

**Homeostatic
 synaptic plasticity,
 learning & memory**

contents

Protein levels at homeostasis	1
Friends postdoc prize 2016 Ethics in Science Lecture	2
Max Planck Junior Scholars Selected recent publications	3
IMPRS students start and finish 2017 Upcoming Lectures	4

Neurons adjust their synapses by altering the synthesis of hundreds of proteins to regulate synaptic strength and network activity.

How do neurons adjust their proteins during homeostasis?

learning and memory formation are based on our brain's ability to adjust and regulate neuronal network activity. This process, called synaptic plasticity, includes homeostatic scaling, a process by which neurons are able to stabilize network activity in response to large perturbations. Scientists at the Max Planck Institute for Brain Research in Frankfurt am Main now report a detailed analysis of the proteins synthesized by neurons to mediate homeostatic scaling. Using bio-orthogonal labeling strategies, they discovered changes in newly-synthesized proteins, including known proteins involved in synaptic plasticity, but also new, yet uncharacterized proteins. The extensive, publicly-available dataset generated in this study provides a valuable starting point and reference for future studies of homeostatic scaling.

Changes in the synthesis of cellular proteins lie at the heart of all adaptations that cells undergo. The complete complement of proteins expressed in a cell is known as the proteome. Tracking proteome changes in neurons during synaptic plasticity represents a major challenge: how can one distinguish the newly synthesized proteins from the pre-existing proteins within a cell? This challenge was addressed by making use of bio-orthogonal, non-canonical amino acid tagging (BONCAT). In this technique, neurons incorporate artificial amino acids into new proteins, allowing subsequent visualization and purification of the newly-synthesized proteome produced upon stimulation or treatment. Together with the joint proteomics lab of the Max Planck Institute for Brain Research and Max Planck Institute of Biophysics, 5940 newly-synthesized proteins were detected and analyzed in primary hippocampal neurons undergoing opposing forms of homeostatic plasticity. "We observed no significant changes in the overall number of proteins being synthesized, but rather adaptations to the expression levels of hundreds of proteins", says **Christoph Schanzenbacher**, lead author of the manuscript.

Read the full press release: www.brain.mpg.de/news-events/news.html

Mark Shein-Idelson receives the Friends postdoc prize

during the Institute's Holiday International Party, **Mark Shein-Idelson**, postdoc at the Lab of **Gilles Laurent** received the annual postdoc prize. **Mark** works on reptiles and his most recent paper was published in *Science*. Together with his colleagues from the Laurent Lab, he examined sleep in bearded dragons (*pogona vitticeps*) and compared the lizard's behavior with sleep in humans. His work closed an evolutionary gap, indicating that sleep likely evolved once.

Like the PhD prize, awarded to **Georgi Tushev** last year, this prize is financed by generous donations of the Friends of the Max Planck Institute for Brain Research. We congratulate **Mark** on this great achievement.



Deputy Chair Matthias Kaschube (right) awards the Friends postdoc prize to Mark Shein-Idelson at the Institute's holiday international party (December 15, 2016)

Second Ethics in Science Lecture by Jean-Pierre Changeux

the annual Ethics in Science lecture series was established by the Max Planck Institute for Brain Research in 2015 to offer a platform to commemorate its tragic past. On December 13, this year's lecturer, presented the ethics in neuroscience as well as the neuroscience of ethics.

Jean-Pierre Changeux, honorary president at the neuroscience department of Institut Pasteur Paris (France), gave an excellent overview about ethics developed throughout the centuries, ranging from philosophers in ancient Greek times to the Declaration of Human Rights (1789) and, more recently, the Nuremberg Code (1947) as well the Universal Declaration of Human Rights, issued by the United Nations in 1948.

In addition, the lecturer shared his views about the neuroscience of unethical behavior and made the audience thinking why humanity on the one hand develops rules, but, on the other hand, in many cases fails to follow them. The lecture and fruitful discussion proved that there is still much more to discover about human behavior.

Ethics in Science Lecture Series


Jean-Pierre Changeux
Honorary President, Neuroscience Department,
Institut Pasteur Paris, France

Title: "Neuroscience and Ethics"

Dec 13, 2016
17.00 hours
Lecture Hall

Max Planck Institute for Brain Research
Max-von-Laue-Straße 4
60438 Frankfurt am Main
www.brain.mpg.de/ethicslecture

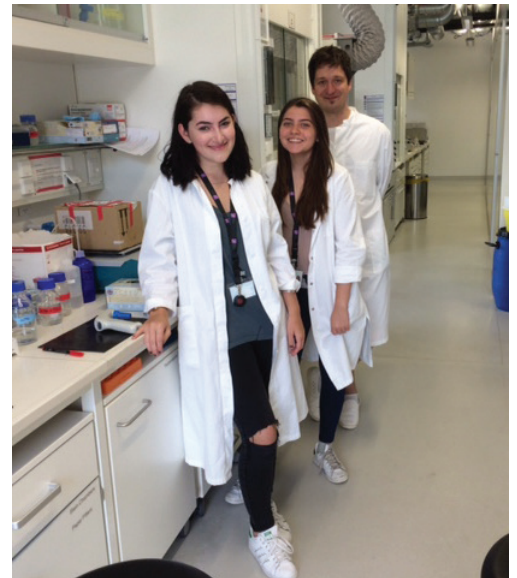
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Friends of the Max Planck Institute for Brain Research

15 interns joined us during summer

the Max Planck Junior Scholars Program is a joint initiative of the Max Planck Institutes of Brain Research and Biophysics (Frankfurt) as well as Heart and Lung Research (Bad Nauheim) where students can apply to a summer internship and work in a research laboratory for a couple of weeks. Starting with one student in 2012, we had fifteen students at the Institute this year. Among these were **Anna Buskhrikidze** and **Maddie Dawson** from New York, who did their internship at the Laurent Lab and wrote us the following valuable feedback: *"Throughout our past experience with science classes in New York public schools, there were limitations to most of our experiments. We signed up for this course not knowing what to expect, but with the help of our mentor, **Robert Naumann**, we were able to explore subjects in science that we never thought we would touch on. For example, observing a perfusion on a lizard, calcium staining, and in situ hybridization. The Max Planck Institute members was very welcoming and were very patient with us. They were kind enough to share their projects with us and in some cases allowed us to contribute. The Junior Scholar Program helped us gain a better perspective on our possible careers in the future and understand the field of science in a more detailed way."* W: www.brain.mpg.de/juniorscholars



Max Planck Junior Scholars Anna Buskhrikidze (left) and Maddie Dawson together with mentor Robert Naumann



*Deadline for
the next round:
February 2017*

Selected recent publications

Schanzenbaecher, C.T., Sambandan, S., Langer, J.D., **Schuman, E.M.** (2016). Nascent proteome remodeling following homeostatic scaling at hippocampal synapses. *Neuron* 92, 358-371. (see also page one of this newsletter)

Hanus, C., Geptin, H., Tushev, G., Garg, S., Alvarez-Castelao, B., Sambandan, S., Kochen, L., Hafner, A.S., Langer, J.D., **Schuman, E.M.** (2016). Unconventional secretory processing diversifies neuronal ion channel properties. *eLife* 5: e20609.

Fournier, J., Mueller, C.M., Shein-Idelson, M., Hemberger, M. and **Laurent, G.** (2016). Consensus-Based Sorting of Neuronal Spike Waveforms. *PLoS ONE* 11(8): e0160494.

Hemberger, M., Pammer, L. and **Laurent, G.** (2016). Comparative approaches to cortical microcircuits *Current Opinion in Neurobiology* 41:24-30.

Bergmann, J., Genc, E., Kohler, A., **Singer, W.** and Pearson, J. (2016). Smaller primary visual cortex is associated with stronger, but less precise mental imagery. *Cerebral Cortex* 26: 3838-3850.

Genc, E., Schölvinck, M.L., Bergmann, J., **Singer, W.** and Kohler, A. (2016). Functional connectivity patterns of visual cortex reflect its anatomical organization. *Cerebral Cortex* 26: 3719-3731.



Eight new IMPRS students with five different nationalities started this year.

Eight new IMPRS students start (and two finish)

on October 5, we welcomed the sixth generation of students from the International Max Planck Research School (IMPRS) for Neural Circuits. During the kick-off, they received information about the program and were taken to a "treasure hunt" in the Institute. In addition, two IMPRS students defended their thesis in the past couple of weeks: **Christoph Hartmann** (Triesch Lab) on November 25 and **Irina Epstein** (Schuman Lab) on December 8. We congratulate them with this tremendous effort and wish both of them all the best for their future careers. W: www.imprs.brain.mpg.de



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2017 Upcoming Lectures

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

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*

08.03.17 **Adam Packer** (University College London, UK) *Neuroscience Lecture*

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

22.03.17 **Anne Ephrussi** (European Molecular Biology Laboratory, Heidelberg, Germany) *Minerva Lecture*

19.04.17 **Timothy O'Leary** (Volen Center for Complex Systems, Brandeis University, USA) *Neuroscience Lecture*

05.05.17 **Dimitri Chklovskii** (Flatiron Institute, Center for Computational Biology, Neuroscience Group, New York, USA) *Neuroscience Lecture*

10.05.2017 **Hongkui Zeng** (Structured Science Allen Institute Brain Science, Seattle, USA) *Neuroscience Lecture*

W: www.brain.mpg.de/news-events/lectures-and-other-events.html



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