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## #Frankfurt hat Hirn

*what* connects brain research and Frankfurt: apple cider, Alzheimer's or the appearance of squid? Answers to these and many other exciting facts about the brain can be found at the website [www.frankfurt-hat-hirn.de](http://www.frankfurt-hat-hirn.de), launched on the occasion of the International Brain Awareness Week 2021 (March 15-21).

To show the Frankfurt public how much brain Mainhattan has, the Max Planck Institute for Brain Research, the Max Planck Institute for Empirical Aesthetics, the Frankfurt Institute for Advanced

Studies, Goethe University, and the Ernst Strüngmann Institute have joined forces with the non-profit Hertie Foundation, which has been promoting brain research since the 1970s.

In addition to these institutions, the "brain" history of the city of Frankfurt also has much to offer: important personalities, events, and research results related to neuroscientific topics. Some of them date back to the 19th century and thus, virtually originate from the cradle of modern brain research.



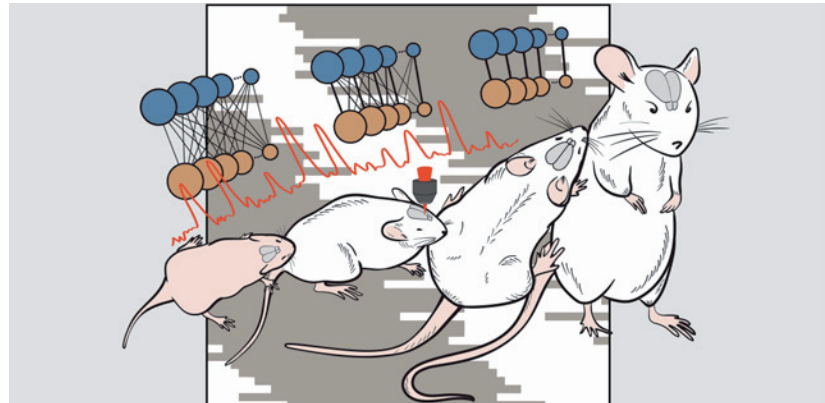
## Science News from the MPI for Brain Research

### How the brain teaches itself to see

*the newborn* brain possesses the remarkable ability to respond to its environment and generate coordinated output without any prior experience. Rodent pups do not open their eyes prior to the age of two weeks, however, neural circuits in the visual pathway of the animal's brain prepare and start wiring up much earlier. Before the eyes open, brain networks undergo substantial organization, tuning and coordination driven by powerful developmental mechanisms. However, without external input from the eyes, other sources generate neural activity to guide the process of connecting neurons. An international team of scientists led by Julijana Gjorgjieva, research group leader at the MPI for Brain Research describes two sources of spontaneous neural activity that play a critical role in the developing visual system of mice.

To understand how spontaneous activity wires up the developing visual system, Gjorgjieva and colleagues designed a computational network model. "In our model, thalamic neurons initially make weak and imprecise synaptic connections to cortical neurons as in the immature visual system.

Two types of spontaneous activity (local and global events) reorganize and selectively strengthen these connections", says Marina Wosniack, the postdoc who led the work. "We found that global spontaneous activity is the perfect candidate to regulate synaptic connection strength and activity," the scientist adds.



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## Hot on the messenger's trail

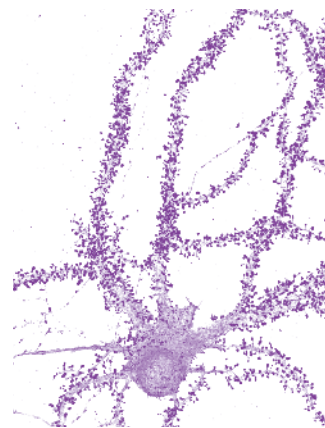
*neurons* communicate across vast distances and form remarkably complex and intricate networks. Their processes, called dendrites and axons, range from hundreds of microns to up to 1 meter in length making up to tens of thousands of connections, synapses, with other brain cells. Strengthening or weakening these connections, "synaptic plasticity", is believed to be an essential component of our ability to learn and remember.

While thousands of mRNAs are localized at distant sites within neurons, little is known about how they get to these distant locations and how they behave during synaptic plasticity. To address this knowledge gap, a team of scientists headed by Erin Schuman, director at the MPI for Brain

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P. Donlin-Asp & C. Polisseni

Research and the Heckel lab at the Goethe University (Frankfurt) developed a strategy to label and track neuronal mRNAs in living neurons. Using a specialized "molecular beacon" to bind individual mRNAs and high-resolution microscopy in live neurons, they tracked and assessed how three different mRNAs are transported within dendrites.

The scientists found that changes in mRNAs behavior during synaptic plasticity did not necessarily result in a change in production of the protein, suggesting that during synaptic plasticity mRNAs may be "captured" first for later protein production.



## Friends of the Max Planck Institute for Brain Research

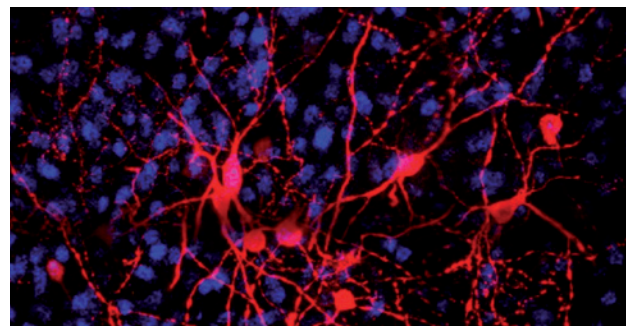
### New Max Planck Research Group: Instinctive Behaviour Circuits



In April 2021, **Vanessa Stempel** joined the MPI for Brain Research as a new Max Planck Research Group Leader.

*"I feel incredibly lucky to start my lab here at the MPI for Brain Research, surrounded by amazing colleagues. My group will have a strong neuroethological focus and study the neural mechanisms underlying instinctive behaviours.*

*We are just starting to do our first experiments, so it's truly exciting times!"*



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for Brain Research / V. Stempel

*instinctive* behaviours, such as hunting, escape and mating, are an animal's survival kit of actions that they acquire with little to no experience. In vertebrates, they are generated by remarkably conserved brain circuits, and it has become increasingly clear in recent years that instinctive behaviours are not just stereotyped fixed-action patterns but that they can be flexible in regard to both action selection and execution.

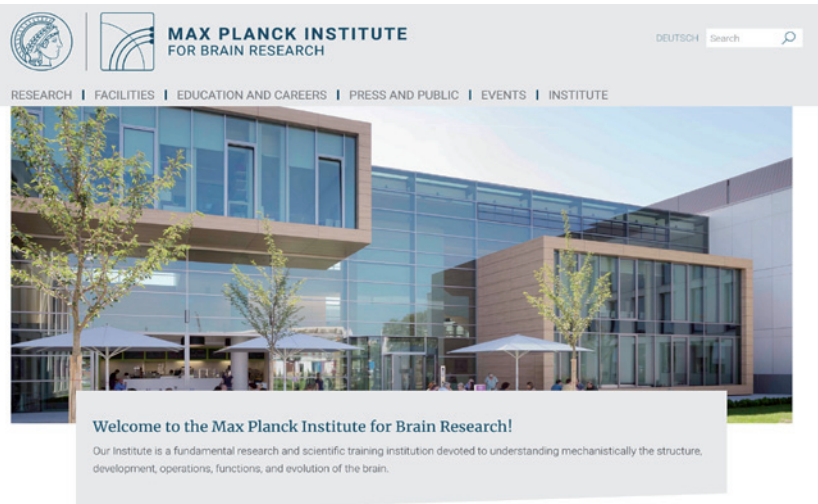
Her group will use a multidisciplinary approach, combining in vivo neural activity recordings and

manipulation experiments in ethologically relevant behavioural tasks with molecular, cellular and circuit-level analyses in vitro.

Vanessa studied Biology in Germany, Poland and the UK. She received her PhD from the Free University Berlin, where she worked on cellular plasticity mechanisms in the group of Dietmar Schmitz. For her postdoc, Vanessa joined the group of Tiago Branco, first at the MRC Laboratory of Molecular Biology, Cambridge and then at UCL, to investigate the neural basis of escape in mice.

### Modern design, new features – new website for the MPI for Brain Research

*in* May 2021, the MPI for Brain Research launched its new website. The new design, based on the content management system Fiona (by Infopark) in collaboration with the Max Planck Society, will facilitate navigation and provide visitors a pleasant browsing experience with easy access to content. New features include the central homepage with quick access to research topics, news, and entry opportunities. →





*(contd.)* Visitors and editors benefit from a responsive web design which has been optimized for use with mobile devices such as smartphones and tablets. Moreover, the MPI for Brain Research has revised and updated its content, a large fraction of which is now available both in English and German. Enjoy browsing through our science, recent news, the institute history and mission at: [www.brain.mpg.de](http://www.brain.mpg.de) and watch out for upcoming lectures and events!

## Eric Kandel Young Neuroscientists Prize 2021 awarded to Julijana Gjorgjieva

On July 13, the Hertie Foundation and the Federation of European Neuroscience Societies (FENS) announced the winner of the Eric Kandel Young Neuroscientists Prize 2021: Prof. Dr. Julijana Gjorgjieva receives the 100,000 Euro award for her scientific achievements in the field of theoretical neuroscience. Every two years, the Eric Kandel Young Neuroscientists Prize recognizes outstanding young scientists in brain research.



*"I am honored and truly grateful for this prize, which I owe to the members of my lab, our collaborators and my mentors."*

**Gjorgjieva** plans to use the prize money to establish a new international scientific collaboration to study the cellular and molecular mechanisms that guide the development of axonal connections in the sensory cortex. She also plans to promote mentoring activities for early career researchers.

## newsletter 1/2021



*For web-related inquiries please contact:  
Irina Epstein, Jan Röhlk or Daniel Brenner  
(from left to right)*

## Kenneth Westhues

Professor Emeritus, University of Waterloo, Canada

Title: "Hierarchies and Mobbing in Academia"

Humans unfortunately sometimes behave in disappointing ways. Scientists are no exception. Westhues's lecture will focus on scientists' mistreatment of one of their own: the harassment, punishment and humiliation of a fellow scientist, toward elimination of him or her from the scientific community, metaphorical or actual death. This unethical practice is called *workplace mobbing*. This lecture will highlight research over the past 20 years on workplace mobbing in universities, commonly called *academic mobbing*.

The Eric Kandel Young Neuroscientists Prize – named after the American neuroscientist and Nobel laureate Eric Kandel – will be awarded on September 23, 2021, in the St. Paul's Church in Frankfurt.

## Coming up: Ethics in Science Lecture 2021

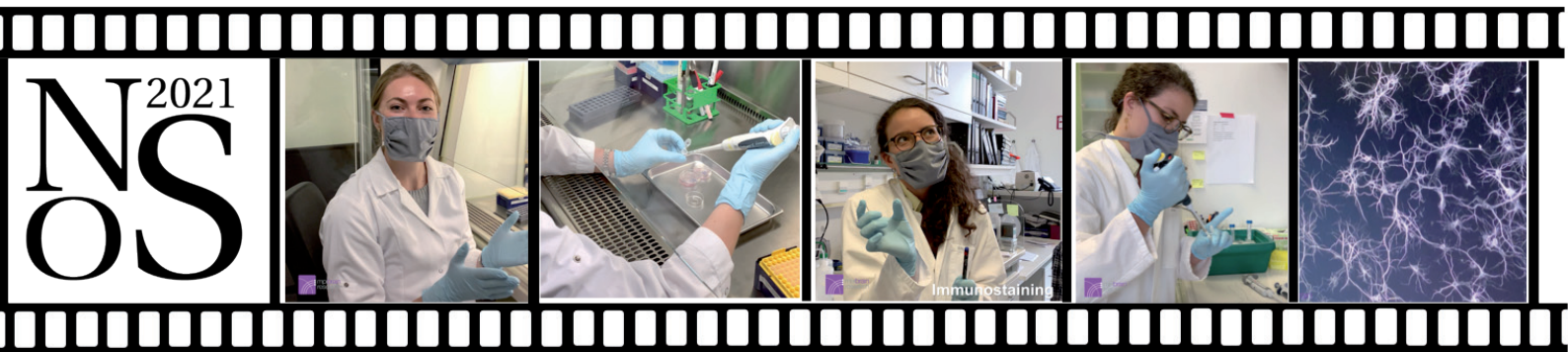


## Outreach Spotlight Night of Science

*June* 18, the (virtual) campus doors stayed open all night for Night of Science 2021. Visitors could experience exciting science and discussions across multiple disciplines, including neuroscience, physics and computer science.

### Making Neurons Glow

MPI for Brain Research scientists, Teresa Spanò and Eleanor Vail, took visitors on a tour to the Department of Synaptic Plasticity and showed how they visualize neurons and their intricate networks in a dish. The video was streamed on YouTube and will soon be available online at [www.brain.mpg.de](http://www.brain.mpg.de)



## Selected Publications

Kirchner, J. H.; Gjorgjieva, J.: **Emergence of local and global synaptic organization on cortical dendrites.** Nat. Commun. 12, 4005 (2021)

Klinger, E.; Motta, A.; Marr, C.; Theis, F. J.; Helmstaedter, M.: **Cellular connectomes as arbiters of local circuit models in the cerebral cortex.** Nature Communications 12, 2785 (2021)

Perez, J. D.; Tom Dieck, S.; Alvarez-Castelao, B.; Tushev, G.; Chan, I. C.; Schuman, E. M.: **Subcellular sequencing of single neurons reveals the dendritic transcriptome of GABAergic interneurons.** Elife 10 (2021)

Donlin-Asp, P. G.; Polisseni, C.; Klimek, R.; Heckel, A.; Schuman, E. M.: **Differential regulation of local mRNA dynamics and translation following long-term potentiation and depression.** Proceedings of the National Academy of Sciences (PNAS) 118 (13) (2021)

Röth, K.; Shao, S.; Gjorgjieva, J.: **Efficient population coding depends on stimulus convergence and source of noise.** PLoS Computational Biology 17 (4), e1008897 (2021)

Wosniack, M. E., Jan H. Kirchner, J. H., Chao L., Zabouri N., Lohmann C., Julijana Gjorgjieva, J. **Adaptation of spontaneous activity in the developing visual cortex.** eLife (2021)

Nold A., Batulin D., Birkner K., Bittner S., Tchumatchenko T. **How Repair-or-Dispose Decisions Under Stress Can Initiate Disease Progression.** iScience (2020)

Laurent, G. **On the value of model diversity in neuroscience.** Nat Rev Neurosci. (2020)