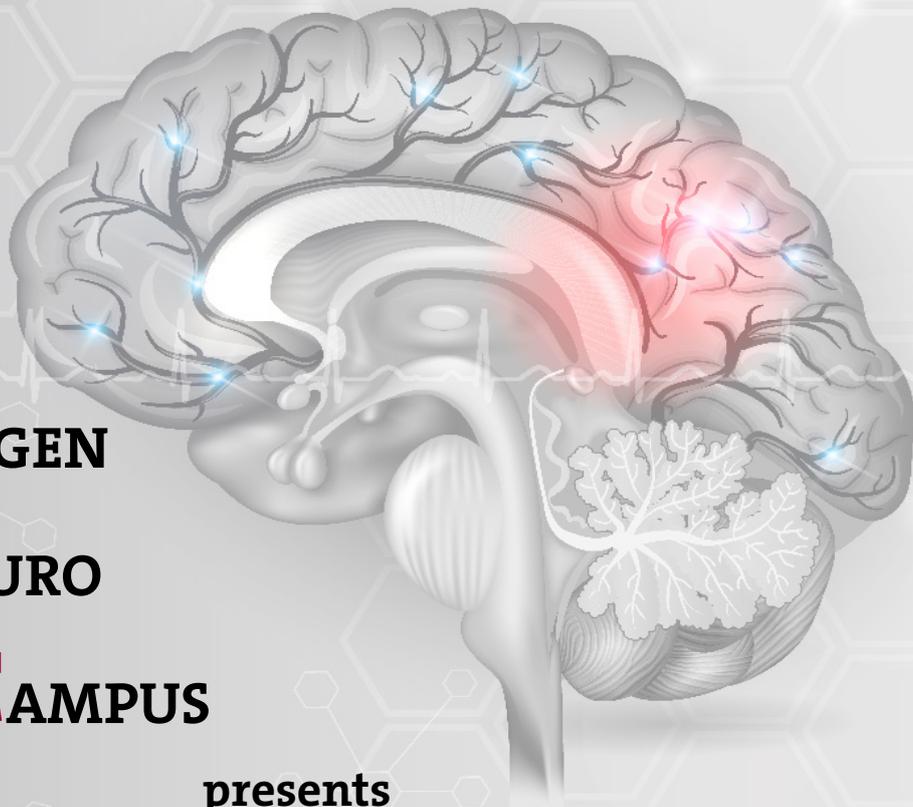


TÜBINGEN

NEURO

CAMPUS

presents



1st TNC Research Day

Thursday, 27th June 2019

Partners



The TNC is an initiative within the



Program

Institute for Medical Microbiology & Institute for Medical Virology (Elfriede-Aulhorn-Str. 6)

10.00 – 11.00

(lecture hall)

Welcome by Prof. Dr. Thomas Gasser (Center for Neurology)

NeuroScience in Tübingen: Clinical, Computational, Molecular & Systems NS

Speakers: PD Dr. Rebecca Schüle (Hertie Institute for Clinical Brain Research)

Dr. Fabian Sinz (IBMI, University of Tübingen & Bernstein Center)

Prof. Dr. Vanessa Nieratschker (University Department of Psychiatry & Psychotherapy)

Dr. Steffen Hage (Centre for Integrative Neuroscience)

11.00 – 12.00

(lecture hall)

Challenges of today and big dreams for the future: an interactive session

Moderator: Prof. Dr. Philipp Berens (Institute for Ophthalmic Research)

12.00 – 13.00

Lunch Break

13.00 – 14.45

WORKSHOP 1 - 3 (seminar rooms)

W1: Bridging the Gap: from Preclinical Test Systems for CNS Diseases to Clinical Applications

W2: Neural Representations for Action – Initiative for a DFG research training group

W3: Understanding the developing brain – pregnancy in the spotlight

14.45 – 15.15

Coffee Break

15.15 – 17.00

WORKSHOP 4 - 6 (seminar rooms)

W4: Introduction to lab automation and high-content screening

W5: Advances in Next-Generation-Sequencing

W6: Technology assisted rehabilitation: From Virtual Worlds to Intelligent Ortheses with Poster Session

Institute for Ophthalmic Research (Elfriede-Aulhorn-Str. 7, common room + terrace)

from 17.00

Networking & Get Together with food and drinks

Evening lecture:

HNO lecture hall (Elfriede-Aulhorn-Str. 5)

18.15 – 19.45

Neurocolloquium

Mehrdad Jazayeri (McGovern Institute of Brain Research, M.I.T.)

„Hierarchical reasoning by neural circuits in the frontal cortex“

WORKSHOP 1

13:00-14:45

Bridging the Gap: from Preclinical Test Systems for CNS Diseases to Clinical Applications

Workshop leader:

Dr. Kristina Herfert Werner Siemens Imaging Center, Department of Preclinical Imaging and Radiopharmacy, University of Tübingen

Speakers:

Prof. Dr. Philipp Kahle Hertie Institute for Clinical Brain Research, Department of Neurodegeneration, University of Tübingen

Dr. Martin Kriebel Natural & Medical Science Institute at the University of Tübingen (NMI), Reutlingen

Abstract

The number of people around the world suffering from neurodegenerative and neuropsychiatric disorders is continuously increasing, in part directly due to an aging population. However, due to several recent failures of novel therapeutic approaches, many companies withdraw from CNS drug development, which initially relies on predictive preclinical models as well as the use of preclinical test systems that strictly comply with the rules of construct, face and predictive validity. Furthermore, for a valid match between human disease pathology and disease models under study, reliable translational tools are required which enable a quantitative assessment of disease parameters both in disease models and in patients.

This workshop aims at bringing together researchers that study molecular pathogenesis and synaptic dysfunction in CNS diseases such as dementia, movement disorders, and neuropsychiatric conditions. We intend to establish and improve the validation of drug targets to ensure the success of novel compounds. First steps are undertaken within this workshop to assemble a complementary and interdisciplinary research consortium which will meet at regular intervals in order to respond to announcements for research grant proposals.

Researchers are invited which make use of translational test systems for academic research and industrial cooperation in the fields of neurodegeneration and psychiatric disorders. Patients, animal and cellular models are integrated by different translational tools. In vivo imaging methods such as PET and fMRI, and sensitive protein profiling (Simoa, Luminex), applicable to patients and animals, allow for a robust translation (bench-to bedside) and reverse translation (bedside-to-bench) between patients and models. Moreover, patient-derived induced pluripotent stem cell (iPSC) technologies can bridge the gap between patients and cellular in vitro models.

In vitro electrophysiology (microelectrode arrays, patch-clamp), high content analysis and high throughput calcium imaging employing cellular models allow for functional assessment as well as for the screening of lead compounds. Transgenic animal models and animal models based on viral transduction (RNA interference, CRISPR/Cas9, overexpression of pathogenic proteins) give access to studies in the context of CNS tissue complexity. In this context, detection of cell-specific and synapse-specific marker proteins by means of confocal fluorescence microscopy allow for an analysis of cellular and synaptic connectivity.

WORKSHOP 2

13:00-14:45

Neural Representations for Action - Initiative for a DFG research training group

Workshop leader:

Prof. Dr. Jan Benda Institute for Neurobiology, University of Tübingen

Speakers:

Prof. Dr. Aristides Arrenberg Institute for Neurobiology, University of Tübingen & Centre for Integrative Neuroscience (CIN)

Dr. Andrea Burgalossi Centre for Integrative Neuroscience (CIN), University of Tübingen

Dr. Anna Levina Department of Computer Science, University of Tübingen

Dr. Lena Veit University of California, San Francisco

Abstract

Animals constantly interact with their environment through their sensory systems and behavioral actions. Seemingly effortlessly, they correctly interpret complex sensory scenes and generate appropriate actions under a wide range of often unfavorable conditions. How neural systems achieve this remarkable performance in difficult natural contexts is a central but so far unsolved question in the neurosciences. A comparison of neural representations and behaviors over a wide range of sensory systems could be the key to uncover fundamental principles underlying sensory acquisition and processing strategies leading to directed behaviors.

Inferring presence, properties, and movements of objects from sensory streams is not a static problem. Rather, the purpose of many behaviors is to further explore the sensory environment or to focus the senses on behaviorally relevant aspects, based on previously acquired information. As a product of natural selection, sensory modalities and acquisition behaviors are adapted to specific properties of natural environments and life histories. Both sensory systems and associated behaviors differ dramatically in their spatial and temporal properties, sometimes being highly dense and continuous as in vision and other times being sparse and sequential as in echolocation. Despite these differences, we expect fundamental common principles in the design and dynamics of these systems arising from similar functional requirements, including the common needs for abilities such as object detection, separating ego-motion from object motion, and aiding decision making for future actions. Dichotomizing these common principles from adaptations to specific environments and behaviors is possible only using a broad comparative study as in our initiative.

Our initiative brings together scientists from the Institute for Neurobiology, the CIN, and the Department of Informatics, working on vision, electrosensation, echolocation, and spatial representations in fish, bats, rodents, birds, and monkeys. Jan Benda will introduce the general concept and his research on natural stimuli and electrosensory processing in weakly electric fish. The different physical properties of an electrosensory world make these fascinating animals an interesting case for comparison with visual and auditory, including echolocating, systems (in collaboration with Annette Denzinger, Hanspeter Mallot, and Jan Grewe). Aristides Arrenberg's work on the encoding of optic flows and the control of saccadic eye movements in the visual system of zebrafish provides detailed data for comparison to visual systems of land-dwelling mammals like mice and monkeys (in collaboration with Katrin Franke, Ziad Hafed, Zhaoping Li, Hanspeter Mallot). Anna Levina, a computational neuroscientist, will evaluate the efficiency of neural codes in different sensory systems and model the dynamics of neural representations (in collaboration with Aristides Arrenberg, Katrin Franke, Jan Benda). Andrea Burgalossi will talk about neural representations of space in the rodent hippocampus, their sensory input, and their role for guiding behaviors (in collaboration with Jan Benda, Jan Grewe). Finally, Lena Veit will present her work on how sensory stimuli influence decisions on song generation in birds (in collaboration with Andrea Burgalossi, Jan Benda).

WORKSHOP 3

Understanding the developing brain - pregnancy in the spotlight

13:00-14:45

Workshop leader:

Dr. Simone Mayer Hertie Institute for Clinical Brain Research, Tübingen

Speakers:

Prof. Dr. Birgit Derntl Department of Psychiatry and Psychotherapy, UKT

PD Dr. Samuel Gröschel Department of Neuropediatrics, UKT

Prof. Dr. Hubert Preißl fMEG Center / Institute for Diabetes Research and Metabolic Diseases of the Helmholtz Center Munich at the University of Tübingen

Ferdinand Sörensen Department of Neuropediatrics, UKT

Abstract

The brain, one of the most complex structures in nature, undergoes rapid and complex changes during embryonic and fetal life that reach far into postnatal development. Recent technical developments in neuroscience have brought closer together basic neurodevelopmental research and clinical neurosciences, since life history may shape disease susceptibility and progression in adulthood and senescence. Several research groups with an interest in different aspects of brain development are spread through TNC member institutions. However, different groups may not know about each other and possible synergy effects between their research topics and methodologies. In this workshop, we aim to raise awareness for developmental neuroscience questions within the TNC, and provide a platform for exchange that fosters collaborations with the long-term goal of strengthening a developmental neuroscience research focus within the TNC.

As an example of groups collaborating across institutions and disciplines, five scientists will present their research in flash reports on the topic of brain development during pregnancy, a special period of co-development of the maternal and fetal brain. Birgit Derntl will share her insights from human studies on how pregnancy shapes the maternal brain. Ferdinand Sörensen will report on how maternal trajectories of perinatal depressive symptoms impact toddler behavior. Simone Mayer will then provide a molecular biologist's perspective on how neurotransmitters affect brain development in the second trimester of gestation. Hubert Preißl will talk about functional studies on fetal brain activity during the third trimester of gestation. Finally, Samuel Gröschel will provide a clinical viewpoint on neuropediatric disorders.

We invite other TNC researchers with an interest in developmental neuroscience to briefly present their research question, models and patient groups, as well as their main research methods. These brief presentations (1 slide and 2 minutes talking time per speaker) will provide a starting point for exchange during the workshop and the networking reception later in the afternoon. Among the possible outcomes of this workshop are the creation of joint group meetings, a jointly organized lecture series, bilateral collaborations, and the establishment of a larger network suitable to apply for team-based funding initiatives such as an SFB.

WORKSHOP 4

Introduction to lab automation and high-content screening

15:15-17:00

Workshop leader:

Dr. Joachim Täger Genome Biology of Neurodegenerative Disease, German Center for Neurodegenerative Diseases (DZNE) Tübingen

Abstract

Despite the high costs for acquisition and maintenance, lab automation is becoming increasingly important in biology. Besides being a powerful workhorse, automation also allows a high degree of reproducibility. The use of automated systems is especially suitable if large screening projects are frequently carried out. This requires usually working with dozens of microwell plates enabling to investigate the effect of numerous perturbations on a specific disease-relevant phenotype of interest. This requires then that proper controls are available on each plate and the plate-to-plate variation is minimal. Since many of such screening projects are done using a cellular model, sterility is an important criterion for automated systems. Last but not least, the assay readout needs to be carefully considered. Plate reader-based assays are quite fast but usually lack some additional information such as toxicity.

Image-based methods used in high-content screenings yield information rich data but can only be processed with sufficient speed if batch image analysis is available. Additionally, images require a large amount of disk space for data archiving. In conclusion, automation and high-content screenings offer a lot of advantages but may also create some additional challenges which are not quite predictable. Additionally, depending on the complexity, it may be challenging for lab personal to make full use of such an automated system.

In this workshop I want to give a broad overview of working with automated systems and high-content screenings. Additionally, I will introduce the automated cell culture system in our laboratory and highlight assays which we have established on that system which we use to investigate neurodegenerative diseases such as Parkinson's disease and amyotrophic lateral sclerosis. Additionally, I will discuss several cellular models which we employ such as neuroblastoma cell lines, NPC-derived neurons and 3D organoids.

WORKSHOP 5

Advances in Next-Generation-Sequencing

15:15-17:00

Workshop leader:

Dr. Nicolas Casadei Institute of Medical Genetics & Applied Genomics, NCCT

Dr. Julia Schulze-Hentrich Institute of Medical Genetics & Applied Genomics, Epigenetics

Participants:

Elena Buena Atienza Institute of Medical Genetics & Applied Genomics

Sabine Fraschka Institute of Medical Genetics & Applied Genomics

Abstract

Genetics is classically seen as the study of genetic traits transmitted by inheritance, but a whole field has emerged in which genetics is used to study mechanisms of molecular biology. In that context, high throughput DNA sequencing was developed to identify genetic causes of inherited diseases and investigate molecular mechanisms, signaling pathways, and epigenetic phenomena. Over the last years, the number of methods created to investigate molecular mechanisms using various next-generation sequencing (NGS) applications is growing exponentially.

A current focus of the Institute of Medical Genetics and Applied Genomics in Tübingen is the use of applied genomics to bring precision medicine to health care, but also to understand complex disorders. For example, we are using whole genome sequencing to understand how structural changes of the genome can lead to neurodegenerative disorders like Parkinson's disease, how environmental factors transduce signals to the epigenome and impact disease progression, or how genomic structural variants lead to cancer. We are using cutting edge technologies such as nanopore DNA sequencing, single-cell sequencing and long-read approaches.

This workshop aims at bringing together researchers that apply these sequencing techniques for different biomedical questions with a particular focus on neuroscience. Within the frame of this workshop, we intend to share technical expertise using state-of-the-art methods in applied genomics, expertise in bioinformatics to answer complex biological hypothesis, and are looking for challenges to develop new methodologies based on specific working hypothesis.

WORKSHOP 6 with POSTER PRESENTATION

15:15-17:00

Technology assisted rehabilitation: From Virtual Worlds to Intelligent Orthoses - Networking at the TNC Research Day

Initiators:

Prof. Dr. Martin Giese, Dr. Daniel Häufle & Dr. Winfried Ilg Hertie Institute for Clinical Brain Research, Tübingen

Abstract

There are many different research areas which use recent technological developments to assist in rehabilitation processes. This includes (but is not limited to): virtual reality, exergames, brain stimulation (transcranial and deep), rehabilitation robotics, exoskeletons, brain computer interfaces. In the TNC and close-by partner institutes researchers develop relevant core technologies, develop rehabilitation devices, study the effectiveness of technology assisted rehabilitation, or have patient groups who could benefit from existing or new rehabilitation technology.

The purpose of this workshop is to bring those researchers and interested colleagues together in an informal setting to meet, network, and exchange ideas. For this, we invite interested researchers to briefly present their research with an overview poster. We will try to group the posters into topic areas and moderate a hopefully dynamic and lively interaction. We hope to initiate a research focus for technology assisted rehabilitation at the TNC which allows all of us to benefit from the broad expertise Tübingen (and area) has to offer in this field.

CALL FOR POSTERS:

We invite everybody who is active or interested in this field to submit a poster. The idea of our poster session is to present an overview of your research questions, main methods/expertise, and open question/collaboration ideas (see example below). Exemplary research posters are also welcome.

Everyone in the TNC is welcome to join us and discuss possibilities.

Exemplary headings for an overview poster:

Core research questions (of your workgroup)

Core research methods and expertise (of your workgroup)

We are searching for collaborations on ... (list exemplary ideas for collaborations)

Please notify Silke Dutz (silke.dutz@medizin.uni-tuebingen.de) before Friday June 21st if you plan to bring a poster.

Contact:

Silke Dutz
Coordinator TübingenNeuroCampus
Hertie Institute for Clinical Brain Research

Email: silke.dutz@medizin.uni-tuebingen.de
Phone: +49 7071 29 88802

Otfried-Müller-Str. 27 | 72076 Tübingen | Germany

Twitter: <https://twitter.com/TueNeuroCampus>
Homepage: <https://tuebingenresearchcampus.com/research-in-tuebingen/tnc/>

LOCATIONS:

Talks & Workshops:

**Institute for Medical Microbiology & Hygiene / Institute for Medical Virology
and Epidemiology of Viral Diseases
Elfriede-Aulhorn-Str. 6, 72076 Tübingen**

Networking & Get Together:

**Institute for Ophthalmic Research
Elfriede-Aulhorn-Str. 7, 72076 Tübingen**

Evening Lecture (Neurocolloquium):

**University Department of Otolaryngology, Head and Neck Surgery (HNO-Klinik)
Elfriede-Aulhorn-Str. 5, 72076 Tübingen**