# CNB Newsletter
# 8/2016

UNIVERSITÄT BERN

CLINICAL NEUROSCIENCE BERN

*Dear CNB Members,*

With the biannual Newsletter we would like to not only inform you about the latest news of CNB and upcoming neuroscientific events, but also create a platform to promote an exchange between CNB research groups. Therefore, in each edition we will include a section in which CNB research groups briefly introduce themselves and their current research focus. We are pleased to introduce the research group of Prof. Beat Meier and Prof. Raphael Sznitman in this first edition.

Also, we include a short section where we discuss a recently published paper in the field of neuroscience. This time work from Prof. Antoine Adamantidis' group about the role of the REM sleep theta rhythm in contextual memory consolidation.

We are currently revising the CNB webpage. The detailed agenda list with upcoming local, national and international events is updated regularly. We also offer a reminder-email, which contains information about upcoming neuroscientific events of the following month. (Click here to subscribe to the reminder-email. Cancellation is possible at anytime).
We would also like to announce the 20th Brain Week, which takes place from the 13th to the 17th of March 2017. For the 20th anniversary, a special program is planned and we recommend you to mark this week in your calendar.
You will further find a job portal and presentations of all CNB research groups on the CNB webpage. (www.neuroscience.unibe.ch).

We would appreciate if you could contact us with any news, upcoming events, or suggestions for the selected publication. We would also like to encourage you to take the opportunity to present your research focus in our newsletter. Please contact Romina Theiler (romina.theiler@insel.ch, 031 632 55 94) with all information or questions.

Prof. Dr. Tobias Nef
President CNB

## ① Clinical Neuroscience Bern News

Interdisciplinary collaboration is pivotal to be successful in clinical neuroscience research and methodology. The University's focus "Clinical Neuroscience Bern" (CNB), aims to improve information exchange and promote cooperation between internal and external partners to thereby augment neuroscientific research in Bern.
The network is constantly expanding and currently 66 research groups in the field of clinical and cognitive neuroscience are involved. By functional, goal-oriented cooperation they contribute to the diversity and strength of the association.
CNB is looking back to a very successful 11th Annual Meeting with more than 180 participants from different disciplines such as Psychology, Psychiatry, Neurology and Neurosurgery. A special focus of this year's meeting was the structural reorganization.
The research group leaders elected the members of the new executive committee:

- Prof. Dr. Tobias Nef (ARTORG), *President*
- PD Dr. Sebastian Walther (Psychiatry), *Vice-President & Support of young researchers*
- Prof. Dr. Benoît Zuber (Anatomy), *Treasurer & Support of young researchers*
- Prof. Dr. med. Urs Fischer (Neurology), *PR & Organization of the Brain Week*

- Prof. Dr. med. Roland Wiest (Neuroradiology), *Organization of congresses and meetings*
- Prof. Dr. sc. Nat. Thomas König (Psychiatry), *Organization of congresses and meetings*
- Prof. Dr. Antoine Adamantidis (Neurology), *Organization of scientific lectures*

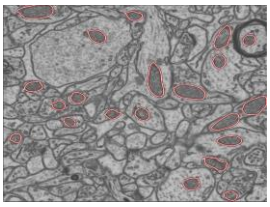
*Executive Committee left to right: Prof. B. Zuber, Prof. A. Adamantidis, Prof. T. König, Prof. R. Wiest, PD S. Walther, Prof. T. Nef, Prof. U. Fischer*

## ② Selected Research Groups

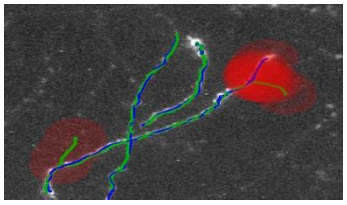
### Prof. Dr. R. Sznitman

*Ophthalmic Technology Laboratory*
*ARTORG Center for Biomedical Engineering Research*

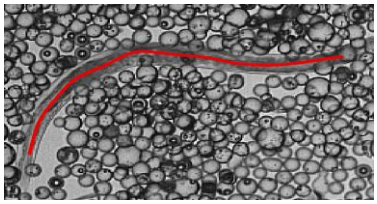
The Ophthalmic Technology Laboratory (OTL) is headed by Prof. Dr. Raphael Sznitman and is primarily focused on the development of novel solutions in image processing, computer vision and machine learning for biomedical applications. With the widespread use of imaging devices, for centimeter sized objected to nanometer structures in the brain, our efforts revolve around making sense of the monumental amount of image data being collected in health fields. As such, our research does not only target the technological questions of how to effectively leverage Big Data in specific applications but more importantly how to make solutions relevant and reliable for use in real settings.



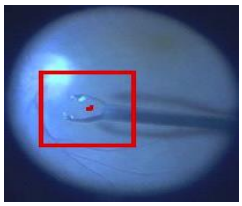
*Mitochondria segmentation*



*Change detection of neurons*



*Video analysis of C. elegans motility*



*Robotic assistance for surgery*

To date, applications of our work have focused on:

- Computational models for human visual perception
- Algorithmic solutions for automated segmentation of tumors in MRI
- Efficient and reliable strategies for perimetry testing strategies
- Automatic intra-cellular structure detection and segmentation in Electron microscopy and light microscopy image stacks
- Automatic delineation of C. elegans for large-scale analysis of motility analysis
- Automated instrument detection and tracking for guided robotic in micro surgery.

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## Prof. Dr. B. Meier

*Learning, Memory & Synaesthesia*
*Institute of Psychology*

The group of Prof. Beat Meier consists of Dr. Stefan Walter, Michèle Friedli, Katrin Lunke and Branislav Savic. We investigate the interplay between automatic and controlled processes in learning, memory, and consolidation from both a general and an individual difference perspective. Here we outline four of our current projects.

One line of research focuses on optimizing prospective memory, the ability to form an intention, maintain it over time and execute it at the appropriate occasion by considering different kinds of processing overlaps. A current project investigates the after-effects of completing an intention, showing that stimuli which were previously relevant can later interfere with performance, and we test under which conditions these lingering influences can be reduced.

Another line focuses on the investigation of the ability to learn, without awareness, regularities in tasks, stimuli, and responses (i.e., implicit learning). Here, a current project tests how learning and consolidation of general skill and sequence-specific learning can be modulated with tDCS and TMS. First results show differential consolidation of skill and sequence-specific learning.

A third line focuses on basic processes involved when switching between simple cognitive activities and how they affect subsequent memory. A current project investigates whether cognitive conflict triggered by the requirement to switch tasks, by processing ambiguous stimuli, or the presence of response conflict affects subsequent memory and whether this influence is affected differentially by consolidation. Results show that a conflict triggered by a task switch immediately reduces subsequent memory performance while a response conflict only after a 24 hour consolidation period.

Fourth, a SNF founded project investigates cognitive effects of synaesthesia, a condition in which ordinary stimuli (e.g. numbers) trigger extra-ordinary experiences (e.g. colours). Specifically, we investigate whether the presumed memory advantage in synaesthesia generalizes across different types (i.e., grapheme-colour, sound-colour, sequence-space synaesthesia) and whether it is specific to the respective inducers (i.e., visual vs. auditory stimuli) and across the respective concurrents (i.e., colour vs. space). Long-term memory is addressed after a one-year interval to further test the "superior memory in synaesthesia" hypothesis.

*Representative publications:*


- Meier, B., & Cock, J. (2014). Offline consolidation in implicit sequence learning. *Cortex, 57,* 156-166. doi:10.1016/j.cortex.2014.03.009
- Meier, B., & Rey-Mermet, A. (2012). Beyond monitoring: After-effects of responding to prospective memory targets. *Consciousness and Cognition, 21,* 1644-1653. doi: 10.1016/j.concog.2012.09.003
- Meier, B., Rey-Mermet, A., Woodward, T.S., Mueri, R. & Gutbrod, K. (2013). Episodic context binding in task switching: Evidence from amnesia. *Neuropsychologia, 51,* 886-892. doi:10.1016/j.neuropsychologia.2013.01.025
- Meier, B. & Rothen, N. (2013). Synaesthesia and Memory. In J. Simner & E. Hubbard (Eds.) *Oxford Handbook of Synaesthesia* (pp. 692-706). Oxford University Press.
- Walter, S. & Meier, B. (2016). The impact of absolute importance and processing overlaps on prospective memory performance. *Applied Cognitive Psychology, 30,* 170-177. doi:10.1002/acp.3174



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## ③ Selected Publication

SCIENCE, May 2016

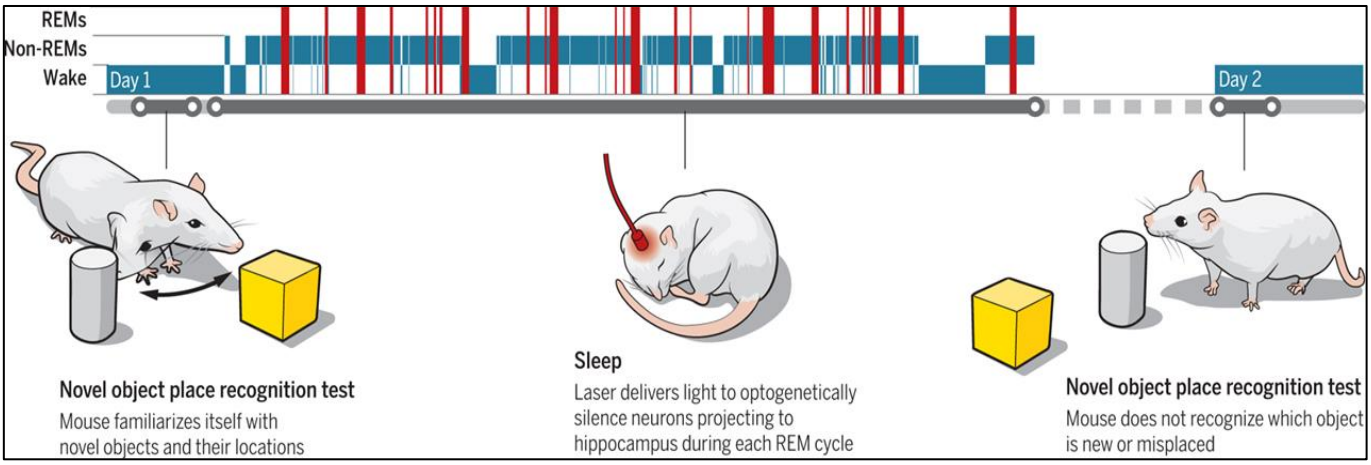
**"Causal evidence for the role of REM sleep theta rhythm in contextual memory consolidation"**

R. Boyce, S. D. Glasgow, S. Williams, A. Adamantidis*
* (Department of Neurology, University Hospital Bern)

*Summary (adapted from an interview with R. Boyce):*

Once acquired, new information is stored into different types of memories (e.g. spatial, emotional), which are subsequently consolidated to allow for later use. How the brain completes this process remains unclear. Using a mouse model, *Boyce et al.,* demonstrated for the first time that rapid-eye-movement (REM) sleep, when dreaming presumably occurs, is directly involved in normal memory formation. To accomplish this, they used a recently established technology called optogenetics that enables the activity of a specific target population of neurons to become precisely controllable by light. In particular, they chose to target a population of neurons that play a critical role in the physiological regulation of the hippocampal formation, a structure critical for memory formation that during wakefulness is known to function as the 'GPS' system of the brain. Then, after training mice to perform a spatial memory task, they observed them during sleep, using light pulses to turn off the memory-associated neurons only when they were in REM sleep. The next day, they tested to see whether mice had learned the spatial memory task from the training session on the prior day and found their spatial memory to be significantly impaired, while other type of memories remain. The present study is the first direct proof that neural activity during REM sleep is required for normal spatial memory formation.

Click here to get the full version of this publication.




*Reducing hippocampal theta oscillations during REM sleep affects what mice remember from learning sessions in the prior waking period. "From Bernat Kocsis, "REMembering what you learned" SCIENCE 352:770 (13 May 2016) Figure by: V. ALTOUNIAN/SCIENCE. Reprinted with permission from AAAS."*

## ④ Upcoming events

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|---|---|
| 13. – 17.3.2017 | Brain Week 2017 |
| 02.11. 2017 | Annual Meeting CNB |

- A complete list of upcoming events is provided on the CNB homepage.
- If you wish to receive a weekly reminder about upcoming events, please subscribe to the mailing list

*For more information or any inquiry, please contact:*

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