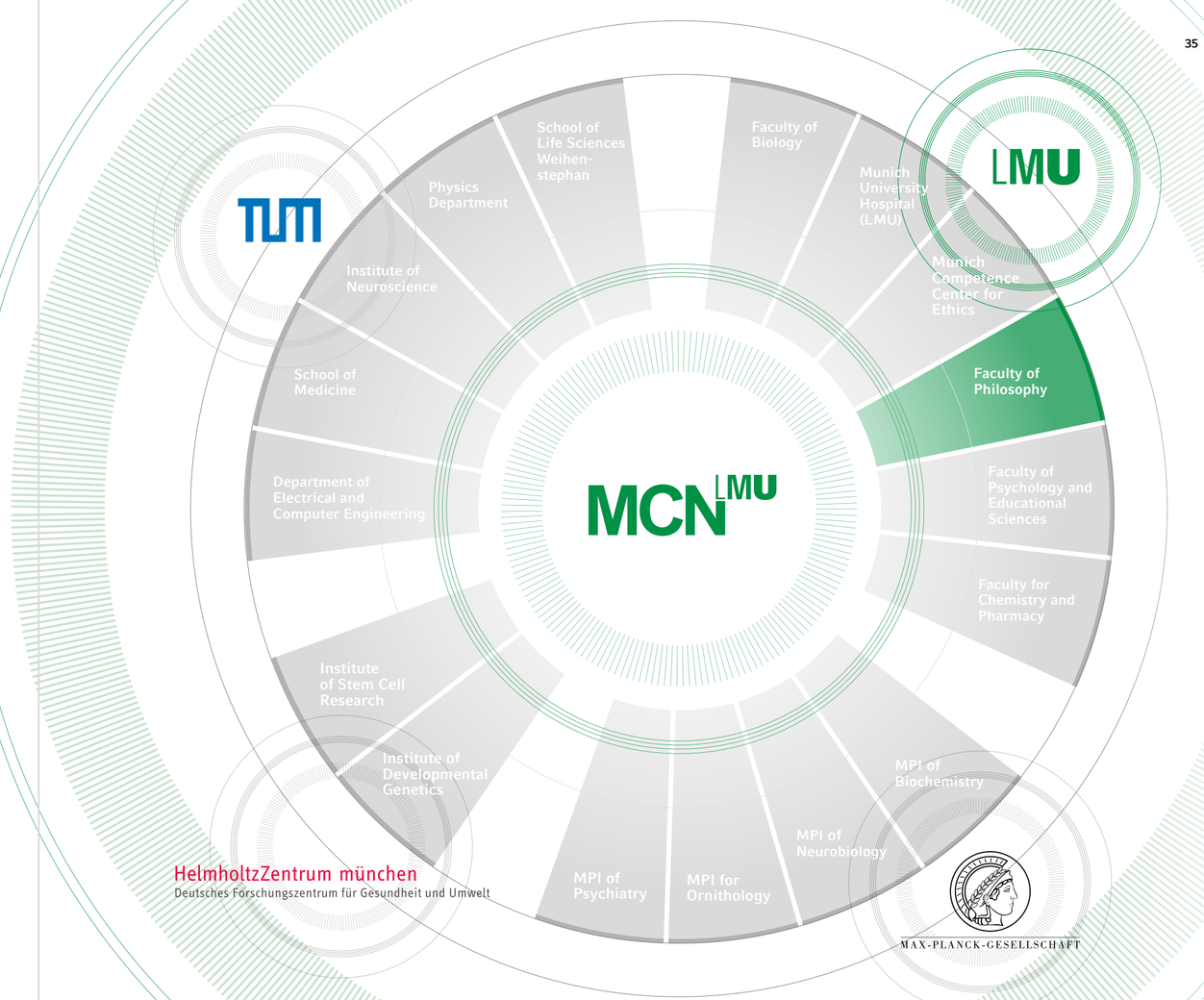


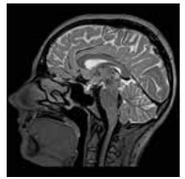
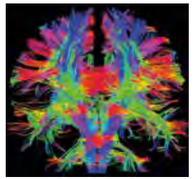
MCMP

Munich Center for Mathematical Philosophy

Prof. Dr. Stephan Hartmann / Prof. Dr. Hannes Leitgeb

Mathematical Philosophy, i.e. the application of mathematical methods in philosophy, is experiencing a tremendous boom in various areas of philosophy. Mathematical methods are now used not only in epistemology, the philosophy of language, the philosophy of science, and the philosophy of mathematics, but also in neurophilosophy, ethics, political philosophy and even in the philosophy of religion. The mathematical methods used to tackle problems and questions from these (and other) fields range from various logics and probability theory to modeling and simulation methods that are imported from the natural and social sciences. Indeed, much of the work done at the MCMP can be characterized as approaching philosophical problems and questions in exactly the same way scientists approach their problems. Besides the methodological similarities between Mathematical Philosophy and science, there are also many problems that are of common interest. Individual and group rationality is a case in point, where philosophers (and indeed several MCMP-ers) closely interact with social scientists – and there are many other examples. We consider the close connection between philosophy and science to be the best recipe to make progress in philosophy, which is ultimately the goal of the MCMP.



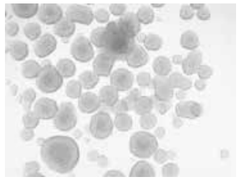




MRI Neuroscience Facility

A new research-dedicated MRI scanning facility

Under the umbrella of the MCN[LMU] and as part of a longer-term strategy to develop the neuro-imaging platforms available to the Munich neuroscience network, Prof. P. Falkai (Psychiatry) and Prof. H. J. Müller (Psychology), have recently applied for and been awarded a 'Major Research Instrumentation' grant by the DFG for the establishment of an MRI scanning facility dedicated to fundamental neuro-cognitive, neurological, and psychiatric research. Specifically, the award is for setting up an inner-city MRI imaging laboratory at the clinic of psychiatry and psychotherapy, which complements a linked facility to be established at the Großhadern campus ('tandem' award to Prof. M. Dichgans, ISD, DZNE). Both sites will have the same – Siemens Magnetom Prisma – 3T scanner, supporting the sharing of technical expertise and methodological developments. The inner-city facility will provide an integrative, state-of-the-art platform for neuroimaging research, permitting MRI methodology to be combined with EEG and eye-movement recording as well as TMS interventions in purpose-designed experimental paradigms.





Roche MCN[LMU]

Research group jointly supported by Roche and MCN[LMU]

Group leader: Dr. Stefan Stricker

The research aim of our research group is to investigate, which of the myriad of epigenetic marks have significant functional relevance in mediating brain stem cell or disease phenotypes.

Being supported by the academic network of the MCN[LMU] and Roche, as an industrial partner, allows us to benefit from an excellent work environment at MCN[LMU] while profiting from interactions with ongoing translational research at Roche. Physically placed at the newly opened BioMedical Center (BMC), we are in a place second to none to address a key question of molecular brain research: How are neural cell identity and diseases epigenetically controlled?

Recently, we, and others, have demonstrated that lineage reprogramming to pluripotency through forced expression of reprogramming transcription factors (termed induced pluripotent stem cell [iPSC] technology) can be applied to study epigenetic mechanisms in human brain cancers (Stricker et al., 2013; Stricker and Pollard, 2014). Such experimentally induced reprogramming can reveal how relevant cancer-specific and lineage-associated epigenetic changes are to maintain the malignant cellular state, but this approach is limited to widespread epigenomic changes. Therefore, we are currently using methods based on variants of the bacterial protein Cas9, to edit the cellular epigenome in an unprecedented and surgically manner ("epigenome editing"). These technologies allow manipulating individual chromatin marks (Stricker et al., in press), and even conducting epigenetic screens (Koferle et al., in press). Applying it to cellular models of neurobiology, we hope to find out how epigenetic mechanisms control brain cell features and how they contribute to neural diseases.




Research Center for Neurophilosophy and Ethics of Neurosciences

Research Center for Neurophilosophy and Ethics of Neurosciences
Director: Prof. Dr. Stephan Sellmaier

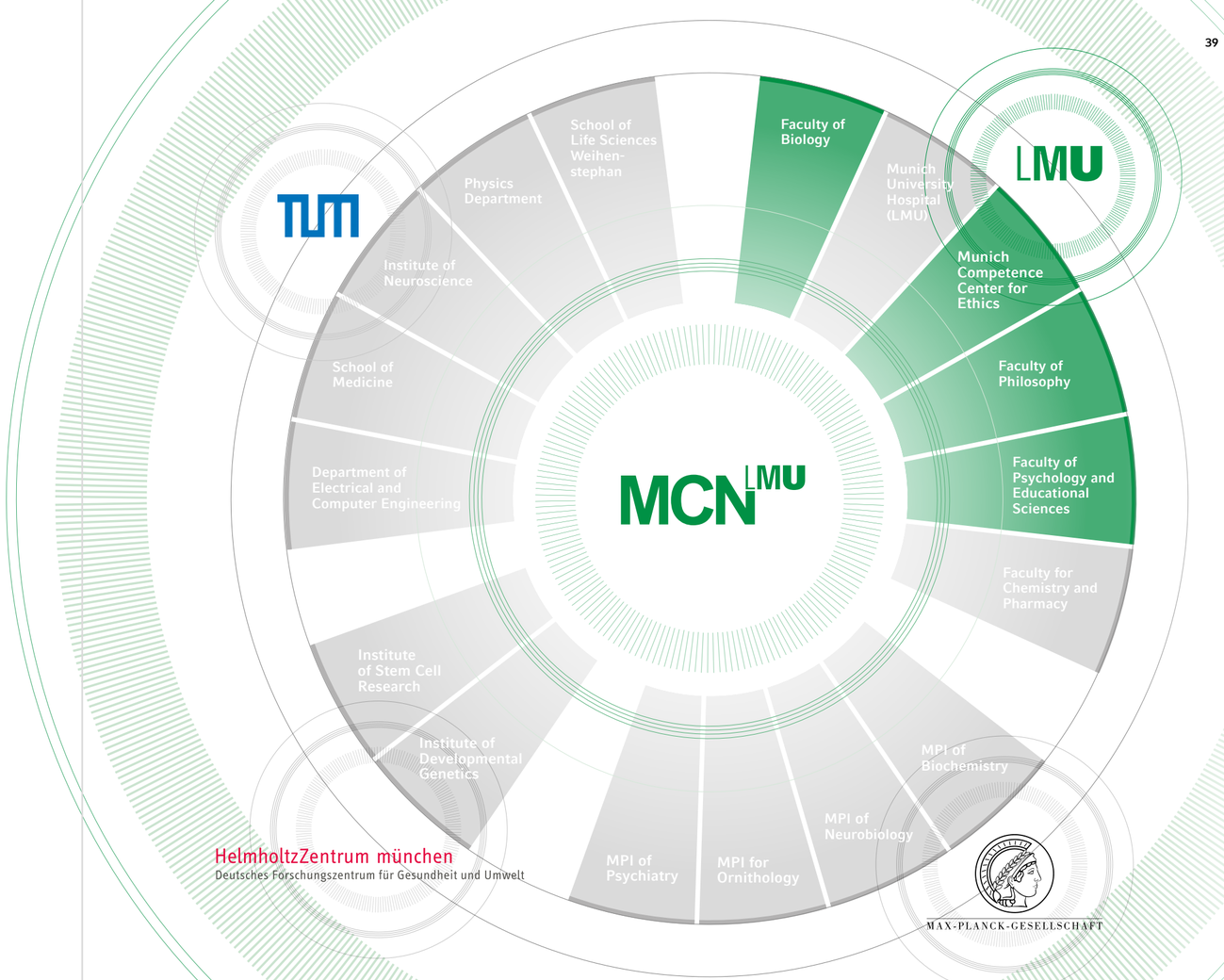
The Research Center for Neurophilosophy and Ethics of Neurosciences of the MCN[LMU] at the Faculty of Philosophy, Philosophy of Science and the Study of Religion investigates the philosophical implications of empirical findings in the cognitive sciences and initiates interdisciplinary research projects. Our main research focus is in the area of ethics (neuroethics and ethics of neuroscience), moral psychology, theory of action and philosophy of neuroscience.

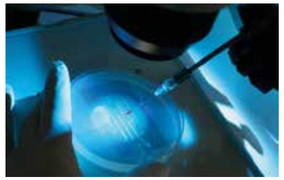
On the one hand, we provide the philosophical education for the master and PhD students at the GSN[LMU] through lectures and courses in neuroethics, philosophy of mind and philosophical action theory, whereas on the other hand, we run research projects in the above mentioned research areas.

Several members of the Research Center (Sellmaier, von Grundherr, Kaufmann, Pourabdolrahim, Selter, and Romano) conduct research in the interdisciplinary area of moral psychology and investigate implications for normative ethical theories. The empirical focus of our work is to understand processes of moral cognition and their interaction with social context. We are also particularly interested in developing, testing and critically evaluating measures for moral judgment and moral capacities.

In this area we engage with an active international debate about the philosophical implications of findings in moral psychology.

In our second – more methodological – research focus, we investigate the interplay between neuroscientific and cognitive findings and philosophical theorizing. In our focus on action theory (Sellmaier, Havlicek) we try to understand to which extent action explanations supplement equivalent neuroscientific explanations of body movements, as well as investigate related conceptual problems in the wider field of philosophy of mind (Lipski, Steinert, Yousefi Heris, Cheruvatur).



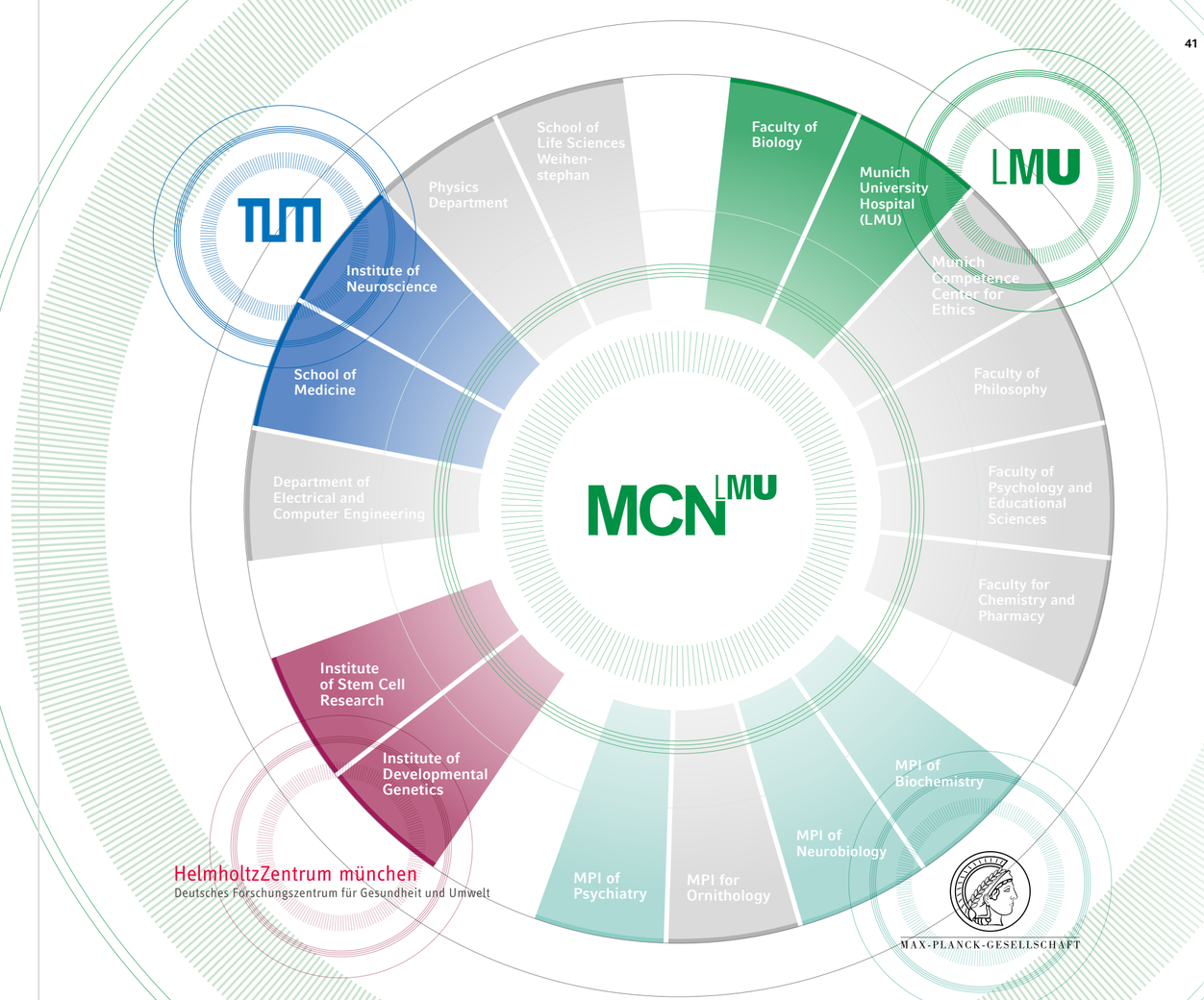


SyNergy
Munich Cluster for
Systems Neurology

SyNergy

Munich Cluster for Systems Neurology
Spokesperson: Prof. Dr. Dr. Christian Haass /
Prof. Dr. Thomas Misgeld

Systems Neurology is defined as a new research field where systems biology and systems neuroscience meet with clinical neurology to generate an integrative understanding of how neurological diseases emerge from the interplay of degenerative, immune, and vascular mechanisms. Traditional nosology holds that neurological diseases can be separated into mechanistically distinct families, including neurodegenerative, inflammatory, and vascular conditions. However, recent insights have revealed a more complex relationship between different disease mechanisms and prompted a rethinking of the relationship between these entities and their underlying functions. This forms the basic research concept of the Munich Cluster for Systems Neurology (SyNergy). Within the Cluster "Tandem Projects" are highly collaborative research projects aimed at improving the understanding of degenerative, inflammatory, and glio-vascular diseases. The projects combine expertise across traditional patho-mechanisms, as well as systems biology and systems neuroscience tools. Further more, in many projects the research efforts of basic scientists and clinicians are interconnected. This allows to combine approaches that range from *in vitro* models to investigator initiated trials.



Teaching

Teaching

The MCN[LMU] offers young researchers innovative teaching and training programs on different levels of education, taking students from their bachelor to a master or doctoral degree. Students benefit from the close cooperation of participating institutions and collaborative research or training entities, which provide the basis of the MCN[LMU] teaching concept.

LMU FACULTIES

Biology
Chemistry and Pharmacy
Medicine
Philosophy, Philosophy of Science and the Study of Religion
Psychology and Educational Sciences
Veterinary Medicine

TUM FACULTIES

Electrical and Computer Engineering
Life Sciences
Medicine
Physics

MAX PLANCK INSTITUTES

Biochemistry
Neurobiology
Ornithology
Psychiatry

HELMHOLTZ INSTITUTES

Developmental Genetics
Stem Cell Research
German Center for Neurodegenerative Diseases

UNDERGRADUATE
BSc PROGRAMS / AMGEN SCHOLARS
FACULTY FOR UNDERGRADUATE NEUROSCIENCE

MASTER OF SCIENCE NEUROSCIENCES

NEURO-COGNITIVE MASTER OF SCIENCE PSYCHOLOGY

GSN[LMU]
GRADUATE SCHOOL OF SYSTEMIC NEUROSCIENCES

BCCN
Bernstein Center for Computational Neuroscience

DZNE
German Center for Neurodegenerative Diseases

DSGZ
German Center for Vertigo and Balance Disorders

ISD
Institute for Stroke and Dementia Research

CRC 870
Assembly and Function of Neuronal Circuits

IMPRS-LS
International Max Planck Research School for Molecular Life Sciences

IMPRS-TP
International Max Planck Research School for Translational Psychiatry

RTG 2175
Perception in Context and its Neural Basis

SyNergy
Munich Cluster for Systems Neurology

Research Center for Neurophilosophy and Ethics of Neurosciences

International Partners* (BCRM Utrecht, CBS Harvard, CofC/MUSC, ENP, HBI, Univ. Innsbruck, QBI)

POSTDOCTORAL
HARVARD-LMU YOUNG SCIENTISTS' FORUM
QUEENSLAND BRAIN INSTITUTE-MCN[LMU] SYMPOSIUM

* For a selection of international partners, see pages 55-59

Graduate School of Systemic Neurosciences
LMU Munich

GSN[LMU]

Program Speaker: **Prof. Dr. Benedikt Grothe**
Program Coordinator: **Lena Bittl**

Graduate School of Systemic Neurosciences – GSN[LMU]

Celebrating 10 years of Excellence in Graduate Neuroscience Education

Founded in 2006 within the framework of the German Excellence Initiative, the Graduate School of Systemic Neurosciences is the teaching entity in Munich dedicated to providing innovative and comprehensive neuroscience education. The school is embedded within the neuroscience research network of the MCN[LMU] and works in tight collaboration with the master programs Neurosciences and Neurocognitive Psychology, offering an integrated teaching program taking students from their bachelor degree studies to a Master or PhD degree and spanning all areas of neuroscience.

As an interdisciplinary institution of LMU Munich, the GSN[LMU] is governed independently, and awards an internationally recognized PhD degree independent of the traditional faculty structure of the universities. Students may carry out research with faculty members at LMU Munich, the Technical University of Munich, Helmholtz Institutes and Max Planck Institutes, while benefiting from comprehensive academic, administrative and personal support from GSN[LMU] staff and structures.

The School's Objective

Do you want to know how our brains work? This is one of the most exciting questions of modern life sciences, and is a reason why neuroscience is one of the most rapidly growing research fields. The focus of the GSN[LMU] reflects a systemic point of view, without neglecting molecular and cellular mechanisms.

As the teaching entity of the MCN[LMU], students are exposed via seminars, workshops, lab visits and special lectures on cutting-edge topics to a combination of the most varied methodological approaches in biology, computational neuroscience, neurophysiology, neuropsychology, philosophy of science and neurophilosophy. This opens up greater capacity for new questions, innovative approaches and concepts. Structured Teaching Sections, comprised of leading researchers and students, regularly meet to assess course offerings. As active participants within this dynamic network, students keep a broad scope, as their individual research becomes increasingly focused, and are actively engaged in a multidisciplinary neuroscientific discourse. Students with unique cross-disciplinary projects, such as those pertaining to the growing field of neurophilosophy, may furthermore be eligible for scholarship support.

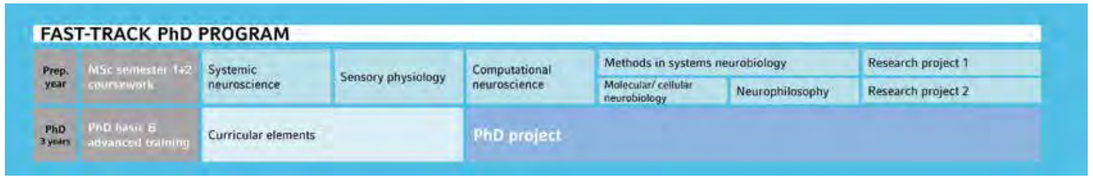
All students enrolled in the GSN[LMU] benefit from individual and interdisciplinary mentoring by leading researchers from different fields of neuroscience and profit from Munich's exceptionally diverse academic environment, allowing them to develop within and beyond their specific professional qualifications. Students are prepared to take on

the challenges of exciting careers in science, industry, the public sector and more by supplementing intensive scientific training with a wide range of workshops focusing on intercultural communication, publishing, grant writing, teaching and management issues. International students account for more than 50% of our student population and receive extensive support from the very beginning to help them ease quickly into daily and scientific life in Munich. In our 10th year, over 200 exceptional students are currently enrolled in our programs with a rapidly growing alumni network.

Our applicants come from a diverse range of academic backgrounds and undergo a stringent and highly competitive 2-stage application process with an admissions rate of maximally 10%. Applicants for the GSN[LMU] PhD program must hold a MSc or equivalent degree in biology, psychology, medicine, physics or related fields. Especially promising candidates holding a Bachelor degree may be recommended by the selection committee for the Master program or the Fast-Track PhD program, linking the programs via a "master-based" preparatory year, based on individual qualifications. We seek to recruit students best suited to excel within our multidisciplinary and innovative neuroscience educational framework.

World-Class PhD training at GSN[LMU]

First and foremost, our PhD program is fully integrated into one of the world's premier neuroscience hubs and benefits from close interactions with leading neuroscience experts in the fields of Behavioral and Cognitive Neuroscience, Cellular and Circuits Neuroscience, Clinical Neuroscience, Computational Neuroscience, Developmental Neuroscience, Molecular Neuroscience and Neurophilosophy. Thus, the program structure supports interdisciplinary thinking, while ensuring that students stay on track via close monitoring. All GSN[LMU] students have a Thesis Advisory Committee (TAC), comprised of 3 or more researchers from different fields, which may include junior or external faculty, based on the scope and aims of the project. Written Training Objectives are evaluated yearly and updated according to project development and demands. The TAC offers continuous support from the beginning until the end of the PhD studies. In addition to discussing each student's progress



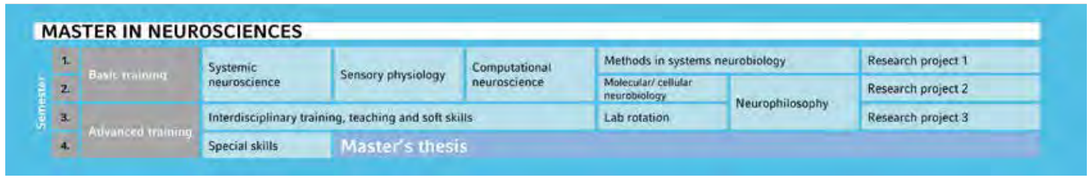
regarding her/his project and publishing options, the TAC also counsels on options for meeting GSN[LMU] coursework requirements and on career options following the PhD. Coursework (30 ECTS credit points) ensures that students will gain solid methodological expertise and also communication, presentation and teaching skills. Based on individual needs at the different stages of the PhD program, the TAC may recommend a variety of methods courses, lectures, summer schools, lab visits, conference attendance and teaching in the Training Objectives to fulfill requirements.

In addition to the scientific program, students take part in numerous informal social activities organized by the GSN[LMU], including orientation tours, dinners, hiking trips in the Bavarian Alps, movie nights, theater visits and much more.

The successfully completed program concludes with the thesis defense and the awarding of the internationally recognized degree PhD in Systemic Neurosciences at our annual GSN[LMU] Graduation Day Ceremony. Following a stately ceremony, graduates join the growing GSN[LMU] alumni network, with continued access to the GSN[LMU] environment and updates on neuroscience-related career options and job openings.

Innovative Fast-Track PhD Education

In many countries, it is standard for students to enter into a PhD program following the completion of a Bachelor degree. Students from Germany or other European countries however generally enter PhD programs with a Master degree or equivalent. The GSN[LMU] Fast-Track PhD program offers highly qualified students the opportunity to enter the program with a Bachelor degree in neuroscience related areas. After successful completion of a preparatory year in conjunction with the MSc Neuroscience curriculum, they may be admitted into the coursework and dissertation phase of the PhD program or continue in the MSc Neuroscience program. A special advisory commission carefully monitors work of Fast-Track students with coursework recommendations based on individual backgrounds and goals. The advisory commission assesses final results and decides if a student is best suited to continue in the MSc or PhD track. The program is highly compatible to programs worldwide, both in terms of structure and the flexibility to change the course based on individual student progress. Regardless whether suitable candidates enter with a Bachelor degree, a Master (or equivalent) degree in directly related fields or with a degree in a more distantly related field, the GSN[LMU] Fast-Track PhD program is set up to accommodate individual needs and ensures that all of our students gain profound knowledge in different areas of neuroscience.



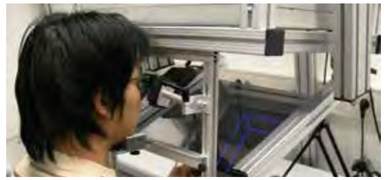
ENB Master Program Neurosciences (Faculty of Biology): Basic and individual teaching in a dynamic and interdisciplinary scientific field

The LMU master program in neurosciences at the Faculty of Biology was founded in 2006 with the support of the Elite Network of Bavaria (ENB) and is embedded into the Graduate School of Systemic Neurosciences and the Munich Center for Neuroscience – Brain & Mind. It provides a basic, individualized teaching concept for bachelor and master students with an educational background in neurosciences but also from other related fields such as life sciences, math, physics, computational sciences, engineering and, unique to our program, philosophy.

Selected students receive intensive individual tutoring and get the chance to study in a challenging scientific environment. Our program continually evaluates and improves methods for educating the newest generation of neuroscientists. With an excellent understanding of the molecular, cellular and systemic principles of neurobiology, our students acquire a deeper knowledge of neuron-neuron interaction, the dynamics of neuron-glia interaction, the rules of information transfer in simple and complex circuits of single brain centers, the interaction of different brain centers, and the function of the human brain. The MSc Neuroscience teaching concept is based on four major themes: general education, individual research training, complementary skills and mentoring, giving students both excellent theoretical knowledge and practical proficiency in our key focus areas.

A host of interdisciplinary lectures, workshops, hands-on methods courses, and research visits in international partner labs organized by the GSN[LMU] are open to MSc Neurosciences students. Courses aimed to develop and improve communication, management and teaching skills round off the curriculum and prepare students for the next academic or career steps. Throughout the MSc program, students receive personal academic counseling and support. From the beginning, students interact with GSN[LMU] PhD students and faculty and become active members in the Munich neuroscience network.

Elite Network of Bavaria



NCP

Program Director: **Prof. Dr. Hermann Müller**
Teaching Coordinator: **Prof. Dr. Thomas Geyer**
Administrative Coordinator: **Nadine Gögler**

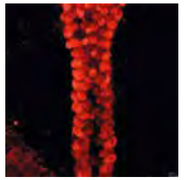
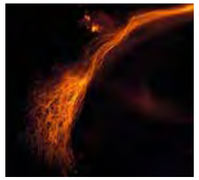
ENB Master program Neuro-Cognitive Psychology (Faculty of Psychology)

The main goal of the Neuro-Cognitive Psychology (NCP) program is to provide a selected group of students, to be recruited from around the world, with a state-of-the-art education in this brain research-oriented discipline of psychology. In terms of its emphasis on basic science, as well as its desired level of achievement, the NCP course of study is competitive with similar international study programs. What sets the NCP program apart from these, however, is its experimental-psychological focus within the field of brain research and that it offers an applied focus beyond the relaying of basic-science knowledge.

The aim in the first two semesters is to relay state-of-the-art basic-science knowledge within an optimally structured curriculum. Subsequently, the second stage of study provides students with the opportunity to extend and deepen their knowledge within individual areas of specialization. At this stage, students also choose an innovative applied subject area, such as "Neuro-Cognitive Ergonomics" or "Experimentally-Based Diagnostics of Basic Neuro-Cognitive Functions", in addition to furthering their basic-science studies.

The Neuro-Cognitive Psychology Program:

- An English-language elite study program designed for a selected group of outstanding students.
- Taught by leading scientists in their fields, both at the University of Munich (home institution) and at national and international (European) partner institutions.
- Major focus on attentional and executive control of vision and action.
- Interdisciplinary in focus,integrating state-of-the-art theoretical and methodological approaches of Experimental Psychology and the Cognitive Neurosciences (Neurobiology, Neurology, Neuropsychology, Neuropsychiatry).
- Research – oriented, providing advanced training in basic-science Neuro-Cognitive Psychology as well as its applications in the emergent fields of Neuro-Cognitive Diagnostics and Ergonomics.
- Consists of intensive, small-group and individual teaching, using both traditional and innovative methods (e.g., debating club seminar).
- Provides individual supervision and advising through a personal mentor system.
- Awards successful students with an international Master's degree, which qualifies the holder for professional work in cutting-edge scientific and applied (e.g., health and industrial) settings.

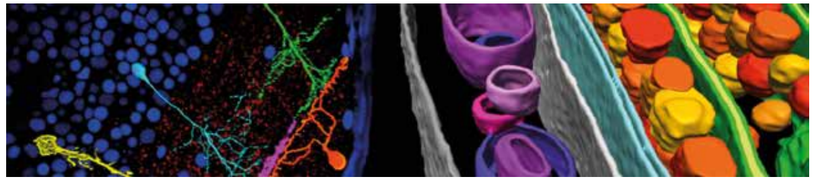

RTG 2175
PERCEPTION IN CONTEXT AND ITS NEURAL BASIS

RTG 2175

Spokesperson: **Prof. Dr. Christian Leibold**
Administrator: **Verena Winkler**

RTG 2175: Perception in Context and its Neural Basis

We do not perceive the world as it is in absolute terms, but a version of the world that is filtered and modulated by our intentions and expectations that are derived from previous experience. Presently, we miss a coherent theory of the functional and mechanistic underpinnings of such contextual modulations both on the perceptual level and on the level of the underlying neuronal activity. In particular, their advantages from a functional and ecological perspective are unclear. Identifying the underlying principles of contextual modulations requires an inherent and strongly interdisciplinary research environment, ranging from neurobiology, psychology and medicine to computational neuroscience. The Research Training Group (RTG) 'Perception in Context and its Neural Basis' aims to bridge this gap by providing a topically focused and inherently cross-disciplinary training program that enables early researchers to not only excel in their own discipline, but also be able to profoundly interact with colleagues from other research fields. Each doctoral candidate and each project has two (or more) supervisors covering distinct methodological backgrounds. The RTG tightly interlocks with the structured PhD training environment of the Graduate School of Systemic Neurosciences, with full access to its teaching measures (e.g. TACs; Fast-Track curriculum) and content.



IMPRS
From Biological Structures to Neural Circuits

IMPRS-LS

Program Speaker: **Prof. Dr. Elena Conti, MPI of Biochemistry**
Program Coordinator: **Dr. Hans-Joerg Schaeffer, MPI of Biochemistry**

International Max Planck Research School for Molecular Life Sciences: From Biological Structures to Neural Circuits

The IMPRS-LS is dedicated to the education and training of the world´s most promising young researchers in the fields of life science.

The PhD program brings together two renowned Munich based Max Planck Institutes, the MPI of Biochemistry and the MPI of Neurobiology as well as two leading partner-universities, the Ludwig-Maximilians-Universität (LMU) and the Technische Universität München (TUM). IMPRS-LS also works in close collaboration with the GSN[LMU].

Currently, 134 top-class students, of which 112 are enrolled at the LMU and 22 at the TUM, are undertaking their PhD with IMPRS-LS and close to 200 students have already successfully completed their doctoral studies. The diversity in our PhD program, both in terms of people and research, is vital to our success as a cutting edge research school; around half of our students are German and the remaining half come from all over the world.

Our school's particular research activities center around three distinct but well connected research branches: our group leaders and their students strive to uncover molecular mechanisms regulating biological processes, analyze the resulting complex biological systems and decipher the intricate network of neural circuits leading to corresponding behavioral responses.

Whilst world class research is a central part of our program, we are also committed to providing our students with dedicated workshops and access to the most relevant training opportunities to ensure our graduates remain highly competitive in the job market. We strive to encourage collaboration between faculty members and local partner institutions through the organization of both internal and cross campus events, thereby providing platforms for our students to communicate innovative and cutting edge research. Combined with a focus on early independence in research, our PhD program ensures those aiming for a successful career in science have the very best starting platform.

INTERNATIONAL MAX PLANCK RESEARCH SCHOOL FOR TRANSLATIONAL PSYCHIATRY

IMPRS
Translational Psychiatry

IMPRS-TP

Program Speaker: **Prof. Dr. Alon Chen**
Program Coordinator: **Dr. Michael Mende**

International Max Planck Research School for Translational Psychiatry

The IMPRS-TP PhD program provides first class training to internationally outstanding students who are passionate about psychiatric research.

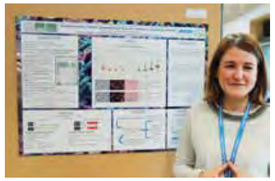
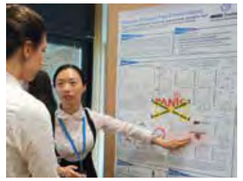
Successful research in clinically-oriented neuroscience and psychiatry needs to bridge findings from the molecular to the systems level and integrate basic science and clinical knowledge.

IMPRS-TP's research aim is the translation of basic and clinical research into practical solutions for improved diagnosis and treatment of people affected by psychiatric disorders such as depression, schizophrenia, mood and anxiety disorders.

We provide interdisciplinary training in molecular, cellular and systemic psychiatric research in an environment of scientific excellence and collaboration to foster translational research. During the course of their studies, students are exposed to a wide range of scientific questions and methods covering areas of molecular medicine, neuroscience, psychiatry, neuroimaging, design-based stereology and clinical studies.

In addition to traditional PhD positions, we offer a unique integrated PhD/residence program in psychiatry for medical doctors. Highlighting the translational facet, PhD students receive insights into clinical aspects of disease and young medical doctors gain research expertise while also developing their clinical skills. Currently, 12 outstanding students enrolled at the LMU are pursuing their PhD with IMPRS-TP.

IMPRS-TP is a joint initiative of leading scientists from the Max Planck Institute of Psychiatry, the Max Planck Institute of Neurobiology and the Ludwig Maximilians University, Munich. Further collaborations have been established with the Munich Medical Research School (MMRS) and the Graduate School of Systemic Neurosciences (GSN[LMU]). IMPRS-TP is co-funded by the Else-Kröner-Fresenius Foundation.


AMGEN Foundation
Inspiring the Scientists of Tomorrow

ASP

Faculty Director: **Prof. Dr. Benedikt Grothe**
Programme Executive Advisor: **Lena Bittl**
Programme Director: **Anca Ionescu (since September 2016), Dr. Raluca Goron (until September 2016)**

Amgen Scholars European Undergraduate Summer Research Programme: From Molecules to Behavior

Amgen Scholars at LMU Munich engage in 9 weeks of intensive laboratory research. Each summer up to 20 undergraduate students gain exposure to cutting edge science in laboratories at LMU Munich's hightech campus offering a unique academic and scientific life science environment with numerous renowned life science research institutions and world leading researchers.

Scholars conduct mentor-guided, hands-on research in the fields of biochemistry, cell, developmental and molecular biology, genetics, microbiology, molecular medicine, neuroscience, computational neuroscience, cancer research, plant sciences and proteomics.

The research programme includes:

- 4 day orientation retreat in the Bavarian countryside
- Weekly seminars and workshops on state-of-the art research topics and methods, bioethics, poster design and presentation, abstract writing and scientific career paths
- Networking events with local graduate students and extra-curricular excursions
- Concluding local symposium with poster presentations
- Participation at the European Amgen Scholars Summer Symposium at the University of Cambridge

The Amgen Scholars Programme aims to create balanced top-level educational opportunities across Europe by supporting the mobility and networking of academics at a very early stage, thus enhancing the interest of the participants in a scientific career.

Targeted group

Selected undergraduate students from relevant fields, coming from European countries (according to the European Higher Education Area (EHEA)).

In Europe the programme is conducted in partnership with the University of Cambridge (UK), Karolinska Institutet (Sweden), Institut Pasteur (France) and ETH Zürich (Switzerland). The programme is financed by the Amgen Foundation.


LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN
COLLEGE of CHARLESTON 1770
FUN Faculty for Undergraduate Neuroscience building the future

FUN

Program Coordinators: **Dr. Alexander Kaiser (LMU)**
Prof. Dr. Michael Ruscio (College of Charleston)
Prof. Dr. Chris Korey (College of Charleston)

Faculty for Undergraduate Neuroscience – Summer Course "Neuroscience Seminar in Germany"

In 2011 the Graduate School of Systemic Neurosciences at LMU together with the Charité Medical University in Berlin and the College of Charleston (USA) launched an international summer school "Neuroscience Seminar in Germany" with the Faculty for Undergraduate Neuroscience (USA). The FUN is an international initiative that is focused on neuroscience education and research at the undergraduate level. FUN's members and supporters include businesses and organizations; private liberal arts colleges, state and research university departments and programs; and individual faculty and students, all sharing a common interest in undergraduate neuroscience.

The mission of FUN is:

- Enhancing undergraduate participation in research and the presentation of research at the SFN meeting (Society for Neuroscience, USA)
- Disseminating innovations in undergraduate neuroscience education
- Recognizing excellence in undergraduate neuroscience education
- Developing national and regional networks that enhance undergraduate neuroscience education and research and faculty development

In order to further develop and enhance the international neuroscience networks, undergraduate students and faculty members of FUN visit Munich and Berlin each for a 2-week summer school on Neuroscience. The courses include lectures, practical course work and lab visits throughout the faculty of the Graduate School of Neurosciences in Munich and the Graduate School of Mind and Brain in Berlin. Both Graduate Schools are members of the German Graduate Schools of Neuroscience (http://www.neuroschools-germany.com) and cooperate on different educational levels. In additon to the scientific education, the students have many opportunities to socialize with local students and faculty members and visit local and regional attractions, like alpine excursions, city tours and of course beer gardens. The summer school is a great success for students and faculty and will definitely be continued on a regular basis. To get a glance about the long-lasting impression and enthusiasm that the summer school evoked in the students, you may watch a YouTube video (http://blogs.cofc.edu/germanneuro), which has been set together by FUN students!

Based on the well-established "Neuroscience Seminar in Germany" the Munich Center for Neurosciences – Brain & Mind, the College of Charleston and the Medical University of South Carolina initiated an Academic and Student Exchange Agreement to further strengthen the mutual collaboration and cooperation in science and training opportunities for students.



CENTER FOR BRAIN SCIENCE

LMU-Harvard Young Scientists' Forum (YSF)

CBS Executive Director: **Dr. Kenneth Blum**
MCN[LMU] Managing Director: **Prof. Dr. Oliver Behrend**

Harvard University - Center for Brain Science

Researchers at the Center for Brain Science (CBS) aim to understand:
- How neuronal circuits govern behavior and vary between individuals
- How neuronal circuits change during development and aging
- How these circuits affect neurological and psychiatric disorders

To accomplish this mission, CBS brings neuroscientists together with physical scientists and engineers to develop new tools for neuroscience. Members are drawn from the Faculty of Arts and Sciences, the Department of Neurobiology at the Harvard Medical School, the School of Engineering, and Harvard-affiliated hospitals.

Since 2009, the LMU-Harvard Young Scientists' Forum (YSF) "From Molecules to Organisms" seeks to annually unite researchers from Harvard University and LMU Munich, bringing PhD students and postdoctoral fellows in touch with core faculty from both universities. To achieve that, the meeting organized under the umbrella of the MCN[LMU]/CBS, takes place on a yearly basis alternating between the Center for Avanced Studies (CAS) in Munich and the Center for Brain Science at Havard University. The goal is to create and maintain an international framework for an interdisciplinary exchange of ideas. The YSF is supported by the LMU's International Office and the excellence Cluster for Integrated Protein Science Munich (CIPSM).



THE UNIVERSITY OF QUEENSLAND AUSTRALIA | QBI
Queensland Brain Institute

QBI-MCN[LMU] Symposia

QBI Director: **Prof. Dr. Pankaj Sah**
QBI Administrative Coordinator: **Alison van Niekerk**

Queensland Brain Institute

The Queensland Brain Institute (QBI) was established in 2003, and aspires to shed light on fundamental mechanisms regulating brain function in health and disease, thereby deepening the understanding of brain circuitry and underlying function. To this end, QBI researchers investigate several key areas (listed below) using a number of model systems from fruit flies, honey bees, worms and mice all the way to humans:
- Cognition and behaviour
- Computation and neuronal circuits
- Neurogenesis and neuronal survival
- Genetics and epigenetics
- Neuroimaging
- Neuronal trafficking
- Neuronal development and connectivity
- Sensory systems
- Synaptic function

In collaborations with clinicians and commercial partners, new discoveries are used as the basis to develop new therapeutic approaches to ameliorate the effects of neuronal disorders such as dementia, schizophrenia, motor neuron disease (MND), and anxiety and depression.

Together with the Queensland Brain Institute (QBI), the Munich Center for Neurosciences and the embedded Graduate School of Systemic Neurosciences co-founded the QBI-MCN[LMU] Symposia Series in 2011. The symposia aim to enhance national and international visibility for both institutions. The concept of collaboration embraces an exchange of MSc and PhD students for summer schools, research projects including long term student exchanges (1-2 years) and ongoing short-term exchanges (2-3 weeks), as well as regular reciprocal faculty visits and teaching.

ENP

ENP Director: **Prof. Dr. Serge Charpak**
Graduate Program Directors: **Dr. Laure Bally-Cuif & Dr. Laurent Venance**
Graduate Program Manager: **Laura Peeters**

École des Neurosciences Paris Île de France

The École des Neurosciences de Paris Île-de-France (ENP) is a foundation created in 2007 and instigated by the French Ministry of Research as a Thematic Network for Advanced Research, which aims to promote research and higher education. The ENP network brings together more than 100 neuroscience research teams, located in 23 centers of the Paris region, investigating in multidisciplinary fields of research (see below).

ENP fields of research:

- Neurogenetics/neurodevelopment
- Neuropharmacology/cell signaling
- Neurophysiology/systems neuroscience
- Neurological and psychiatric diseases
- Cognitive neurosciences/ neuropsychology
- Computational neurosciences/ neural theory

A collaboration between the Graduate School of Systemic Neurosciences and École des Neurosciences de Paris Île-de-France (ENP) was recently established, aiming to broaden the possible interactions between ENP and GSN[LMU] students, as well as supporting opportunities for postdoctoral positions. Additionally, this collaboration enables researchers and students to attend GSN[LMU] and ENP symposia, like the GSN[LMU]/ENP joint Neurophilosophy Workshop "Predictive Brain" in San Servolo, Italy (2015).

SPIN

Program Directors: **Prof. Dr. Georg Dechant & Prof. Dr. Francesco Ferraguti**
Program Coordinator: **Sheela Braganca**

Signal Processing in Neurons

The SPIN doctoral school is a joined program set up by the Medical University of Innsbruck and the University of Innsbruck. It was established in September 2007 with the support of the Austrian Science Fund (FWF).

Benefits:

- Individual supervision and monitoring (individual thesis steering committee)
- A highly structured SPIN-specific educational program
- Lab rotations in the 12 participating institutions
- Funded research exchange in international labs
- Retreats and social activities
- State-of-the-art facilities and resources
- Personal and career development
- PhD student salary as suggested by the FWF (2.024,90€ gross per month) for 3 year as well as health insurance and social benefits

Key Points:

- Duration of degree: 3 years
- Degree awarded: PhD (Doctor of Philosophy)
- Supervised research project and formal coursework
- Application requirements: degree in life sciences, bioinformatics, chemistry, pharmacy, psychology or human medicine graduate
- Recruitment procedure: written application and personal interview

SPIN in Numbers:

- PIs: 10
- Departments: 8
- Current Students: 18 (11 female, 7 male)
- Alumni: 29 (18 female, 11 male)
- Nationalities: 15

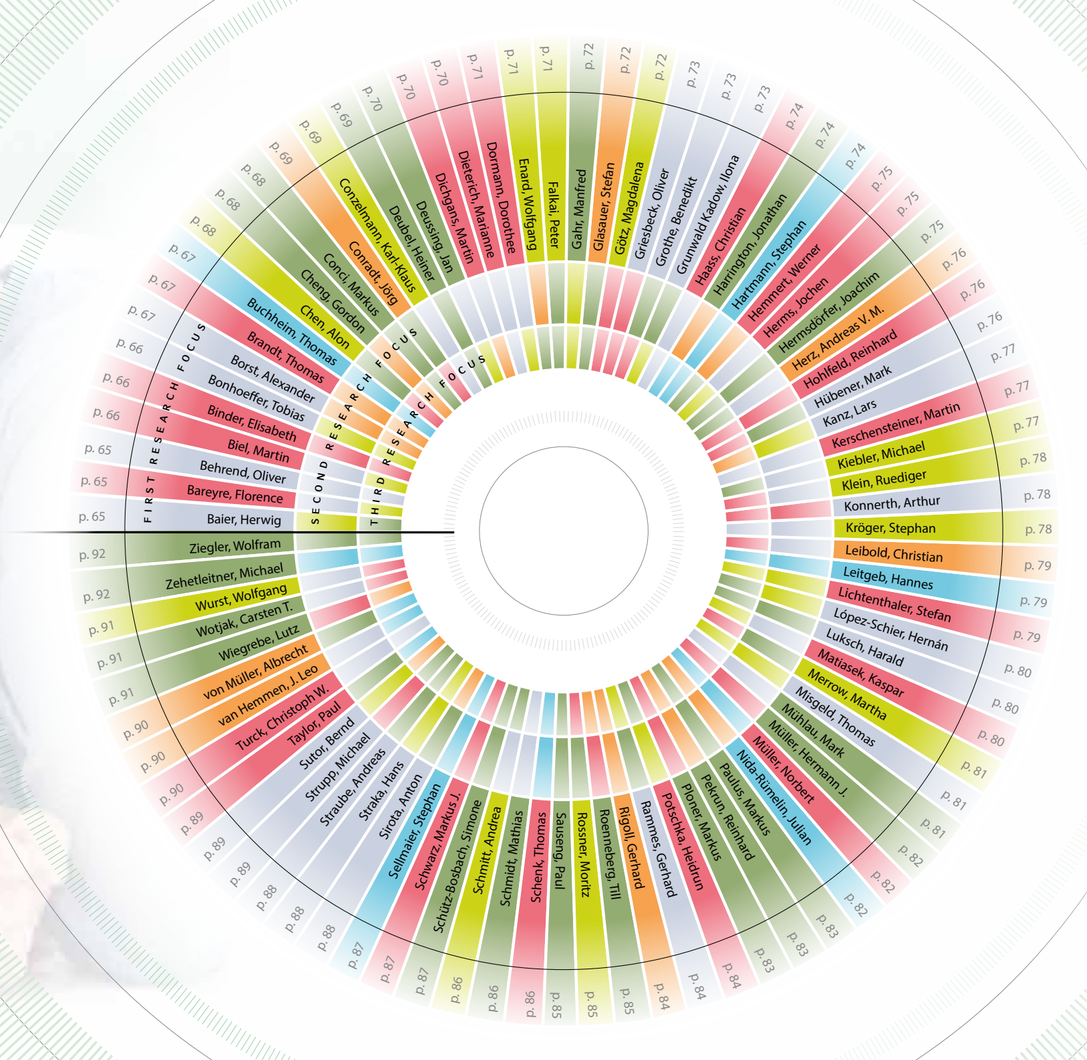
The GSN[LMU] Fall Symposium (since 2012) has always been an opportunity to boost scientific exchange between GSN[LMU], SPIN and ENP students through exciting talks and poster presentations. This takes place in addition to joint events like the GSN[LMU]/ Neurospin joint spring school in Obergurgl, Austria (2013).

People

People

Over the past 10 years, more than 100 MCN[LMU] members have contributed to cutting-edge interdisciplinary research across virtually all fields of neuroscience. Students benefit from highly innovative and pioneering faculty members who extend the boundaries of established fields towards new topics and disciplines. Apart from 3 new members admitted after this brochure's editorial deadline (Professors Busse, Geyer, zu Eulenburg), all regular MCN[LMU] members are introduced on the following pages, a list of associated members is given on page 64.

- **Behavioral & Cognitive Neuroscience**
- **Biomedical Neuroscience**
- **Cellular & Systems Neuroscience**
- **Molecular & Developmental Neuroscience**
- **Neurophilosophy**
- **Theoretical Neuroscience & Technical Applications**



MCN[LMU] Kuratorium

Prof. Dr. Godehard Link
LMU, Faculty of Philosophy

Prof. Dr. Dr. h.c. mult. Wolf Singer
MPI for Brain Research

Prof. Dr. Reto Weiler
Carl von Ossietzky University of Oldenburg,
Department of Neurosciences

MCN[LMU] Board

Prof. Dr. Marianne Dieterich
LMU, Department of Neurology

Prof. Dr. Stephan Glasauer
LMU, Department of Neurology

Prof. Dr. Benedikt Grothe
LMU, Division of Neurobiology

Prof. Dr. Stephan Hartmann (until 5.12.2016)
LMU, Faculty of Philosophy

Prof. Dr. Mark Hübener
MPI of Neurobiology

Prof. Dr. Christian Leibold (since 6.12.2016)
LMU, Division of Neurobiology

Prof. Dr. Hermann Müller
LMU, Department of Psychology

Prof. Dr. Heidrun Potschka (until 5.12.2016)
LMU, Faculty of Veterinary Medicine

Prof. Dr. Hans Straka (since 6.12.2016)
LMU, Division of Neurobiology

MCN[LMU] Associated

PD Dr. Boris Chagnaud
LMU, Division of Neurobiology

Dr. Amory Danek
University of Illinois at Chicago,
Department of Psychology

Prof. Dr. Helmut Glünder
TU Darmstadt, Department of Electrical Engineering
and Information Technology

Prof. Dr. med. Klaus Jahn
LMU, Department of Neurology

Dr. Alexander Kaiser
LMU, Division of Neurobiology

Prof. Dr. Dr. Florian Kolb
LMU, Faculty of Medicine

Dr. Yu Liu
LMU, Department of Earth & Environmental Science

Dr. Michael Pecka
LMU, Division of Neurobiology

Prof. Dr. Ernst Pöppel
LMU, Faculty of Medicine

Ass. Prof. Dr. Stephan Schleim
University of Groningen, Faculty of Behavioral and
Social Sciences

Dr. Kay Thurley
LMU, Division of Neurobiology

Prof. Dr. Chadi Touma
Osnabrück University, Department of Biology

Prof. Dr. Wilhelm Vossenkuhl
LMU, Faculty of Philosophy

Dr. Klaus Wunderlich
LMU, Department of Psychology

Prof. Dr. Walter Zieglgänsberger
Max Planck Institute of Psychiatry

More information: www.mcn.lmu.de/members

Neural circuits and behavior in zebrafish

Filosa A et al. (2016) ***Feeding state modulates behavioral choice and processing of prey stimuli in the zebrafish tectum.*** Neuron 90: 596-608.
Thiele T et al. (2014) ***Modular descending control of swim posture in zebrafish.*** Neuron 83: 679-691.
Xiao T et al. (2011) ***Assembly of lamina-specific neuronal connections by Slit bound to type IV collagen.*** Cell 146: 164-176.

Max Planck Institute of Neurobiology

Prof. Dr. Herwig Baier

Department of Gene – Circuits – Behavior
hbaier@neuro.mpg.de

We are employing genetic, optical and optogenetic approaches to study the function and development of the zebrafish brain. Another interest of the lab is in the neural substrates of emotion, motivation and cognition in fish.

Promoting axonal repair and functional recovery following brain and spinal cord injuries

Jacobi A et al. (2015) ***FGF22 signaling regulates synapse formation during post-injury remodeling of the spinal cord.*** EMBO J 34(9): 1231-43.
Lang C et al. (2013) ***STAT3 promotes corticospinal remodelling and functional recovery after spinal cord injury. EMBO Rep.*** 14(10): 931-7.
Bareyre FM et al. ***(2011) In vivo imaging reveals a phase-specific role of STAT3 during central and peripheral nervous system axon regeneration.*** Proc Natl Acad Sci USA 108(15): 6282-7.

LMU Munich, Faculty of Medicine

PD Dr. Florence Bareyre

Institute of Clinical Neuroimmunology
Florence.Bareyre@med.uni-muenchen.de

Lesions to the spinal cord lead to the transection of axonal tracts. If the lesions are complete, persistent deficits ensue. If the lesions are incomplete, some recovery of function can be observed. We are studying the anatomical, functional and molecular mechanisms underlying the recovery process to develop new therapeutic strategies to support spinal cord repair.

Executive and academic management of the Munich Center for Neurosciences

Branoner F et al. (2012) ***Central representation of spatial and temporal surface wave parameters in the African clawed frog.*** J Comp Physiol A 198(11): 797-815.
Behrend O et al. (2004) ***Neural responses to free field and virtual acoustic stimulation in the inferior colliculus of the guinea pig.*** J Neurophysiol 92: 3014-3029.
Brand A et al. (2002) ***Precise inhibition is essential for microsecond interaural time difference coding.*** Nature 417: 543-547.

LMU Munich, Faculty of Biology

Prof. Dr. Oliver Behrend

Munich Center for Neurosciences
o.behrend@lmu.de

Since 2008 Managing Director of the Munich Center for Neurosciences. Most recent research focus on central processing and localisation of surface wave sources by the amphibian lateral line system. A second scientific focus remains on central processing and sound source localisation by the mammalian auditory system.

LMU Munich, Faculty for Chemistry and Pharmacy

Prof. Dr. Martin Biel

Department of Pharmacy, Center for Drug Research
martin.biel@lmu.de

Our laboratory is interested in the function and physiological regulation of ion channels. On the basis of these studies we are seeking to understand the role of ion channels in diseased states, to explore their druggability and to rescue their function *in vivo*. The focus of our translational studies is on the development of gene therapy approaches to restore vision.

Ion channels in health and disease: From genes to clinical translation

Sakurai Y et al. (2015) ***Two pore channels control Ebolavirus host cell entry and are drug targets for disease treatment.*** Science 347: 995-998.
Michalakis S et al. (2010) ***Gene therapy restores missing cone-mediated vision in the CNGA3- / - mouse model of achromatopsia.*** Mol Ther 18: 2057-2063.
Ludwig A et al. (1998) ***A family of hyperpolarization-activated mammalian cation channels.*** Nature 393: 587-591.

Max Planck Institute of Psychiatry

Prof. Dr. Elisabeth Binder

Department of Translational Research in Psychiatry
binder@psych.mpg.de

Much of our research has focused on understanding how trauma in childhood affects future risk for psychiatric disorders, both in genetic and epigenetic studies. Another focus has been the prediction of treatment outcome with antidepressants, as well as the development of biomarkers in depression.

Molecular mechanisms of gene x stress interactions: Implications for psychiatric disorders

Arloth J et al. (2015) ***Genetic Differences in the Immediate Transcriptome Response to Stress Predict Risk-Related Brain Function and Psychiatric Disorders.*** Neuron 86(5): 1189-202.
Klengel T et al. (2013) ***Allele-specific DNA demethylation in FKBP5: a molecular mediator of gene x childhood trauma interactions.*** Nat Neurosci 16(1): 33-41.
Binder EB et al. (2008) ***Association of FKBP5 Polymorphisms and Childhood Abuse with Risk of Posttraumatic Stress Disorder Symptoms in Adults.*** JAMA 299(11): 1-5.

Max Planck Institute of Neurobiology

Prof. Dr. Tobias Bonhoeffer

Department of Synapses – Circuits – Plasticity
office-bonhoeffer@neuro.mpg.de

Our lab investigates the fundamental principles underlying learning, memory, and synaptic plasticity with a number of different approaches, ranging from molecular to systems and behavioral studies. One important insight from our work is that structural changes in dendritic spines underlie many forms of synaptic plasticity as well as learning events in the intact brain.

How experience changes the structure of the brain

Rose T et al. (2016) ***Cell-specific restoration of stimulus preference after monocular deprivation in the visual cortex.*** Science 352: 1319-1322.
Hofer SB et al. (2009) ***Experience leaves a lasting structural trace in cortical circuits.*** Nature 457: 313-317.
Engert F et al. (1999) ***Dendritic spine changes associated with hippocampal long-term synaptic plasticity.*** Nature 399: 66-70.

More information: www.mcn.lmu.de/people

Visual motion detection

Max Planck Institute of Neurobiology

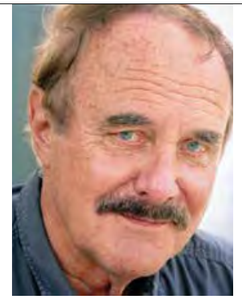
Prof. Dr. Alexander Borst

Department of Circuits – Computation – Models
borst@neuro.mpg.de

Our department investigates how individual neurons and small neural circuits compute sensory information. As an example for this, we study visual motion detection in the fruit fly *Drosophila*. Here, we can genetically target individual neurons and express proteins that allow for either recording their activity or for blocking or activating them artificially.

Mauss AS et al. (2015) ***Neural circuit to integrate opposing motions in the visual field.*** Cell 162: 351-362.
Maisak MS et al. (2013) ***A directional tuning map of Drosophila elementary motion detectors.*** Nature 500: 212-216.
Joesch M et al. (2010) ***ON and OFF pathways in Drosophila motion vision.*** Nature 468: 300-304.

Systemic neurophysiology of vertigo, balance, orientation and navigation



LMU Munich, Faculty of Medicine

Prof. Dr. Dr. Thomas Brandt

Institute for Clinical Neurosciences & DSGZ
thomas.brandt@med.uni-muenchen.de

Our research focuses on neurophysiological mechanisms, vertigo, balance, locomotion, motion perception, spatial orientation, and navigation. Methods used include psychophysics, behaviour, stance and gait analysis, functional imaging with MR and PET and mathematical modeling.

Brandt T et al. (2016) ***A new type of cervical vertigo: Head motion -induced spells in acute neck pain.*** Neurology 86: 974-975.
Brandt T et al. (2005) ***Vestibular loss causes hippocampal atrophy and impaired spatial memory in humans.*** Brain 128: 2732-2741.
Brandt T et al. (1999) ***You are better off running than walking with acute vestibulopathy.*** Lancet 354: 746.

Free will, ontology and metaphysics (esp. living beings and persons), Aristotle

LMU Munich, Faculty of Philosophy

Prof. Dr. Thomas Buchheim

Faculty of Philosophy, Philosophy of Science and Study of Religion
thomas.buchheim@lrz.uni-muenchen.de

In our research we focus on classical Greek philosophy (Presocratics, Plato, Aristotle), Augustine, German Idealism, and Heidegger. Systematically, ontology and metaphysics, the philosophy of religion, and the philosophy of freedom belong to our areas of competence. Regarding the free will debate, we defend a compatibilistic conception of human freedom.

Buchheim T. (2012) ***Neuronenfeuer und seelische Tat. Ein neo-aristotelischer Vorschlag zum Verständnis mentaler Kausalität.*** In: Philosophisches Jahrbuch 119: 332-246.
Buchheim T. ***Unser Verlangen nach Freiheit: Kein Traum, sondern Drama mit Zukunft.*** Hamburg (Meiner-Verlag), 2006.
Buchheim T. (2001) ***The Functions of the Concept of physis in Aristotle's Metaphysics.*** In: Oxford Studies in Ancient Philosophy 20: 201-234.

Max Planck Institute of Psychiatry

Prof. Dr. Alon Chen

Department of Stress Neurobiology and Neurogenetics
alon_chen@psych.mpg.de

The collective long-term goal of our research is to elucidate the pathways and mechanisms, by which stressors are perceived, processed, and transduced into neuroendocrine and behavioral responses under healthy and pathological conditions.

Stress neurobiology and neurogenetics: Bridging the genotype-phenotype gap

Kuperman Y et al. (2016) ***CRFR1 in AgRP neurons modulates sympathetic nervous system activity to adapt to cold stress and fasting.*** Cell Metab 23(6): 1185-1199.
Shemesh Y et al. (2016) ***Ucn3-CRFR2 in the medial amygdala regulates complex social dynamics.*** Nat Neurosci [Epub ahead of print].
Issler O et al. (2014) ***MicroRNA 135 is essential for chronic stress resiliency, antidepressant efficacy, and intact serotonergic activity.*** Neuron 83: 344-360.

TUM, Department of Electrical and Computer Engineering

Prof. Dr. Gordon Cheng

Institute for Cognitive Systems
gordon@tum.de

The Institute for Cognitive Systems deals with the fundamental understanding and creation of cognitive systems. Our research interests fall in line with the notion of "Understanding through Creating", three essential aspects motivate our approach in the area of Humanoid Robotics and Neuroscience: Science, Engineering and Society.

Humanoid robotics and neuroscience: Science, engineering and society

Donati AR et al. (2016) ***Long-Term Training with a Brain-Machine Interface-Based Gait Protocol Induces Partial Neurological Re-covery in Paraplegic Patients.*** Sci Rep 6: 30383.
Cheng G (ed.): ***Humanoid Robotics and Neuroscience: Science, Engineering and Society.*** Frontiers in Neuroengineering Series, CRC Press, 2014.
Cheng G et al. (2007) ***A humanoid research platform for exploring neuroscience.*** Advanced Robotics 21(10): 1097-1114.

LMU Munich, Faculty of Psychology

PD Dr. Markus Conci

Department of Psychology
conci@psy.lmu.de

Perceptual organization can provide a basic structure to the complex visual input. We investigate how such structural representations emerge and how these interact with the spatio-temporal allocation of attention and with (short- and long-term) memory, using a combination of psychophysics, human electrophysiology and neuropsychological patient testing.

Perceptual organization in visual attention and memory

Conci M et al. (2013) ***Object-based implicit learning in visual search: Perceptual segmentation constrains contextual cueing.*** J Vis 13(3): 15.
Conci M et al. (2011) ***The time-course of global and local attentional guidance in Kanizsa-figure detection.*** Neuropsychologia 49: 2456-2464.
Conci M et al. (2009) ***Preattentive surface and contour grouping in Kanizsa figures: Evidence from parietal extinction.*** Neuropsychologia 47: 726-732.

More information: www.mcn.lmu.de/people

Engineering applications of computational neuroscience

Mulas M et al. (2016) ***Hebbian plasticity realigns grid cell activity with external sensory cues in continuous attractor models.*** Front Comput Neurosci 10: 13.
Firouzi M et al. (2015) ***Asynchronous Event-based Cooperative Stereo Matching Using Neuromorphic Silicon Retinas.*** Neural Processing Letters 43(2): 311-326.
Conradt J et al. (2014) ***Trainable sensorimotor mapping in a neuromorphic robot.*** Robotics and Autonomous Systems 71: 60-68.

TUM, Department of Electrical and Computer Engineering

Prof. Dr. Jörg Conradt

Neuroscientific System Theory research group (NST)
conradt@tum.de

The NST group at TUM investigates theory, models, and applied robotic implementations of distributed neuronal information processing, to (a) discover key principles by which large networks of neurons operate and (b) implement those in engineered systems to enhance their real-world performance.

Rabies virus vectors for *in vivo* imaging, optogenetics, and circuit mapping

Ghanem A et al. (2016) ***G gene-deficient single-round rabies viruses for neuronal circuit analysis.*** Virus Res 216: 41-54.
Wertz A et al. (2015) ***Single-cell-initiated monosynaptic tracing reveals layer-specific cortical network modules.*** Science 349(6243): 70-4.
Foster E et al.(2015) ***Targeted ablation, silencing, and activation establish glycinergic dorsal horn neurons as key components of a spinal gate for pain and itch.*** Neuron 85(6): 1289-304.

LMU Munich, Faculty of Medicine

Prof. Dr. Karl-Klaus Conzelmann

Max von Pettenkofer-Institute of Virology & Gene Center
conzelmann@genzentrum.lmu.de

Pseudotyped delta G rabies viruses have emerged as gold standard for mapping of direct (mono-) synaptic connections and functional analysis of neuronal circuits in the central and peripheral nervous system. We are developing rabies vectors for *in vivo* imaging and optogenetics, and studying mechanistic details of viral transsynaptic transmission.

Perception-action coupling in eye and hand movements

Deubel H. (2014) ***Attention in Action. In: The Oxford Handbook of Attention.*** Oxford University Press, pp. 865-889.
Rolfs M et al. (2011) ***Predictive remapping of attention across eye movements.*** Nat Neurosci 14(2): 252-256.
Deubel H et al. (1996) ***Saccade target selection and object recognition: Evidence for a common attentional mechanism.*** Vision Res 36: 1827-1837.

LMU Munich, Faculty of Psychology

Prof. Dr. Heiner Deubel

Department of Psychology, Experimental Psychology
heiner.deubel@psy.lmu.de

Our research is focused on the interplay between perception and action. Research topics concern the role of attention in the selection of action goals, visual processing around eye movements, oculomotor control and plasticity, and mechanisms of visual working memory. Methods include psychophysics, eye and hand movement recording, EEG and TMS.

Max Planck Institute of Psychiatry

Dr. Jan Deussing

Department of Stress Neurobiology and Neurogenetics
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We are interested in genetic risk factors associated with neuropsychiatric disorders, their interaction with environmental exposures and the question how these translate into persistent epigenetic signatures. Moreover, we are intrigued by neural circuits conveying an adaptive stress response and their disturbances underlying pathological conditions.

Genetics, epigenetics and neural circuits of stress-related neuropsychiatric disorders

Bender J et al. (2015) ***Corticotropin-Releasing Hormone Receptor Type 1 (CRHR1) Clustering with MAGUKs Is Mediated via Its C-Terminal PDZ Binding Motif.*** PLoS One 10(9): e0136768.
Deussing JM (2013). ***Targeted mutagenesis tools for modelling psychiatric disorders.*** Cell Tissue Res 354(1): 9-25.
Refojo D et al. (2011). ***Glutamatergic and dopaminergic neurons mediate anxiogenic and anxiolytic effects of CRHR1.*** Science 333(6051): 1903-7.

LMU Munich, Faculty of Medicine

Prof. Dr. Martin Dichgans

Institute for Stroke and Dementia Research
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We aim to identify new targets for stroke and dementia through genome-wide approaches and are interested in mechanisms by which common and rare genetic variants confer disease risk. We focus on small vessel disease, atherosclerosis and vascular cognitive impairment. Using neuroimaging we study the roles of vascular and neurodegenerative pathology in cognitive decline.

Stroke and dementia research

Azghandi S et al. (2015) ***Deficiency of the stroke relevant HDAC9 gene attenuates atherosclerosis in accord with allele-specific effects at 7p21.1.*** Stroke 46(1): 197-202.
Wardlaw JM et al. (2013) ***Neuroimaging standards for research into small vessel disease and its contribution to ageing and neurodegeneration.*** Lancet Neurol 12(8): 822-38.
Dichgans M et al. (2008) ***Donepezil in Patients with Subcortical Vascular Cognitive Impairment: a randomized double-blind trial in CADASIL.*** Lancet Neurol 7(4): 310-8.

LMU Munich, Faculty of Medicine

Prof. Dr. Marianne Dieterich

Department of Neurology
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The bilateral structure of the central vestibular system helps us to understand its sensorimotor, perceptual, and cognitive functions as well as its disorders. It requires a continuous interaction between the right and left circuits at all levels in order to produce a global percept and adequate motor reactions to maintain balance within the gravitational field.

The bilateral structure of the vestibular system and its multisensory interactions

Baier et al. (2014) ***What part of the cerebellum contributes to a visuospatial working memory task?*** Ann Neurol 76(5): 754-7.
Dieterich M et al. (2008) ***Functional brain imaging of peripheral and central vestibular disorders.*** Brain 131: 2538-52.
Dieterich M et al. (2003) ***Dominance for vestibular cortical function in the non-dominant hemisphere.*** Cereb Cortex 13 (9): 994-1007.

More information: www.mcn.lmu.de/people

RNA-binding proteins in neurodegeneration: Transport pathways and protein aggregation

Bowden H et al. (2016) ***Altered mRNP granule dynamics in FTLD pathogenesis.*** J Neurochem 138 Suppl 1: 112-33.
Dormann D et al. (2012) ***Arginine methylation next to the PY-NLS modulates Transportin binding and nuclear import of FUS.*** EMBO J 31(22): 4258-75.
Dormann D et al. (2010) ***ALS-associated FUS mutations disrupt Transportin-mediated nuclear transport.*** EMBO J 29(16): 2841-57.

LMU Munich, Faculty of Medicine

Dr. Dorothee Dormann

Department of Cell Biology
dorothee.dormann@med.uni-muenchen.de

Our research is focused on the cellular mechanisms that underlie the neurodegenerative diseases amyotrophic lateral sclerosis (ALS) and frontotemporal dementia (FTD). We are particularly interested in intracellular transport pathways of RNA-protein complexes and the mechanisms that lead to pathological aggregation of RNA-binding proteins.

Comparative primate genomics

Chen YC et al. (2016) ***Foxp2 controls synaptic wiring of corticostriatal circuits and vocal communication by opposing Mef2c.*** Nat Neurosci 19(11): 1513-1522.
Enard W (2016). ***The Molecular Basis of Human Brain Evolution.*** Curr Biol 26(20): R1109-R1117.
Enard W et al. (2009) ***A humanized version of Foxp2 affects cortico-basal ganglia circuits in mice.*** Cell 137: 961-971.

LMU Munich, Faculty of Biology

Prof. Dr. Wolfgang Enard

Department Biology II, Anthropology and Human Genomics
enard@bio.lmu.de

Our goal is to understand the molecular basis of human brain evolution, including its implications for biomedical questions. We use a mouse model to study human-specific aspects of FOXP2, a transcription factor involved in the evolution of speech, primate iPS cells and genomic technologies such as single-cell RNA-seq.

Post-mortem and brain imaging studies, use of gene expression and structural techniques

Falkai P et al. (2016) ***Decreased oligodendrocyte and neuron number in anterior hippocampal areas and the entire hippocampus in schizophrenia: A stereological post-mortem study.*** Schizophr Bull, in press.
Falkai P et al. (2015) ***Kraepelin revisited: schizophrenia from degeneration to failed regeneration.*** Mol Psychiatry 20(6): 671-676.

LMU Munich, Faculty of Medicine

Prof. Dr. Peter Falkai

Department of Psychiatry
peter.falkai@med.uni-muenchen.de

Our research is focused on neurobiology and treatment of psychotic disorders, namely schizophrenia. Multidisciplinary teams of researchers, allow the use of techniques ranging from functional imaging to gene expression in human post-mortem-tissue.

Max Planck Institute for Ornithology

Prof. Dr. Manfred Gahr

Department of Behavioural Neurobiology
gahr@orn.mpg.de

The research of the department focuses on the sexual differentiation of the brain, seeking to understand the mechanisms responsible for the development of sex-specific behaviours and sensory processing. In this context, we study the endocrine, molecular, and neurobiological mechanisms of innate and learned vocalizations for various bird species in a natural setting.

Neuroendocrine mechanisms of sex-specific vocal behaviour

Gill LF et al. (2015) ***Patterns of call communication between group-housed zebra finches change during the breeding cycle.*** Elife 4: e07770.
Hartog TE et al. (2009) ***BDNF signaling in the HVC is required for testosterone-induced song of female canaries.*** J Neurosci 29: 15511-15519.
Gahr M. (1997) ***How should brain nuclei be delineated? Consequences for developmental mechanisms and for correlations of area size, neuron numbers and functions of brain nuclei.*** Trends Neurosci 20: 58-62.

LMU Munich, Faculty of Medicine

Prof. Dr. Stefan Glasauer

Center for Sensorimotor Research, Department of Neurology
sglasauer@lmu.de

Our work focuses on the principles and computations underlying sensorimotor function and perception by combining experimental approaches reaching from psychophysical measurements over brain imaging to motion tracking and, in collaborative work, single cell recordings in animal models, with theory and computational neuroscience.

Principles and computations of sensorimotor function, spatial navigation, and perception

Petzschner FH et al. (2015) ***A Bayesian Perspective on Magnitude Estimation.*** Trends Cogn Sci 19: 285-293.
Brostek L et al. (2015) ***Eye velocity gain fields in MSTd during optokinetic stimulation.*** Cereb Cortex 25: 2181-90.
Saglam M et al. (2014) ***Vestibular and Cerebellar Contribution to Gaze Optimality.*** Brain 137: 1080-1094.

LMU Munich, Faculty of Medicine; Helmholtz Zentrum München

Prof. Dr. Magdalena Götz

Department of Physiological Genomics & Institute of Stem Cell Research
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We work on elucidating the mechanisms of neurogenesis, when and where they work (during brain development and in some regions of the adult brain), in order to then implement them for repair after brain injury. We use direct reprogramming, an approach pioneered by us, to turn scar forming glia into new neurons for repair.

Understanding and reactivating neurogenesis

Falkner S et al. (2017) ***Transplanted embryonic neurons integrate into adult neocortical circuits.*** Nature 541(7635): 122.
Gascon S et al. (2016) ***Identification and Successful Negotiation of a Metabolic Checkpoint in Direct Neuronal Reprogramming.*** Cell Stem Cell 18(3): 396-409.
Stahl R et al. (2013) ***Trnp1 regulates expansion and folding of the mammalian cerebral cortex by control of radial glial fate.*** Cell 153(3): 535-49.

More information: www.mcn.lmu.de/people

Protein tools for neuroscience

Thestrup T et al. (2014) ***Optimized ratiometric calcium sensors for functional in vivo imaging of neurons and T-lymphocytes.*** Nat Methods 11: 175-82.
Mank M et al.(2008) ***A genetically encoded calcium indicator for chronic in vivo two photon imaging.*** Nat Methods 5: 805-811.
Griesbeck O et al. (2001) ***Reducing the environmental sensitivity of yellow fluorescent protein: mechanism and application.*** J Biol Chem 276: 29188-94.

Max Planck Institute of Neurobiology

PD Dr. Oliver Griesbeck

Tools for Bio-Imaging
griesbeck@neuro.mpg.de

We use mutants of the Green Fluorescent Protein and other related proteins to turn them into sensors of physiological events inside living neurons. For this purpose, techniques from molecular biology, protein engineering, biophysics and cell biology are employed.

Assembly and function of neuronal circuits in the auditory system

Ford MC et al. (2015) ***Tuning of Ranvier node and internode properties in myelinated axons to adjust action potential timing.*** Nat Commun 6: 8073.
Grothe B et al. (2010) ***Mechanisms of sound localization in mammals.*** Physiol Rev 90: 983-1012.
Brand A et al. (2002) ***Precise inhibition is essential for microsecond interaural time difference coding.*** Nature 417: 543-547.

LMU Munich, Faculty of Biology

Prof. Dr. Benedikt Grothe

Department Biology II, Division of Neurobiology
neurobio@lmu.de

Comparative research on the structure and function of neuronal circuits with a focus on sensory processing in the mammalian auditory system. The lab employs various methods including cytochemistry and immunohistochemistry, imaging, optogenetics, electrophysiology (*in vitro* and *in vivo*), psychoacoustics, and modeling.

Neural circuits and neuronal mechanisms of state-dependent processing of odors and tastes

Hussain A et al.(2016) ***Neuropeptides modulate female chemosensory processing upon mating in Drosophila.*** PLoS Biol 14: e1002455.
Lewis L et al. (2015) ***A higher brain circuit for immediate integration of conflicting sensory information in Drosophila.*** Curr Biol PMID: 26299514.
Bräcker LB et al. (2013) ***Essential role of the mushroom body in context-dependent CO_2 avoidance in Drosophila.*** Curr Biol 23(13): 1228-34.

TUM, School of Life Sciences

Prof. Dr. Ilona Grunwald Kadow

Neuronal Control of the Metabolism
ilona.grunwald@tum.de

We investigate how sensory information, in particular odors and tastes, is processed by the brain and translated into behavior. One of our key questions is how context such as physiological and metabolic states affect such neuronal processing and ultimately decision-making.

LMU Munich, Faculty of Medicine

Prof. Dr. Dr. Christian Haass

Division of Biochemistry & DZNE
christian.haass@mail03.med.uni-muenchen.de

The Haass lab focuses on the molecular mechanisms of Amyloid ß-peptide generation via ß-, and γ-secretase. Very recently, the lab also works on novel aspects of microglial activation via proteolytic processing of TREM2. Besides Alzheimer's disease, cellular mechanisms of Frontotemporal lobar degeneration and amyotrophic lateral sclerosis are an additional focus.

Cellular mechanisms of neurodegeneration

Willem M et al. (2015) ***n-Secretase processing of APP inhibits neuronal activity in the hippocampus.*** Nature 526(7573): 443-7.
Kleinberger G et al. (2014) ***TREM2 mutations implicated in neurodegeneration impair cell surface transport and phagocytosis.*** Sci Transl Med 6(243): 243ra86.
Willem M et al. (2006) ***Control of peripheral nerve myelination by the beta-secretase BACE1.*** Science 314: 664-6.

LMU Munich, Faculty of Languages and Literatures

Prof. Dr. Jonathan Harrington

Institute for Phonetics and Speech Processing (IPS)
jmh@phonetik.uni-muenchen.de

Our research is concerned with developing cognitive and computational model of how humans process speech in order to explain the origin and spread of historical sound change. Our further research interests are in speech physiology, techniques in acoustic phonetic processing, and the development of tools for analysing speech corpora.

Human speech processing and the evolution of sound change

Harrington J et al. (2017) ***/ u /-fronting and agent-based modeling: The relationship between the origin and spread of sound change.*** Language, in press.
Harrington J et al. (2008) ***Compensation for coarticulation, / u /-fronting, and sound change in Standard Southern British: an acoustic and perceptual study.*** J Acoust Soc Am 123(5): 2825-2835.
Harrington J et al.(2000) ***Does the Queen speak the Queen's English?*** Nature: 408: 927-928.

LMU Munich, Faculty of Philosophy

Prof. Dr. Stephan Hartmann

Munich Center for Mathematical Philosophy
S.Hartmann@lmu.de

We are interested in how scientists reason and argue. Our work combines descriptive and normative considerations and asks: (1) How do scientists reason and argue? (2) How should scientists reason and argue? To address (2), we construct and analyze various Bayesian models.

Scientific reasoning and argumentation

Dawid R et al. (2015) ***The No Alternatives Argument.*** Br J Philos Sci 66(1): 213-234.
Hartmann S et al. (2012) ***Judgment Aggregation and the Problem of Tracking the Truth.*** Synthese 187: 209-221.
Dizadji-Bahmani F et al. (2011) ***Confirmation and Reduction: A Bayesian Account.*** Synthese 179(2): 321-338.

Improving speech understanding in patients with cochlear implants

Weiss RS et al. (2016) ***Optogenetic stimulation of the cochlea—A review of mechanisms, measurements, and first models.*** Network: Computation in Neural Systems: 1-25.
Zirn S et al. (2016) ***The effect of fluctuating maskers on speech understanding of high-performing cochlear implant users.*** Int J Audiol 55(5): 295-304.
Rudnicki M et al. (2015) ***Modeling auditory coding: from sound to spikes. Cell Tissue Res.*** 361(1): 159-175.

TUM, Department of Electrical and Computer Engineering

Prof. Dr. Werner Hemmert

Bio-Inspired Information Processing
werner.hemmert@tum.de

We study computational neuroscience, spiking neuronal networks in the auditory brainstem, and novel electrical and optical stimulation methods for hearing implants. We complement our model calculations with psychophysical measurements in human subjects with cochlear implants.

Synaptic failure in neurodegenerative diseases

Herms J et al. (2016) ***Dendritic Spine Pathology in Neurodegenerative Diseases.*** Annu Rev Pathol, in press.
Zou C et al. (2016) ***Neuroinflammation impairs adaptive structural plasticity of dendritic spines in a preclinical model of Alzheimer's disease.*** Acta Neuropathol 131(2): 235-46.
Fuhrmann M et al. (2010) ***Microglia Cx3cr1 knockout prevents neuron loss in a mouse model of Alzheimer's disease.*** Nat Neurosci 13(4): 411-3.

LMU Munich, Faculty of Medicine

Prof. Dr. Jochen Herms

Center for Neuropathology and Prion Research & DZNE
Jochen.Herms@med.uni-muenchen.de

Basic mechanisms of synaptic transmission in health and disease; Synaptic and neuronal network changes in transgenic animal models of neurodegenerative diseases; *In vivo* two-photon-Imaging; Functional calcium imaging; Electrophysiology; Validation of new therapeutical approaches *in vivo* for Alzheimer`s and Parkinson`s disease.

Sensorimotor control in health and neurological disorders

Brandi ML et al. (2014) ***The neural correlates of planning and executing actual tool use.*** J Neurosci 34(39): 13183-94.
Hermsdörfer J et al. (2013) ***Tool use kinematics across different modes of execution.*** Implications for action representation and apraxia. Cortex 49(1): 184-99.
Hermsdörfer J et al. (2003) ***Grip force control during object manipulation in cerebral stroke.*** Clin Neurophysiol 114(5): 915-29.

TUM, Department of Sport and Health Sciences

Prof. Dr. Joachim Hermsdörfer

Human Movement Science
Joachim.Hermsdoerfer@tum.de

Our main interest is sensorimotor control in healthy individuals and in patients with neurological diseases. We are studying a variety of motor skills ranging from elementary motor acts to complex tool use. To that aim, we employ measurements of motor behavior, neuroimaging, and neurophysiological methods, as well as new technologies in neurorehabilitation.

LMU Munich, Faculty of Biology

Prof. Dr. Andreas V. M. Herz

Department Biology II, Computational Neuroscience
herz@bio.lmu.de

The brain is one of the most complex biological systems. Understanding its fascinating dynamics and information processing strategies remains a challenge. Focusing on spatial cognition, our group combines concepts and techniques from theoretical biophysics and non-linear dynamics to answer the question of how living organisms solve difficult computational problems.

Neural basis of spatial cognition: Theory, data analysis, computational modeling

Stemmler M et al. (2016) ***Connecting multiple spatial scales to decode the population activity of grid cells.*** Sci Adv 1: e1500816.
Reifenstein E et al. (2012) ***Grid cells in rat entorhinal cortex encode physical space with independent firing fields and phase precession at the single-trial level.*** PNAS 109: 6301-6306.
Herz AVM et al.(2006) ***Modeling single-neuron dynamics and computations: a balance of detail and abstraction.*** Science 314: 80-85.

LMU Munich, Faculty of Medicine

Prof. Dr. Reinhard Hohlfeld

Institute of Clinical Neuroimmunology
reinhard.hohlfeld@med.uni-muenchen.de

Our research focuses on the pathogenesis and treatment of multiple sclerosis. We believe that translational research is not a one-way road from animal to human, but is bidirectional: observations in the human disease may inspire mechanistic studies in animals. We are especially interested in devising methods for studying immune responses directly in human tissues.

Pathogenesis and treatment of multiple sclerosis

Hohlfeld R et al. (2016) ***The search for the target antigens of multiple sclerosis, part 1: autoreactive CD4+ T lymphocytes as pathogenic effectors and therapeutic targets.*** Lancet Neurol 15: 198-209.
Hohlfeld R et al. (2016) ***The search for the target antigens of multiple sclerosis, part 2: CD8+ T cells, B cells, and antibodies in the focus of reverse-translational research.*** Lancet Neurol 15: 317-331.

Max Planck Institute of Neurobiology

Prof. Dr. Mark Hübener

Department of Synapses – Circuits – Plasticity
mark@neuro.mpg.de

We study the cellular and circuit mechanisms that enable the visual cortex to adapt to changes in the visual environment and to take part in the storage of visual memories. To address these questions at the functional and at the structural level, we use a number of imaging techniques, such as two-photon microscopy and intrinsic signal imaging.

Experience dependent plasticity in the mammalian visual system

Liebscher S et al. (2016) ***Selective persistence of sensorimotor mismatch signals in visual cortex of behaving Alzheimer's disease mice.*** Curr Biol 26: 956-964.
Keck T et al. (2013) ***Synaptic scaling and homeostatic plasticity in the mouse visual cortex in vivo.*** Neuron 80: 327-334.
Hofer SB et al. (2009) ***Experience leaves a lasting structural trace in cortical circuits.*** Nature 457: 313-317.

More information: www.mcn.lmu.de/people

Astrocytes in the auditory system, neuroenergetics, ion channels in non-excitable cells

Direnberger S et al. (2015) ***Analysis of signal processing in vestibular circuits with a novel light-emitting diodes-based fluorescence microscope.*** Eur J Neurosci 41(10): 1332-44.
Trattner B et al. (2013) ***Metabolic Maturation of Auditory Neurones in the Superior Olivary Complex.*** PLoS One 8(6): e67351.
Trattner B et al. (2013) ***Depolarization-induced suppression of a glycinergic synapse in the superior olivary complex by endocannabinoids.*** J Neurochem 127(1): 78-90.

LMU Munich, Faculty of Biology

PD Dr. Lars Kanz

Department Biology II, Division of Neurobiology
lars.kunz@bio.lmu.de

We focus on neurophysiology of the auditory system, particularly on the role of astrocytes and the metabolic cost of neuronal activity. We apply electrophysiological and imaging techniques as well as biochemical modelling. Furthermore, we investigate the function of ion channels, neurotransmitters and radical oxygen species in non-excitable cells of the human gonads.

Pathogenesis and therapy of neuroinflammatory tissue damage

Sorbara CD et al. (2014) ***Pervasive axonal transport deficits in multiple sclerosis models.*** Neuron 84(6): 1183-90.
Breckwoldt MO et al. (2014) ***Multiparametric optical analysis of mitochondrial redox signals during neuronal physiology and pathology in vivo.*** Nat Med 20(5): 555-60.
Niki I et al. (2011) ***A reversible form of axon damage in experimental autoimmune encephalomyelitis and multiple sclerosis.*** Nat Med 17(4): 495-9.

LMU Munich, Faculty of Medicine

Prof. Dr. Martin Kerschensteiner

Institute of Clinical Neuroimmunology
Martin.Kerschensteiner@med.uni-muenchen.de

Multiple sclerosis is a common inflammatory condition of the CNS, in which immune cells damage neurons and oligodendrocytes. Our lab aims to (i) visualize how neuroinflammatory tissue damage in real-time, (ii) define the cells and molecules that drive this process and (iii) develop therapeutic strategies that can protect the nervous system from the immune attack.

The role of RNA-binding proteins at synapses: Staufen2, Pumilio2 and Barentsz

Heraud-Farlow JE et al. (2014) ***The multifunctional Staufen proteins: conserved roles from neurogenesis to synaptic plasticity.*** Trends Neurosci 37(9):470-9.
Vessey JP et al. (2010) ***Mammalian Pumilio 2 regulates dendrite morphogenesis and synaptic function.*** Proc Natl Acad Sci U S A 107(7): 3222-7.
Macchi et al. (2003) ***Barentsz, a new component of the staufen-containing ribonucleoprotein particles in mammalian cells, interacts with Staufen in an RNA-dependent manner.*** J Neurosi 23(13): 5778-5788.

LMU Munich, Faculty of Medicine

Prof. Dr. Michael Kiebler

Department for Cell Biology
michael.kiebler@med.uni-muenchen.de

We would like to understand the molecular basis of synaptic plasticity in general, i.e. how individual synapses are altered during their lifetime and how this contributes to our ability to learn and remember. Here we study in detail how dendritic RNA localization and subsequent translational control at the synapse critically contribute to this process.

Max-Planck Institute of Neurobiology

Prof. Dr. Ruediger Klein

Department of Molecules – Signaling – Development
rklein@neuro.mpg.de

Understanding the principles of cell-cell communication in the developing and mature nervous system. Understanding how specific neuron populations contribute to certain types of behavior of adult mice.

Mouse CNS diversity, circuit mapping and behavior

Gaitanos TN et al. (2016) ***Tiam / Rac signaling mediates trans-endocytosis of ephrin receptor EphB2 and is important for cell repulsion.*** J Cell Biol 214: 735-752.
Gong J et al. (2016) ***Exosomes mediate cell contact-independent ephrin-Eph signaling during axon guidance.*** J Cell Biol214(1): 35-44.
Seiradake E et al. (2014) ***FLRT structure: balancing repulsion and cell adhesion in cortical and vascular developme.*** Neuron 84(2): 370-85.

TUM, School of Medicine

Prof. Dr. Arthur Konnerth

Institute of Neuroscience
arthur.konnerth@tum.de

Our research is focused on a better understanding of the cellular and circuit mechanisms underlying brain function in health and disease. We are particularly interested in a better understanding of signal processing on the level of individual cortical neurons in awake animals.

Dendritic integration *in vivo*

Busche MA et al. (2015) ***Rescue of long-range circuit dysfunction in Alzheimer´s disease model.*** Nat Neurosci 18: 1623-1630.
Chen X et al. (2011) ***Functional mapping of single spines in cortical neurons in vivo.*** Nature 475: 501-505.
Jia H et al. (2010) ***Dendritic organization of sensory input to cortical neurons in vivo.*** Nature 464: 1307-1312.

LMU Munich, Faculty of Medicine

Prof. Dr. Stephan Kröger

Department of Physiological Genomics
skroeger@lmu.de

We are interested in the molecular mechanisms that underlie the formation, regeneration and pathological changes at synapses. We study synaptogenesis at the neuromuscular junction, in muscle spindles and in the CNS of wildtype and transgenic mice. These studies will help to understand nervous system development and the molecular basis of nervous system diseases.

Synaptogenesis at the neuromuscular junction, in muscle spindles and in the developing CNS

Zhang Y et al. (2015) ***Differential regulation of AChR clustering in the polar and equatorial region of murine muscle spindles.*** Eur J Neurosci 41: 69-78.
Gasperi C et al. (2014) ***Anti-agrin autoantibodies in myasthenia gravis.*** Neurology 82: 1976-1983.
Porten E et al. (2010) ***The process-inducing activity of transmembrane agrin requires follistatin-like domains.*** J Biol Chem 285: 3114-3125.

More information: www.mcn.lmu.de/people

Theory of learning and plasticity in the nervous system

Lehnert S et al. (2014) ***Action Potential Generation in an Anatomically Constrained Model of Medial Superior Olive Axons.*** J Neurosci 34: 5370-5384.
Maier N et al. (2011) ***Coherent phasic excitation during hippocampal ripples.*** Neuron 72: 137-152.
Leibold C et al. (2008) ***Sparseness constrains the prolongation of memory lifetime via synaptic metaplasticity.*** Cereb Cortex 18: 67-77.

LMU Munich, Faculty of Biology

Prof. Dr. Christian Leibold

Department Biology II, Computational Neuroscience
leibold@bio.lmu.de

Our laboratory works on three major topics combining theory, computational modeling, data analysis, and experiments: 1) Temporal processing of acoustic information in the auditory system, 2) Theory and modelling of memory formation in the hippocampal cortical system, 3) Data analysis of temporal hippocampal activity patterns.

Artificial neural network models of conditionals and induction

Leitgeb H. ***The Stability of Belief, forthcoming with Oxford University Press.***
Leitgeb H. ***Inference on the Low Level.*** Springer Netherlands, 2004.
Leitgeb H. (2001) ***Nonmonotonic Reasoning by Inhibition Nets.*** Artif Intell 128(1-2): 161-201.

LMU Munich, Faculty of Philosophy

Prof. Dr. Hannes Leitgeb

Logic and Philosophy of Language
Hannes.Leitgeb@lmu.de

Logic (truth, modality, paradox, conditionals, nonmonotonic reasoning, dynamic doxastic logic), epistemology (belief, inference, belief revision, Bayesianism), philosophy of mathematics (structuralism, informal provability, abstraction), cognitive science (symbolic representation and neural networks, metacognition).

Proteases in the nervous system

Kuhn PH et al. (2016) ***Systematic substrate identification indicates a central role for the metalloprotease ADAM10 in axon targeting and synapse function.*** Elife: e12748.
Kuhn PH et al. (2012) ***Secretome protein enrichment identifies physiological BACE1 protease substrates in neurons.*** EMBO J 31(14): 3157-68.
Lichtenthaler SF. (2012) ***Cell Biology: Sheddase Gets Guidance.*** Science 335: 179-180.

TUM, School of Medicine; DZNE

Prof. Dr. Stefan Lichtenthaler

Neuroproteomics
stefan.lichtenthaler@dzne.de

We study how cell surface proteases control the communication between the cells in the nervous system and how they contribute to brain disorders, in particular Alzheimer's disease. To this aim, we use methods from biochemistry, molecular biology, neurobiology and proteomics.

Helmholtz Zentrum München

Dr. Hernán López-Schier

Department of Sensory Biology and Organogenesis
hernan.lopez-schier@helmholtz-muenchen.de

Our research focuses on the fundamental bases underlying the homeostasis and regeneration of sensory receptors and sensorineural circuits. In particular, our multidisciplinary group studies directional mechanoreception, the cellular and neural bases of mechanosensory-guided behaviours, and the neuronal control of systemic metabolism.

Homeotasis and regeneration of neuronal circuits that control behaviour

Xiao Y et al.(2015) ***Optogenetic stimulation of neuronal repair.*** Curr Biol 25(22): R1068-9.
Pujol-Martí J et al. (2014) ***Converging axons collectively initiate and maintain synaptic selectivity in a constantly remodeling sensory organ.*** Curr Biol 24(24): 2968-74.
Pujol-Martí J et al. (2012) ***Neuronal birth order identifies a dimorphic sensorineural map.*** J Neurosci 32(9): 2976-87.

TUM, School of Life Sciences

Prof. Dr. Harald Luksch

Zoology
harald.luksch@wzw.tum.de

We attempt to gain a mechanistic understanding of single neuron input processing in the brain of vertebrates by using electrophysiology *in vitro* and *in vivo*, imaging techniques, and advanced neuroanatomical methods to describe neuronal networks in great detail. We study birds, snakes, and bats for their specific sensory systems and multimodal integration networks.

Sensory processing and multimodal integration in the vertebrate midbrain

Niederleitner B et al. (2016) ***A novel relay nucleus between the inferior colliculus and the optic tectum in the chicken (Gallus gallus).*** J Comp Neurol, in press.
Kugler K et al. (2016) ***Echo-acoustic flow affects flight in bats.*** J Exp Biol 219: 1793-7.
Luksch H et al. (2004) ***Synaptic depression mediates form-cue invariant motion analysis.*** Nat Neurosci 7: 380-388.

LMU Munich, Faculty of Veterinary Medicine

Prof. Dr. Kaspar Matiasek

Centre for Clinical Veterinary Medicine
kaspar.matiasek@lmu.de

Our research focuses on exploration of large animal models for human diseases and enrolls tissues gained from animals suffering from spontaneous neurological disorders. Thereby, we evaluate the interspecies resemblance of concepts gained from either humans or animals.

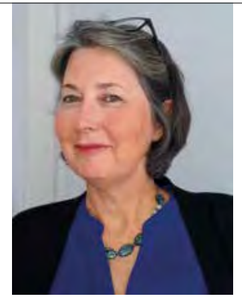
Subclassification and characterisation of Guillain-Barré like polyradiculoneuropathies

Gross S et al. (2016) ***Nodo-paranodopathy, internodopathy and cleftopathy: target-based reclassification of Guillain-Barré-like immune-mediated polyradiculoneuropathies.*** In Press.
Rupp A et al. (2013). ***Anti-GM2 ganglioside antibodies are a biomarker for acute canine polyradiculoneuritis.*** J Peripher Nerv Syst 18(1): 75-88.
Bader SR et al. (2010) ***Acute paretic syndrome in juvenile White Leghorn chickens resembles late stages of acute inflammatory demyelinating polyneuropathies in humans.*** J Neuroinflammation 7: 7.

More information: www.mcn.lmu.de/people

Biological clocks in simple models and their role in protein aggregation

Olmedo M et al. (2015) ***A High-Throughput Method for the Analysis of Larval Developmental Phenotypes in Caenorhabditis elegans.*** Genetics 201(2): 443-8.
Olmedo M et al. (2012) ***Circadian regulation of olfaction and an evolutionarily conserved, nontranscriptional marker in Caenorhabditis elegans.*** Proc Natl Acad Sci U S A 109(50): 20479-84.
Eelderink-Chen Z et al. (2010) ***A circadian clock in Saccharomyces cerevisiae.*** Proc Natl Acad Sci U S A 107(5): 2043-7.



LMU Munich, Faculty of Medicine

Prof. Dr. Martha Merrow

Institute of Medical Psychology
merrow@lmu.de

The circadian clock is a temporal program that is active in all of our cells. It controls basic physiologies as well as complex behaviour. We are interested in how the clock synchronises with the environment and how the de-synchronised state leads to pathologies.

Cellular mechanisms of axon dismantling

Breckwoldt MO et al. (2014) ***Multi-parametric optical analysis of mitochondrial redox signals during neuronal physiology and pathology in vivo.*** Nat Med 20: 555-60.
Sorbara CD et al. (2014) ***Pervasive axonal transport deficits in multiple sclerosis models.*** Neuron 84: 1183-90.
Kleele T et al. (2014) ***Imaging of microtubular dynamics in intact mammalian axons.*** Nat Commun 5: 4827.

TUM, School of Medicine

Prof. Dr. Thomas Misgeld

Institute of Neuronal Cell Biology
thomas.misgeld@tum.de

We study the axon remodelling in the developing and diseased nervous system. We are particularly interested in the interplay of intrinsic (e.g. axonal transport) and extrinsic (e.g. axon-glial) factors that maintain axons, to understand how axons normally uphold homeostasis and how they respond to neuroinflammation or neurodegeneration.

Systemic Multiple Sclerosis research

Schmidt P et al. (2012) ***An automated tool for detection of FLAIR-hyperintense white-matter lesions in Multiple Sclerosis.*** Neuroimage 59: 3774-3783.
Biberacher V et al. (2010) Intra- and interscanner variability of magnetic resonance imaging based volumetry in multiple sclerosis. Neuroimage (Epub ahead of print).
Rauschecker JP et al. (2010) ***Tuning Out the Noise: Limbic-Auditory Interactions in Tinnitus.*** Neuron 66: 819-826.

TUM, Klinikum rechts der Isar

Prof. Dr. Mark Mühlau

Department of Neurology
mark.muehlau@tum.de

Multiple Sclerosis (MS) is a chronic inflammatory disease of the central nervous system. Magnetic resonance imaging has proved an important tool for diagnosis, monitoring disease and research. We aim to better understand MS at the systemic level and to bridge the gap between molecular and systemic research in MS.

LMU Munich, Faculty of Psychology

Prof. Dr. Hermann J. Müller

Department of Psychology, General & Experimental Psychology
hmueller@psy.lmu.de

Visuo-spatial attention; adaptive weighting dynamics in visual search, cross-modal processing & motor action; adaptive control & plasticity of cognitive functions; normal & pathological cognitive aging; integrative methodological approach, incl. psychophysics, mental chronometry, EEG / ERP, fNIRS, fMRI, TMS, neuropsychological (patient) studies, & mathematical modeling.

Active / adaptive perception: How action goals & action context influence what we perceive

Töllner T et al. (2012) ***How the speed of motor-response decisions, but not focal-attentional selection, differs as a function of task set and target prevalence.*** Proc Natl Acad Sci USA 109: E1990-E1999.
Müller HJ et al. (2009) ***Attentional capture by salient color singleton distractors is modulated by top-down dimensional set.*** J Exp Psychol Hum Percept Perform 35: 1-16.
Müller HJ et al. (1989) ***Reflexive and voluntary orienting of visual attention: Time course of activation and resistance to interruption.*** J Exp Psychol Hum Percept Perform 15: 315-330.

LMU Munich, Faculty of Medicine

Prof. Dr. Norbert Müller

Clinic for Psychiatry and Psychotherapy
norbert.mueller@med.uni-muenchen.de

Inflammation and the immune system in major depression, schizophrenia, dementia. Biomarkers in serum and CSF. Therapeutic approaches based on anti-inflammatory / immune therapy including COX-2 inhibitors. Astrocytes and microglia in inflammatory CNS disorders. Infection / inflammation in Tourette's syndrome. The tryptophan / kynurenine metabolism in psychiatric disorders.

EU-funded projects: EMTICS and Moodinflame

Müller N et al. (2010) ***Celecoxib treatment in an early stage of schizophrenia: results of a randomized, double-blind, placebo-controlled trial of celecoxib augmentation of amisulpride treatment.*** Schizophr Res. 121(1-3): 118-24.
Müller N et al. (2007) ***The immune-mediated alteration of serotonin and glutamate: towards an integrated view of depression.*** Mol Psychiatry 1-13.
Müller N et al. (2006) ***The cyclooxygenase-2 inhibitor celecoxib has therapeutic effects in major depression: results of a double-blind, randomized, placebo-controlled, add-on pilot study to reboxetine.*** Mol Psychiatry 11: 680-684.

LMU Munich, Faculty of Philosophy

Prof. Dr. Julian Nida-Rümelin

Philosophy IV, Department of Philosophy
sekretariat.nida-ruemelin@lrz.uni-muenchen.de

Prof. Julian Nida-Rümelin is a German philosopher. He studied philosophy, physics, mathematics, and political sciences. His focus is on theoretical and applied ethics, political philosophy, theory of rationality and action theory.

Nida-Rümelin J. ***Humanistische Reflexion.*** Suhrkamp Verlag, 2016.
Henz S. et al (2015) ***Stimulus-dependent deliberation process leading to a specific motor action demonstrated via a multi-channel EEG analysis.*** Front Hum Neurosci 9: 355.
Nida-Rümelin J. ***Über menschliche Freiheit.*** Reclam Verlag, 2006.

More information: www.mcn.lmu.de/people

Social and cognitive development in early childhood

Paulus M (2016). ***The development of action planning in a joint action context.*** Dev Psychol 52: 1052-1063.
Paulus M (2014). ***How and why do infants imitate? An ideomotor approach to social and imitative learning in infancy (and beyond).*** Psychon Bull Rev 21: 1139-1156.
Paulus M et al. (2013) ***Neural correlates of prosocial behavior in infancy: Different neurophysiological mechanisms support the emergence of helping and comforting.*** NeuroImage 66: 522-530.

LMU Munich, Faculty of Psychology

Prof. Dr. Markus Paulus

Department of Psychology, Developmental Psychology
markus.paulus@lmu.de

Our research focuses on social and cognitive development in early childhood. Current research topics include the early development of social cognition, social learning and the emergence of prosocial behavior and moral cognition.

Impact of emotions on problem-solving, memory processes, and cognitive performance

Pekrun R et al. (2016) ***Achievement emotions and academic performance: Longitudinal models of reciprocal effects.*** Child Development (in press).
Spachtholz P et al. (2014) ***Negative affect improves the quality of memories: An affect-induced trading of capacity for precision in sensory and working memory.*** J Exp Psychol Gen 143(4): 1450-1456.
Pekrun R. (2006) ***The control-value theory of achievement emotions: Assumptions, corollaries, and implications for educational research and practice.*** Educ Psychol Rev 18(4): 315-341.

LMU Munich, Faculty of Psychology; Australian Catholic University

Prof. Dr. Reinhard Pekrun

Department of Psychology &
Institute for Positive Psychology & Education
pekrun@lmu.de

Our research areas include achievement emotion and motivation, personality development, and educational assessment. Currently, a major focus is research on the impact of emotions on cognitive functions underlying human learning. This research uses laboratory-based behavioral and neuroscientific methods as well as field studies in educational contexts.

Brain mechanisms of pain

Schulz E et al.(2015) ***Prefrontal gamma oscillations encode tonic pain in humans.*** Cereb Cortex 25: 4407-4414.
Schulz E et al. (2012) ***Decoding an individual's sensitivity to pain from the multivariate analysis of EEG data.*** Cereb Cortex 22: 1118-23.
Ploner M et al. (2010) ***Prestimulus functional connectivity determines pain perception in humans.*** Proc Natl Acad Sci USA 107: 355-60.

TUM, School of Medicine

Prof. Dr. Markus Ploner

Department of Neurology
markus.ploner@tum.de

We work on the representation of pain in the human brain. We use fMRI and EEG and perform complex time-frequency and connectivity analyses of brain activity to elucidate the brain mechanisms of pain in health and disease with the ultimate goal of optimizing the diagnosis and therapy of chronic pain.

LMU Munich, Faculty of Veterinary Medicine

Prof. Dr. Heidrun Potschka

Institute of Pharmacology, Toxicology, and Pharmacy
potschka@pharmtox.vetmed.uni-muenchen.de

Our research aims to improve the understanding of molecular and cellular mechanisms of epilepsies, epileptic encephalopathies, and their development. The gain-in-knowledge provides a basis for the identification of biomarker and target candidates. Novel therapeutic and preventive approaches are developed and assessed regarding efficacy and tolerability.

Pathophysiology and pharmacology of epilepsy

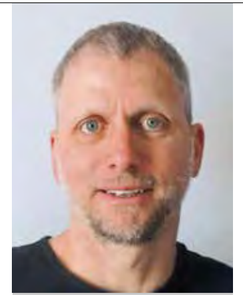
Walker A et al. (2016) ***Proteomic profiling of epileptogenesis in a rat model: Focus on inflammation.*** Brain Behav Immun 53: 138-58.
Potschka H. (2012) ***Role of CNS efflux drug transporters in antiepileptic drug delivery: overcoming CNS efflux drug transport.*** Adv Drug Deliv Rev 64: 943-52.
Löscher W et al. (2005) ***Drug resistance in brain diseases and the role of drug efflux transporters.*** Nat Rev Neurosci 6: 591-602.

TUM, Klinikum rechts der Isar

Prof. Dr. Gerhard Rammes

Clinic for Anaesthesiology
g.rammes@tum.de

Neuronal processes are determining brain function. Our research focuses on the neuronal and cellular physiology regarding Alzheimer's disease pathology, anaesthesia and learning and memory mechanisms. Consequently, we are also interested whether and how these processes are related and if, interfere with each other.



Is xenon and TSPO activation neuroprotective against Alzheimer's disease?

Mattusch C et al. (2015) ***Impact of Hyperpolarization-activated, Cyclic Nucleotide-gated Cation Channel Type 2 for the Xenon-mediated Anesthetic Effect: Evidence from in Vitro and in Vivo Experiments.*** Anesthesiology 122(5): 1047-1059.
Rammes G et al. (2015) ***MRZ-99030 - A novel modulator of Abeta aggregation: II - Reversal of Abeta oligomer-induced deficits in long-term potentiation (LTP) and cognitive performance in rats and mice.*** Neuropharmacol 92: 170-182.
Rupprecht R et al. (2009) ***Translocator protein (18 kD) as target for anxiolytics without benzodiazepine-like side effects.*** Science 325(5939): 490-493.

TUM, Department of Electrical and Computer Engineering

Prof. Dr. Gerhard Rigoll

Institute for Human-Machine Communication
mmk@tum.de

The Institute for Human-Machine Communication performs research on novel techniques for an intuitive and natural interaction of humans with all types of computers and computer-controlled systems and machines. The focus is on multi-modal human-machine communication using mainly statistical machine learning techniques and other probabilistic pattern recognition methods.

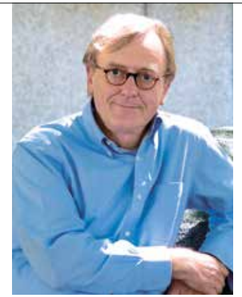
Deep learning methods and recurrent neural nets for multimodal human-machine communication

Geiger JT et al. (2014) ***Memory-Enhanced Neural Networks and NMF for Robust ASR.*** IEEE / ACM Transactions on Audio, Speech and Language Processing 22(6): 1037-1046.
Schuller B et al.: ***Speech Communication and Multimodal Interfaces.*** In: Advanced Man-Machine Interaction. Springer Verlag Berlin Heidelberg New York, 2006.
Schuller B et al. (2004) ***Speech Emotion Recognition Combining Acoustic Features and Linguistic Information in a Hybrid Support Vector Machine - Belief Network Architecture.*** IEEE-ICASSP 1: 577-580.

More information: www.mcn.lmu.de/people

The human sleep project

Allebrandt KV et al. (2013) ***A K(ATP) channel gene effect on sleep duration: from genome-wide association studies to function in Drosophila.*** Mol Psychiatry 18(1): 122-132.
Roenneberg T et al. (2012) ***Social Jetlag and Obesity.*** Curr Biol 22(10): 939-943.
Roenneberg T et al. (1993) ***Two circadian oscillators in one cell.*** Nature 362(6418): 362-364.



LMU Munich, Faculty of Medicine

Prof. Dr. Till Roenneberg

Institute of Medical Psychology
roenneberg@lmu.de

Our research bridges circadian biology, sleep research and epidemiology. We originally used sleep as a hand of the clock in large-scale, worldwide studies (our Munich ChronoType Database has >250,000 entries). Now, we focus more on characterising sleep itself and developed methods to extract sleep structure from wrist-actimetry, using the world as our sleep lab.

Mouse models of psychiatric diseases, biosensors, repurposing and genetic screening

Shahmoradi A et al. (2015) ***Enhanced memory consolidation in mice lacking the circadian modulators Sharp1 and -2 caused by elevated Igf2 signaling in the cortex.*** Proc Natl Acad Sci USA 112(27): E3582-9.
Brzózka MM et al. (2010) ***Cognitive and sensorimotor gating impairments in transgenic mice overexpressing the schizophrenia susceptibility gene Tcf4 in the forebrain.*** Biol Psychiatry 68(1): 33-40.
Wehr MC et al. (2006) ***Monitoring regulated protein-protein interactions using split TEV.*** Nat Methods 3(12): 985-93.

LMU Munich, Faculty of Medicine

Prof. Dr. Moritz Rossner

Department of Psychiatry
moritz.Rossner@med.uni-muenchen.de

Characterization of animal models for neurological and psychiatric diseases. Focus on transcription factors implicated in neuronal development and circadian processes. Development and adaptation of -omic technologies for applications in the brain, as well as genetic and repurposing screenings in cellular systems with a focus on schizophrenia-associated pathways.

Neural synchronisation as coordinating process in human cognition

Glennon M et al. (2016) ***Distributed cortical phase synchronization in the EEG reveals parallel attention and working memory processes involved in the attentional blink.*** Cereb Cortex 26: 2035-2045.
Pinal D et al. (2015) ***Stuck in default mode: Ineffienct cross-frequency synchronization may lead to age-related short-term memory decline.*** Neurobiol 36: 1611-1618.
Sauseng P et al. (2009) ***Brain oscillatory substrates of visual short-term memory capacity.*** Curr Biol 19(21): 1846-1852.

LMU Munich, Faculty of Psychology

Prof. Dr. Paul Sauseng

Department of Psychology
paul.sauseng@lmu.de

Neural signatures of (visual) working memory, short-term memory, attention and executive control in humans; measured via scalp electroencephalography and probed with transcranial magnetic and electrical stimulation.

LMU Munich, Faculty of Psychology

Prof. Dr. Thomas Schenk

Department of Psychology, Clinical Neuropsychology
thomas.schenk@psy.lmu.de

We are interested in the neural correlates of visual perception, attention and motor control and in the study of neuropsychological disorders in these domains. A particular focus of our research is on understanding how visual disorders affect our ability to produce motor behaviour.

The neural correlates of visuomotor behaviour

Schenk T. (2012) ***No dissociation between perception and action in patient DF when haptic feedback is withdrawn.*** J Neurosci 32(6): 2013-2017.
Lane AR et al. (2010) ***Visual exploration training is no better than attention training for treating hemianopia.*** Brain 133: 1717-1728.
Schenk T. (2006) ***An allocentric rather than perceptual deficit in patient D.F.*** Nat Neurosci 9: 1345-1347.

Max Planck Institute of Psychiatry

PD Dr. Mathias Schmidt

Department of Stress Neurobiology and Neurogenetics
mschmidt@psych.mpg.de

The main focus of our research group is to study the impact of stress on the body during different developmental stages, specifically focussing on the behavioral, neuroendocrine, and molecular basis of individual stress vulnerability and resilience.

Stress resilience: Understanding mechanisms – developing novel treatments

Hartmann J et al. (2016) ***Forebrain glutamatergic, but not GABAergic neurons mediate anxiogenic effects of the glucocorticoid receptor.*** Mol Psychiatry, in press.
Uribe-Marino A et al. (2016) ***Prefrontal cortex corticotropin-releasing hormone receptor 1 conveys acute stress-induced executive dysfunction.*** Biol Psychiatry, in press.
Wang XD et al. (2013) ***Nectin-3 links CRHR1 signaling to stress-induced memory deficits and spine loss.*** Nat Neurosci 16(6): 706-13.

LMU Munich, Faculty of Medicine

Prof. Dr. Andrea Schmitt

Department of Psychiatry and Psychotherapy
Andrea.Schmitt@med.uni-muenchen.de

In post-mortem brain regions we used microarrays and proteomics to disentagle the molecular background of schizophrenia. In morphological design, based stereology studies, we investigated cell numbers in hippocampal subregions in schizophrenia and affective disorders. We coordinated a clinical study of aerobic exercise in chronic schizophrenia patients.

Neurobiology of schizophrenia

Falkai P et al. (2016) ***Decreased Oligodendrocyte and Neuron Number in Anterior Hippocampal Areas and the Entire Hippocampus in Schizophrenia: A Stereological Postmortem Study.*** Schizophr Bull 42 Suppl 1: S4-S12.
Falkai P et al. (2015) ***Kraepelin revisited: Schizophrenia from degeneration to failed regeneration.*** Mol Psychiatry 20(6): 671-676.
Malchow B et al. (2015) ***Effects of Endurance Training Combined With Cognitive Remediation on Everyday Functioning, Symptoms, and Cognition in Multiepisode Schizophrenia Patients.*** Schizophr Bull 41(4): 847-58.

The self in action: From intentions to actions and a sense of self

Kuehn E et al. (2014) ***The functional architecture of S1 during touch observation described with 7 Tesla fMRI.*** Brain Struct and Funct 219(1): 119-40.
Schütz-Bosbach S et al. (2006) ***Self and other and in the human motor system.*** Curr Biol 16(8): 1830-1834.
Bosbach S et al. (2005) ***Inferring another's expectation from action: The role of peripheral sensation.*** Nat Neurosci 8(10): 1295-1297.

LMU Munich, Faculty of Psychology

Prof. Dr. Simone Schütz-Bosbach

Department of Psychology
s.schuetz-bosbach@lmu.de

Our research focuses on human sensation, perception and action by using both behavioral and neurophysiological methodologies. In particular, we are interested in the neurocognitive aspects of action and conscious intention, and the brain processes that allow the motor system to link actions to events that occur in the environment.

Seminar on pharmacodynamics and pharmacokinetics of antidepressant and antipsychotic drugs

Schütze G et al. (2016) ***Therapeutic drug monitoring for individualised risk reduction in psychopharmacotherapy.*** Trends Anal. Chem (Epub ahead of print).
Schwarz MJ et al. (2013) ***Increased 3-Hydroxykynurenine serum concentrations differentiate Alzheimer's disease patients from controls.*** Eur Arch Psychiatry Clin Neurosci 263(4): 345-352.
Meyer U et al. (2011) ***Inflammatory processes in schizophrenia: A promising neuroimmunological target for the treatment of negative / cognitive symptoms and beyond.*** Pharmacol Ther 132: 96-110.

LMU Munich, Faculty of Medicine

Prof. Dr. Markus J. Schwarz

Institute of Laboratory Medicine
markus.schwarz@med.uni-muenchen.de

1) Neurobiochemistry: Functional relationship between the immune system and the two main metabolism pathways of tryptophan (serotonin and kynurenine) in health and disease. 2) Psychopharmacology: Therapeutic drug monitoring – Influence of co-medication and genetic predisposition on therapeutic blood levels of psychotropic drugs.

Human agency

Sellmaier S: Ethik der Konflikte. ***Über den moralisch angemessenen Umgang mit ethischem Dissens und moralischen Dilemmata. Zweite durchgesehene Auflage.*** Stuttgart, Kohlhammer Verlag, 2011.
Sellmaier S: ***Was beweisen Benjamin Libets Experimente zur Willensfreiheit?*** In: Philosophisches Jahrbuch 2. Halbband, 2007.
Sellmaier S: ***Langfristiges Entscheiden. Eine Grundlagenuntersuchung zur Entscheidungstheorie.*** Berlin, LIT-Verlag, 2007.

LMU Munich, Faculty of Philosophy

Prof. Dr. Stephan Sellmaier

Department of Philosophy
sellmaier@lmu.de

The Research Center for Neurophilosophy and Ethics of Neurosciences is part of the philosophy department and the Munich Center for Neurosiences – Brain & Mind at the LMU. We investigate the philosophical implications of empirical findings in the cognitive sciences and initiate interdisciplinary research projects.

LMU Munich, Faculty of Medicine

Prof. Dr. Anton Sirota

Cognition and Neural Plasticity
sirota@bio.lmu.de

Our research is focused on principles of learning and memory consolidation. We are studying the neurophysiological mechanisms of information transfer and processing in cortical and hippocampal circuits across different behavioral and arousal states of freely-behaving rodents.

Mechanisms of learning and memory

Sirota A et al. (2008) ***Entrainment of neocortical neurons and gamma oscillations by the hippocampal theta rhythm.*** Neuron 60(4): 683-697.
Isomura Y et al.(2006) ***Integration and segregation of activity in entorhinal-hippocampal subregions by neocortical slow oscillations.*** Neuron 52(5): 871-82.
Khazipov R et al.(2004) ***Early motor activity drives spindle bursts in the developing somatosensory cortex.*** Nature 432(7018): 758-61.

LMU Munich, Faculty of Biology

Prof. Dr. Hans Straka

Department Biology II, Division of Neurobiology
straka@lmu.de

Using *Xenopus laevis* as a model, our group focuses on deciphering the developmental assembly, functional organization and adaptive plasticity of the gaze control system during locomotion. The multi-methodological approach and the unlimited access to all network elements allows linking activity related sensory-motor computations with the behavioral performance.

Functional organization and plasticity of gaze stabilization

Chagnaud BP et al. (2015) ***Spinal corollary discharge modulates motion sensing during vertebrate locomotion.*** Nat Comm 6: 7982. von Uckermann G et al. (2013) ***Spinal efference copy signaling and gaze stabilization during locomotion in juvenile Xenopus frogs.*** J Neurosci 33: 4253-4264.
Lambert FM et al. (2012) ***Gaze stabilization by efference copy signaling without sensory feedback during vertebrate locomotion.*** Curr Biol 22: 1649-1658.

LMU Munich, Faculty of Medicine

Prof. Dr. Andreas Straube

Department of Neurology
andreas.straube@med.uni-muenchen.de

Our research is clinically oriented with a focus on the following main topics: 1) Headache and pain: mechanisms of endogenous pain modulation; 2) Cerebral lymphoma: *in-vivo and in-vitro* models of primary cerebral lymphoma; 3) Eye and hand movement control: contribution of cerebellar structures.

In vivo dual photone microscopy of primary brain lymphoma in the mouse

Eggert T et al. (2016) ***Modeling Inter-trial Variability of Saccade Trajectories: Effects of Lesions of the Oculomotor Part of the Fastigial Nucleus.*** PLoS Comput Biol 12(6): e1004866.
Schankin CJ et al. (2016) ***New-Onset Headache in Patients With Autoimmune Encephalitis Is Associated With anti-NMDA-Receptor Antibodies.*** Headache 56(6): 995-1003.
Ruscheweyh R et al. (2015) ***Learned control over spinal nociception reduces supraspinal nociception as quantified by late somatosensory evoked potentials.*** Pain 156(12): 2505-13.

More information: www.mcn.lmu.de/people

Pharmacotherapy of vestibular, ocular motor and cerebellar disorders

Adrion C et al. (2016) ***Efficacy and safety of betahistine treatment in patients with Meniere's disease: primary results of a long term, multicentre, double blind, randomised, placebo controlled, dose defining trial.*** BMJ 352: h6816.
Strupp M et al. (2011) ***A randomized trial of 4-aminopyridine in EA2 and related familial episodic ataxias.*** Neurology 77: 269-275.
Strupp M et al. (2004) ***Methylprednisolone, valacyclovir, or the combination for vestibular neuritis.*** N Engl J Med 351: 354-361.

LMU Munich, Faculty of Medicine

Prof. Dr. Michael Strupp

Department of Neurology & DSGZ
michael.strupp@med.uni-muenchen.de

Diagnosis and treatment of vestibular, ocular motor and cerebellar disorders with back-translational research (animal models, molecular biology and functional imaging) and multi-center randomized controlled clinical trials.

Development and function of GABAergic interneurons in the cerebral cortex

Riedemann T et al. (2016) ***Immunocytochemical heterogeneity of somatostatin-expressing GABAergic interneurons in layers II and III of the mouse cingulate cortex: A combined immunofluorescence / design-based stereologic study.*** J Comp Neurol 524: 2281-2299.
Riedemann T et al. (2016) ***Determination and compensation of series resistances during whole-cell patch-clamp recordings using an active bridge circuit and the phase-sensitive technique.*** Pflügers Archiv - Eur J Physiol [Epub ahead of print].
Sutor B et al. (2005) ***Involvement of gap junctions in the development of the neocortex.*** Biochim Biophys Acta 1719: 59-68.

LMU Munich, Faculty of Medicine

Prof. Dr. Bernd Sutor

Department of Physiological Genomics
bernd.sutor@lrz.uni-muenchen.de

Using electrophysiological and morphological techniques, we investigate the intrinsic properties and synaptic integration of inhibitory interneurons in local circuits of the neocortex, particularly of the cingulate cortex. In addition, we analyze the postnatal development of these cells and circuits.

Cognition and higher vestibular disorders

Rangelov D et al. (2015) ***Occipital TMS at phosphene detection threshold captures attention automatically.*** Neuroimage 109: 199-205.
Soutschek A et al. (2013) ***Dissociable Mechanisms Control Conflict during Perception and Response Selection: a Transcranial Magnetic Stimulation study.*** J Neurosci 33(13): 5647-5654.
Taylor PC et al. (2010) ***The neural signature of phosphene perception.*** Hum Brain Mapp 31(9): 1408-1417.

LMU Munich, Faculty of Medicine

Prof. Dr. Paul Taylor

DSGZ
paul.taylor@med.uni-muenchen.de

We study how cognition affects perception, its neural basis, and how this is affected in neurological disorders. Our focus is on developing combined brain stimulation-recording techniques (e.g. TMS, tCS, EEG) to test how visual and vestibular information is used in the human brain to represent space, orient attention and control our actions.

Max Planck Institute of Psychiatry

Prof. Dr. Christoph W. Turck

Department of Translational Research in Psychiatry
turck@psych.mpg.de

Our research focuses on the identification of biosignatures for psychiatric disorders and the antidepressant response. Omics platforms are used to provide a rich source of data for *in silico* pathway analyses. The goal is to complement imprecise DSM-based clinical parameters with molecular biosignatures to improve patient diagnosis, stratification and treatment.

Neurochemical basis of the stress and ketamine drug response

Kao CY et al. (2016) ***Fluoxetine treatment prevents the inflammatory response in a mouse model of posttraumatic stress disorder.*** J Psychiatr Res 76: 74-83.
Weckmann K et al. (2014) ***Time-dependent metabolomic profiling of Ketamine drug action reveals hippocampal pathway alterations and biomarker candidates.*** Transl Psychiatry 4: e481.
Ditzen C et al. (2010) ***Proteomic-based genotyping in a mouse model of trait anxiety exposes disease-relevant pathways.*** Mol Psychiatry 15: 702-711.

TUM, Department of Physics

Prof. Dr. J. Leo van Hemmen

Theoretical Biophysics
lvh@tum.de

We focus on the theoretical biophysics of neuronal information processing ensuing from organs of perception such as the mechanosensory system including map formation of audition and the lateral-line system, and infrared vision of snakes.

Internally coupled ears

Vedurmudi AP et al. (2016) ***How internally coupled ears generate temporal and amplitude cues for sound localization.*** Phys Rev Lett 116: 028101.
van Hemmen JL et al. (2008) ***Population vector code: a geometric universal as actuator.*** Biol Cybern 98: 509-518.
Gerstner W et al.(1996) ***A neuronal learning rule for sub-millisecond temporal coding.*** Nature 383: 76-78.

Parmenides Foundation

Prof. Dr. Albrecht von Mueller

Parmenides Center for the Study of Thinking
avm@parmenides-foundation.org

We focus on the structures and dynamics of complex thinking processes, especially the interplay between analytical and constellatory thinking operations (the characteristic feature of “constellatory” thinking operations being that the considered items unfold their full meaning only mutually, i.e. in their specific configuration).

The neural correlates of reason (as richer than just analytical cognitive operations)

von Müller A. : ***The Forgotten Present. In: Re-thinking Time at the Interface of Physics and Philosophy.*** Heidelberg, Springer, 2015.
von Müller A. : ***On the Emegence and Relativity of the Local Spacetime Portrait of Reality. In: Welt der Gründe: XXII.*** Deutsches Jahrbuch für Philosophie. Hamburg, Felix Meiner Verlag, 2012.
Filk T et al. (2010): ***A Categorical Framework for Quantum Theory.*** In: Annalen der Physik 522(11): 783-801.

More information: www.mcn.lmu.de/people

The perception and neural basis of echolocation, listening, and communication

Geberl C et al. (2016) ***Fast sensory-motor reactions in echolocating bats to sudden changes during the final buzz and prey intercept.*** Proc Natl Acad Sci U S A 112(13): 4122-7.
Luo J et al. (2015) ***Linking the sender to the receiver: vocal adjustments by bats to maintain signal detection in noise.*** Sci Rep 5:18556.
Wallmeier L et al. (2013) ***Echolocation versus echo suppression in humans.*** Proc Biol Sci 280(1769): 20131428.

LMU Munich, Faculty of Biology

Prof. Dr. Lutz Wiegrebe

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We work on auditory perception and its underlying neurobiology, currently focusing on the analysis and suppression of echoes by bats and humans (echolocation and the precedence effect) and the neural basis of vocal production learning in bats.

Antagonistic roles of CB1 vs. TRPV1 in control of defensive behavior in midbrain / tectum

Riebe CJ et al. (2012) ***Fear relief-toward a new conceptual frame work and what endocannabinoids gotta do with it.*** Neuroscience 204: 159-185.
Moreira FA et al. (2012) ***Cannabinoid type 1 receptors and transient receptor potential vanilloid type 1 channels in fear and anxiety-two sides of one coin?*** Neuroscience 204: 186-192.
Marsicano G et al. (2002) ***The endogenous cannabinoid system controls extinction of aversive memories.*** Nature 418: 530-534.

Max Planck Institute of Psychiatry

PD Dr. Carsten T. Wotjak

Department of Stress Neurobiology and Neurogenetics
wotjak@psych.mpg.de

We are working with refined mouse models of fear and anxiety disorders to study the implication of the endogenous cannabinoid system in the control of negative affect at behavioral, neural network and cellular level.

Direct cellular reprogramming / neuroprotection in animal and cellular models of disease

Schick JA et al. (2016) ***CRISPR-Cas9 enables conditional mutagenesis of challenging loci.*** Sci Rep 6: 32326.
Zhang J et al. (2015) ***A WNT1-regulated developmental gene cascade prevents dopaminergic neurodegeneration in adult En1(+/-) mice.*** Neurobiol Dis 82: 32-45.
Refojo D et al. (2011) ***Glutamatergic and dopaminergic neurons mediate anxiogenic and anxiolytic effects of CRHR1.*** Science 333(6051): 1903-7.

TUM, School of Life Sciences; Helmholtz Zentrum München

Prof. Dr. Wolfgang Wurst

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We focus on unraveling the molecular pathoaetiology of human diseases by generating and analyzing animal models and cellular models using the CrispR / Cas technology. The resulting identification of neuroprotective factors and of networks essential for reprogramming of cells into neurons might translate into new therapeutic approaches for neurological diseases.

Catholic University of Eichstaett-Ingolstadt

Prof. Dr. Michael Zehetleitner

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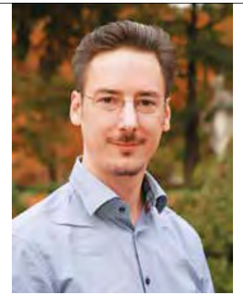

Human decision making

What are the causes of human behaviour? From the proximate perspective- how do humans decide? From the ultimate perspective - why do humans decide as they do and not differently? To answer these questions, we combine psychological, neuroscientific, and mathematical approaches. Central is the idea to understand cognitive functions as decisions and to model them as such.

Zehetleitner M et al. ***When misrepresentations are successful. In: Epistemological Dimensions of Evolutionary Psychology.*** New York, Springer, 2015.
Zehetleitner M et al.(2013) ***Being confident without seeing: What subjective measures of visual consciousness are about.*** Atten Percept Psychophys 75(7): 1406-26.
Zehetleitner M et al.(2012) ***Top-down control of attention: it's gradual, practice-dependent, and hierarchically organised.*** J Exp Psychol Hum Percept Perform 38(4): 941-57.

LMU Munich, Faculty of Languages and Literatures

Prof. Dr. Wolfram Ziegler

Institute of Phonetics and Speech Processing
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Neurologic impairment of speech and language production and of nonverbal communication

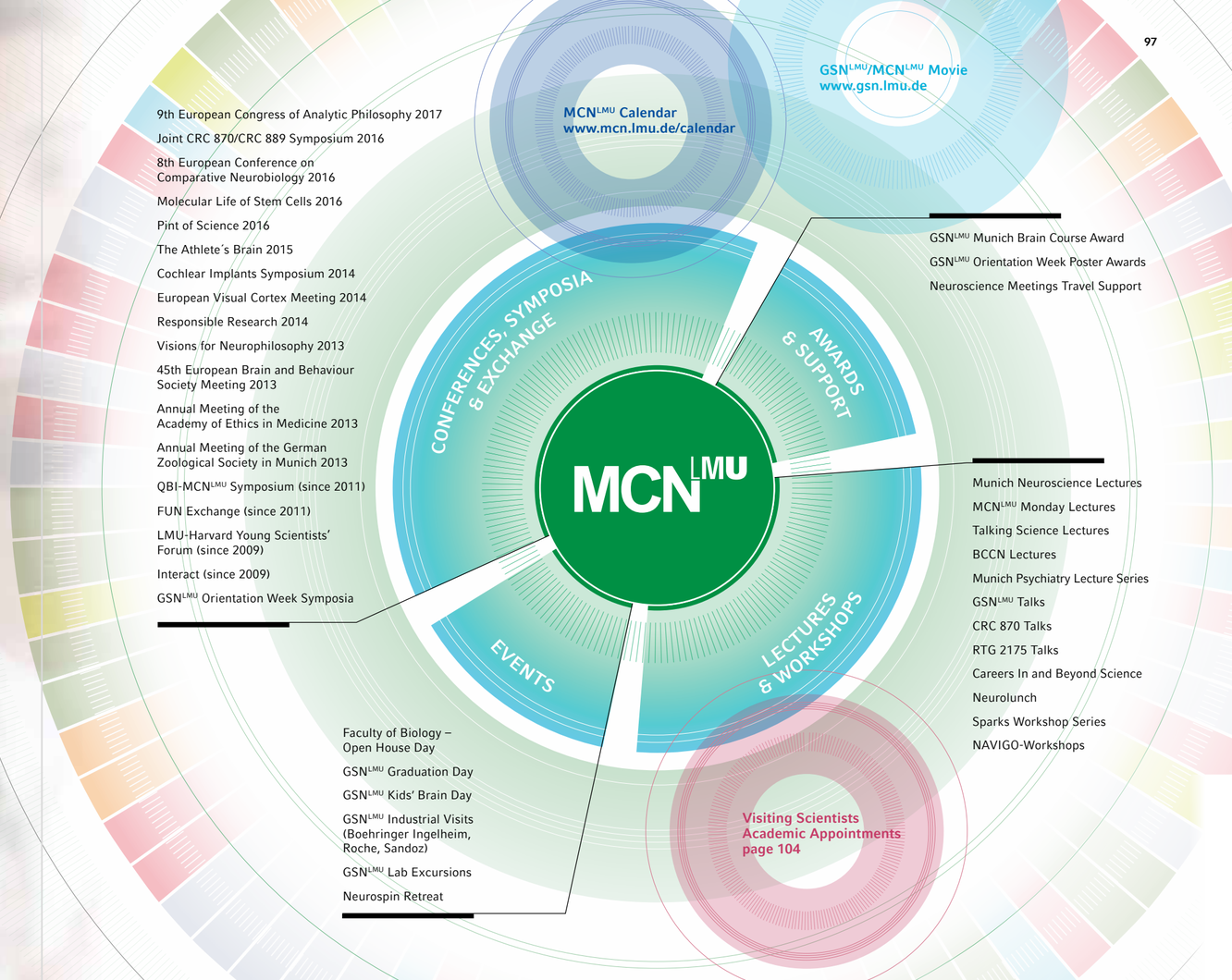
Our major research interest is in studying the neural organization of speech by analyzing how speech production may break down in adults and children with neurologic disorders. A focus lies on the interface between speech and language and on auditory-motor integration aspects of speech processing. This research has implications for clinical assessment and treatment.

Schölderle T et al. (2016) ***Dysarthria in adults with cerebral palsy: Clinical presentation and impacts on communication.*** J Speech Lang Hear Res 59: 216-229.
Ziegler W et al. (2015) ***How much is a word? Predicting ease of articulation planning from apraxic speech error patterns.*** Cortex 69: 24-39.
Ackermann H et al. (2014) ***Brain mechanisms of acoustic communication in humans and nonhuman primates: An evolutionary perspective.*** Behav Brain Sci 37: 529-604.

Community Outreach

Community Outreach

MCN[LMU] reaches out to the public with a range of timely and relevant topics within neuroscience via the support and/or organization of workshops and events open to both the neuroscience community and a general audience. Moreover, MCN[LMU] sponsors and awards GSN[LMU] students' participation in neuroscience meetings, workshops and conferences.



This *Outreach Section* lists numerous measures, joint conferences and workshops that were supported by the MCN[LMU] to link up with our scientific and public communities. Please note: research interactions of the MCN[LMU] with the Technical University Munich, Helmholtz and Max Planck institutes, as well as pharmaceutical companies like Roche and Amgen are displayed in the *Network Section*. Accordingly, the *Teaching Section* showcases international partners in education like the École Neuroscience Paris Île-de-France, the Harvard Center for Brain Sciences and the University of Queensland, Queensland Brain Institute.

Conferences / Symposia / Exchange

9th European Congress of Analytic Philosophy 2017

In view of the Center's well-developed interactions with the local humanities, MCN[LMU] support has been granted to back the ninth European Congress of Analytic Philosophy (ECAP 9) that will take place at LMU Munich from August 21 to 26, 2017. The European Society for Analytic Philosophy (ESAP) organizes the major congress every three years. The goal of this congress is to bring together analytic philosophers from Europe and all over the world to discuss their work and to exchange ideas. There will also be four plenary speakers and nine panel speakers as well as several invited symposia representing the diverse field of analytic philosophy.

Joint CRC* 870 / CRC 889 Symposium 2016

The Munich joint meeting of the CRC 889 (Cellular Mechanisms of Sensory Processing) and the CRC 870 (Neuronal Circuits; initiated by the MCN[LMU] in 2009) brought together experts from Munich and Göttingen to discuss, and then explore common principles emerging from, the recent progress made by projects at both CRCs. Since sensory systems lie at the core of both CRCs, the conference was a most-welcome opportunity to continue and deepen the vital exchange between both academic groups. All CRC projects were presented with at least one poster. Most recent results were presented in 12 talks given by CRC young researchers and principal investigators.

* Collaborative Research Center

8th European Conference on Comparative Neurobiology 2016

The 8th European Conference on Comparative Neurobiology at the Bavarian Academy of Science was organised by the MCN[LMU] April 7-9, 2016 in Munich – as the latest event of a series initiated by Hans J. ten Donkelaar and Gerhard Roth. The selection of plenary speakers and symposia covered a particularly wide range of evolutionary and developmental research topics, touching on, e.g., fish forebrain organization as well as human isocortex evolution. For more than 20 years, the ECCN has offered a unique forum to present and discuss new developments in the field of comparative neuroscience – this time to the benefit of the Munich neuroscience community.

Responsible Research 2014 / Cutting Edge Technologies 2015

Initiated by the GraduateCenter[LMU] and supported by the MCN[LMU] and its Graduate School for Systemic Neurosciences, the various graduate programs of the Lifescience Campus team up to work toward the common goal of providing doctoral researchers an excellent education with a sound foundation based on good scientific practice. This Campus network is committed to organizing large scale information events on topics of overall interest and benefit, e.g. Responsible Research 2014 & Cutting Edge Technologies 2015.

Responsible Research 2014 aimed to raise the students´ awareness on responsible research conduct, accurate data presentation, avoiding plagiarism and the pros and cons of peer review publication.

Cutting Edge Technologies 2015 aimed to increase the visibility of local cutting-edge technologies and to connect peers and expert users. Keynote speakers who have developed groundbreaking methods (e.g. CRISPR/Cas9, Optogenetics) and have visionary ideas for the future (Connectomics) were invited. Moreover, break-out sessions were conducted by local pioneers reflecting the wealth of cutting-edge techniques at the Campus Großhadern/Martinsried.

106th Annual Meeting of the German Zoological Society 2013

Backed and managed by the MCN[LMU], the largest zoological conference in Germany was hosted at LMU Munich September 13-16, 2013. Highly distinguished national and international researchers took part at the 106th Annual Meeting of the German Zoological Society (DZG) and presented the rapid progress in zoological sciences ranging from developmental biology to zoological systematics. About 500 participants had access to close to 400 posters and oral presentations which demonstrated a variety of state-of-the-art scientific approaches from molecular to behavioral levels, including three satellite symposia on neuro-ethology, physiology, and electron-microscopy. In particular, the Annual Meeting was a platform for young researchers to present their work to a large and influential audience in their respective fields.

Visions for Neurophilosophy 2013

Professor Schleim, intermittent holder of the MCN[LMU] Chair for Neurophilosophy, organised Visions for Neurophilosophy as an international and interdisciplinary meeting on the state of the art of interdisciplinary neuroscience, with a focus on ethics, law, philosophy, psychology, and sociology. Experts from various fields and countries presented their views on how neuroscience is relevant to other disciplines or how their disciplines react to brain research. Two discussions were dedicated to the social challenges of neuroscience and visions for neurophilosophy. The conference was held at LMU Munich on March 21 and 22, 2013.

<interact>

Since its first meeting in 2007, the symposium, co-sponsored by the GSN[LMU], has encouraged hundreds of young scientists in their early career to actively interact, share knowledge and build networks between all the different life science communities of Munich. Moreover, <interact> offers an extensive overview of industries and institutions present in the Munich area, giving the participants an opportunity to expand their career perspectives. Interact 2016 brought together more than 200 participants, offering over 80 scientific collaborations, as well as internationally renowned keynote lecturers and invited speakers.

Lectures & Workshops

Munich Neuroscience Lecture

The MCN[LMU] network brings together all research groups interested in disciplines related to neurobiology and cognition, i.e. "brain & mind". In addition, the center strives to stimulate public knowledge and excitement around these disciplines through bringing relevant issues and topics within the neurosciences to both specialized and wider communities. Many MCN[LMU]-organized lectures and some workshops are open to neuroscientists and the general public.

In this context, the firmly established MCN[LMU] Monday Lecture Series was recently developed into a joint Munich Neuroscience Lecture Series hosted by the the Max-Planck Institute of Neurobiology, the Bernstein Center for Computational Neurosciences and the MCN[LMU]. The monthly lectures represent an attractive forum for the neuroscience community, featuring high-profile local and international experts who cover an interdisciplinary spectrum of current top-notch research. The newly established series exposes students and faculty of the greater Munich area to key figures across all fields of the neurosciences and, ideally, inspires a broad audience of scholars with a wide range of interests. During each term, the lectures are scheduled on every first available Monday of the month and are held at the LMU Biocenter.

Friday Neurolunch

To further promote scientific exchange on a smaller scale, the center's GSN[LMU] hosts a weekly lecture series, the Friday Neuro-Lunch, featuring local researchers from a range of fields where they present and discuss their work. Lectures take place in the LMU Biocenter and are open to all GSN[LMU] affiliates. The GSN[LMU] also facilitates scientific exchange by hosting monthly GSN[LMU] Talks, co-organized by GSN[LMU] students, where leading international scientists are invited to showcase their work and research results.

Careers In and Beyond Science

Careers In and Beyond Science is a new GSN[LMU] series of talks and workshops dealing with career and career planning issues in and outside science. The first series workshop "Being a mom/dad in (neuro)-science" addressed the challenges of combining a career (in science) with parenthood, and how children fit in a busy work schedule. In a moderated panel discussion, experienced mothers and fathers at various stages in their scientific careers – from PhD students to professors – shared their experiences on how they combine it all and discussed some of the myths and realities of the term "work-life balance" in a family and career context.

Associated Event Series

Many more neuroscientific lecture series are integrated in the MCN[LMU] framework (a selection is listed on the outreach graphic), among them those of the research entities Bernstein Center for Computational Neurosciences BCCN Munich, Collaborative Research Center CRC 870 and Excellence Cluster for Systems Neurology SyNergy, as well as those of the Research Training Group RTG 2175, the Max-Planck Research School for Translational Psychiatry IMPRS-TP and for Molecular Life Sciences IMPRS-LS.

BCCN Lecture Series

The BCCN Lecture Series features research talks in Computational Neuroscience. Guest speakers are invited to present their latest findings. The series is open to all interested students, postdocs and PIs, fosters the scientific exchange within the Munich community, and links the Bernstein Center at the national and international level. The lectures are integrated into the Monday lectures hosted in alternating order by BCCN, GSN[LMU], MCN[LMU], RTG 2175 and CRC 870.

Talking Science Event

The Talking Science Event is a yearly two-day workshop that allows young scientists to meet a top neuroscientist and interact with her/him in an informal atmosphere. In addition, the guest speaker presents a plenary lecture. The event is organized by a small group of doctoral students and supported by BCCN, GSN[LMU], and MCN[LMU]. Since its initiation in 2009, Talking Science has become an integral part of neuroscience activities in Munich (2009: M. Meister, 2010: K. Svoboda, 2011: M.B. Moser, 2012: N. Logothetis; 2013: L. Abbott; 2014: E. Boyden; 2015: G. Laurent; 2016: G. Turrigiano).

Events

GSN[LMU] Kids´ Brain Day

Since 2014, the GSN[LMU] and its graduate students invite preschoolers, as well as primary and high school students, to the Kids' Brain Day, a day of discoveries, experiments and fun activities. This yearly event has been extended to accommodate several groups of pupils from all ages and offers a special program to each age group accordingly. Kids get the chance to learn more about the brain and its functions, the senses, and how they help us perceive the environment. Additionally, children explore the fascinating world of science through puzzles, riddles, experiments and physical challenges. The ultimate goal of Kids' Brain Day is to make children aware of the fun and excitement behind neuroscience, and science in general.

GSN[LMU] Industrial Visits

Industrial visits play an important role in informing students about current developments and opportunities in industry. They gain insight into the internal working of companies and knowledge of new modern technologies employed in the industries. GSN[LMU] students have had the chance to gain awareness about industrial practices through visits to Sandoz Pharmaceuticals in Kündl, as well as Roche and Novartis in Basel. Industrial visits to Roche Diagnostics in Penzberg and Boehringer Ingelheim Pharma in Ingelheim are scheduled for 2017.

GSN[LMU] Lab Excursions

To support scientific exchange and networking among scientists, the GSN[LMU] has annually organized 4-day long lab excursions for its students to neuroscience institutes in different countries since 2012. On average, 20 students participate in each excursion, where an intensive program with a focus on neuroscience is offered.

A glimpse of the past scientific lab excursions:
- 2012: Tübingen (University Hospital Tübingen, MPI for Intelligent Systems)
- 2013: Paris (Paris Descartes University, ENP Graduate School)
- 2013: Dublin (Trinity College Dublin, Royal College of Surgeons in Ireland)
- 2014: Oxford (University of Oxford, Warneford Hospital)
- 2015: Jerusalem (The Hebrew University of Jerusalem)
- 2016: Basel (Biozentrum of the University of Basel, Friedrich Miescher Institute for Biomedical Research)
- 2016: Lisbon (Faculty of Medicine of Lisbon, Champalimaud Centre for the Unknown)
- 2017: Stockholm (Karolinska Institutet)

GSN[LMU] Graduation Day

Being declared a Graduate constitutes one of the most important moments in a student's life, as it marks a transition from one stage in his/her educational life to another. Therefore, the GSN[LMU] honors this event, by organizing its own graduation ceremony for GSN[LMU] MSc and PhD students.

In 2016, the GSN[LMU] not only celebrated its graduation ceremony but also the 10th anniversary of GSN[LMU] and MCN[LMU] in the Große Aula at the LMU Munich, followed by a formal dinner at the Münchner Künstlerhaus.

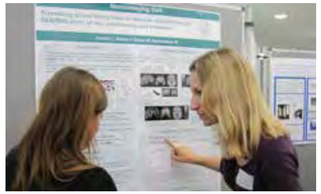
Awards & Support

GSN[LMU] Munich Brain Course Award

The Munich Brain Course is a yearly spring event. Each course features several topics, providing specific presentations and hands-on dissections. As a sponsor of the Munich Brain Course, the Graduate School of Systemic Neurosciences at LMU Munich selects up to 10 BSc and MSc students to participate yearly in the course. Selected students receive an award covering travel costs, accommodation and course fees.

GSN[LMU] Poster Awards

As a part of the GSN[LMU] orientation week, a poster session competition is held yearly, providing the GSN[LMU] students with the opportunity to share their research achievements with a wide audience. The posters are evaluated by a jury of professors and travel vouchers are awarded for the authors of the top 3 posters.



GSN[LMU] Neuroscience Meeting Travel Support

GSN[LMU] supports young scientists presenting their research at national and international meetings. In addition to advancing their careers, awardees should be enabled to directly learn from experts, collaborate with peers, and explore new tools and technologies. Student travel grants are awarded for active participation at neuroscience meetings like the Society for Neuroscience annual meeting, the Göttingen Meeting of the German Neuroscience Society and Federation of European Neuroscience Societies meeting.

Visiting Scholars & Academic Appointments

As a part of outreach measures and cooperations, the MCN[LMU] funds the stay of visiting scientists to provide students and faculty with ample opportunities to learn from national and international experts across neuroscience disciplines. Visiting Professors have held numerous lectures and workshops during their stay, thereby sharing their in-depth expertise in a wide variety of fields. In 2012, for instance, Professor Venkatesh Murthy (Harvard University) was hosted by Professor Herz (MCN[LMU] Chair for Computational Neuroscience) as an expert for the neural and algorithmic basis of odor-guided behaviors in terrestrial animals. In 2013, Professor Stefan Schleim (University of Groningen) intermittently acted as the MCN[LMU] Chair for Neurophilosophy. In 2014, the MCN[LMU] hosted Professor Michael Burger (Lehigh University) on behalf of Dr. Kopp-Scheinpflug to learn more about how cellular, synaptic, and systems level properties are integrated, allowing sensory neurons to extract and represent features of the acoustic environment. Professor Harold Zakon (University of Texas), a Carl Friedrich von Siemens Research Award Laureate of the Humboldt Foundation interested in function, regulation, and evolution of ion channels, was hosted by the MCN[LMU] at the Grothe lab in 2015. Professor Sellmeier initiated a fully funded stay of Professor Stephen Stich (Rutgers University) at the MCN[LMU] Research Center for Neurophilosophy and Ethics of Neurosciences in 2016. Also in 2016, Professor Amitha Seghal (University of Pennsylvania) was hosted at the MCN[LMU] by Professor Martha Merrow. Students and faculty appreciated learning about Seghal's research on mechanisms underlying circadian rhythms of behavior and physiology.

In addition, the MCN[LMU] and its Board provide both political momentum and tangible support for strategic academic appointments, benefitting the Munich neuroscience community, the latter by either funding temporary lab positions and/or essential equipment.

A list of MCN[LMU] supported appointments is given below:

- Professor Hartmann, Chair for Philosophy of Science (2012)
- Professor Paulus, Psychology of Early Childhood Development (2013)
- Professor Sirota, Chair for Cognition and Neuroplasticity (2014)
- Professor Sauseng, Biological Psychology (2014)
- Professor Taylor, Cognitive Disorders and the Vestibular Systems (2015)
- Professor Graf zu Eulenburg, Multimodal Imaging of Sensorimotor Systems (2016)
- Professor Busse, Organismic Neurobiology (2016)
- Professor Schütz-Bosbach, Experimental Psychology of Neuro-Cognition (2016)
- Professor Grunwald-Kadow, Neuronal Control of Metabolism (2016)
- Professor Deroy, Chair for Philosophy of Mind (2017)

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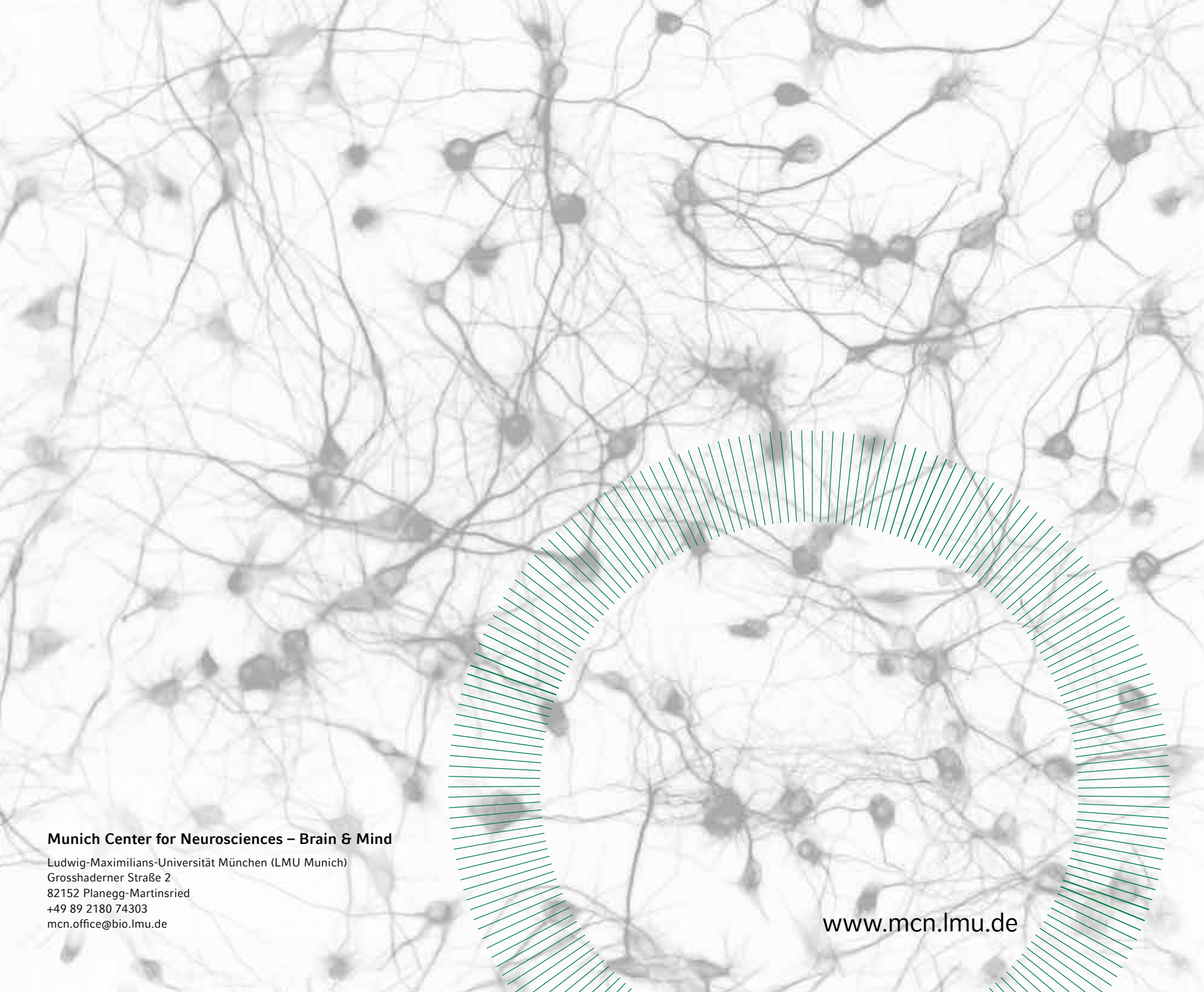

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