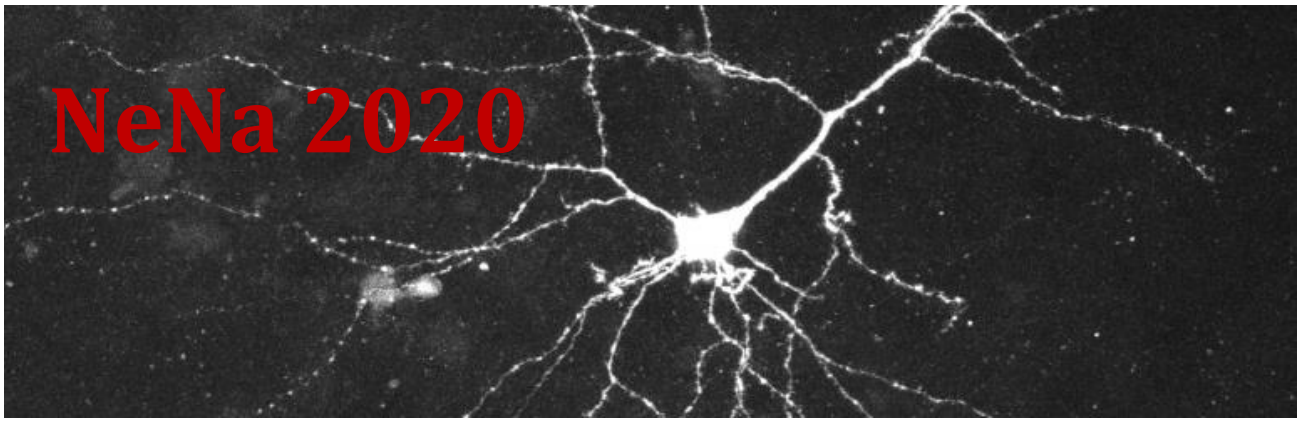
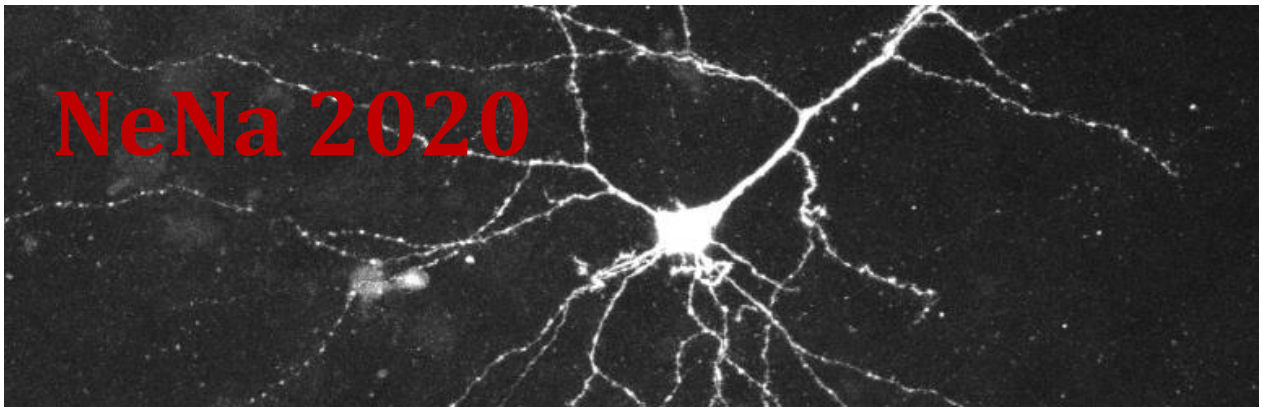


Schedule, Friday 2nd October 2020

9:00-10:00	Welcome and opening session
10:00-10:15	*"Neural correlates of second-order regularity learning over the course of gestation"* - Julia Moser, fEMG Center, University of Tuebingen
10:15-10:30	*"How does physical activity change body image? Exploring the roles of interoception and affective response in body image outcomes"* – Duangkamol Srismith, Department of Psychosomatic Medicine and Psychotherapy, University Hospital Tuebingen
10:30-10:45	*"Estradiol Administration Modulates Neural Emotion Regulation"* – Elisa Rehbein, Department of Psychiatry and Psychotherapy, Innovative Neuroimaging, University of Tuebingen
10:45-11:00	Break
11:00-12:00	**KEYNOTE: Shani Stern** **Precision disease modelling with iPSCs**
12:00-13:00	Lunch Break
13:00-14:00	Workshop: "Life after the PhD – academia or industry? " – Michael Paolillo and Renée Hartig

14:00-14:15	Break
14:15-14:30	*"Male or female? Influencing factors on the perception of ambiguous face stimuli"* – Teresa Luther, Department of Psychology, University of Tuebingen
14:30-14:45	*"Antibody Recognition Profiling of A**β** assemblies"* – Christine Rother, Department of Cellular Neurobiology, Hertie Institute for Clinical Brain Research, University of Tuebingen
14:45-15:00	*"An EEG-based brain-spine interface for the volitional control of trans-spinal magnetic stimulation"* – Ainhoa Insausti-Delgado, Institute of Medical Psychology and Behavioral Neurobiology, University of Tuebingen
15:00-15:15	*"* KCNQ5*: a novel gene causing genetic generalized epilepsy"* – Johanna Krüger, Department of Experimental Epileptology, Hertie Institute for Clinical Brain Research, University of Tuebingen
15:15-15:30	Break
15:30-16:00	Workshop: "Tips on giving an online presentation" – Polina Krivykh
16:00-17:00	**KEYNOTE: Amy Arnsten** **Unique molecular regulation of prefrontal cortex confers vulnerability to cognitive disorders**
17:00-17:30	Closing session



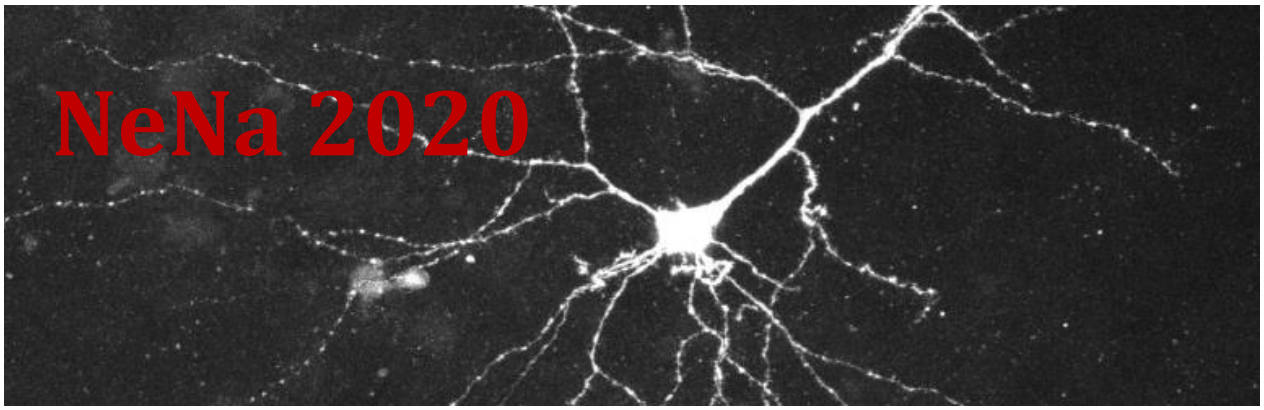
Keynote Speakers

Amy Arnsten (Yale University)

Amy Arnsten studies molecular influences on the higher cognitive circuits of the prefrontal cortex (PFC), in order to understand mechanisms affecting working memory at the cellular and behavioral levels. Her expertise spans a broad spectrum of techniques, with focus on neuromodulators within the PFC network and their effect on Dynamic Network Connectivity (DNC), a rapid form of neuroplasticity. Her lab demonstrated how stress causes the loss of cognitive abilities, how genetic mutations in molecules regulating these pathways can lead to symptoms of mental illness, and how age-related dysregulation of these pathways can lead to dementia. Arnsten's research eventually aims to develop new treatments for mental illness and age-related degenerative disorders: this has already led to successful innovations, including the use of guanfacine (Intuniv™) for a variety of PFC disorders.

Shani Stern (University of Haifa)

Shani Stern aims to model neurological diseases using neurons derived from induced pluripotent stem cells (iPSCs), obtained from human patients. Her lab uses a variety of techniques to derive different types of neurons and glia and studies the electrophysiological behavior as well as other molecular properties of those cells. Stern eventually performs computational modeling to identify disease states of the human brain with the goal of improving treatment.



Abstracts

Neural correlates of second-order regularity learning over the course of gestation

- Julia Moser, fEMG Center, University of Tuebingen

During the last trimester of pregnancy, visual and auditory event-related responses as well as auditory mismatch responses can be recorded non-invasively with fetal magnetoencephalography (fMEG). By using a more complex – hierarchical – auditory oddball paradigm, this method allows to investigate the neuronal correlates of rule learning before birth. fMEG was recorded in 56 participants from 25-40 weeks of gestation during a "local-global" auditory oddball paradigm. The paradigm consists of sequences of four tones (500Hz/750Hz) which can be four same tones or three same tones and one deviant (first-order "local" regularity). In addition, the sequences themselves can be frequent or rare (second-order "global" regularity). After preprocessing and extraction of fetal brain signals, datasets from 43 participants were included. By comparing responses to the fourth tone with responses to the third tone of the sequences, we found that fetuses showed a significantly different response towards second order standards or deviants. While a habituation-like response decrement was seen towards standards, responses towards deviants rather increased. This differential response mainly occurred between 350-650 ms after stimulus onset. A follow up analysis showed a development over gestation, as this differential response was present in a group of fetuses in weeks 34-40 but not in weeks 25-33. These results show that learning of second-order regularities is already possible in the last trimester of pregnancy and most likely starts a few weeks before birth. Within the framework of the "local-global" paradigm, this form of hierarchical rule learning is seen as a neuronal correlate of conscious processing. Investigating this correlate before birth can give us valuable insights into early cognitive development.

How does physical activity change body image? Exploring the roles of interoception and affective response in body image outcomes"

– Duangkamol Srismith, Department of Psychosomatic Medicine and Psychotherapy, University Hospital Tuebingen

It has been suggested that many aspects of physical and psychological health can be improved with regular engagement in physical activity. The role of physical activity has also been implied in the maintenance and improvement of body image. However, there is a lack of investigations into how factors such as interoceptive abilities and affective response to physical activity contributes to body image outcomes. The present study evaluates the extent to which affective response mediates the association between interoceptive abilities and body image outcome after engagement in physical activity. Participants were 29 sedentary adults who

had successfully completed a 12-week long physical activity intervention program. Interoceptive abilities and affective response to physical activity were measured at baseline; body image outcomes were measured at baseline as well as upon completion of the intervention. Affective valence mediated the relation between perception of interoceptive cues and change in perception of body dynamics. Interestingly, interoceptive accuracy and awareness do not predict changes in body image outcomes. Our results suggest that effects of physical activity on body image are independent from both interoceptive abilities, as well as from perceived effort expended on physical activity. Instead, body image improvement was achieved when positive valence was assigned to interoceptive cues and experienced exertion during exercise.

Estradiol Administration Modulates Neural Emotion Regulation

– Elisa Rehbein, Department of Psychiatry and Psychotherapy, Innovative Neuroimaging, University of Tuebingen

Variations of sex hormones during the menstrual cycle can lead to changes in emotion processing. The ability to successfully regulate one's own emotions is associated with better social abilities and mental health. While women showed better performance in fear extinction learning under high estradiol (E2) levels, little is known about the effect of E2 on emotion regulation. In order to study the effects of E2, we administered E2 valerate to young naturally cycling women during their early follicular phase in a double-blind, placebo-controlled within-subject design. This standardized and strict experimental control allowed us to explore the specific effect of E2 on emotion regulation and controlled for other hormones varying throughout the menstrual cycle. We explored whether E2 modulates emotion regulation in a functional magnetic resonance imaging paradigm. In accordance with previous literature, down-regulation of negative emotions showed significant activation of the superior frontal gyrus bilaterally, the right inferior frontal gyrus and the left posterior medial frontal gyrus. E2 levels correlated positively with emotional state during down-regulation of negative emotions. E2 administration, in comparison to the placebo condition, led to less negative affect, and stronger activation of the dorsolateral prefrontal cortex and lower activation of the right orbitofrontal cortex and left hippocampus. The results fit well in a previously described model of an emotion regulation network which is mediated by E2 levels and thought to impact the development of mental disorders. Therefore, our findings essentially contribute to women's health research.

Male or female? Influencing factors on the perception of ambiguous face stimuli

– Teresa Luther, Department of Psychology, University of Tuebingen

As a social being, humans communicate with each other on an almost daily basis. However, even before we initiate communication with other individuals, we form impressions of them and a great body of research indicates that we are able to derive various information about our fellow human beings solely based on their faces, for example their sex. Although it has frequently been found that humans perform such sex categorization tasks based on facial information with high accuracy, it is still an open question whether and to what extent factors on the part of the observer, such as their own sex, contribute to whether a face is perceived as being male or female. In our study we mainly examined whether and to what extent the observers' sex influences sex categorization. Participants (N = 67, 34 female, 33 male) were presented original female and original male facial stimuli, which were morphed to male and female faces respectively, and were asked to rate the extent to which they perceived each image as male or female. Furthermore, we used two self-report inventories to assess whether gender, sexual orientation, and masculinity and femininity traits of the observer have an influence on sex judgements. Contrary to findings from studies focusing on recognition memory of male and female faces, we did not find a significant effect of participants' sex on ratings in our categorization task. However, we did find that ratings were significantly impacted by participants' identification with several femininity and masculinity traits at the level of personality, cognition and interests/activities. Furthermore, we were able to replicate the tendency to often misclassify female

faces as male faces (male response bias) – an effect likely due to the elimination of external facial cues such as hair and cosmetics which act as reliable indicators of femininity.

*Antibody Recognition Profiling of A**β** assemblies*

– Christine Rother, Department of Cellular Neurobiology, Hertie Institute for Clinical Brain Research, University of Tuebingen

An estimate of 50 million people worldwide suffering from dementia, including from its most common form, Alzheimer's disease (AD). This neurodegenerative and progressive disease is histologically characterized by senile plaques consisting of aggregated amyloid-β peptide (Aβ) in the patient's brain. It is believed that Aβ aggregation takes place decades before first clinical symptoms manifest and therefore often remain unnoticed until cognitive impairment arises. Aβ aggregation in the brain is a nucleation dependent polymerization which is time and concentration-dependent. First, an Aβ seed is formed which then, by incorporating more Aβ monomers, rapidly grows into oligomers, protofibrils and finally large fibrils. This seeding process generates a variety of conformationally different Aβ assemblies. We developed a novel "Antibody Recognition Profiling of Aβ assemblies" technique, short ARPA, that allows separating semi-natively brain Aβ assemblies within specific size ranges. Aβ-targeting antibodies are then subjected to size-separated Aβ assemblies to provide a profile of Aβ-assembly recognition for each antibody. Such antibody "barcoding" now provides valuable information for current and future clinical studies using Aβ-targeting antibodies.

An EEG-based brain-spine interface for the volitional control of trans-spinal magnetic stimulation

– Ainhoa Insausti-Delgado, Institute of Medical Psychology and Behavioral Neurobiology, University of Tuebingen

Brain-machine interfaces have emerged as a potential tool to modulate neural networks and could be used for alleviating gait deficits in patients with motor disabilities. Towards a non-invasive brain-controlled technology for leg neurorehabilitation, we propose an innovative set-up that relies on the continuous monitoring of electroencephalographic (EEG) activity to volitionally control trans-spinal magnetic stimulation (ts-MS). We devised the first non-invasive brain-spine interface (BSI) that contingently links task-related activation of the motor cortex with the activation of lower limb muscles through ts-MS. This novel BSI was tested in 10 healthy participants who used motor imagery of their lower limb to control the closed-loop system with different ts-MS conditions. We proved the good usability of our BSI and its robustness to eliminate ts-MS artifacts, regardless of stimulation intensity applied, allowing online decoding of motor intentions from EEG signals. Our findings evidenced the capacity of the BSI to induce afferent and efferent intensity-dependent modulation of the nervous system by means of motor and somatosensory evoked potentials. The here presented system constitutes the first step towards the application of non-invasive BSIs as a neuroscientific and therapeutic tool for patients with motor impairments.

KCNQ5*: a novel gene causing genetic generalized epilepsy*

– Johanna Krüger, Department of Experimental Epileptology, Hertie Institute for Clinical Brain Research, University of Tuebingen

Genetic generalized epilepsies (GGEs) are the most common form of inherited epilepsy, comprising about 25% of all epilepsies. About one third of these patients remains pharmaco-resistant meaning they do not respond to drug treatment. To be able to develop drugs for these patients, the underlying molecular mechanisms and genetic mutations have to be identified. Most often these mutations occur in genes which

encode ion channels or subunits such as KCNQ5, a voltage-gated delayed rectifier potassium channel generating M-type currents. Mutations in this gene have recently been identified in individuals with intellectual disability and/or developmental epileptic encephalopathy. Here, we found three C-terminal point mutations in the KCNQ5 gene in three independent families through whole-exome sequencing. These point mutations were inserted into a plasmid carrying hKCNQ5 cDNA. These plasmids were used to transfect Chinese hamster ovary (CHO) cells and functionally analyze the mutations via whole-cell patch-clamp recordings. All three mutations were showing a severe loss-of-function in current density, with one mutation displaying a complete loss-of-function, while activation curves were not significantly altered. Under wildtype co-expression, channel function remained significantly decreased, indicating a dominant negative effect of the mutations on wildtype subunits. Further addition of Kv7.3 subunits, a subunit that naturally forms heterotetramers with Kv7.5 subunits, was amplifying currents, yet the dominant negative loss-of-function effect remained. To investigate whether this effect was caused by a reduction in membrane expression, biotinylation assays of transfected cells were performed. The results showed no significant reduction in any of the mutations as compared to the wildtype. Hence, we conclude that the loss-of-function is most likely caused by an opening defect of the channel and propose KCNQ5 as a novel gene involved in the development of GGEs.