

**Maxim Volgushev**

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**Academic information***Education*

1976: School Nr.2 in Moscow (Mathematics & Physics as special subjects)

1981: Moscow State Lomonosov University, Biological Faculty:

Physiology, Neurophysiology, Higher Brain Functions

Diplom: "Dynamic reorganisation of receptive fields in cat visual cortex"

Supervisor: Prof. Igor A. Shevelev

1988: Cand. Sci. (Ph.D.) Institute of Higher Nervous Activity and Neurophysiology,  
Russian Academy of Sciences

PhD Thesis: "Interaction between neurons in orientation columns in cat visual  
cortex: a crosscorrelation analysis"

Supervisor: Prof. Igor A. Shevelev

2000: Habilitation in Physiology. Medical Faculty, Ruhr-University Bochum

"Cellular mechanisms of the orientation selectivity in the visual cortex"

*Experience*

1981 - 1990 Institute of Higher Nervous Activity and Neurophysiology

Russian Academy of Sciences, Moscow

PhD student, Research Scientist

1990 - 1992 Max-Planck-Institute for Biophysical Chemistry, Göttingen

Department of Neurobiology (Director Prof. Otto D. Creutzfeldt)

Alexander-von-Humboldt Foundation Fellow, Max-Planck-Society Fellow

1992 - 1995 Max-Planck-Institute for Brain Research, Frankfurt/M.

Department of Neurophysiology (Director Prof. Wolf Singer)

Max-Planck-Society Fellow, Research Scientist

1996 - 2007 Ruhr-University Bochum, Medical Faculty,

Department of Neurophysiology (Director Prof. Ulf T. Eysel)

Research Scientist, Hochschuldozent

2007 - (present time) University of Connecticut, Storrs

Department of Psychological Sciences

Associate Professor, since 2012 Professor

*Membership*

Society for Neuroscience

*Reviewer for:*

Journals: *ad hoc* reviewer for over 15 journals, including *Cerebral Cortex*; *European Journal of Neuroscience*;  
*Journal of Neuroscience*; *Journal of Physiology*; *Nature Communications*; *Neuron*; *Neuroscience*;

Grant agencies (*ad hoc* reviewer): *Human Frontier Science Program*; *Minevra Foundation*; *National Science  
Foundation*; *Netherlands Organisation for Scientific Research*; *US-Israel Binational Science Foundation*;  
*Wellcome Trust*.

Editorial Board: *Acta Neurobiologia Experimentalis*. *Frontiers in Synaptic Neuroscience*

**External funding**

2018-2020: UConn Foundation, Research Excellence Program. \$49,920.-. Volgushev M (PI), Fitch RH (Co-PI). The role of adenosine A1 receptors in learning visual tasks and synaptic plasticity in visual cortex

2018-2022: National Institutes of Health, Swadlow, H (PI) Thalamocortical Processing of Visual Information During Alert and Non-Alert Brain States.

Comment: There are no funds for my lab in this grant.

**Completed grants:**

2010 – 2016: \$938,235 National Institutes of Health, Volgushev M (PI), Bazhenov M (Co-I, UCalifornia Riverside)  
(Total award: \$1,904,677)

2012 – 2015: National Institutes of Health, Swadlow, H (PI) JM Alonso (Co-I) , M. Volgushev (Co-I)

2007 – 2011: \$295,000 National Institutes of Health, R-21, H Swadlow (PI) JM Alonso (Co-I), M Volgushev (Co-I)

2007 – 2011: €71,176 Ministry of Education and Science, Germany, 01GQ07112 (Total award ca. €800,000)

2009 – 2010: \$15,000 UConn Research Foundation, IFP-090051

2008 – 2010: €1,000 German-Israeli Foundation for Scientific Research and Development (Total ca. €205,000)

2006 – 2007: €67,535 FoRUM-Programm, F475-2005

2005 – 2007: €302,700 Deutsche Forschungsgemeinschaft, SFB 509, TPA5

2002 – 2004: €18,600 NATO Scientific and Environmental Affairs Division, LST.CLG.978859

2002 – 2004: DM 528,600 Deutsche Forschungsgemeinschaft, SFB 509, TPA5

1999 – 2001: DM 461,900 Deutsche Forschungsgemeinschaft, SFB 509, TPA5

1996 – 1998: DM 238,800 Deutsche Forschungsgemeinschaft, SFB 509, TPA5

**Fellowships**

Research Fellowship, Alexander von Humboldt Foundation 1990-1991

Research Fellowship, Max-Planck Society 1992-1993

Humboldt Research Award, Alexander von Humboldt Foundation 2014

**Research**

My research is aimed at understanding the neuronal basis of brain functioning, with a focus on sensory systems. Sensory systems provide a unique possibility to study operation of neurons and neural circuits in a system with well-defined structure and specific functions. Comparison of processing of different sensory modalities facilitates understanding of general principles of neuronal operations. Nerve cells are on the one hand elementary units, of which neuronal circuitry is built. On the other hand, each neuron is itself a complex entity, which processes biochemical and electrical information impinging at its inputs. These multiple facets of functional roles of nerve cells necessitate the use of combined approaches, which deal with experimental objects of different levels of complexity: whole brain, neurons, and synaptic connections. The combination of *in vivo*, *in vitro* and theoretical techniques is essential for my research. While studying nerve cells, synapses and their specific properties, we are always trying to understand how these elements are embedded in the system and what role(s) are they playing in the functioning of the whole system.

My **research fields** include synaptic transmission and plasticity in the neocortex, electrophysiology of nerve cells, signal processing and encoding in cortical neurons, the neurophysiology of the visual system, origin of slow oscillation and brain-state related signal processing.

In my **research projects**, we are exploiting complementary advantages of a combination of different experimental and theoretical approaches, including *in vivo* and *in vitro* intracellular recording from cells and cell pairs; *in vivo* and *in vitro* optical imaging of intrinsic signals and with fluorescent dyes; elaborated data analysis; computer simulations.

In my most recent research projects we address following questions.

- *What is the role of heterosynaptic plasticity in achieving stable yet adaptable memory storage?*
- *How sensory inputs are integrated and processed by cortical neurons?*
- *How cortical neurons encode synaptic input in their output - sequences of action potentials?*
- *What is the origin and cellular mechanisms of slow sleep oscillation, how does the brain state influence neuronal properties and sensory processing?*

On these projects, we have an ongoing or developing collaboration with the groups of Maxim Bazhenov, Riverside; Pavel Balaban, Moscow; Fred Wolf, Göttingen; Michael Gutnick, Rehovot; Igor Timofeev, Quebec; Harvey Swadlow and Heather Read, Storrs.

**Teaching**

University of Connecticut, Department of Psychology (since 2007):

PSYC5200 – Behavioral Neuroscience Research (BNS Seminar, Fall 2010 – Spring 2014)

PSYC5270 – Current Topics in Behavioral Neuroscience, Synaptic Transmission and Plasticity

PSYC3501 – Sensation and Perception (was PSYC254)

Ruhr-University Bochum, Medical Faculty, preclinical courses for medical students (1996-2007).

Lectures: Neurophysiology

Seminars: Physiology of the Nervous System

Practical courses: Physiology of Vision; Membrane Physiology