

CNB Newsletter

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Dear CNB members,

With the CNB Newsletter, we intend to inform you about upcoming CNB events, ongoing projects and give insights into the research topics of selected CNB members. In this edition we look back on the 18th Annual Meeting and are looking forward to the Brain Week 2024 which will take place from March 11th to 14th 2024. The topic of this year's Brain Week is "*Gute Zeiten und Schlechte Zeiten für das Gehirn*", focusing on brain health and mental well-being during both good and difficult times. The upcoming event will highlight multiple aspect of this topic in inspiring lectures and lively discussions.

The Brain Week will organize again a researchers' night with a poster session, that is open to all young researchers. Please note that graduate students may obtain a credit for presenting their posters.

CNB provides excellent opportunities for exchanging ideas and building novel collaborations within the University of Bern neuroscience community. This issue introduces PD Dr. Maria Stein as the new Executive Committee Member and her research and Prof. Dr. Athina as a new Research Group Leader.

Please reach out to us if you would like to showcase your research in the next newsletter. Please also indicate if new groups should be included in the CNB platform.

Please also note that we are updating and upgrading the CNB-Website, so please feel free to contact Ms. Alessia Carlucci (alessia.carlucci@unibe.ch) if you want to make changes on your research group-site (e.g. add photos, videos, members etc.). If you follow us on X (formerly Twitter), we are happy to repost your research articles to spread the word about your science. The X handle is @clin_neurobern.

We hope you enjoy reading the December 2023 edition.

Prof. Dr. Sebastian Walther
President CNB

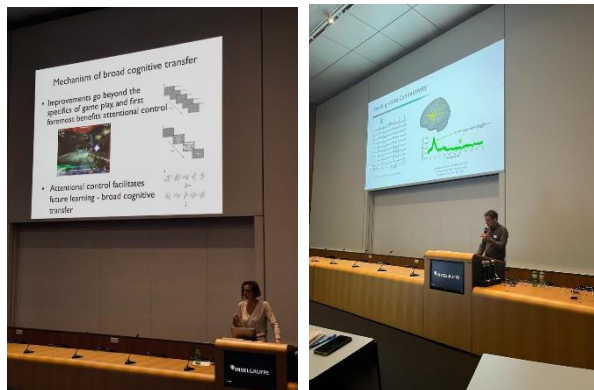
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18th CNB Annual Meeting – Modulating the Brain

Friday, 8th of September, 9.00-17.00

This year’s Annual Meeting was held at the Inselspital, in the auditorium Ettore Rossi. The welcome address, held by one of the CNB Executive Committee Member and Organizing Committee Prof. Benoît Zuber, was followed by the first keynote speaker Prof. Daphné Bavelier (Faculty of Psychology and Education Science, University of Geneva). She gave an exciting insight in her talk “Gaming the Brain” and introduced perspectives on brain plasticity and learning. Her presentation was about her current studies of specific game play to observe the mechanism of broad cognitive transfer and how it would be affected by attentional control.



After a very lively discussion on Prof. Bavelier’s talk, early career scientists presented their work. The four selected abstracts were presented by investigators:

Liana Hayrapetyan, Anastasia Pavlidou, Dimitra Zarafeta, and Marina Wunderlin.



Liana’s research focuses on sex- and strain-dependent dominant behavior in MET S1014A knock-in (HOM) mice. She explained that the high number of parvalbumin-expressing interneurons in the striatum and the low level of Slc17a7 mRNA transcripts in the PFC of MET S1014A knock-in mice may contribute to the alterations of the excitation-inhibition ratio, one of the core determinants of ASD development. Through their research, they further validate RNA sequencing data and test the molecular signaling alterations that may be responsible for the observed phenotype.

Anastasia’s research reports on gestures and visible body movements in patients suffering from schizophrenia and depression. She investigates the frequency, intensity, and quality of gesture use by asking the patients to report their own thoughts, behaviors, and experiences related to gesture use and comparing them to healthy control controls.

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Dimitra presented her study on the association between sleep EEG and cognitive functions in adolescents. She talked about intriguing results regarding the association between IQ and distinct frequency bands. Specifically, they found a significant and positive correlation between IQ and high-frequency activity, with further research needed to investigate the mechanisms and potential implications of these findings.

“Phase-locked auditory stimulation in three consecutive nights to prevent cognitive decline” was presented by Marina Wunderlin. Through her study, she was able to provide first evidence that PLAS can improve memory performance in older people with MCI if applied across several nights of intervention. It has thus proven to be a promising non-invasive tool for enhancing slow-wave sleep, which could potentially ameliorate cognitive decline.

The second keynote “Modulating network interactions” was given by Prof. Adrian Guggisberg. He highlighted the behavioral impact of functional connectivity. In his keynote lecture he focused on the one hand the importance of task related activations and how they relate to performance and on the other hand how resting interactions are linked to behavioral performance. The question how resting interactions relates to task-related activations and which one would be more important or could be modulated was the main topic of his presentation.

After the morning program the poster session and lunch followed and provided young researcher with the opportunity to exchange ideas and discuss about current research.



It was a fantastic showcase of the local neuroscience research in Bern.

At the end of the poster session, three poster awards were given by the Poster Award Committee:

Jana Leuenberger (Category: Basic Research)
 Titel: “Exploring Cellular Models for Synapse Studies: Insights from SH-SY5Y, PC12 and iPSC-derived Motoneurons”

Liana Hayrapetyan (Category: Basic Research)
 Titel: “Sex- and strain-dependent dominant behavior in mice lacking the novel S1014 phosphosite on the receptor tyrosine kinase MET”

Lydia Maderthaner (Category: Clinical Research)
 Titel: “Neural Correlates of Formal Thought Disorder Dimensions in Psychosis”

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In the afternoon three parallel symposia took place: *“Objective Symptom Monitoring in Neurodegeneration”* by Prof. Paul Krack and Prof. Tobias Nef; *“Visual Snow Syndrom”* presented by Prof. C. Schanking, PD Dr. M. Ertl and, Prof. A. Klein; and *“Antibody-based therapies and biomarkers for inflammatory CNS diseases”* by Prof. Vincent Perinet.



In the Group Leader Meeting Prof. Dr. Leila Soravia was welcomed as a new Research Group Leader of the CNB. The group leaders further discussed the outlook of 2024 and talked about the upcoming Annual Meeting and Brain Week as well as the inclusion of further new members.

Please consider updating your information on the CNB website (www.neuroscience.unibe.ch).

Thank you all again for a great Annual Meeting, with lots of Talks, Interactions and Posters.

We're looking forward to next Year!

The next Annual Meeting will take place on the **6th of September 2024**.

The program and further information will be published on our website (www.neuroscience.unibe.ch) and sent out via mail. If you like to participate as a speaker, help organize or have some ideas for the next Annual Meeting, please reach out to any member of the Executive Committee. We are looking forward to receiving your inputs, ideas and help.

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New member of the Executive Committee

PD Dr. Maria Stein

Research Group leader at the Translational Research Center, University Hospital for Psychiatry and Psychotherapy, Bern, and Researcher and Lecturer at the Department of Clinical Psychology and Psychotherapy, Psychological Institute, University of Bern.

After finishing her studies in psychology, Maria Stein obtained a PhD in Neuroscience (thesis on neuronal plasticity in the human language system), a Master of Advanced Studies in Psychotherapy and the Venia Docendi in Psychology and Psychiatric Neuroscience from the Medical Faculty and the Faculty of Human Sciences of the University of Bern. In her professional career, besides clinical work as a psychotherapist, she conducted research on the neurophysiology of transdiagnostic constructs with high relevance to psychotherapy, like emotional autobiography memories, or motivation, before focusing her research on inhibition in alcohol use disorder (AUD):

AUD is a very common and devastating disorder and a major contributor to global burden of disease. In AUD, appetitive mechanisms (e.g. cue-reactivity) that lead to fast and often automatized reactions to alcohol-related stimuli, are typically enhanced and the opposing inhibitory control system is often deficient. Together with her team, Dr. Stein has conducted a series of studies in which they used evoked potentials and fMRI to elucidate the relationship between these appetitive mechanisms and the opposing inhibitory control. These studies demonstrated that inhibition in an alcohol-related context requires additional neuronal resources, particularly when patients experience high craving.



Furthermore, this neurophysiological signature could predict relapse, both, when assessed with fMRI as well as with EEG. In a subsequent SNF-funded study, Dr. Stein and collaborators followed a translational approach and conducted the first clinical RCT on the efficacy of a novel alcohol-specific inhibition training in patients with severe AUD. Results indicated that this training has the potential to improve treatment outcome. Thanks to funding by the Swiss Society for Alcohol research (SSA) and by the SNF, Dr. Stein and her team currently investigate potential moderators of treatment outcome and apply machine learning algorithms to predict treatment outcome.

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New Research Group Leader

Prof. Dr. Athina Tzovara

Athina Tzovara, Assistant Professor, Institute of Computer Science, Faculty of Science, Center for Experimental Neurology, Department of Neurology, Faculty of Medicine, University of Bern.

In our daily lives, we are exposed to environmental stimuli like sounds or images. Our brains can efficiently extract patterns from recurring stimuli of the environment and anticipate future events before they occur. The neural mechanisms that support processing of sensory stimuli and detection of environmental regularities may be preserved in states of reduced consciousness, such as in coma or sleep.

To investigate auditory processing across consciousness states, we are using scalp and intracranial electroencephalography recordings in coma [1, 2], wakefulness [3], and sleep [4]. We are analyzing these rich signals with the use of computational modeling and machine learning.

Our recent work has shown that neural synchrony in response to auditory stimuli is stronger for patients who eventually regain consciousness and predicts coma outcome [1]. In a follow up study, we used an interpretable deep learning framework to disentangle residual auditory processing in coma [2]. We focused on a multi-treatment and multi-hospital cohort of patients in a post-anoxic coma and showed that deep neural networks can identify patients that eventually regain consciousness based on their auditory responses. We additionally validated this result in a cohort of 'gray-zone' patients, who would have



an unclear prognosis based on existing clinical criteria. This work provides novel insights on neural functions that are preserved without consciousness and can impact the domain of neuro-critical care and outcome prognostication.

In parallel to this work, we are also developing novel algorithms for analyzing neurological data [5]. As the amount of data collected in neuroscience increases, there is a strong need for novel computational approaches to analyze them. We are therefore developing novel techniques for electrophysiological data that are robust and also interpretable in order to assist the field of neurology.

[1] Alnes S, De Lucia M, Rossetti AO, Tzovara A (2021). Complementary roles of neural synchrony and complexity for indexing consciousness and chances of surviving in acute coma, *Neuroimage*.

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[2] Aellen FM, Alnes SL, Loosli F, Rossetti AO, Zubler F, De Lucia M, Tzovara A (2023) Auditory stimulation and deep learning predict awakening from coma after cardiac arrest, *Brain*.

[3] Cusinato R *, Alnes SL *, van Maren E, Boccalaro I, Ledergerber D, Adamantidis A, Imbach LL, Schindler K, Baud MO, Tzovara A (2023) Intrinsic neural time-scales in the temporal lobe support an auditory processing hierarchy, *Journal of Neuroscience*. * Equal contribution.

[4] Alnes S, Bächlin L, Schindler K, Tzovara A (2023) Neural complexity and the spectral slope characterize auditory processing in wakefulness and sleep, *European Journal of Neuroscience*.

[5] Aellen FM, Kavis-Göktepe P, Apostolopoulos S, Tzovara A (2021). Convolutional neural networks for decoding electroencephalography responses and visualizing trial by trial changes in discriminant features, *Journal of Neuroscience Methods*.

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Upcoming events

11 th – 14 th March 2024	Brain Week Bern
13 th March 2024	Researchers' Night
6 th September 2024	19 th CNB Annual Meeting

For any inquiries, please contact:

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