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For your orientation, MCNLMU research areas are colour-coded throughout the brochure as shown below. Individual MCNLMU members, and their research, are introduced in the section “People”.

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

Key Figures
Over 500 GSNLMU Student Publications
104 MCNLMU Members
133 GSNLMU Faculty Members
56% Internationals
7 Teaching Sections
81 Male Students
104 Female Students
Over 20 International & National Collaborations
37 Nationalities
134 Graduates
77 PhD
11 Fast-track PhD
46 MSc
211 GSNLMU Students
157 PhD
41 Fast-track PhD
12 MSc
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
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 (MCNLMU).” Since 2006, when it was founded, MCNLMU continues to contribute essentially to LMU’s top position within the life sciences. MCNLMU created a network of groups and disciplines with interest in questions of neurobiology, cognition, and “brain and mind”. With its interdisciplinary approach, MCNLMU 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 MCNLMU.

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 GSNLMU, which is funded within the German Excellence Initiative, evolved into a world wide visible integrated teaching framework. During the last 10 years the GSNLMU became a prime example for innovative and interdisciplinary teaching and career development.

One essential requirement for the success of the MCNLMU 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 Neurosciences. 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 MCNLMU. 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.

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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 and interdisciplinary research. The Munich Center for Neurosciences (MCN LMU) 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 MSE Neurosciences and MSE Neuro-Cognitive Psychology (both fully funded by the Elite Network of Bavaria for a period of 10 years) and the PhD program of the Graduate School of Systems 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 behavior, 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 (biomedical 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
In 2005, the Munich Center for Neurosciences (MCN) had been conceived as a multi-faculty, inter-institutional initiative promoting scientific collaborations across the wider Munich area. The MCN 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 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 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 junior and senior 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 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
MCN Managing Director
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. How- ever, 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 Wümmsee (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 and director of the Kreisirrenanstalt München (the psychiatric clinic) in 1873. He was the responsible au- thor 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 deated at Schloss Berg on June 12 did von Gudden meet him in per- son. 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 signifi- cant contributions to the treatment of the mentally ill. What happened then and their death remains a mystery until today.

Recognized hubs of neurosciences. Körbinian Brodmann, who had studied at LMU, worked for several years as a Neurologist at the psy- chiatric hospital in Munich and returned in his last year in 1896 to join Kraepelin’s new psychiatric hospital in Munich, like that of vestibular function and its role. Additionally, other important neuroscience departments and institutions were estab- lished in and around Munich. Karl von Frisch, who had studied at LMU, returned in 1924, it became a leading group working on bat echolocation. Their work pioneered the field of “neuroethology” and still reverberates in the CRC 870 and in the Deutsches Schwanen- und Gleichgewichtszentrum (DSGZ; page 26).

Four years later, Konrad Lorenz joined the newly established Max Planck Institute of Behavioral Physiology. His most signifi- cant contributions to the development of a new discipline “ethology” were the – undis- puted – description of imprinting in goslings and highly controversial – the psychiatric model of motivation. Interestingly, Walter

At the same time, the differentiation into modern psychiatry and neurology as inde- pendent disciplines helped to establish other, neuroscientifically oriented research groups 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 the psychiatric hospital in Munich and returned in 1926 and, since 1917, founding Director of the Deutsche Forschungsanstalt für Psychiatrie (German Institute for Psychi- atric Research), the world’s first privately financed, independent brain research insti- tute. In 1954, it became a Kaiser Wilhelm Institute (predecessor of the Max Planck Institute (MPI) of Psychiatry). Kraepelin turned Munich into one of the world-wide leading group working on bat echoloca- tion. The structural and functional basis of sensory systems in the brain and organization, remains a main focus of the Division of Neurobiology at LMU and the Collabora- tive Research Center (CRC) 870 (page 22) to this day.

In 1954, Erich Walther von Holst and soon also Horst Möller started research groups in Sewanee and developed and also presented proof for “the human brain’s role in coordinating the actions of the arms, legs and other parts of the body”. They showed that the inner ear was the basis for the brain’s awareness of the environment. Their work pioneered the field of “neuroethology” and still reverberates in the CRC 870 and in the Deutsches Schwanen- und Gleichgewichtszentrum (DSGZ; page 26).

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Heiligenberg (who died much too early in 1994), also in Seewiesen, produced ev-
ipple this trend. Creutzfeldt joined the Max Planck Institute for Psychiatry from 1962 to
ot interfering. Creutzfeldt and Hans Thoenen exemplify the long, rich, and co-
the MPI of Psychiatry, at least partially, also evolved into a basic research institute, as
Heinrich-von-Heremans-Schipperges, later became anesthesiologist at the University of Essen.
1971 and obtained a degree in clinical neu-
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 neu-
Heiligenberg, including LMU, TUM, Helmholtz and recently groups of the Technical University of Munich (TUM) – politically motivated by rather financial rea-
As a virtual center, MCNLMU provided generous funding, strategic appointments like computational neurosciences and neuro-
As a spin-off of the MPI of Psychiatry, dis-
ting in songbirds.
1973 to the LMU chair of anatomy Karl von Frisch and the MPI director Konrad Lorenz together with Nikolaus Tinbergen “for their discoveries concerning organization and elicitation of individual and social-behavior patterns”, appears to show otherwise. However, students at LMU almost never saw MPI directors, common overarching teaching concepts were unheard of. Official collabora-
Heinrich-von-Heremans-Schipperges, later became anesthesiologist at the University of Essen.
Heiligenberg, including LMU, TUM, Helmholtz and recently groups of the Technical University of Munich (TUM) – politically motivated by rather financial rea-
creatively and incomplete – notes exemplify the long, rich, and co-
their expression and release. Development and plasticity of neuronal circuits remain major areas of research at the MPI in
He was a key player in the nationalism debate of the 1950s, contributing to the formulation of the theory of national unification. However, he later became disillusioned with the political situation in Germany and moved to the United States, where he worked on theoretical models of social behavior and decision-making processes. His research focused on the role of social norms and cultural values in shaping human behavior, and he developed mathematical models to describe these phenomena. His work laid the groundwork for later developments in social psychology and decision theory.
Research Network

The current MCN\textsuperscript{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 Ecole Neuroscience Paris, 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\textsuperscript{LMU}.
Bernstein Center for Computational Neuroscience Munich

Coordinator: Prof. Dr. Andreas F. 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.mncn.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 Seed (Audio Information Processing, TUM), Prof. Dr. Anton Sirota (Cognition and Neural Plasticity, LMU Munich), and Prof. Dr. Bernhard Widholm (Neuroelectronics, TUM).

MCN Munich University Hospital (LMU)
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 ratio and the auditory brainstem, for example, allows 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 neurally 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 included, 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 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.
Clinical Research Group 241: Genotype-phenotype relationships and neurobiology of the longitudinal course of psychosis
Spokesperson: Prof. Dr. Peter Falkai
Prof. Dr. Thomas G. Schrieber

The overarching theme of the Clinical Research Group 241 and its successor consortium PsyCourse is to explore the determinants of delivering clues to our understanding of the complex biological basis of the longitudinal course of affective and non-affective psychoses, 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 phenomenics, genomics, pharmacogenetics, 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 inter-actions with the environment. This in turn will hopefully contribute to the development of therapies improving the long-term outcomes of psychosis.
The objectives of the German Center for Vertigo and Balance Disorders (Deutsches Schwindel- und Gleichgewichtszentrum) 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 pharmacotherapies; 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 professors (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 – “DiopSyst” – was founded in 2014.
Deutsches Zentrum für Neurodegenerative Erkrankungen
Sprecher: Prof. Dr. Christian Hesse

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 high-tech 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 endorsement 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.
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) anticipation 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” (Ri-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 remapping, 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.
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 interact in causing cognitive decline.
Munich Center for Mathematical Philosophy
Prof. Dr. Sebastian 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.
A new research-dedicated MRI scanning facility

Under the umbrella of the MCNLMU 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.

Research group jointly supported by Roche and MCNLMU

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 MCNLMU and Roche, as an industrial partner, allows us to benefit from an excellent work environment at MCNLMU 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.
The Research Center for Neurophilosophy and Ethics of Neurosciences of the Munich Center for Neural and Behavioral Sciences (MCN) 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 CSW 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 bodily movements, as well as investigate related conceptual problems in the wider field of philosophy of mind (Lipps, Steinitz, Yousefi Heris, Chersuvari).
The projects combine expertise across traditional patho-mechanisms, as well as systems biology and systems neuroscience tools. Furthermore, 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.

SyNergy

Munich Cluster for Systems Neurology

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.
The MCN<sup>LMU</sup> 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<sup>LMU</sup> teaching concept.
Program Speaker: Prof. Dr. Berndt Gratze
Program Coordinator: Lena Bitt

Graduate School of Systemic Neurosciences (GSNLMU)

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 MCNLMU 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 GSNLMU is governed independently, reflecting a systemic point of view, without negating research fields. The focus of the GSNLMU reflects a systemic point of view, without neglecting molecular and cellular mechanisms.

As the teaching entity of the MCNLMU, students are exposed to 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 neuropsychology. This opens up greater capacity for new questions, innovative approaches and concepts. Structured Teaching Sessions, 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 multidisciplinary neuroscience discourse. Students with a systemic point of view 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.

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 GSNLMU 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 beginning until the end of the PhD studies. In addition to discussing each student’s progress until the end of the PhD studies, TAC offers continuous support from the beginning until the end of the PhD studies.

All students enrolled in the GSNLMU 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. Their progress is evaluated yearly and updated according to 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 GSNLMU PhD program must hold a MSc or equivalent degree in biology, psychology, medicine, physics or related fields. Especially promising candidates holding a Bachelor degree in biology, psychology, medicine, physics or related fields 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.

World-Class PhD training at GSNLMU

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 GSNLMU 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 beginning until the end of the PhD studies, TAC offers continuous support from the beginning until the end of the PhD studies. In addition to discussing each student’s progress.
The successfully completed program concludes with the thesis defense and the awarding of the internationally recognized degree PhD in Systemic Neurosciences at our University. Students from Germany or other European countries however generally enter PhD programs with a Master degree or equivalent. The GSN-FF PhD-Track program offers highly qualified students the opportunity to enter the program with a Bachelor degree in neurosciences or other related fields such as life sciences, mathematics, 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 teaching concept for bachelor and master students with an educational background from Germany or other European countries, 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-FF 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.

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, mathematics, physics, computational sciences, engineering and, unique to our program, philosophy.

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

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:
- A 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.
- Intercultural 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.

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

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.
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RTG 2175: Perception in Context and its Neural Bases

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 Bases' aims to bridge this gap by providing a topical focus 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 interacts 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.

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

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 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. 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.

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 (GSNLMU).

IMPRS-TP is co-funded by the Else-Kröner-Fresenius Foundation.

IMPRS-TP

Program Speaker: Prof. Dr. Alex Chen
Program Coordinator: Dr. Michael Mende

International Max Planck Research School | Molecular Life Sciences

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IMPRS-TP is co-funded by the Else-Kröner-Fresenius Foundation.
Amgen Scholars Programme:

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 high-tech 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.

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 Zurich (Switzerland). The programme is financed by the Amgen Foundation.

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.

Amgen Scholars’ 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 course includes lectures, practical course work and lab visits throughout the faculty of the Graduate School of Neurosciences at 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 addition 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.

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Programme Director:

Prof. Dr. Michael Rusie (College of Charleston)

Program Coordinators:

Dr. Alexander Kaiser (LMU)

Research at the SFN meeting (Society for Neuroscience, USA)
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) seeks to annually unite researchers from Harvard University and LMU Munich, bringing PhD students and post-doctoral fellows in touch with core faculty from both universities. To achieve that, the meeting organized under the umbrella of the MCNLMU/CBS, takes place on a yearly basis alternating between the Center for Advanced Studies (CAS) in Munich and the Center for Brain Science at Harvard 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).

In collaborations with clinicians and commercial partners, new discoveries are used as the basis to develop new therapeutic approaches to ameliorate the effects of neurological 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-MCNLMU 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 shorter term exchanges (2-3 weeks), as well as regular reciprocal faculty visits and teaching.
Signal Processing in Neurons

The SPIN doctoral school is a joint 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
- Ph.D. student salary as suggested by 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:
- Ph.D.: 10
- Departments: 8
- Current Students: 18 (11 female, 7 male)
- Alumni: 29 (18 female, 11 male)
- Nationalities: 15

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

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-ITU students, as well as supporting opportunities for postdoctoral positions. Additionally, this collaboration enables researchers and students to attend GSNLMU and ENP symposiums, like the GSNLMU/ENP joint Neurophilosophy Workshop “Predictive Brain” in San Servolo, Italy (2015).

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

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People

Over the past 10 years, more than 100 MCN 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 members are introduced on the following pages, a list of associated members is given on page 64.
Neural circuits and behavior in zebrafish


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


LMU Munich, Faculty of Biology

Prof. Dr. Oliver Behrend

Munich Center for Neurosciences

Prof. Dr. Christian Bechtel

Since 2008 Managing Director of the Munich Center for Neurosciences. Most recent research focus on central processing and loudness 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.
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.

Max Planck Institute of Psychiatry

Prof. Dr. Elisabeth Binder

Department of Translational Research in Psychiatry

binder@psych.mpg.de

Department of Translational Research in Psychiatry

Prof. Dr. Elisabeth Binder

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.

Max Planck Institute of Neurobiology

Prof. Dr. Dr. Thomas Brandt

LMU Munich, Faculty of Medicine

brandt@tum.de

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

Max Planck Institute for Human Development

Prof. Dr. Thomas Buchheim

Facility of Philosophy, Philosophy of Science and Study of Religion

bucheim@mpib-berlin.mpg.de

In our research we focus on classical Greek philosophy (Plato, Aristotle, Augustine, German Idealism, and Heidegger). Systematic neurophysiology 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 compatibilist conception of human freedom.
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.

Perceptual organization can provide a basic structure to the presentations emerge and how these interact with the spatio- and action. Research topics concern the role of attention in the mechanisms and processes, oculomotor control and plasticity, and mechanisms of selection of action goals, visual processing around eye movements, and action. Research topics concern the role of attention in the

Stress neurobiology and neurogenetics: Bridging the genotype-phenotype gap

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.

Research applications of computational neuroscience

The Institute for Cognitive Systems in Munich, Faculty of Psychology

PD Dr. Markus Conci

Department of Stress Neurobiology and Neurogenetics

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

PD Dr. Karl-Klaus Conzelmann

Max von Pettenkofer-Institute of Virology & Gene Center

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

Stöhr et al. (2013) Targeted ablation, silencing, and activation of neuronal populations using pseudotyped rabies viral vectors.

Perception-action coupling in eye and hand movements

Dr. Heiner Deubel

Department of Psychology, Experimental Psychology

Our research is focused on the interplay between perception and action. Research topics concern the role of attention in the selection of action and spatial 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.

Humanoid robotics and neuroscience: Science, engineering and society


LMU Munich, Faculty of Medicine

Prof. Dr. Karl-Klaus Conzelmann

Max von Pettenkofer-Institute of Virology & Gene Center

Pseudotyped delta G rabies viruses have emerged as gold standard for mapping of direct laminar synaptic connections and functional analyses 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.

LMU Munich, Faculty of Psychology

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Department of Psychology, Experimental Psychology

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PD Dr. Markus Conci

Department of Stress Neurobiology and Neurogenetics

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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.

Research applications of computational neuroscience

The Institute for Cognitive Systems in Munich, Faculty of Psychology

PD Dr. Markus Conci

Department of Stress Neurobiology and Neurogenetics

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.

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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.

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 neurodegeneration. 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.

Our research is focused on neurobiology and treatment of psychiatric disorders. 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.

Our research is focused on neurobiology and treatment of psychiatric disorders, namely schizophrenia. Multidisciplinary teams of researchers, allow the use of techniques ranging from functional imaging to gene expression in human post-mortem tissue.
We work on elucidating the mechanisms of neurogenesis, when and where they work (during brain development and in adult life), and understanding neurodegeneration and repair processes. For repair, we use a model system of the mammalian cerebral cortex by control of radial glial fate. Fetal stem cells are grafted into an adult brain lesion, and we observe integration and regeneration results. We use engrafted cells as reporter cells marking grafts and surroundings. We use intravital and chronic in vivo two photon imaging, fluorescent proteins, transgenic animals, viral vectors, and antibodies to label and tag cells. We combine functional and labelled cell Fate analyses. For transcriptional control and cell fate decisions, we use genetic tools, in vitro systems and in vivo models (rodent and primates), and we combine computational biology tools. For generation of neurons for repair, we use an approach pioneered by us, to turn scar forming glia into new neurons for repair.

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

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- Neuroendocrine mechanisms of sex-specific vocal behaviour
- Principles and computations of sensorimotor function, spatial navigation, and perception
- Understanding and reactivating neurogenesis
- Protein tools for neuroscience
- Assembly and function of neuronal circuits in the auditory system
- Neural circuits and neuronal mechanisms of state-dependent processing of odors and tastes

**Neuroendocrine mechanisms of sex-specific vocal behaviour**


Skeen WS (1985) How should transmitters be identified? Comparative and evolutionary neuroanatomy of the avian and mammalian nervous system and functional bases of these marks. Trends Neurosci 23: 19-26

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


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**Tools for Bio-Imaging**


**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 central and behavioral testing, imaging, optogenetics, electrophysiology, ion and ex-vivo, psychophysical, and modeling.

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Lyze various Bayesian models.

Scientists reason and argue? To address (2), we construct and analyze computational models of how humans process speech in order to explain the origin and spread of historical sound change. 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 fine motor behavior, and in patients with neurological diseases. We are investigating the relationship between the origin and spread of sound change.

Human speech processing and the evolution of sound change

Scientific reasoning and argumentation

Cellular mechanisms of neurodegeneration

Improving speech understanding in patients with cochlear implants

Synaptic failure in neurodegenerative diseases

Sensorimotor control in health and neurological disorders

TUM, Department of Electrical and Computer Engineering

Prof. Dr. Werner Hemmert

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

We study computational neuroscience, spiking neural 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.

TUM, Department of Sport and Health Sciences

Prof. Dr. Joachim Hermsdörfer

Human Movement Science
Joachim.Hermsdorfer@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 Medicine

Prof. Dr. Jochen Herms

Center for Neuropharmacology 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 therapeutic approaches in vivo for Alzheimer’s and Parkinson’s disease.

Human Movement Science

Joachim.Hermsdorfer@tum.de

LMU Munich, Faculty of Medicine

Prof. Dr. Christian Haass

Division of Biochemistry & DZNE

christian.haass@mail03.med.uni-muenchen.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.

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 models 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 analyzing speech corpora.

We study computational neuroscience, spiking neural 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.
number of imaging techniques, such as two-photon microscopy to take part in the storage of visual memories. To address these challenges, our group combines concepts and techniques from theoretical neurobiology and non-linear dynamics to answer the question of how living organisms solve difficult computational problems.

LNG Munich, Faculty of Biology

Prof. Dr. Andreas V. M. Herz
Department of Biology II, Computational Neurocience
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 a spatial cognition, we try to decode the population activity of grid cells. Here we present a method to study the localization and subsequent translational control at the synapse level.

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

Nanverk M et al. (2019) Decoding multiple spatial marks to decode the population activity of grid cells.

Keck T et al. (2013) Grid cells in rodent medial entorhinal cortex reveal discrete firing patterns and precise dynamics of spatial representations.

Hohlfeld R et al. (2016) Modelling single neuron dynamics and computations in a balance of stimuli and dynamics.

Lancet Neurol 15: 198-209.

Neuron 80: 327-334.


Experience dependent plasticity in the mammalian visual system


Stemmler M et al. (2016) How to decode a grid: multifrequency phase precession and computational information processing in grid cells.

Experience dependent plasticity in the mammalian visual system


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Experience dependent plasticity in the mammalian visual system


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Multiple sclerosis is a common inflammatory condition of the CNS, in which immune cells damage neurons and oligodendrocytes. Our lab aims to fill visualise 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.

Pathogenesis and therapy of neuroinflammatory tissue damage

Muller et al. (2012) Oligodendrocytes and microvascular endothelial cells as drivers of the neuroinflamatory response.


107(7): 3222-7.

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

Heraud-Farlow JE et al. (2014) The multifunctional Staufen proteins: conserved roles from neurogenesis to synaptic plasticity.


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

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

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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.

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.

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.

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

Mouse CNS diversity, circuit mapping and behavior

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

Dendritic integration in vivo

Artificial neural network models of conditionals and induction

Proteases in the nervous system

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 modeling of memory formation in the hippocampal cortical system, 3) Data analysis of temporal hippocampal activity patterns.

Theory of learning and plasticity in the nervous system

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 end, we use methods from biochemistry, molecular biology, neurobiology and proteomics.

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MacPlanck 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.

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DENDRE

Prof. Dr. Hannes Leitgeb
Logic and Philosophy of Language
Hannes.Leitgeb@tum.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).

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

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 detail. We study birds, snakes, and bats for their specific sensory systems and multimodal integration networks.

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.

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

Subclassification and characterisation of Guillain-Barré like polyradiculoneuropathies


Inflammation and the immune system in major depression, schizophrenia, dementia. Biomarkers in serum and CSF. Therapeutic studies, & mathematical modeling.


Social and cognitive development in early childhood

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.

TUM, School of Medicine

Prof. Dr. Markus Ploner

Department of Neurology

markus.ploner@tum.de

Hence, reduced blood flow mediates the emergence of helping and comforting.

Neural correlates of prosocial behavior in infancy: Different neurophysiological mechanisms support the development of social and imitative learning in infancy (and beyond). Paulus M (2014).


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.

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.


Töllner T et al. (2012) How the speed of motor-response decisions, the time to achieve optimal target performance, and the degree of spatial accuracy are related to reaction time variability: evidence from movement variability.


Our research focuses on social and cognitive development


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

We focus on theoretical and applied ethics, political philosophy, theory of rationality and action theory.

In this study, we examine how emotional and social-cognitive factors interact to influence what we perceive. von Wangenheim, Julia, Tschirgi, M., et al. (2012). The role of empathy and social-cognitive abilities in the development of helping behavior: a longitudinal prospective study in early childhood. Child Dev 83(3): 770-790.


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


The human sleep project


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

Neural processes are determining brain function. Our re- search focuses on the neural and cellular physiology regarding Alzheimer’s disease pathology, pain sensation, 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?


Pathophysiological mechanisms in Alzheimer’s disease.


Geiger JT et al. (2014) A hybrid deep learning approach for Robust ASR.


Neural signatures of (visual) working memory, short-term memory capacity.


Characterization of animal models for neurological and psychi- atric diseases. Focus on transcription factors implicated in neu- rodevelopmental disease and circadian processes. Development and adaptation of -omic technologies for applications in the brain, as well as genetic and repurposing screenings in cellular sys- tems with a focus on schizophrenia-associated pathways.

The Institute for Human-Machine Communication performs re- search 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 modern 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. (2006) An approach to哥伦比亚 is KATP channel gene effect on sleep duration: from genome-wide association studies to function in large-scale, worldwide studies (our Munich ChronoType Database has >250,000 entrees). Now, we focus more on characterising sleep itself and developed methods to extract sleep structure from wrist-acctivity, using the world as our sleep lab.

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

LMU Munich, Faculty of Psychology

Prof. Dr. Paul Sauseng

Department of Psychology

paul.sauseng@tum.de

Neural signatures of heisau working memory, short-term memory, attention and executive control in humans; measured via scalp electroencephalography and proved with transcranial magnetic and electrical stimulation.
The neural correlates of visuomotor behaviour

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

Neurobiology of schizophrenia

Stress resilience: Understanding mechanisms – developing novel treatments

Seminar on pharmacodynamics and pharmacokinetics of antidepressant and antipsychotic drugs

Human agency

LCN | Members

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.

Max Planck Institute for Psychiatry

PD Dr. Mathias Schmidt

Department of Stress Neurobiology and Neurogenetics

mathis@psyp melakukan.de

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

LMU Munich, Faculty of Medicine

Prof. Dr. Andreas Schmitt

Department of Psychiatry and Psychotherapy

andreas.schmitt@med.uni-muenchen.de

In post-mortem brain regions we used microarrays and proteomics to disentangle the molecular background of schizophrenia. In morphological design, based stereology studies, we investigated cell numbers in hippocampal subregions in schizophrenia. 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.

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 neuropsychological methods. 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.

LMU Munich, Faculty of Medicine

Prof. Dr. Markus J. Schwarz

Institute of Laboratory Medicine

markus.schwarz@med.uni-muenchen.de

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

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Mechanisms of learning and memory


Cognition and Neural Plasticity

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: models of primary brain lymphoma in the mouse; 3) Eye and hand movement control: contribution of cerebellar structures.

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Functional organization and plasticity of gaze stabilization


Development and function of GABAergic interneurons in the cerebral cortex

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, ICs, EEG) to test how visual and vestibular information is used in the human brain to represent space, orient attention and control our actions.

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


Cognition and higher vestibular disorders


Stimulation study.


Soutschek A et al. (2013): In vivo dual photone microscopy of primary brain lymphoma in the mouse.
Neurochemical basis of the stress and ketamine drug response

Ken CY et al. 2016: Repeated ketamine treatment provides the inflammatory response increases in microglial glutaminase 2 activity.

Robertson PE et al. 2012: Neuronal-glial interactions, pruning of neocortical synapses, and the emergence of mesolimbic dopamine projections are temporally distinct.

Internally coupled ears

Vedurmudi AP et al. 2016: The interaural coupled ear provides geometric coding of the binaural soundfield.

 Logistic regression analyses in an infra-red sensitive model of the auditory brainstem of juvenile rats.

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


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

Select: 2012: Pre-empting neural mechanisms of echolocation locate binaural time delays during flight and prey interception.

Loewen et al. 2010: Looking for order in the random: neural auditory analysis by bats and echolocation.

Bats: 2010: The role of the rostral and posterior auditory cortices in vocalization.

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

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

Koizumi A.: 2013: Pre-empting neural mechanisms of echolocation locate binaural time delays during flight and prey interception.

Moreira et al. 2012: The discovery of TRPV1 receptors and their role in fear and anxiety.

Ranganathan et al. 2003: The antagonism of cannabinoid CB1 receptors and TRPV1 receptor activity.

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


Garvis et al. 2015: A novel strategy for the development of gene-targeted models using craniofacial imaging.

The latest labeling of cellular and tissue-specific epigenetic modifications in mice.

TUM, School of Life Sciences; Helmholtz Zentrum München

Prof. Dr. Wolfgang Wurst
Institute of Developmental Genetics
aural@helmholtz-muenchen.de

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

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 four and anxiety disorders to study the implication of the endogenous cannabinoïd system in the control of negative affect at behavioral, neural network and cellular level.

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. OmiX platforms are used to provide a rich source of data for in silico pathway analyses. The goal is to complement imprecise GEM-based clinical parameters with molecular biosignatures to improve patient diagnosis, stratification and treatment.

TUM, Department of Physics

Prof. Dr. J. Leo van Hemmen
Theoretical Biophysics

hbg.sctum.de

We focus on the theoretical biophysics of neural 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.

Department of Translational Research in Psychiatry

Prof. Dr. Lutz Wiegrebe
Division of Neurology

wiegrebe@muc.de

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

Max Planck Institute of Psychiatry

Prof. Dr. Albrecht von Mueller
Parrenesies Foundation Center for the Study of Thinking

aum@parmenides-foundation.org

We focus on the structures and dynamics of complex thinking processes, especially the interplay between analytical and cognitive 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.
Human decision making


Neurologic impairment of speech and language production and of nonverbal communication

Ackermann H et al. (2014) Brain mechanisms of acoustic communication in humans and nonhuman primates: the evolutionary perspective. Neuroimage 90: 666-76.
Community Outreach
MCN\textsuperscript{MU} 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\textsuperscript{MU} sponsors and awards GSN\textsuperscript{MU} students’ participation in neuroscience meetings, workshops and conferences.
This Outreach Section lists numerous measures, joint conferences and workshops that were supported by the MCNLMU to link up with our scientific and public audience. These research interactions of the MCNLMU with public communities. Please note: This MCNLMU workshops that were supported by the various measures, joint conferences and Network Section. Accordingly, like Roche and Amgen are displayed in the Outreach Section, Lists numer - Outro Section showscases in - Teaching Section - Symposia / Conferences / (Cellular Mechanisms of Sensory Processing) The Munich joint meeting of the CRC 889 Joint CRC* 870 / CRC 889 Symposium 2016 philosophy. The conference was held at LMU Munich on March 21 and 22, 2013. The European Society for Analytic Philosophy (ESAP) organizes the major congress every three years. The goal of this congress is to discuss, and then explore common prin - Joint CRC* 870 (Neuronal Circuits; initiated by the MCN LMU in 2009) brought to - together experts from Munich and Göttingen to discuss, and then explore common prin- - per review publication. Cutting Edge Technologies 2015 aimed to increase the visibility of local cutting-edge technologies and to connect peers and ex- - 106th Annual Meeting of the German Zoology 2013 more than 200 participants, offering more than 80 scientific collaborations, as well as - are displayed in the Network Section. Accordingly, 9th European Congress of Analytic Philos- - The Munich joint meeting of the CRC 889 (Cellular Mechanisms of Sensory Processing) and the CRC 870 (Neuronal Circuits, initi- - 9th European Congress of Analytic Philos- - 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 MCNLMU 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 oppor- - 1st CRC 870 / CRC 889 Symposium 2016 The 8th European Conference on Comparative Neurobiology at the Bavarian Academy of Science was organised by the MCNLMU 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 and poster speakers reflected the particu- larly wide range of evolutionary and develop- - The Munich joint meeting of the CRC 889 (Cellular Mechanisms of Sensory Processing) and the CRC 870 (Neuronal Circuits, initiated by the MCNLMU 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. 1st Collaborative Research Center...
In this context, the firmly established MCNLMU Monday Lecture Series was recently developed into a joint Munich Neuroscience Lecture Series hosted by the Max-Planck Institute of Neurobiology, the Bernstein Center for Computational Neurosciences and the MCNLMU. 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 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 Neurolunch, 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 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 neuroscience” addressed the challenges of combining a career (in science) with parenthood, and how children fit in busy work schedules. 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 MCNLMU framework (a selection is listed on the outreach graphic), among them those of the research entities Bernstein Center for Computational Neuroscience 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 (MPS) for Translational Psychiatry IMPRS-TP and for Molecular Life Sciences IMPRS-LS.
Events

GSNLMU Industrial Visits
Industrial visits play an important role in informing students about current developments and opportunities in industry. They gain insight into the internal workings of companies and knowledge of new modern technologies employed in the industries. GSNLMU students have had the chance to gain awareness about industrial practices through visits to Sanofi 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.

GSNLMU Lab Excursions
To support scientific exchange and networking among scientists, the GSNLMU 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, ENS 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)

GSNLMU 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 GSNLMU honors this event, by organizing its own graduation ceremony for GSNLMU MSc and PhD students.

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

GSNLMU Poster Awards
As a part of the GSNLMU orientation week, a poster session competition is held yearly, providing the GSNLMU 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.

GSNLMU Neuroscience Meeting Travel Support
GSNLMU 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.

Awards & Support

GSNLMU 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.

GSNLMU Kids´ Brain Day
Since 2014, the GSNLMU 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.

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Awards & Support
Visiting Scholars & Academic Appointments

As a part of outreach measures and cooperations, the MCNLMU 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 (MCNLMU 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 MCNLMU Chair for Neurophilosophy. In 2014, the MCNLMU 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 MCNLMU at the Grote Lab in 2015. Professor Sedelmeier initiated a fully funded stay of Professor Stephen Stich (Rutgers University) at the MCNLMU Research Center for Neurophilosophy and Ethics of Neurosciences in 2016. Also in 2016, Professor Amitha Seghal (University of Pennsylvania) was hosted at the MCNLMU by Professor Martha Marrow. Students and faculty appreciated learning about Seghal’s research on mechanisms underlying circadian rhythms of behavior and physiology.

In addition, the MCNLMU 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 MCNLMU 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 Sauvage, Biological Psychology (2014)
- Professor Taylor, Cognitive Disorders and the Vestibular System (2015)
- Professor Graf zu Eulenburg, Multimodal Imaging of Sensorimotor Systems (2016)
- Professor Busse, Organismic Neurobiology (2016)
- Professor Schütz-Brobach, 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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<td>Berlin School of Mind and Brain Humboldt-Universität zu Berlin</td>
<td>BCMR – Brain Center Rudolf Magnus, University Medical Center Utrecht</td>
<td>CAS – University of Sydney</td>
<td>CIPSM – Center for the Interdisciplinary Study of Mind and Science, Harvard University</td>
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For your orientation, MCNLMU research areas are colour-coded throughout the brochure as shown below. Individual MCNLMU members, and their research, are introduced in the section “People”.

**Behavioral & Cognitive Neuroscience**

**Biomedical Neuroscience**

**Cellular & Systems Neuroscience**

**Molecular & Developmental Neuroscience**

**Neurophilosophy**

**Theoretical Neuroscience & Technical Applications**

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**Key Figures**

Over 500

GSNLMU Student Publications
211

GSNLMU/ENB Students
157 PhD
41 Fast-track PhD
13 MSc

MCNLMU Members
104

Over 20

International & National Collaborations 134

Graduates
77 PhD
11 Fast-track PhD
46 MSc

Nationalities
37

Male Students
81

Publications*
133

Students*
110

GSNLMU Faculty Members
7


*Cumulative

56%

Internationals
130

Female Students
193
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