Curriculum Vitae – Prof. Dmitry E. Postnov

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Formal Qualifications

Habilitation, Doctor of Sciences, 2001, Saratov State University, Saratov, Russia
(highest academic degree in Russia)
Title: Mechanisms of Synchronization and Multistability of Non-periodic Oscillations in the Systems of Coupled Oscillators".

Ph.D. in Physics and Mathematics, 1990, Saratov State University, Saratov, Russia
Title: "Regular and Chaotic Processes in the Systems of Interacting Nonlinear Oscillators"

M.Sc, B.Sc. in Physics, Major - Radiophysics and Electronics, 1983, Saratov State University, Saratov, Russia

Positions held

Professor at the Department of Optics and Biophotonics, Saratov State University, Saratov, Russia, 2009 – present.

Head of Scientific Division #2, Saratov State University, Saratov, Russia, 06.2014 – 31.12.2020

Professor at the School of Physics, Unit of Radiophysics and Nonlinear Dynamics, Saratov State University, Saratov, Russia, 2001 – 2009.

Associate Professor, School of Physics, Unit of Radiophysics, Saratov State University, Saratov, Russia, 1998 - 2000

Invited Lecturer and Research Fellow, College of Natural Science, Chungbuk National University, Chungbuk, Korea, 1997 – 1998.

Senior Lecturer, School of Physics, Unit of Radiophysics, Saratov State University, Saratov, Russia, 1995 -1997.

Lecturer, School of Physics, Unit of Radiophysics, Saratov State University, Saratov, Russia, 1991—1995.

Postdoctoral Fellow, Research Institute of Mechanics and Physics, Saratov, Russia, 1990-1991.

PhD student, School of Physics, Saratov State University, Saratov State University, 1987-1990.

Engineer, School of Physics, Unit of Radiophysics, Saratov State University, 1983-1987.

Invited Visiting Positions

04.2013-- 04.2013 Wuhan National Laboratory for Optoelectronics, Wuhan, China.

06.2004 -- 12.2004 Denmark Technical University, Denmark.
Guest professorship granted by Otto Monsted Foundation. Title: "The study of coupled nonlinear oscillator and systems, particularly within the area of nephron-nephron communication".

06.2000 – 07.2000, South Korea, Chungbuk Natl.Univ., invited researcher

02.1999 – 05.1999 South Korea, Chungbuk Natl.Univ., invited researcher

07.1997 – 07.1998 South Korea, Chungbuk Natl.Univ., research fellow

10.1994 - 11.1994 USA, Univ. of California in Berkly, EECS, invited researcher

Grants

2019-2021: Russian Science Foundation:"Multimodal study of the transport mechanisms of substances and fluids in the brain parenchyma during "sleep-wake" cycle as a new approach in drag delivery" %#19-15-00201. Project Leader, (260K$)

2017-2019: Russian Ministry of Education and Science: "Quantification of physical mechanisms of blood flow autoregulation in microcirculatory networks using optical monitoring and computational modeling" #

3.1586.2017/4.6. Project Leader, (300K$)

2016-2018: Russian Science Foundation: “Development of technology for the monitoring of BBB state using multiscale analysis of transients in data obtained by optical visualization techniques”, #16-15-10252”, Project Leader, (200K$)

2016: RFBR grant # 16-32-50221 “Investigation of patterns of formation and evolution of activity patterns in the functional model of spreading cortical depression”,
Project Leader, (30K$)

2015: RFBR grant # 15-32-51178 “Patterns of collective calcium dynamics of astrocytes in neural-glial networks: a model study of the effects of heterogeneity of the intracellular environment and the topology of intercellular connections”,
Project Leader, (20K$)

2014-2016: Russian Ministry of Education and Science: "Functional Diagnostics of Microcirculation by means of Optical Imaging Techniques",
Project Leader, (378K$)

2010: German Academic Exchange Service (DAAD) “Noise induced and deterministic pattern formation in bistable-excitable media”, Humboldt University, Berlin, Germany (3K$)

2009 – 2010: Russian Foundation for Basic research "Spatial synchronization and irregular wave patterns in active media with dual interaction",
Project Leader (20K$)
2007: Ministry of Education, Russian Federation “Search for early indicators in development of renal hypertension” Associate Investigator (40K$)

2006: Ministry of Education, Russian Federation “Multi-level mathematical modeling of self-regulating living systems” Project Leader/Chief Investigator (20K$)

2004 – 2006: Russian Foundation for Basic Research "Role of subthreshold oscillations in stochastic dynamics of excitable systems", Project Leader/Chief Investigator (10K$)

2004: Fellowship from Otto Monsted Foundation, Denmark (15K$)

2002-2005: International Association for the Promotion of Cooperation with Scientists from the Independent States of the Former Soviet Union (INTAS) "Synchronization of biological oscillators: experiments, analysis and modeling" Associate Investigator (ca 15K$)

2000-2005: Research fellowship from the Research and Education Centre within the framework of Basic Research in Higher Education program of Civilian Research and Development Fund USA and Ministry of Education of Russian Federation.

2001-2003: Russian Foundation for Basic Research "Coherent dynamics of ensembles of excitable systems", Project Leader/Chief Investigator.

1999-2000: Russian Foundation for Basic Research " Cooperative Dynamics of Coupled Neuronal Oscillators” Associate Investigator.

1998-1999: Russian Foundation for Basic Research “Synchronization and Chaos Control in ensembles of coupled oscillators” Associate Investigator.

Travel Awards

2012: Panum Institute, University of Copenhagen, Denmark (ca 1200 euro); Institute of Physics, Humboldt University in Berlin, Germany, (ca 1100 euro)
2011: Panum Institute, University of Copenhagen, Denmark (ca 1300 euro); Institute of Physics, Humboldt

University in Berlin, Germany, (ca 2000 euro)
2009: Polish Academy of Sciences, Institute of Physical Chemistry, Poland (ca 400$); Max Plank Institute for Complex Systems, Germany (ca 500$)
2008: European Commission through EU 6th Network of Excellence, BioSim (BioSimulations in Drug Development) (ca 600$)
2007: Max Plank Institute for Complex Systems, Germany; European Commission through EU 6th Network of Excellence, BioSim (BioSimulations in Drug Development). (ca 500$); Max Plank Institute for Complex Systems, Germany; Humboldt University, Germany (ca 600$)
2006: Ukrainian Academy of Sciences (ca 250$); Max Plank Institute for Complex Systems, Germany (ca 600$); Asia Pacific Centre for Theoretical Physics (3000$); Chungbuk University, Korea (200$)
2005: European Commission through EU 6th Network of Excellence, BioSim (BioSimulations in Drug Development) (ca 550$)

TEACHING EXPERIENCE

Curriculum development

One of the key developers of the new specialization on "Physics of Living Systems" at the School of Physics, Saratov State University. This involved detailed development of the curriculum, syllabuses, and entire documentation for the new educational profile. The first enrollment to the "Physics of Living Systems" is September 2011 (1st semester of the year 2011-12).

Teaching experience from 1991 until now, including lectures, seminars, and practical courses.
Lectures (course title (number of hours p.a., students' year)):
Interdisciplinary Physics

1. Modern problems of biophysics (36 h., M.Sc.)
2. Neurodynamics (51 h., 3 y.)
3. Mathematical physiology (68 h., 4 y.)
4. Introduction to mathematical modeling of living systems (72 h., 1 year)
5. Electronics in Medicine (54 h., M.Sc.)
6. Physics Methods in Medicine (36 h., M.Sc.)
7. Analog and Digital Methods of Signal Analysis in Medicine (36 h., M.Sc.)

Ph.D. Students Supervision

Elena Litvinenko "Experimental and model studies of the contribution of the endothelium-mediated mechanism of vascular tone autoregulation to the dynamics of small microcirculatory networks" Ph.D. awarded in 2021.
Anastasia Neganova, "Modeling study of spatiotemporal vasoreactivity patterns". Ph.D. awarded in 2017.
Olga Pavlova, "Oscillating processes and their interaction in the dynamics of normotensive nephrons in hypertensive rats". Ph.D. awarded in 2009.
Pavel Scherbakov, "Deterministic and Noise-Induced oscillating regimes in the ensembles of coupled oscillators with energy-resource coupling". Ph.D. awarded in 2009.
Ludmila Ryazanova, "Mathematical Modeling of Neural-Glial Interactions". Ph.D. awarded in 2007.
Alexander Nekrasov, "Phase multi-stability in diffusively coupled nonlinear oscillators". Ph.D. awarded in 2007.
Alexander Shishkin, "Complex Oscillations in the Mathematical Models of Renal Auto-regulation and Blood Flow". Ph.D. awarded in 2006.
Dmitry Setsinsky, "Stochastic Dynamics of small ensembles of excitable systems". Ph.D. awarded in 2004.
Alexander Balanov, "Mechanisms of Bifurcations and Synchronization: Unstable Synchronization". Ph.D. awarded in 2000.
Alexander Nikitin, "Stochastic transport induced by a quasi-random telegraphic signal". Ph.D. awarded in 1999.

Selected Recent Publications:

Verveyko, D. V., Verisokin, A. Y., Postnov, D. E., & Brazhe, A. R. (2021). Modeling of astrocyte networks: towards realistic topology and dynamics. *Frontiers in cellular neuroscience*, *15*, 50.

Verveyko, D. V., Verisokin, A. Y., Postnov, D. E., & Brazhe, A. R. (2021). Connectivity promotes repeatable activation patterns in the model of astrocytic networks. *The European Physical Journal Plus*, *136*(7), 732.

Verisokin, A. Y., Verveyko, D. V., Kucherenko, V. V., Postnov, D. E., & Brazhe, A. R. (2021). Translating from Na+ to Ca2+: Na/Ca-exchanger exerts Na+-dependent control over astrocytic Ca 2+ oscillations. *The European Physical Journal Plus*, *136*(7), 1-16.

Postnov, D. E., Merkulova, K. O., & Postnova, S. (2021). Desynchrony and synchronisation underpinning sleep–wake cycles. *The European Physical Journal Plus*, *136*(5), 1-19.

Postnikov, E. B., Namykin, A. A., Semyachkina-Glushkovskaya, O. V., & Postnov, D. E. (2021). Diffusion assessment through image processing: beyond the point-source paradigm. *The European Physical Journal Plus*, *136*(5), 1-18.

Glushkovskaya, O., Postnov, D., Lavrova, A., Fedosov, I., Borisova, E., Nikolenko, V., ... & Tuchin, V. (2020). Biophotonic strategies of measurement and stimulation of the cranial and the extracranial lymphatic drainage function. *IEEE Journal of Selected Topics in Quantum Electronics*.

Semyachkina-Glushkovskaya, O., Postnov, D., Penzel, T., & Kurths, J. (2020). Sleep as a Novel Biomarker and a Promising Therapeutic Target for Cerebral Small Vessel Disease: A Review Focusing on Alzheimer's Disease and the Blood-Brain Barrier. *International Journal of Molecular Sciences*, *21*(17), 6293.

Postnikov, E. B., Tsoy, M. O., Timoshina, P. A., & Postnov, D. E. (2019). Gaussian sliding window for robust processing laser speckle contrast images. *International journal for numerical methods in biomedical engineering*, *35*(4), e3186.

Semyachkina-Glushkovskaya, O., Postnov, D., & Kurths, J. (2018). Blood–brain barrier, lymphatic clearance, and recovery: Ariadne's thread in labyrinths of hypotheses. *International journal of molecular sciences*, *19*(12), 3818.

Brazhe, A. R., Verisokin, A. Y., Verveyko, D. V., & Postnov, D. E. (2018). Sodium–calcium exchanger can account for regenerative Ca2+ entry in thin astrocyte processes. *Frontiers in cellular neuroscience*, *12*, 250.

Verisokin A. Y. et al. Noise-sustained patterns in a model of volume-coupled neural tissue //Chaos: An Interdisciplinary Journal of Nonlinear Science. – 2018. – v. 28. – (10) – pp. 106326. doi: 10.1063/1.5039854

Brazhe A. R., Postnov D. E., Sosnovtseva O. Astrocyte calcium signaling: Interplay between structural and dynamical patterns //Chaos: An Interdisciplinary Journal of Nonlinear Science. – 2018. – v. 28. (10) – pp. 106320. doi: 10.1063/1.5037153

A. Yu. Verisokin, D. V. Verveyko, and D. E. Postnov. Turing-like structures in a functional model of cortical spreading depression , Phys.Rev.E 96, 062409 (2017)

E.B. Postnikov, E.S. Stiukhina, D.E. Postnov. A fast memory-saving method for the Morlet wavelet-based transform and its application to in vivo assessment of microcirculation dynamics. Applied Mathematics and Computation. 2017. V. 305. P. 351-361.

Maximenko, V. A., Hramov, A. E., Koronovskii, A. A., Makarov, V. V., Postnov, D. E., & Balanov, A. G. (2017). Lyapunov analysis of the spatially discrete-continuous system dynamics. Chaos, Solitons & Fractals, 104, 228-

237.

Postnov DD, Marsh DJ, Postnov DE, Braunstein TH, Holstein-Rathlou N-H, Martens EA, et al. (2016) Modeling of Kidney Hemodynamics: Probability-Based Topology of an Arterial Network. PLoS Comput Biol 12(7): e1004922. doi:10.1371/ journal.pcbi.1004922

D.E. Postnov, A.Y. Neganova, O.V. Sosnovtseva, N.-H. Holstein-Rathlou, J.C. Brings Jacobsen, "Conducted Vasoreactivity: the Dynamical Point of View", Bull Math Biol (2015) 77:230–249

D. E. Postnov, A. Y. Neganova, D. D. Postnov, A. R. Brazhe "Monitoring of rhythms in laser speckle data", Journal of Innovative Optical Health Sciences Vol. 7, No. 6 (2014) 1450015

Donald J Marsh, Anthony S Wexler, Alexey Brazhe, Dmitry E Postnov, Olga V Sosnovtseva, Niels-Henrik Holstein-Rathlou "Multinephron dynamics on the renal vascular network", Am J Physiol Renal Physiol 304: F88–F102, (2013)

D.E. Postnov, D.D. Postnov, L. Schimansky-Geier "Self-terminating wave patterns and self-organized pacemakers in a phenomenological model of spreading depression", Brain Research, 2012. Vol.1434, p.200-211.

D.D. Postnov, D.E. Postnov, D.J. Marsh, N-H Holstein-Rathlou, O.V. Sosnovtseva "Dynamics of Nephron-Vascular Network", Bulletin of Mathematical Biology. 10/2012; doi:10.1007/s11538-012-9781-6

D.E. Postnov, J.C. Brings Jacobsen, N.-H. Holstein-Rathlou, O.V. Sosnovtseva "Functional Modeling of the Shift in Cellular Calcium Dynamics at the Onset of Synchronization in Smooth Muscle Cells", Bull Math. Biol. 2011, V.73(10), p.2507-2525.

2 Books:

Balanov A, Janson N, Postnov D, Sosnovtseva O (2009) Synchronization: From Simple to Complex, Springer, pp 425.

Mosekilde E, Maistrenko Y, Postnov D (2002) Chaotic Synchronization: application to living systems. Singapore.: World Scientific, pp 428.

Extended publication list is available under:
https://scholar.google.ru/citations?user=xm29kZsAAAAJ&hl=en