



SPP 1665:

## Resolving and manipulating neuronal networks in the mammalian brain – from correlative to causal analysis

Newsletter, third edition, July 2015

### 1) Publications

New publications of the troikas:

*Attention: The publication by Peter Hegemann and Thomas Oertner (see below letter j) ) includes information about a new protein that might be interesting as a novel optogenetic tool for some of our SPP member. The article itself is not yet available, but will be circulated as soon as possible.*

- a) Dreyer AM, **Herrmann CS** (2015): Frequency-modulated steady-state visual evoked potentials: A new stimulation method for brain-computer interfaces. Journal of Neuroscience Methods 241:1-9.  
*Link: <http://www.ncbi.nlm.nih.gov/pubmed/25522824>*
- b) **Helfrich RF**, Knepper H, Nolte G, Strüber D, Rach S, **Herrmann CS**, Schneider TR, **Engel AK** (2014): Selective Modulation of Interhemispheric Functional Connectivity by HD-tACS Shapes Perception. PLOS Biology 12(12).  
*Link: <http://www.ncbi.nlm.nih.gov/pubmed/25549264>*
- c) **Herrmann CS**, Strüber D, **Helfrich RF**, **Engel AK** (in press): EEG oscillations: From correlation to causality. International Journal of Psychophysiology (Epub before print).  
*Link: <http://www.ncbi.nlm.nih.gov/pubmed/25659527>*
- d) **Schander A**, Tolstosheeva E, Bielefeld V, Kempen, L, **Stemann H**, **Kreiter A**, **Lang W**: Design and fabrication of multi-contact flexible silicon probes for intracortical floating implantation. Transducers 2015, Alaska, USA, pp. 1739 – 1742.
- e) **Bitzenhofer SH**, Sieben K, Siebert KD, Spehr M, **Hanganu-Opatz IL** (2015): Oscillatory activity in developing prefrontal networks results from theta-gamma-modulated synaptic inputs. Cell Rep 2015 Apr 21;11(3):486-97; published in pubmed  
*Link: <http://www.ncbi.nlm.nih.gov/pubmed/25865885>*
- f) **Ehinger BV**, **König P**, Ossandón JP (2015): Predictions of visual content across eye movements and their modulation by inferred information. DOI: 10.1523/JNEUROSCI.5114-14.2015. J Neurosci 35:7403-13  
*Link: <http://www.ncbi.nlm.nih.gov/pubmed/25972169>*

- g) Nortmann N, Rekauzke S, **Azimi Z**, Onat S, **König P**, **Jancke D** (2015): Visual homeostatic processing in V1: when probability meets dynamics. DOI: 10.3389/fnsys.2015.00006. *Front Syst Neurosci* 9:6  
Link: <http://www.ncbi.nlm.nih.gov/pubmed/25691861>
- h) Sinning A, Liebmann L, **Hübner CA** (2015): Disruption of Sic4a10 augments neuronal excitability and modulates synaptic short-term plasticity. DOI: 10.3389/fncel.2015.00223. *Front Cell Neurosci* 9:223  
Link: <http://www.ncbi.nlm.nih.gov/pubmed/26136660>
- i) Scheib U, Stehfest K, **Gee CE**, Körschen HG, Fudim R, **Oertner TG**, **Hegemann P** (2015): The rhodopsin-guanylyl cyclase of the aquatic fungus *Blastocladiella emersonii* enables fast optical control of cGMP signaling. *Science Signaling* (in press).
- j) Schmidt C, **Wagner S**, Burger M, van Rienen U, **Wolters CH** (2015): Impact of Uncertain Head Tissue Conductivity in the Optimization of Transcranial Direct Current Stimulation for an Auditory Target. *J Neural Eng* accepted for publication.
- k) Bauer M, Pursiainen S, Vorwerk J, Köstler H, **Wolters CH** (2015): Comparison Study for Whitney (Raviart-Thomas). Type Source Models in Finite Element Method Based EEG Forward Modeling. *IEEE Trans Biomed Eng*, in press.
- l) González-Hernández JA, Marot M, Lencer R, **Wolters CH**, Padrón A, Finalé A, Galán-García L, Pita-Alcorta C (2015): Specificity and sensitivity of visual evoked potentials in the diagnosis of schizophrenia: Rethinking VEPs. *Schizophrenia Research*, in press.  
Link: <http://www.ncbi.nlm.nih.gov/pubmed/26004691>
- m) **Aydin Ü**, Vorwerk J, Dümpelmann M, Küpper R, Kugel H, Heers M, Wellmer J, Kellinghaus C, Haueisen J, Rampp S, Stefan H, **Wolters CH** (2015): Combined EEG/MEG Can Outperform Single Modality EEG or MEG Source Reconstruction in Presurgical Epilepsy Diagnosis. *PLoS One*, 10(3): e0118753.  
Link: <http://www.ncbi.nlm.nih.gov/pubmed/25761059>
- n) Vorwerk J, Cho J-H, Rampp S, Hamber H, Knösche TR, **Wolters CH** (2014): A Guideline for Head Volume Conductor Modeling in EEG and MEG. *NeuroImage*, 100 pp 590-607.  
Link: <http://www.ncbi.nlm.nih.gov/pubmed/24971512>
- o) Rampersad SM, Janssen AM, Lucka F, **Aydin Ü**, Lanfer B, Lew S, **Wolters CH**, Stegeman DF, Oostendorp TF (2014): Simulating Transcranial Direct Current Stimulation With a Detailed Anisotropic Human Head Model. *IEEE Trans Neur Sys & Rehab Eng*, 22 (3), pp 441- 452.  
Link: <http://www.ncbi.nlm.nih.gov/pubmed/24760939>
- p) **Wagner S**, Rampersad SM, **Aydin Ü**, Vorwerk J, Oostendorp TF, Neuling T, **Herrmann CS**, Stegeman DF, **Wolters CH** (2014): Investigation of tDCS volume conduction effects in a highly realistic head model. *J Neural Eng*, 11:016002(14pp).  
Link: <http://www.ncbi.nlm.nih.gov/pubmed/24310982>

- q) **Sigurdsson T** (2015): Neural circuit dysfunction in schizophrenia: Insights from animal models. Neuroscience, in press.

Link: <http://dx.doi.org/10.1016/j.neuroscience.2015.06.059>

- r) Wieland S, Schindler S, Huber C, Köhr G, Oswald MJ, **Kelsch W** (2015): Phasic Dopamine Modifies Sensory-Driven Output of Striatal Neurons through Synoptic Plasticity. JNeurosci 35(27) 9946-9956

Link: <http://www.jneurosci.org/content/35/27/9946.short>

## 2) Poster contributions:

- a) **Ehinger BV, König P, Ossandón J** (2015): Predictions of visual content across eye movements and their modulation by inferred information in the blind spot. Brain Conference Kopenhagen 19 – 24 April 2015.

## 3) Talks:

- a) **Ehinger BV, König P, Ossandón J** (2015): Prediction of visual content across eye movements and their modulation by inferred information in the blind spot. VSS 2015, St. Petersburg, Florida 15 – 20 May 2015.
- b) **König P, Ehinger BV, Ossandón J** (2015): Predictions of visual content across eye movements and their modulation by inferred information. IT University Michigan Ann Arbor, 6 March 2015
- c) **König P** (2015). Saliency, grid cells and predictions. ACCAM Osnabrück, 7 May 2015.

#### 4) Progress Report Meeting, Göttingen, 18<sup>th</sup> of March 2015

The Priority Program's progress report meeting 2015 was held at the Georg-August-Universität in Göttingen shortly before the 11<sup>th</sup> Göttinger Meeting of the German Neuroscience Society. Each troika was represented by at least one student and one PI. A total of 65 SPP members intensively discussed the current state of each project. At the beginning of the meeting, the coordinator of the SPP 1665 Ileana Hanganu-Opatz gave an overview on the aims and current achievements of the entire program. The efforts for ensuring a strong exchange between troikas and the promotion of young scientists have been particularly summarized. In line with the efforts presentations were held by students involved in the Priority Program. They highlighted the project's progress and the collaborative efforts within the troika. The talks were followed by a very productive discussion focusing on the technical difficulties, improvements of methodological approaches, common usage of optogenetic and analytical tools.

Some visual impressions (unfortunately the group photo was not good at all):



The presentations were held as followed:

- **Troika Diester – Buchholz – Monyer – Fries**  
„Cell-type specific optogenetic manipulation for characterizing the role of inhibitory interneurons in motor cortex of non-transgenic animals“  
Speaker: *Jessica Hartmann, Langen*
- **Troika Hanganu-Opatz – Hegemann – Oertner – Denker**  
„Optogenetic dissection of the developing prefrontal-hippocampal circuitry that gates mnemonic and executive maturation“  
Speaker: *Sebastian Bitzenhofer, Hamburg*

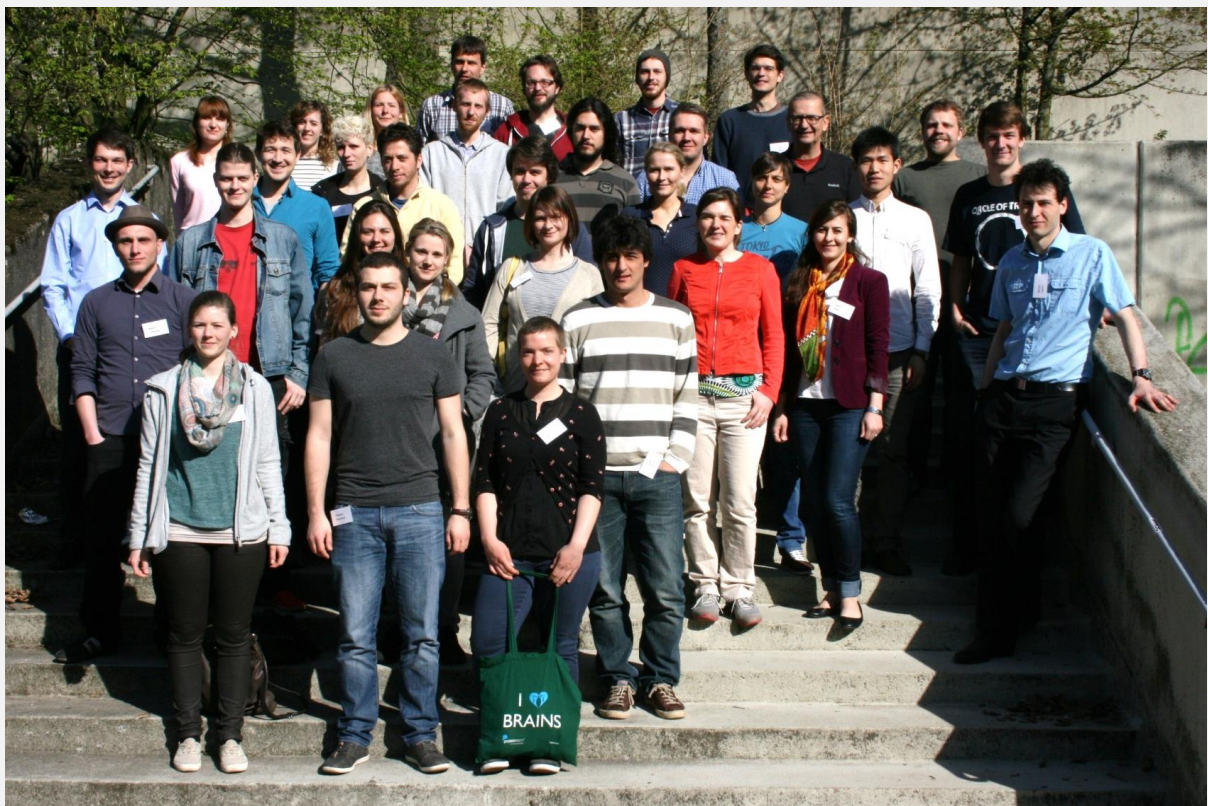
- **Troika Sigurdsson – Röper – Duvarci – Schneider**  
 „Dopamine function in working memory networks and its dysfunction in a mouse model of schizophrenia“  
 Speaker: *Pascal Vogel, Frankfurt*
- **Troika Hahn – Kelsch – Durstewitz**  
 „Network dynamics and computational mechanisms of rule learning“  
 Speaker: *Georgia Koppe, Mannheim*
- **Troika Hermann – Engel – Wolters**  
 „Causal role of brain oscillations in perception: modulation of network dynamics by transcranial alternating current stimulation“  
 Speaker: *Heiko Stecher, Oldenburg and Sven Wagner, Münster*
- **Troika Kreiter – Ernst – Lang**  
 „Interareal phase coherence as a mechanism for attention-dependent neuronal signal routing: A model-guided causal analysis using new, multi-contact floating silicon probes for intracortical chronic stimulation and recording in primates“  
 Speaker: *Heiko Stemmann, Bremen*
- **Troika Holthoff – Kirmse – Hübner – Kiebel**  
 „Developmental significance of GABAergic depolarization for the functional maturation of the primary visual cortex“  
 Speaker: *Chuanqiang Zhang, Jena*
- **Troika Paulus – Logothetis – Obermayer**  
 „Causal relations among systems states and behavior in primate memory: A tACS perturbation approach“  
 Speaker: *Florian Aspart, Bremen*
- **Troika Jancke – Herlitze – König**  
 „The influence of serotonergic signaling on visual and somatosensory cortical processing and its relevance for motor behavior“  
 Speaker: *Katharina Spoida, Bochum*
- **Troika Isbrandt – Sirota – Krautschneider**  
 „High-resolution characterization of functional connectivity and behavior in healthy and transgenic mice from the neonatal period through adulthood“  
 Speaker: *Robin Hinsch, Köln and Lait Abu-Saleh, Hamburg*
- **Troika Marshall – Schweikard – Ponomarenko**  
 „Weak electric current stimulation and optogenetics to investigate sleep-dependent memory consolidation and ensemble reactivation“  
 Speaker: *Xiaojie Gao, Berlin*
- **Troika Ohl – Grün – Schmidt**  
 „Causative mechanisms of mesoscopic activity patterns in auditory category discrimination“  
 Speaker: *Kentaroh Takagaki, Magdeburg*



## 5) Optogenetics Workshop, Bochum, 20<sup>th</sup> – 23<sup>rd</sup> April 2015

The optogenetic workshop was held in the Department of Zoology and Neurobiology at the Ruhr-University Bochum from the 20<sup>th</sup> – 23<sup>rd</sup> April 2015. It was organized by Ilka Diester (Freiburg), Olivia Masek (Bochum) and Stefan Herlitze (Bochum). The aim of the course was the distribution of optogenetic expertise within the SPP 1665. Twenty-one participants from the labs involved in the Priority Program were trained in small groups of 3 – 4 students at six hands on sessions in various aspects of optogenetics including biophysical characterization of optogenetic probes, optogenetic stimulation and neural recordings of Purkinje cells in anaesthetized mice, building, implanting and using multi-electrode-fiber drives, in vivo recordings and optogenetic control of motor behavior as well as the analysis of optogenetic experiments with Matlab scripts. The hands on sessions which were offered by the Diester lab, the Herlitze lab and the Ponomarenko lab were complemented by talks from Peter Hegemann (Berlin), Johannes Letzkus (Frankfurt), Jessica Hartmann (Frankfurt), Alexey Ponomarenko (Berlin) and Patrick Ruther (Freiburg) to emphasize the newest development in optogenetic tools and devices, strategies for the delivery of optogenetic tools and imaging the brain using these tools. In addition, Ilka Diester gave an overview of how to plan an optogenetic experiment and Stefan Herlitze, Olivia Masek and Katharina Spoida presented their work on controlling of GPCR signaling pathways by light. In addition, the workshop offered a unique opportunity to exchange expertise between the labs of the SPP 1665 and gave ample opportunity for scientific discussions.

Here are the participants:



## 6) Workshops/ upcoming events

### Analytical Workshop (Hamburg, 23 – 25 October 2015)

The second part of the analytical workshop will be held in Hamburg on October 23<sup>rd</sup> – 25<sup>th</sup> 2015. It will be organized by Andreas Engel and Christoph Herrmann. Further information will be circulated as soon as possible.

### Annual Meeting (Frankfurt, 29 February – 2 March 2016)

As the ending of the first funding period is approaching quite rapidly, the plan of having a midterm meeting in October 2015 was changed into having a longer meeting in February/ March 2016 with more time for discussions and exchanges. The meeting will be held as a retreat with the DFG participating. Also external experts will be attending to support the pre-evaluation process with feedback and input.

The meeting will take place at the Dorint Hotel in Frankfurt /Niederrad. Further information and the preliminary program will be sent around by the end of this year. **The participation in this meeting is obligatory for the PIs, therefore please do save the date!**

### Upcoming events

2015			
October, 23 - 25	Hamburg	Analytical Workshop (II)	Andreas Engel, Christoph Herrmann
2016			
February 29 – March 2	Frankfurt	Annual Meeting	Ileana Hanganu-Opatz
February 1 – March 31		<i>Call for proposals for next funding period</i>	
April – June		<i>Evaluation</i>	
September 1		<i>Start of next funding period</i>	

### Next newsletter

Scheduled for December 2015.