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*An image of a sleeping bearded dragon (*Pogona vitticeps*).*

## Bearded dragons show REM and slow-wave sleep

*behavioral* sleep is ubiquitous among animals, from insects to man. In humans, sleep is also characterized by brain activity: periods of slow-wave activity are each followed by short phases of Rapid-Eye-Movement sleep (REM sleep). These electrical features of brain sleep, whose functions are not well understood, have so far been described only in mammals and birds, but not in reptiles, amphibians or fish. Yet, birds are reptiles—they are the feathered descendants of the now extinct dinosaurs. How then did brain sleep evolve? Gilles Laurent and colleagues describe REM and slow-wave sleep in a reptile, the Australian dragon *Pogona vitticeps* for the first time. Their results suggest that brain sleep dates back at least to the evolution of our ancestors, the amniotes (around 320 million years ago). They published their findings in the journal *Science*.

Gilles Laurent studies the reptilian brain because of its simpler, ancestral design, to understand cortical function, dynamics and computation. In the midst of one of these studies, they observed that brain activity recorded from resting lizards during the night oscillated regularly between two states. The present work derives from this initial observation. They asked: are we seeing REM and slow-wave sleep (SWS)?

Indeed, the research team found many similarities between REM and slow-wave sleep in mammals and dragons, such as a phase with low frequency and high amplitude average brain activity as well as with rare and bursty neuronal firing (SWS) and yet another phase with awake-like brain activity and rapid eye movements (REM). Another common feature with mammalian sleep was the coordinated activity of cortex with another brain area during slow-wave sleep. In dragons, this other area is the dorsal ventricular ridge (DVR), whereas in mammals this is the hippocampus. Beside the difference in brain areas coordinated with cortex (DVR for reptiles and hippocampus for mammals), the sleep cycles are much shorter for lizards (less than two minutes) than for humans (60 to 90 minutes).

Read the full press release: [www.brain.mpg.de/news-events/news.html](http://www.brain.mpg.de/news-events/news.html)

## Night of science

for the second year in a row, the Max Planck Institute for Brain Research participated at the annual Night of Science. On June 3, hundreds of participants visited the institute to attend lectures by Hiroshi Ito, Stephan Junek and Gilles Laurent, to do experiments in the Teaching Lab, to speak with Institute's members and to tour inside of the Institute. A highlight of the evening was the Max Planck Horror Picture Show, a play directed by Anne-Sophie Hafner, where audience members outside watched a scientific horror show staged in the illuminated windows of the Schuman lab. The "silent" play was made audible by a beautiful accompaniment by the Rheingauer Film-Symphoniker.

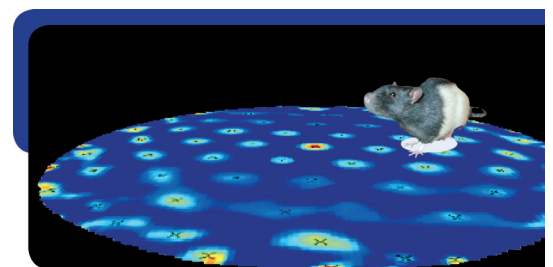


Left: Gilles Laurent gives a talk at the Night of Science and right: members of the Rheingauer Film-Symphoniker (upper left), actors and organisers of the Max Planck Horror Picture Show (full right director Anne-Sophie Hafner).

## Third Hertie Lecture by May-Britt Moser

we are pleased to announce that the third Hertie Lecture will be held by Nobel laureate May-Britt Moser on September 14, 2016. May-Britt Moser is a Co-Director of the Kavli Institute for Systems Neuroscience and Founding Director of the Centre for the Biology of Memory at the Norwegian University of Science and Technology (NTNU), Trondheim, Norway and shares the 2014 Nobel Prize in Physiology and Medicine with husband and colleague Edvard I. Moser as well as with John O'Keefe (University College, London, UK) „for their discoveries of cells that constitute a positioning system in the brain". One of our newest recruits, research group leader Hiroshi Ito (see below), conducted his postdoctoral research in the Moser lab.

We look forward to May-Britt Moser' lecture, which is titled „Grid cells, space and memory", and thank the Hertie Foundation and the Friends of the Max Planck Institute for Brain Research for their generous contribution.



Hertie Foundation Lecture  
at the MPI for Brain Research

May-Britt Moser

Sep 14, 11 am

(Kavli Institute for Systems Neuroscience  
and Centre for the Biology of Memory at the Norwegian University  
of Science and Technology (NTNU), Trondheim, Norway)

Title: "Grid cells, space and memory"

Lecture Hall of the Max Planck Institute for  
Brain Research, Max-von-Laue-Straße 4,  
60438 Frankfurt am Main (Campus Riedberg)

[www.ntnu.edu/kavli/research/moser](http://www.ntnu.edu/kavli/research/moser)





## Friends of the Max Planck Institute for Brain Research

### Two new research group leaders join the MPI

*in* the beginning of 2016 both **Julijana Gjorgieva** and **Hiroshi Ito** joined our Institute as a Max Planck Research Group Leader. **Julijana** joined the MPI in April, coming from the Marder lab at Brandeis University (Waltham, US) and studies, using computational and mathematical approaches, how activity, generated spontaneously in the circuit or by the external environment, shapes network organization and dynamics.

**Hiroshi** previously worked at the Moser lab (Trondheim, Norway) and studies memory and navigational circuits using electrophysiology, optogenetics and pharmacogenetic manipulations of the neural activity and already joined the Institute in January of this year.

Both scientists are very happy to be in Frankfurt. **Hiroshi Ito**: *„I enjoy life in Germany so far. I found several good restaurants, went to museums and music concerts, and visited historical castles and cathedrals. I want to explore much more. As for the institute, I really like a collaborative atmosphere. I feel that we, as a group, work together to understand the brain using different approaches. I am very excited to join such a wonderful community!”*



*Both Julijana Gjorgieva and Hiroshi Ito joined the MPI this year and are very happy to be in Frankfurt.*

### Selected recent publications

Shein-Idelson, M., Ondracek, J., Liaw, H.-P., Reiter, S. and **Laurent, G.** (2016). Slow waves, sharp-waves, ripples and REM in sleeping dragons. *Science* 352: 590-595.

Tushev, G. and **Schuman, E.M.** (2016). Rethinking functional segregation: Gradients of gene expression in area CA1. *Neuron*, 89, 242-243.

Mayer, A., Schwiedrzik, C.M. Wibral, **Singer, W.** and Melloni, L. (2016). Expecting to see a letter: Alpha oscillations as carriers of top-down sensory predictions. *Cerebral Cortex* 26: 3146-3160.

Káradóttir R.T., **Letzkus, J.J.**, Mameli, M. and Ribeiro, C. (2015). Your ticket to independence: A guide to getting your first principal investigator position. *European Journal of Neuroscience* 42: 2372-79.

L. A. Gatys, A. S. Ecker, **Tchumatchenko, T.**, and Bethge, M. (2015). Synaptic unreliability facilitates information transmission in balanced cortical populations. *Phys Rev E* 91:062707.



*Participants from IMPRS as well as CCU enjoying the joint retreat in front of the amazing Lisbon Institute's building.*

## IMPRS retreat to Lisbon, Portugal

*in* the beginning of April 2016, a group of 32 students from the International Max Planck Research (IMPRS) for Neural Circuits as well as the program coordinator, visited the lovely city of Lisbon. The retreat was co-organised by graduate students from the Champalimaud Centre for the Unknown (CCU) and featured visits to the CCU with talks from graduate students from both Institutions, as well as a workshop on science communication, a chalk talk by [Rui Costa](#) and a methods lecture by [Inbal Israely](#) (both scientists at CCU). In addition, the students explored Lisbon and a couple of interesting museums.

## 2016/2017 Upcoming Lectures

*(all Lectures start at 11.00 hours at the Institute's Lecture Hall)*

14.09.16 [May-Britt Moser](#) (Kavli Institute for Systems Neuroscience and Centre for the Biology of Memory at the Norwegian University of Science and Technology (NTNU), Trondheim, Norway) Title: „Grid cells, space and memory“ *Hertie Lecture*

15.09.16 [Kelsey Martin](#) (UCLA Department of Biological Chemistry, Los Angeles, USA) Title: „Spatial Regulation of Gene Expression During Neuronal Plasticity“ *Neuroscience Lecture*

12.10.16 [Caspar Hoogenraad](#) (Utrecht University, the Netherlands) Title: „Building a neuron: cytoskeleton organisation and transport mechanisms“ *Neuroscience Lecture*

09.11.16 [Axel Borst](#) (Max Planck Institute of Neurobiology, Martinsried, Germany) *Neuroscience Lecture*

18.01.17 [Silvio Rizzoli](#) (Institute for Neuro- and Sensory Physiology, University Göttingen Medical Center, Germany) *Neuroscience Lecture*

08.02.17 [Rui Olivera](#) (ISPA, Instituto Universitario Behavioral Biology, Lisbon, Portugal) *Neuroscience Lecture*

15.03.17 [Germán Sumbre](#) (Institut de Biologie de École Normale Supérieure Section de Neurosciences, Paris, France) *Neuroscience Lecture*

### Did you know?

*... that, as part of the Max Planck Junior Scholars Program, the Institute currently hosts sixteen high-school students from eight different schools for summer internships?*

[www.brain.mpg.de/juniorscholars](http://www.brain.mpg.de/juniorscholars)



### Contact

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