

Andrey Shilnikov

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 Neuroscience Institute, and Department of Mathematics and Statistics,
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I. Education

Royal Society Postdoctoral Fellow, DAMTP, Cambridge University, UK, 1994-1995.

Mentors: C. Sparrow and P. Glendenning.

Ph.D., Differential Equations incl. Mathematical Physics, University of Nizhny Novgorod, Russia, 1990. Thesis “Qualitative Analysis of Lorenz-like models.”

M.S., Mathematics & Physics, University of Nizhny Novgorod, Russia, 1984.

II. Professional Credentials

Mar 2012 – present	Professor, Neuroscience Institute, and Department of Mathematics, GSU
Jul 2008 – Mar 2012	Associate Professor, Neuroscience Institute, GSU
Aug 2006 – Mar 2012	Associate Professor, Department of Mathematics and Statistics, GSU
Sep 2007 – Dec 2007	Sabbatical leave at Juelich Research Center, Germany
Aug 2000 – Jul 2006	Assistant Professor, Department of Mathematics and Statistics, GSU
Dec 1999 – Jul 2000	Visiting Assistant Professor, Cornell University
Nov 1999 – Jul 1999	Assistant Research Scientist, UC Berkeley
Jan 1999 – Jun 1999	Visiting Assistant Professor, Georgia Institute of Technology
May 1996 – Dec 1998	Visiting Assistant Research Scientist, UC Berkeley
Jun 1994 – May 1995	Post-Doctoral Fellow, Cambridge University, UK
Oct 1993 – May 1994	Post-Doctoral Fellow, UC Berkeley
	Research Scientist I, Institute of Applied Mathematics, Nizhny Novgorod, Russia
Jun 1989 – May 1996	Senior Lecturer, Department of Mathematics, Academy of Transport Engineers, Nizhny Novgorod, Russia
Aug 1987 – May 1989	Research Associate, Department of Nonlinear Oscillations, University of Nizhny Novgorod, Russia
Aug 1984 – Jun 1981	

III. Scholarship and Professional Development

A. Publications

s of August 12, 2012 I have at least 747 citations to my peer-reviewed papers, (according to Google Scholar). Part II (2001) of Shilnikov L.P., Shilnikov A., Turaev D. and Chua, L., Methods of Qualitative Theory in Nonlinear Dynamics, including the two international editions: Russian (2004, 2009) and Chinese (2011), has generated more than 360 citations. The citations index of Part I (1998) is unavailable in Google Scholar due to copyright matters.

My current h-index is 17 [14 since 2007], while its extension: g-index is 27 (Harzing's “Publish or

Perish,” 2011), and i10-Index is 21 [15 since 2007], based on the research papers (and texts).

Journal Articles

(* indicates students directed)

- Wojcik J.*, Clewley R. and Shilnikov A.L. Polyrythms in models of multifunctional CPGs, to be submitted to J. Neuroscience, 2012
 - Xing T.*, Shilnikov L. and Shilnikov A. Torus bifurcations in a slow-fast systems, to be submitted to J Bifurcations and Chaos. 2012
45. Shilnikov A., Shilnikov L. and Barrio R. Kneadings, symbolic dynamics, and painting Lorenz chaos. Tutorial. J. Bifurcations and Chaos, Vol. 22, No. 4, 123016 (24 pages) 2012.
 44. Jalil S.*, Belykh I. and Shilnikov A. Multiple phase locked states in half-center oscillators, Physics Review E 85, 036214, 2012, doi:10.1103/PhysRevE.85.036214
 43. Shilnikov A. Complete dynamical analysis of an interneuron model. Invited referred review in special issue: Dynamics in Biology and Medicine. J. Nonlinear Dynamics., 68(3), 305-328, 2012. DOI 10.1007/s11071-011-0046-y
 42. Neiman A., Han A.*, Dierkes K.*, Lindner B. and Shilnikov A. Spontaneous voltage oscillations and response dynamics of a Hodgkin-Huxley type model of sensory hair cells, 1:11, J. Mathematical Neuroscience, 2011, doi:10.1186/2190-8567-1-11
 41. Malaschenko T.*, Shilnikov A and Cymbalyuk G. Bistability of bursting and silence regimes in a model of a leech heart interneuron, Physics Review E 84, 041910, 2011
 40. Barrio R., Blesa F.*, Serrano S.* and Shilnikov A. Global organization of spiral structures in parametric phase space of dissipative flows, Physics Review E 84, 035201, 2011, doi: 10.1103/PhysRevE.84.035201
 39. Malaschenko T.*, Shilnikov A. and Cymbalyuk G. Oscillatory and silent regimes of a low-dimensional model of a leech heart interneuron. PLoS ONE 6(7): e21782, 2011. doi:10.1371/journal.pone.0021782
 38. Barrio R., and Shilnikov A. Parameter-sweeping techniques for temporal dynamics of neuronal systems: Hindmarsh-Rose model, J. Mathematical Neuroscience 1:6, 2011. doi:10.1186/2190-8567-1-6
 37. Wojcik J.*, Clewley R., and Shilnikov A. Order parameter for bursting polyrythms in multifunctional central pattern generators. Physics Review E, E 83, 056209-6, 2011. DOI: 10.1103/PhysRevE.83.056209
 36. Wojcik J.* and Shilnikov A.L. Voltage interval mappings for dynamics transitions in elliptic bursters, Physica D 240, 1164-1180, 2011. <http://dx.doi.org/10.1016/j.physd.2011.04.003>
 35. Jalil S.*, Belykh I., and Shilnikov A. Fast reciprocal inhibition can synchronize bursting neurons, Physics Review E 81(4), 045201-4, Rapid Communications, 2010; Virtual Journal of Biological Physics Research: biological networks. 19(9), 2010

34. Belykh I., Jalil S.*, and Shilnikov A. Burst-duration mechanism of in-phase bursting in inhibitory networks. *Regular & Chaotic Dynamics*, 15(2-3), 148-160, 2010
33. Коломиец М.Л. и Шильников А.Л. Методы качественной теории для модели Хиндмарш-Роуз. *Нелинейная Динамика*, Т. 6, №2, с. 1–30, 2010
32. Channell P.*, Fuwape I., Neiman A., and Shilnikov A.L. Variability of bursting patterns in a neuronal model in the presence of noise, 2009, *J. Computational Neuroscience*, 27(3), 527-542, DOI 10.1007/s10827-009-0167-1
31. Shilnikov A. L. and Kolomiets M.L. Methods of the qualitative theory for the Hindmarsh-Rose model: a case study. Tutorial. *J. Bifurcations and Chaos*, vol. 18, August, 2008
30. Shilnikov A.L., Gordon R.* and Belykh I.V. Polyrhythmic synchronization in bursting network motifs, *J. Chaos*, 18(3), 037120, 2008. DOI: 10.1063/1.2959850. *Virtual Journal of Biological Physics Research: biological networks*. 16(7), 2008.
29. Belykh I.V. and Shilnikov, A.L. David vs. Goliath: when weak inhibition synchronizes strongly desynchronizing networks of bursting neurons, *Physics Review Letters*, 101, 078102, 2008
28. Shilnikov L.P. and Shilnikov A. Shilnikov Saddle-Node, *Scholarpedia*, 3(4):4789, 2008
27. Shilnikov L.P. and Shilnikov A., Shilnikov Bifurcation, *Scholarpedia*, 2(8):1891, 2007
26. Channell P.*, Cymbalyuk, G. and Shilnikov, A. L. Homoclinic chaos on a spike adding route into bursting in a neuronal model, *Physics Review Letters*, Letters, 98, 134101, 2007
25. Channell P.*, Cymbalyuk, G. and Shilnikov, A. L. Applications of the Poincare mapping technique to analysis of neuronal dynamics, *Neurocomputing*, 70 (10-12), 2007; doi:10.1016/j.neucom.2006.10.091
24. Shilnikov A.L. and Turaev D. Blue Sky Catastrophe, *Scholarpedia*, 2006, 2(8):1889
23. Shilnikov A. L. and Cymbalyuk, G. Transition between tonic-spiking and bursting in a neuron model via the blue-sky catastrophe, *Phys Review Letters*, 94, 048101 (2005) and *Virtual Journal of Biological Physics Research*, February issue, 2005
22. Cymbalyuk G. and Shilnikov, A. L. Co-existing tonic spiking modes in a leech neuron model, *Journal of Computational Neuroscience* 18 (3), 255-263, 2005
21. Shilnikov A.L., Shilnikov, L.P. and Turaev, D.V. Blue sky catastrophe in singularly perturbed systems, *AMS Moscow Mathematical Journal*, 5(1), 205-218, 2005
20. Shilnikov A. L., Calabrese R. and Cymbalyuk, G. How a neuron model can demonstrate coexistence of tonic spiking and bursting? *Neurocomputing*, 65-66, 869-875, 2005
19. Mira C. and Shilnikov, A.L. Slow and fast dynamics generated by non-invertible plane maps, *Bifurcations and Chaos* 15(11), 2005

18. Shilnikov A. L., Calabrese R. and Cymbalyuk G. Mechanism of bi-stability: tonic spiking and bursting in a neuron model, *Phys Review E* 71(1), 205, 2005
17. Shilnikov A. L. and Cymbalyuk, G. Homoclinic saddle-node orbit bifurcations en a route between tonic spiking and bursting in neuron models, *Regular & Chaotic Dynamics* 9 (3), 281-297, 2004
16. Shilnikov A. L., Shilnikov L.P. and Turaev D.V. Mathematical aspects of classical synchronization theory. Tutorial. *Bifurcations and Chaos* 14(7), 2143-2160, 2004
15. Shilnikov A.L. and Rulkov N.F. Subthreshold oscillations in a map-based neuron model, *Physics Letters A* 328, 177-184, 2004
15. Shilnikov A.L. and Rulkov N.F. Origin of chaos in a two-dimensional map modeling spiking-bursting neural activity, *Bifurcations and Chaos* 13(11), 2003
13. Gavrilov N. and Shilnikov A.L. Example of a blue sky catastrophe. *Amer. Math. Soc. Trans. Ser. 2*, 200, 2000
12. Pisarevskii V., Shilnikov A. and Turaev D. Asymptotic normal forms for equilibria with a triplet of zero characteristic exponents in systems with symmetry. *Regular and Chaotic Dynamics* 3 (1), 19-27, 1998
11. Shilnikov A. L. Homoclinic phenomena in laser models. *Computational tools of complex systems*, *J. Comput. Math. Appl.* 34(2-4), 245-251, 1997
10. Shilnikov A., Nicolis G. and Nicolis C. Bifurcation and predictability analysis of a low-order atmospheric circulation model. *Bifurcations and Chaos* 5(6), 1701-1711, 1995
9. Shilnikov A.L. On bifurcations of the Lorenz attractor in the Shimizu-Morioka model. Homoclinic chaos, *Physica D* 62 (1-4), 338-346, 1993
8. Bykov V. V. and Shilnikov A. L. On the boundaries of the domain of existence of the Lorenz attractor. *Selecta Mathematica Sovietica* 11 (4), 375-382, 1992
7. Shilnikov A. L. Codimension-2 homoclinic bifurcations in CO2 laser model, *SPIE SCNO*, 11,121-128, 1993
6. Shilnikov A. L. and Shilnikov L. P. On the nonsymmetrical Lorenz model. *Bifurcations and Chaos* 1(4), 773-776, 1991
5. Shilnikov A. L. Bifurcation and chaos in the Morioka-Shimizu system. *Selecta Mathematica Sovietica* 10(2), 105-117, 1991
4. Shilnikov A.L. and Shilnikov, L.P. Bifurcation analysis of the asymmetric Lorenz model, *Nonlinear World*, *Naukova Dumka*, 124-129, 1990
3. Shilnikov A. L. Bifurcations and chaos in the Morioka-Shimizu model, Part II. Methods in qualitative theory and bifurcation theory, 130-138, *Gorkov. Gos. Univ., Gorky*, 1989, in Russian

2. Bykov V. V. and Shilnikov, A. L. Boundaries of the domain of existence of a Lorenz attractor. *Methods in qualitative theory and bifurcation theory*, 151-159, Gorkov. Univ., Gorky, 1989, in Russian

1. Shilnikov A. L. Bifurcation and chaos in the Morioka-Shimizu system. *Methods of qualitative theory of differential equations*, 180-193, 216, Gorkov. Gos. Univ., Gorky 1986, in Russian

Books and Chapters

10. Shilnikov LP, Shilnikov AL and Turaev DV, Showcase of Blue Sky Catastrophes, "Nonlinear Dynamics: New Directions," Springer Series "Nonlinear Physical Science," 2012

9. Shilnikov A., Shilnikov L. and Barrio R, Symbolic dynamics and spiral structures due to the saddle-focus bifurcations, in "Chaos, CNN, Memristors and Beyond", 2012

8. Wojcik J. and Shilnikov A.L. Voltage interval mappings for an elliptic burster, in "Nonlinear Dynamics: New Directions," Springer Series "Nonlinear Physical Science," 2012

7. Chinese Editions of Shilnikov L.P., Shilnikov A., Turaev D. and Chua L., *Methods of Qualitative Theory in Nonlinear Dynamics. Part II*, 2011
俄罗斯数学教材选译非线性动力学定性理论方法(第二卷)

6. Chinese Editions of Shilnikov L.P., Shilnikov A., Turaev D. and Chua L., *Methods of Qualitative Theory in Nonlinear Dynamics. Part I*, 2011
俄罗斯数学教材选译非线性动力学定性理论方法(第二卷)

5. Шильников Л.П., Шильников А.Л., Тураев Д.В. и Чуа Л. Методы качественной теории в нелинейной динамике. *Russian Edition* of Shilnikov L.P., Shilnikov A., Turaev D. and Chua, L., *Methods of Qualitative Theory in Nonlinear Dynamics. Part II*. World Scientific Pub., 2009

4. Shilnikov A. L., Shilnikov L.P. and Turaev D.V. On some mathematical problems in classical synchronization, in 2004 *Nonlinear Oscillation and Waves*, Eds. Gaponov-Grekhov A.V. and Nekorkin V., IPFRAN, N.Novgorod, 426-450, 2005

3. Russian Edition of Shilnikov L.P., Shilnikov A.L., Turaev, DV. and Chua, Leon O. *Methods of qualitative theory in nonlinear dynamics. Volume I*. Шильников Л.П., Шильников А.Л., Тураев Д.В., Чуа Л. Методы качественной теории в нелинейной динамике. Часть 1, ISBN 5-93972-305-5 ИКИ, 2004

2. Shilnikov L. P., Shilnikov A. L., Turaev D. V. and Chua L.O. *Methods of qualitative theory in nonlinear dynamics. Part II*. World Scientific Series on Nonlinear Science. Series A: Monographs and Treatises, 5. World Scientific Publishing Co., Inc., River Edge, NJ, 2001

1. Shilnikov L.P., Shilnikov A. L., Turaev, D. V. and Chua L.O. *Methods of qualitative theory in nonlinear dynamics. Part I*. World Scientific Series on Nonlinear Science. Series A: Monographs and Treatises, 4. World Scientific Publishing Co., Inc., River Edge, NJ, 1998

Refereed conference proceedings

11. Hu X.*, J. Yorcker, Wojcik J.*, Clewley R. and Shilnikov A., Phase and exact models for multifunctional central pattern generators, Proc. 4th Dynamical Systems and Control Conference, Arlington, VA, Oct 31-Nov 2, 2011, accepted.
10. Shilnikov L.P. and Shilnikov A.L. Development of Synchronization Theory. 2nd IEEE International Conference on Circuits and Systems for Communications, 2, 2004
9. Cymbalyuk G., Calabrese R. and Shilnikov A. How a neuron model can demonstrate co-existence of tonic spiking and bursting? Proc. of the Annual Computational Neuroscience Meeting (CNS-2003), 2004
8. Rulkov N.F, Bazhenov M.V. and Shilnikov A.L. Modeling of spiking-bursting neural activity using map-based models, Proc. Topical Problems of Nonlinear Wave Physics, 2003
7. Cymbalyuk G., Calabrese R. and Shilnikov A. Yin and yang of leech heart central pattern generator: endogenously bursting neurons yoked together into a half-center oscillator. Proc. of the Annual Computational Neuroscience Meeting, 2003
6. Shilnikov A. L. and Rulkov N.F. Chaos in 2D slow-fast maps for spiking-bursting neural activity, IEEE Proc. Nonlinear Dynamics of Electronic Systems, 2003
5. Shilnikov A. L. and Cymbalyuk G. and Calabrese R. Multistability and infinite cycles in a model for the leech heart interneuron, Proc. NDES IEEE, 2003
4. Pisarevskii, A., Shilnikov, A.L., And Turaev, D.V. Asymptotic normal forms for equilibria with a triplet of zero characteristic exponents in systems with symmetry. Iteration theory (ECIT '96) (Urbino), Grazer Math. Ber., 339, Karl-Franzens-Univ., 291-300, 1999
3. Gavrilov N. and Shilnikov A.L., On a blue sky catastrophe model, Contemporary Problems in Theory of Dynamical Systems, Nizhny Novgorod, Russia, 37-40, 1996
2. Shilnikov A.L. and Shilnikov L.P, Dangerous and safe stability boundaries of equilibria and periodic orbits, IEEE NDES 95, University College Dublin, Ireland, 55-63, 1995
1. Shilnikov A.L., Codimension-2 homoclinic bifurcations and three-level laser models, IEEE NDES'95, University College Dublin, Ireland, 65-70, 1995

Preprints

2. Shilnikov A.L., Shilnikov L.P. and Turaev, D.V. Blue sky catastrophe in singularly perturbed systems, Preprint no. 841, WIAS, Berlin, 2003
1. Shilnikov A.L., Shilnikov L.P. and Turaev, D.V. On some mathematical topics in classic synchronization. WIAS Preprint No. 892, 2003

PhD Thesis

Shilnikov A.L. On qualitative and numerical analysis of models of the Lorenz type, 1989, Gorky University Publishing. 1989.

B. Presentations at Professional Meetings

(* indicates students directed)

- J. Wojcik*, R. Clewley, A. Shilnikov, Phase-lag return mappings for a 3 cell multifunctional central pattern generator. 2012 Computational Neuroscience meeting, Atlanta, GA, July 24-27, 2012.
- S. Jalil*, D. Allen*, and A. Shilnikov, Modeling study of a Central Pattern Generator in the Melibe seaslug. 2012 Computational Neuroscience meeting, Atlanta, GA, July 24-27, 2012.
- A. Shilnikov, A. Neiman, K. Dierkes* and B. Lindner. Voltage oscillations and response dynamics in a model of sensory hair cells. 2012 Computational Neuroscience meeting, Atlanta, GA, July 24-27, 2012.
- R. Barrio_, F. Blesa, S. Serrano and A. Shilnikov. Homoclinic spirals: theory and numerics. Dynamical Systems: 100 years after Poincaré, Gijón, September 2012
- R. Barrio and A. Shilnikov and S. Serrano*. Symbolic Dynamics for Painting Chaos: Homoclinic spirals. Dynamics, Topology and Computations, Bedkewo, Poland, June 24-30, 2012.
- J. Wojcik*, and A. Shilnikov, Principle bifurcations of bursting polyrhythms in small network. 7th Crimean School and Workshop. Mellas, Crimea, Ukraine. May 20-27, 2012.
- S. Jalil*, D. Allen*, and A. Shilnikov, Minimal configuration models for experiment-based central pattern generator of Melibe. 12th Experimental Chaos and Complexity Conference, University of Michigan, May 16-19, 2012.
- J. Wojcik*, and A. Shilnikov, Return phase-lag mapping approach uncover multi-rhythmicity in 3-cell CPGs with mixed synapses. 12th Experimental Chaos and Complexity Conference, University of Michigan, May 16-19, 2012.
- S. Jalil*, D. Allen*, and A. Shilnikov, Experimental phase relation captured by model central pattern generator. Section: Mathematical Biology and Neuroscience. Carolina Dynamical Systems Symposium, Clemson University, MC, April 13-15, 2012.
- T. Xing*, J. Wojcik* and A. Shilnikov, Kneading on the Lorenz systems and Shimizu-Morioka model. Carolina Dynamical Systems Symposium, Clemson University, MC, April 13-15, 2012.
- J. Wojcik*, R. Clewley, A. Shilnikov, Phase-lag return mappings for control of polyrhythms in bursting 3-cell networks. Section: Mathematical Biology and Neuroscience. Carolina Dynamical Systems Symposium, Clemson University, MC, April 13-15, 2012.
- G. Krishnan*, A. Shilnikov, M. Bazhenov, Dynamical mechanisms underlying generation of epileptic states. Society for Neuroscience conference, Washington DC, November 12-16, 2011
- A. Shilnikov, J. Wojcik*, X. Hu* and R. Clewley, Models of multifunctional Central Pattern Generators: bursting polyrhythmic motifs. 2011 ASME Dynamic Systems and Control Conference. Arlington, VA, Oct 31 – Nov 2, 2011. **Invited.**
- A. Shilnikov, X. Hu* and J. Wojcik*, Reduced models of CPGs. Workshop on Nonlinear Physics and Applications. Joao Pessoa, Brazil. September 5-9, 2011. **Invited.**
- R. Barrio and A. Shilnikov, Techniques for temporal dynamics of neuronal systems: the Hindmarsh-Rose model, XXII Congreso de Ecuaciones Diferenciales y Aplicaciones, Palma de Mallorca, September 5-9, 2011.
- A. Shilnikov and R. Barrio, Painting chaos and global bifurcations: universality of the Lorenz attractor. The sixth international conference on Differential and Functional Differential Equations: Spatio-temporal workshop. Moscow, Russia, August 14-21, 2011. Contributed.
- A. Shilnikov, **Invited** Lecturer at Workshop: Advanced Course on New Trends in Applied Bifurcation Analysis, Castro-Urdiales, Spain, July 25-29, 2011.
- A. Shilnikov, Scientific Committee member: Advanced Course on New Trends in Applied Bifurcation Analysis, Castro-Urdiales, Spain, July 25-29, 2011
- R. Barrio and A. Shilnikov, Parameter-sweeping techniques for studying complex systems: numerical and rigorous results, Conference on Computational Methods in Dynamics The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy. 4-8 July 2011
- GP Krishnan*, A Shilnikov, M Bazhenov, Dynamical mechanisms underlying generation of epileptic states, 18th Joint Symposium on Neural Computation, Institute for Neural Computation, UCSD, La Jolla,

CA, June 4, 2011.

- A. Shilnikov and R. Barrio, Painting chaos: universality of parameter patterns of systems with the Lorenz attractor, 4th Chaotic Modeling and Simulation International Conference (CHAOS2011), Agios Nikolaos, Crete, Greece, May 31-June 3, 2011. Contributed.
- A. Shilnikov, **co-organizer** of Multistability and rhythmogenesis: basic motifs and network dynamics. SIAM Applied Dynamical Systems, Snowbird, UT. May 21-26, 2011.
- A. Shilnikov, J. Wojcik*, M. Brooks*, and R. Clewley, Duty cycle as order parameter for polyrhythms in multifunctional center pattern generator motifs. SIAM Applied Dynamical Systems, Snowbird, UT. May 21-26, 2011. Contributed.
- S. Jalil*, I. Belykh, and A. Shilnikov, Multiple Phase Locked States in Half-Center Oscillators. SIAM Applied Dynamical Systems, Snowbird, UT. May 21-26, 2011. Contributed.
- J. Wojcik*, R. Clewley and A. Shilnikov, An Equationless Approach to Studying the Organizing Principles of a Multifunctional Central Pattern Generator. SIAM Applied Dynamical Systems, Snowbird, UT. May 21-26, 2011. Contributed.
- A. Neiman, A. Shilnikov, Complex Spontaneous Oscillations and Response Properties of Sensory Hair Cells, SIAM Conference on Applications of Dynamical Systems, May 22-26, 2011, Snowbird, Utah, USA, p89.
- R. Barrio and A. Shilnikov, Painting chaos: computational methods for exploration of complex behaviors. SIAM Applied Dynamical Systems, Snowbird, UT. May 21-26, 2011. Contributed.
- A. Shilnikov, **Co-organizer** of Symbolic and computational algorithms for chaos explorations. SIAM Applied Dynamical Systems, Snowbird, UT. May 21-26, 2011.
- V. Bondarenko and A. Shilnikov, Spiking and bursting in an autonomous model of mouse ventricular myocytes. SIAM Applied Dynamical Systems, Snowbird, UT. May 21-26, 2011. Contributed.
- R. Clewley, J. Wojcik* and A. Shilnikov, Order parameter for multifunctional central pattern generators. Mathematical Biosciences Institute, Columbus, OH. "CTW: New Developments in Dynamical Systems Arising from the Biosciences" (March 22-26, 2011). Poster.
- A. Shilnikov, J. Wojcik*, and R. Clewley, Bursting duty cycle as an order parameter in a multifunctional central pattern generator. COSYNE 2011, Salk Lake City, UT. Feb 24-27, 2011. Poster.
- A. Neiman, L. Han, A*. Shilnikov, Interactions of Mechanical and Electrical Oscillations in Bullfrog Sacculus Hair Cells, Abstracts of the 34-th annual winter research meeting of the Association for Research in Otolaryngology, February 19-23, 2011, Baltimore, MD, USA, p.116 v34 (2011)
- J. Wojcik* and A.L. Shilnikov, Poincare mapping for voltage intervals in elliptic bursters. Dynamic Days 2010, Duke University, SC, Jan 5-9, 2011. Poster
- A. Neiman, L. Han*, A. Shilnikov, Interactions of mechanical and electrical oscillations in hair cells, The Dynamics of Nonlinear Stochastic Systems International Focus Workshop – October 6 - 7, 2010, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany

- A.L. Shilnikov and J.Wojcik*, Polyrhythms in dynamical models of multi-functional central pattern generator networks, Workshop on Bifurcation Analysis and its Applications, Montreal, Canada, July 7-10, 2010 July 6-10, 2010. **Invited.**
- A.L. Shilnikov and J.Wojcik*, Polyrhythms of Synchronous Bursting in Models of Multifunctional Central Pattern Generators, the Seventh Annual Conference on Frontiers in Applied and Computational Mathematics (FACM '10), New Jersey Institute of Technology (NJIT), Newark, New Jersey, May 21-23, 2010. **Invited.**
- S., Jalil*, I. Belykh and A.L. Shilnikov, Synchronization in a Bursting Half-center Oscillator with Slow-to-fast Reciprocal Inhibition, the Seventh Annual Conference on Frontiers in Applied and Computational Mathematics (FACM '10), New Jersey Institute of Technology (NJIT), Newark, New Jersey, May 21-23, 2010. Contributed.
- J. Wojcik* and A.L. Shilnikov, Poincare mapping for voltage intervals in elliptic bursters, the Seventh Annual Conference on Frontiers in Applied and Computational Mathematics (FACM), New Jersey Institute of Technology (NJIT), Newark, New Jersey, May 21-23, 2010. Poster.
- A.L. Shilnikov and J.Wojcik*, Dynamical Models of Multifunctional Central Pattern Generators, Nonlinear Dynamics: New Directions, Guanajuato, Mexico May 11-14, 2010. **Invited.**
- A.L. Shilnikov and J.Wojcik*, Polyrhythms of bursting patterns in deterministic models for central pattern generators, Dynamics of Bursting Activity of Neurons, GSU, Atlanta, April 16-17, 2010. Contributed. **Co-organizer.**
- S., Jalil*, I. Belykh and A.L. Shilnikov, Synchronization in a Bursting Half-center Oscillator with Slow-to-fast Reciprocal Inhibition, Dynamics of Bursting Activity of Neurons, GSU, Atlanta, April 16-17, 2010. Poster.
- A.L. Shilnikov and J.Wojcik*, Poincare mapping for voltage intervals in elliptic bursters, B&B Retreat, GSU, Atlanta, April 30, 2010. Poster.
- S., Jalil*, I. Belykh and A.L. Shilnikov, Synchronization in a Bursting Half-center Oscillator with Slow-to-fast Reciprocal Inhibition, B&B Retreat, GSU, Atlanta, April 30, 2010. Poster.
- A.L. Shilnikov and J.Wojcik*, Poincare mapping for voltage intervals in elliptic bursters, Dynamics of Bursting Activity of Neurons, GSU, Atlanta, April 16-17, 2010. Poster.
- S., Jalil*, I. Belykh and A.L. Shilnikov, Synchronization in a Bursting Half-center Oscillator with Slow-to-fast Reciprocal Inhibition, Joint South East Nerve Net and Georgia/South Carolina Neuroscience Consortium Conference 2010, Emory University, Atlanta, March 5-7. Poster.
- A.L. Shilnikov and J.Wojcik*, Poincare mapping for voltage intervals in elliptic bursters, Joint South East Nerve Net and Georgia/South Carolina Neuroscience Consortium Conference 2010, Emory University, Atlanta, March 5-7. Poster.
- V. Bondarenko and A.L. Shilnikov Busting and tonic spiking in a comprehensive models of a myocytes. Dynamics of Bursting Activity of Neurons, GSU, Atlanta, April 16-17, 2010.
- A.L. Shilnikov, R. Gordon*, I. Belykh. Polyrhythms in Central Pattern Generator motifs, Workshop at the 18th annual Computational Neuroscience Science meeting 2009, Berlin, Germany, July 21-26, 2009. Workshop key-note speaker.
- I. Belykh, S.Jalil*, A. Shilnikov, Synchronization in inhibitory networks of bursting neurons. ICCSA 2009, The 3rd International Conference on Complex Systems and Applications, University of Le Havre Le Havre, Normandy, France Jun 29 - Jul 02, 2009. Contributed.
- S., Jalil*, I. Belykh and A.L. Shilnikov, Fast Reciprocal Inhibition Can Synchronize Bursting Neurons 2009 SIAM Conference on Application of Dynamical Systems, Snowbird, Utah, May 17-21 2009. **Co-organizer.**
- A.L. Shilnikov, R. Gordon*, I. Belykh. Polyrhythmic synchronization in bursting network motifs. Mathematical Neuroscience 2009, Edinburgh, UK March 23-25, 2009. **Invited speaker.**
- A.L. Shilnikov, R. Gordon, I. Belykh. Polyrhythmic bursting patterns in models of central pattern generators. Dynamics and Statistics of Spatially Extended Systems, BIRS, Canada, January 18-23, 2009. **Invited speaker.**
- A.L. Shilnikov, R. Gordon* and I. Belykh, Polyrhythmic synchronization in bursting network motifs.

Minisymposium “Polyrhythms of central pattern generators.” 2009 SIAM Conference on Application of Dynamical Systems, Snowbird, Utah, May 17-21 2009.

- A.L. Shilnikov, and R. Barrio. “Lorenz equation revisited.” Minisymposium. 2009 SIAM Conference on Application of Dynamical Systems, Snowbird, Utah, May 17-21 2009. **Co-organizer.**
- A.L. Shilnikov, I. Rybak. Minisymposium “Polyrhythms of central pattern generators.” 2009 SIAM Conference on Application of Dynamical Systems, Snowbird, Utah, May 17-21 2009. **Co-organizer.**
- I. Belykh, R. Gordon* and A. Shilnikov, Polyrhythmic synchronization in inhibitory-excitatory bursting motifs. Atlanta Computational Neuroscience Workshop, GSU, April 7-8, 2008.
- A. Shilnikov, I. Belykh. R. Clewley and G. Cymbalyuk. Atlanta Computational Neuroscience Workshop, GSU, April 7-8, 2008. **Organizer.**
- I. Belykh and A.L. Shilnikov. Bursting rhythmogenesis and synchronization in inhibitory CPG networks. Synergetics: Self-Organization Principles in Animate and Inanimate Systems, Physikzentrum Bad Honnef, Germany, October 22-24, 2007.
- I. Belykh and A.L. Shilnikov. Bursting rhythmogenesis and synchronization in inhibitory CPG networks. Coherent Behavior in Neuronal Networks, Mallorca, Spain, October 17-20, 2007.
- P. Channell*, G. Cymbalyuk and A. Shilnikov Homoclinic Chaos on a Spike Adding Route into Bursting Neurons. SIAM Conference on Applications of Dynamical Systems, Salk Lake City, Utah, May 28-June 2, 2007. **Co-organizer** of a mini-symposium “Exotic bifurcation in neuronal models.”
- P. Channell*, G. Cymbalyuk and A. Shilnikov, Complex homoclinic bifurcations of periodic orbits for onset on bursting in a neuron model. Dynamics Days 2007, Boston, January 3-6, 2007.
- P. Channell*, G. Cymbalyuk and A. Shilnikov, Mapping reduction of voltage dynamics in a Hodgkin-Huxley type model. Neuroscience Meeting, Atlanta, October 14-18, 2006.
- P. Channell*, G. Cymbalyuk and A. Shilnikov, Applications of the Poincare mapping technique to analysis of spike adding. CNS-2006, Edinburgh, UK, July 16-20, 2006,
- G. Cymbalyuk, R. Calabrese, A. Olypher, and A. Shilnikov, Regulation of bursting activity of simple units of CPGs. CNS-2006, Edinburgh, UK, July 16-20, 2006,
- A. Shilnikov, P. Channell* and G. Cymbalyuk, Methods of qualitative theory for bursting rhythmogenesis. 6th Crimean School and Workshops Nonlinear Dynamics, Chaos, and Applications Workshop 1: Stochastic and Chaotic Dynamics in Action: from Laser to Brain, from Communication to Medicine, May 15-19, 2006. **Invited**
- R. Calabrese (Emory), G. Cymbalyuk and A. Shilnikov (GSU) Origin and Regulation of Bursting Activity in Neurons Atlanta, GA, April 6-7, 2006. Scientific Committee: I. Belykh, D. Edwards, P. Katz (GSU) **Co-organizer**
- A. Shilnikov, P. Channell* and G. Cymbalyuk, Homoclinic chaos on a spike adding route into bursting in a neuronal model, Origin and Regulation of Bursting Activity in Neurons, Atlanta, April 6-7, 2006.
- K. Mokhov*, A. Shilnikov, G. Cymbalyuk. A model of long period bursting activity. Presented as a poster at “Origin and Regulation of Bursting Activity in Neurons”, Atlanta, April 6-7, 2006.
- G. Cymbalyuk, J. Bates*, T. Malashchenko* and A. Shilnikov (2006) Bifurcations and regulation of bursting activity. “Origin and Regulation of Bursting Activity in Neurons”, Atlanta, April 6-7, 2006.
- SENN, Biophysical Mechanisms Controlling Bursting Activity in a Neuron Model, with G. Cymbalyuk, P. Channell*, J. Bates*, T. Malashchenko*, GSU, Atlanta, April 29-30, 2006
- SENN, Applications of the Poincare mapping technique to analysis of neuronal dynamics, with P. Channell*, G. Cymbalyuk, GSU, Atlanta, April 29-30, 2006
- SENN, A model of long period bursting activity. with K. Mokhov* and G. Cymbalyuk, GSU, Atlanta, April 29-30, 2006
- Annual AMS meeting, Applications of the Poincar'e mapping technique to analysis of neuronal dynamics, with A. Shilnikov, P. Channell* and G. Cymbalyuk, San Antonio TX, January 12-15, 2006
- Neuroscience Meeting, Bifurcations giving rise to Bursting Activity in a Neuron Mode, with Channell P., Malashchenko T. and Cymbalyuk G., Washington, DC, November 12-16, 2005
- Neuroscience Meeting, Regulation of Calcium Driven Bursting Activity in a Neuron Model, with Mokhov K., and Cymbalyuk G., Washington, DC, November 12-16, 2005

- 2005 Fall Central Section Meeting: Special Session in Mathematical Ecology Multistability and map reduction in a neural model, **Invited** talk, Lincoln NE, October 21-23, 2005
- Conference on control and synchronization of dynamical systems, Homoclinic saddle-node cycles in a Hodgkin-Huxley type model of neurons, **Invited** talk, León, México, October 4-7, 2005
- SIAM Conference on Applications of Dynamical Systems, Complex Dynamics of Two Time Scale Neuron Models, with Cymbalyuk G, Salk Lake City, Utah, May 22-26, 2005. A **co-organizer** of a mini-symposium Complex dynamics of systems with multiple time scales
- GSU biotech symposium, Implementation of neuronal models, dynamic clamp, and tools for the hybrid system analysis using FPGA technology, with Bourgeois A. and Cymbalyuk G. Atlanta, June 5, 2005.
- Calcium Club Meeting, Regulation of Calcium Driven Bursting Activity, with Mokhov, K.* and Cymbalyuk G., Atlanta, May 1-2, 2005
- Dynamical Systems in Neuroscience, Canard torus bifurcation in a two time scale neuron model, **Invited**, with Cymbalyuk G,AMS, Santa Barbara, April 16-17, 2005
- Henri Poincare symposium, Poincaré Homoclinic Orbits: The State of the Art, **Invited**. With L. Shilnikov, Brussels, October 8-9, 2004
- Society for Neuroscience 34th Annual Meeting, Genesis and Regulation of bursting activity in a neuron model, with G. Cymbalyuk. San Diego, CA, October 23-27, 2004
- 2nd IEEE International Conference on Circuits and Systems for Communications, Development of Synchronization Theory, **Invited**, with Shilnikov L., Moscow, Russia. June 30-July 2, 2004
- Coupled Map Lattices, Subthreshold oscillations in map based neural models, Paris, June 21-July 2, 2004
- Computational Neuroscience Meeting, Transition between tonic spiking and bursting in a neuron model, with R. Calabrese, and G. Cymbalyuk, Baltimore July, 18-20, 2004
- CNS'04 workshop “Reduced Models of Neuronal Excitability and Dynamics of Spike-Generation”, Two Routes to Bursting in Neuron models, Invited, with G. Cymbalyuk, Baltimore July, 18-20, 2004
- 2004 SIAM Conference on the Life Science, Mechanism of Bistability: Simultaneous Tonic Spiking and Bursting in a Neuron Model, with G. Cymbalyuk. Portland, Oregon, July 11-14, 2004. A **co-organizer** of a mini-symposium The Geometry of Spiking and Bursting.
- SECABC Symposium, Neurobehavioral section, Co-existence of tonic-spiking and bursting modes in a leech neuron model, with G. Cymbalyuk. Atlanta, May 19-21, 2004
- 20th Annual South East Nerve Net, Regulation of bursting activity in a neuronal model, with Cymbalyuk G, Atlanta, GA, March 26-27, 2004
- Symmetry and Bifurcation in Biology, Multistability and Infinite Cycles in a Model of the Leech. Invited. Banff International Research Station, Canada, May 31- June 05, 2003
- SIAM Conference on Applications of Dynamical Systems, Canards and Chaos in Some Slow-fast Maps, Snowbird, Utah, May 27-31, 2003. A **co-organizer** of a mini-symposium Bursting in Mappings,
- 11th IEEE Workshop on Nonlinear Dynamics of Electronic Systems, Multistability and infinite cycles in a model of the leech heart interneuron, with Cymbalyuk G, Scuol, Switzerland, May 18-21, 2003
- 11th IEEE Workshop on Nonlinear Dynamics of Electronic Systems, Chaos in 2D slow-fast maps for spiking-bursting neural activity, with Rulkov N., Scuol, Switzerland, May 18-21, 2003
- NATO Advanced Study Institute: Synchronization: Theory and Application, 1D singularly perturbed maps for neural dynamics, Crimea, Ukraine May 19-June 1, 2002.
- School on Dynamical Systems, Infinite cycles in two times scale systems, ICTP, Trieste, Italy, July 30-August 17, 2001
- Int. Conference: Progress in Nonlinear Science. Dedicated to the 100-th anniversary of A.

Andronov, Asymptotic Normal Forms and Strange Attractors, Nizhny Novgorod, Russia, July 2-6, 2001

- MRI meeting: Analysis and Continuation of Bifurcations, Complex dynamics of systems in backward time, Invited. Utrecht University, the Netherlands, June 21-22, 2001. **Invited**
- SIAM Conference on Applications of Dynamical Systems, Blue sky catastrophe in two time-scale systems, Snowbird, Utah, May 25-29, 2001, a **co-organizer**
- Bifurcations: Numerical Methods, Software, Applications, On a blue sky bifurcation, **Invited**. Gent, Belgium, June 29-30, 2000
- Dynamical Systems and Applications, Strange attractors in normal forms, Atlanta, May 26-29, 1999
- Numerical Methods for Bifurcation Problems, Qualitatively numerical analysis of some concrete models with non-trivial dynamics, IMA, Minnesota, September 15-19, 1997. **Invited**
- IEEE Nonlinear Dynamics Electronic Systems, Homoclinic cod-2 bifurcations in laser modes, Moscow, Russia, July 1-3, 1996
- Contemporary Problems in Dynamical Systems Theory, On a model with the blue sky catastrophe, Nizhny Novgorod, Russia, June 2-4, 1996. **Co-organizer**.
- Solvey Meeting. On dynamics in a low order atmospheric model, Brussels, Belgium, March 16-21, 1996. **Invited**
- Iteration Theory, Asymptotic normal forms with triple zero, Urbino, Italy, September 1-4, 1996. **Invited**.
- Contemporary Problems in Theory of Dynamical Systems, Bifurcations of Lorenz attractors in cod-3 normal forms with symmetries, Moscow, June 23-26, 1996
- Noninvertible Dynamical Systems Workshop, Maps near codimension two homoclinic bifurcations, Minneapolis, MN, March 17-20, 1995. **Invited**.
- IEEE Nonlinear Dynamics Electronic Systems, On safe and dangerous stability boundaries, Dublin, Ireland, August 15-17, 1995. **Invited**.
- Singular Vector Fields, On boundaries of the existence region of the Lorenz attractor. Invited. Trieste, Italy, September 2-12, 1995
- Homoclinic Bifurcations, Codimension-2 homoclinic bifurcations and strange attractors, in Lorenz-like systems, Amsterdam, Netherlands, June 8-11, 1994. **Invited**
- Dynamics of Vector Fields, Normal forms and Lorenz attractors, Kyoto, Japan, June 1-6, 1994. **Invited**.
- Dynamical Systems and Chaos, Dynamics of Lorenz attractors in asymptotic normal forms, Tokyo, Japan, May 26-30, 1994
- Differential Equations, Topological normal forms of codimension three with nontrivial dynamics, Katseveli, Ukraine, May 12-21, 1994. **Invited**.
- Solvey Meeting, One dimensional maps and non-oriented Lorenz attractors, Invited. Brussels, Belgium, January 5-9, 1994
- Volga-laser-tour: On normal form reduction in laser models, Russia, Moscow-Nizhny Novgorod, Russia, June 10-18, 1993
- NATO Complexity in Optical Systems, Lorenz attractors in laser models, Edinburgh, Scotland, August 25-30, 1992
- NATO Homoclinic Chaos, Qualitative and numeric studies of Lorenz attractors in Shilmizu-Morioka system. Brussels, Belgium, May 6-10, 1991. **Invited**.
- Synchronization in coupled systems, Lorenz attractor through homoclinic bifurcations, Saratov, Russia, September 2-10, 1990

- Numerical Methods in Bifurcation Theory, Bifurcations in asymmetric Lorenz model, Puschino, Russia, February 2-6, 1989
- Numerical Methods in Bifurcation Theory, Boundaries of symmetric Lorenz attractor, Puschino, Russia, February 2-6, 1989
- Nonlinear Oscillations and Waves, On nonorientable Lorenz attractor, Gorky, Russia, March 8-18, 1987.
- Qualitative Theory of Differential Equations, Bifurcations of a Lorenz-like attractor, Riga, Lithuania, May 15-19, 1986.
- Numerical Methods in Bifurcation Theory: On orbit flip homoclinic figure-8 bifurcation, Puschino, Russia, February 2-6, 1985.
- Nonlinear Oscillations and Waves, On Shimizu-Morioka systems, Gorky, Russia, March 7-16, 1985
- Numerical Methods in Bifurcation Theory: On resonant homoclinic figure-8, Puschino, Russia, February 2-6, 1984
- Nonlinear Oscillations and Waves, Poincare revolving number in coupled Josephson junctions, Gorky, Russia, March 7-17, 1983

C. Colloquia and Seminar Presentations

- Dynamics and bifurcations in bursting neuronal networks: central pattern generators. LP Shilnikov Seminar: Institute for Applied Mathematics Cybernetics, Nizhny Novgorod. March 22, 2012.
- A. Kelley*, J. Youker*, and A. Shilnikov. Reduced phase models for 3-cell CPG. Spineless Neuroscience Forum, Georgia State University, February 2012.
- J. Wojcik*, R. Clewley, and A. Shilnikov, Bifurcations in 3-cell motifs. Spineless Neuroscience Forum, Georgia State University, February 2012.
- S. Jalil*, D. Allen*, and A. Shilnikov, A model for a central pattern generator in the melibe seaslug., Georgia State University Undergraduate Conference, March 26, 2012.
- A. Kelley*, J. Youker*, and A. Shilnikov. Reduced phase models for 3-cell CPG. Georgia State University Undergraduate Conference, March 26, 2012.
- S. Jalil*, D. Allen*, and A. Shilnikov, A four neuron CPG model for swimming behavior in Melibe. Spineless Neuroscience Forum, Georgia State University, February 2012.
- S. Jalil*, I. Belykh, and A. Shilnikov, Stability analysis of phase-locked bursting in inhibitory neuron networks. Brains and Behavior Annual Spring Retreat, Georgia State University, April 2012.
- S. Jalil*, D. Allen*, and A. Shilnikov, Experimental phase relation captured by model central pattern generator. Brains and Behavior Annual Spring Retreat, Georgia State University, April 2012.
- S. Jalil*, D. Allen*, and A. Shilnikov, Experimental phase relation captured by model central pattern generator. Workshop on Biostatistics and Bioinformatics, Department of Mathematics and Statistics, Georgia State University, May 2012.
- S. Jalil*, I. Belykh, and A. Shilnikov, Multiple phase locked states in half-center oscillators. Frances Skinner's Neural Computational Lab, Toronto Western Hospital, July 2011.
- (co-author) Spontaneous voltage and mechanical oscillations in a model of sensory hair cell, University of Oldenburg, ICBM, December 2, 2010, Oldenburg, Germany.
- (co-author) Complex spontaneous oscillations and response properties of sensory hair cells, University of Houston, Networks Cluster Seminar, April 29, 2011
- (co-author) Stochastic oscillations enhance sensitivity of sensory hair cells, Colloquium: University of Missouri at St. Louis, Department of Physics, March 11, 2011, St. Louis, MO, USA
- Multiple phase locked states in bursting outcomes of CPGs. Boston University. November 5, 2010.

- Bifurcation theory in life sciences. Augusta State University. October 29, 2010.
- Overview on qualitative methods for neurodynamics. Spineless colloquium talk, Atlanta. October 8, 2010.
- Polyrhythms of bursting activity in CPG motifs. NI colloquium talk, GSU. October 5, 2010.
- Multistability in CPG motifs. Neuroscience Department colloquium talk, UC Riverside, September 15, 2010.
- Poincaré mapping technique for bursting models of neurons. Potsdam University, Berlin, July 22, 2009. Joint with J. Wojcik*.
- Multistability in Multistability in models of center pattern generators. Weierstrass Institute for Applied Analysis and Stochastics. Berlin, Germany, July 21, 2009. Joint with I. Belykh
- A case study: from a model to the single leech interneuron to a network, University of Saragossa, Spain, July 10, 2009
- Mathematical models and bifurcations for individual neurons. University of Saragossa, Spain, June, 17, 2009.
- Multistability in neurons and networks. Imperial College, London, UK, March 19, 2009. Joint with I. Belykh
- Polyrhythms in networking motifs. Spineless Seminar, GSU, March 13, 2009. Joint with I. Belykh and R. Gordon*.
- Multistability in bursting inhibitory networks motifs. UC San Diego, Department of Neuroscience, Kristan's Lab. August 9, 2009. Joint with I. Belykh
- University of New York, Polyrhythmic synchronization in inhibitory-excitatory motifs composed of bursting neuron models, New York, April 4, 2008.
- Applied Dynamical Systems and Mathematical Neuroscience Seminar, GSU, Methods of the qualitative theory for the Hindmarsh-Rose model. February 28, 2008.
- University Libre de Bruxelles, Neuronal motifs: Bursting rhythmogenesis, synchronization and its regulation, Brussels, Belgium. November 20, 2007. Invited
- Utrecht University, Complex bifurcations in slow-fast systems of neuronal types, Utrecht, the Netherlands, November 19, 2007. Invited
- The Institute of Medicine, Julich Research Center, Synchronization of inhibitory networks. Juelich, Germany. November 15, 2007
- Joint colloquium of Weierstrasse Institute and Free University of Berlin. Complex homoclinic bifurcations in slow-fast systems for neurons dynamics. Berlin, Germany. October 30, 2007. Invited
- Department of Theory of Oscillations, University of Nizhny Novgorod, Origin of Bursting, its Regulation in Neuronal models/networks of Hodgkin-Huxley formalism. Nizhny Novgorod, Russia, September 19, 2007.
- Quantitative Biology Institute and Biophysics Seminar Series. Routes to bursting in neuronal models. University of Athens, Athens, OH, May 16, 2007. Invited
- School of Mathematics CDSNS Colloquium, Gatech, Complex homoclinic bifurcations of periodic orbits for onset on bursting in a neuron model, Atlanta, GA, February 12, 2007. Invited
- Colloquium of Department of Mathematical Sciences at Indiana University-Purdue University Indianapolis, Homoclinic chaos on routes into bursting in slow-fast models of neurons, Indianapolis, IA, January 20, 2007. Invited
- The Institute of Medicine, Julich Research Center, Spike adding cascade toward bursting in neuronal models, Julich, Germany, December 15, 2006
- Nizhny Novgorod Mathematical Society, Methods of qualitative theory for bursting rhythmogenesis, Nizhny Novgorod, Russia, July 4, 2006
- Ben-Gurion University, Homoclinic saddle-node periodic orbits in singularly perturbed systems of Hodgkin-Huxley type, Israel, March 10, 2005
- Weizmann Institute, Saddle-node periodic orbits in singularly perturbed systems of Hodgkin-Huxley type, Israel, March 9, 2005
- The Salk Institute, Bifurcation transitions between tonic-spiking and bursting regimes in neuron

models, San Diego, CA, July 28, 2004

- UC San Diego, Bifurcations of saddle-node periodic orbits in slow-fast systems and ghosting effect, August 6, 2003
- GaTech, Bifurcations of saddle-node periodic orbits in slow-fast systems and ghosting effect, September 18, 2003
- Weierstrass Institute for Applied Analysis and Stochastics, Chaotic dynamics in singularly perturbed, noninvertible maps. Berlin, Germany, June 15, 2002
- Boston University, Blue sky bifurcations in singularly perturbed systems, November 26, 2001
- UC San Diego, Strange attractors from homoclinic bifurcations, August 1, 2001
- Cornell University, Blue-sky catastrophe bifurcation, Ithaca, NY, March 27, 2000
- Weierstrass Institute for Applied Analysis and Stochastics, Chaotic repeller in low order atmospheric model, Berlin, Germany, July 2000
- GaTech, On homoclinic codimension two bifurcations and chaotic dynamics, Atlanta, GA March 1999
- Seminar talk, Institute Nonlinear Science at UC San Diego, San Diego, CA, August 1998
- United Technologies Research Center, Safe and dangerous stability boundaries, East Harford, Connecticut, August 8, 1998
- Seminar talk, University of Cambridge, On blue sky bifurcation model, Cambridge, UK, May 1997
- Seminar talk, On a new cod-1 bifurcation for periodic orbits. Center for Informatics & Computers, Netherlands, 1997
- Seminar talk, UC Berkeley, Berkeley, CA, August 1996
- Seminar talk, Noninvertible maps of Lorenz type. University of Urbino, Italy, 1995
- Seminar talk, Bifurcations of Lorenz attractors. Cornell University, Ithaca, NY. January 1995
- Seminar talk at United Technologies Research Center, Numeric technique for homoclinic bifurcations based on kneading invariants. Invited. East Harford, Connecticut, January 1995
- Seminar talk, Bath University, Bath, UK, 1995
- Seminar talk, Bristol University, Bristol, UK, 1995
- Seminar talk, Brussels Free University, Brussels, Belgium, 1995
- Seminar talk, Royal Meteorological Institute, Solvey Institute, Brussels, Belgium, 1995
- Technical University of Copenhagen, Copenhagen, Denmark, 1994
- Seminar talk, University of Modena, Modena, Italy, 1994
- Seminar talk, Keldysh Applied Math., Moscow, Russia, 1990
- Seminar talk, Institute, Space Research Institute, Moscow, Russia, 1989
- Seminar talk, Leningrad State University, Leningrad, Russia, 1989
- Seminar talk, Electronic Research Institute, Moscow, Russia, 1988
- Seminar talk, Leningrad State University, Leningrad, Russia, 1989
- Institute for Applied Mathematics, Nizhny Novgorod, Russia, 1986-1991

E. Sponsored activities and grants

External grants

- Dynamical mechanisms of functioning in peripheral sensory systems. NSF Mathematical Biology Program, January 13, 2013, pending.
- Multistability and bifurcations for polyrhythmic Central Pattern Generators. DMS-1009591 NSF Applied Mathematics Division and Mathematical Biology, **\$219,738**. August 15, 2010 - July 13, 2013.

- PI of “Studies of formation mechanisms of rhythms for motor activities in biological neuronal networks in application to adaptive bio-robotics, **\$91,000** (2,400,000 rubles), #14.740.11.0919 Grant “Attracting leading scientists to Russian universities” by Ministry of Education and Science of Russian Federation, 2011-12. <http://eng.mon.gov.ru/pro/ved/uch/>
- 2012-2014 Neurodynamics Workshops in Atlanta, NSF Math Biology, **\$39,504**.
- Summer Research Experience for Undergraduates (REU) Supplement to DMS #1009591, **\$14,931**. 2011-12.
- Advanced Course on New Trends in Applied Bifurcation Analysis, Castro-Urdiales, Spain, July 25-29, 2011, **Invited** lecturer - travel grant **\$2,200**.
- Nonlinear stochastic dynamics of sensory hair cells, joint with Ohio University. NSF Physics of Living Systems, **\$345,000**. August 1, 2011-13. Pending.
- Workshop on Bifurcation Analysis and its Applications, Montreal, Canada, July 7-10, 2010 July 6-10, 2010. **\$300** Travel grant for to cover local expenses.
- The Seventh Annual Conference on Frontiers in Applied and Computational Mathematics (FACM '10), New Jersey Institute of Technology (NJIT), Newark, New Jersey, May 21-23, 2010. **\$400** Travel grant to cover local expenses.
- Nonlinear Dynamics: New Directions, Guanajuato, Mexico May 11-14, 2010. **\$200** Travel grant to cover local expenses.
- Computational Neuroscience Meeting 2009, Berlin, Germany, July 21-26, 2009. Travel award **\$240**.
- Mathematical Neuroscience Meeting, Mar 23-25, 2008 Royal Society of Edinburgh, 22-26 George Street, Edinburgh. Travel award **\$1500** in addition to local expenses.
- Imperial College, London, UK. March 18-22, 2009. Travel award **\$450**.
- Weierstrass Institute for Applied Analysis and Stochastics. Berlin, Germany, Research visit July 19-21, 2009. Travels grant **\$350**.
- Potsdam University, Germany, Research visit July 21-23, 2009. Travel grant **\$300**.
- University of Saragossa, IUMA, Mathematics Research Institute, Spain, June 16–July 20, 2009, Research Grant **\$6,000**. Travel great **\$1200**.
- Shilnikov A., the Neuroscience Institute short visit grant, San Diego, CA, **\$2,000** travel grant, 8/10/2007.
- Shilnikov A., Institute for Mathematics and Its Application conference and travel grant: Organization of Biological Networks, March 3-7, 2008, **\$1,200** Travel grant.
- Shilnikov A., Institute for Medicine of Juelich Research Center Visiting grant, September 23-December 23, 2007, **\$24,000** Research.
- Shilnikov A., Institute for Mathematics and Its Application conference and travel grant. RNA in Biology, Bioengineering and Nanotechnology, Oct 29-Nov 2, 2007, **\$1,200** travel grant
- Shilnikov A., Xilinx FPGA hardware and software, **\$5280** equipment grant (External funding), 2006
- Bourgeois A., Cymbalyuk G. and Shilnikov A. (Co-PI), Implementation of neuronal models, dynamic clamp, and tools for the hybrid system analysis using FPGA technology, Project with P20 Planning Grant, NIH, 2005-2006, DLN55, **\$20,191**.
 - Govaertz W., Hazewinkel M., Kuznetsov Y. and Shilnikov A. (coPI) INTAS Grant 99-000 Numerical Methods for Local and Global Bifurcations in ODE, **46,000 Euro**, 1999–2001.
 - World Scientific Publ. Grant, **\$5,000**. Singapore - New York - London, 1998.
 - World Scientific Publ. Grant, **\$3,000**. Singapore - New York - London, 1996.
 - International Science Foundation Travel Grant, **\$1,100**, 1996.
 - International Science Foundation Travel Grant, **\$500**, 1995.

- International Science Foundation Travel Grant, **\$1,000**, 1994.
- Royal Society Postdoctoral Award **£20,000**, London-Cambridge, UK, 1993-1994.

Internal grants

- Katz, P. and Shilnikov A., co-PI. Comparative analysis of neural circuit dynamics. B&B pilot grant, **\$30,000**, 2012-2013.
 - Shilnikov A., PI. Modeling of active amplification and tuning in inner hair cells. B&B pilot grant **\$21,300**, 2011-2012.
 - B&B summer assistantship for J. Yourker, **\$2,000**, 05/1/2011
 - Shilnikov A.L. and Belykh I.V. Dynamical principles of multifunctional central pattern generators, B&B Pilot grant **\$28,000**, 2009-2010.
 - Bondarenko V., Belykh I.V, and Shilnikov A.L. B&B Pilot grant Modeling and dynamical analysis of isolated cardiac cells and cells connected into multicellular tissues. **\$13,000**, 2009-2010.
 - Presidential B&B summer assistantships for R. Gordon and J. Wojcik, **\$2,200**, 07/1/2007
 - Shilnikov A., Center for Neuromics: Visiting scientist travel support for collaboration and work on bursting neurons. Dr. Burylko (Ukraine). Award amount **\$840**, 2007.
 - Shilnikov A. (Co-PI), Belykh I. B&B Pilot grant Synchronization in networks of bursting neurons, GSU internal grant, **\$21,000**, 2007-2008.
 - Pallas S., Prasad S. and Shilnikov A. (Co-PI) Modeling circuits for stimulus velocity tuning in the superior colliculus, Brains & Behaviors program, **\$30,000**, 2006-2007.
 - Belykh I., Bourgeois A., Cymbalyuk G. and Shilnikov A. (Co-PI), Analysis of Computationally Intensive Neuronal Models Using FPGA Technology, Brains & Behaviors program, submitted, **\$30,000**, 2005-2006.
 - Cymbalyuk G. and Shilnikov A. (PI), Applications of the Poincaré mapping technique to analysis of neuronal dynamics, Brains & Behaviors program, **\$23,000**, 2005-2006.
 - Cymbalyuk G., and Shilnikov A, Brains & Behaviors research supplement, **\$6,000**, 2005.
 - Bourgeois A., Cymbalyuk G. and Shilnikov A. (Co-PI), P20 Implementation of neuronal models, dynamic clamp, and tools for the hybrid system analysis using FPGA technology, **\$20,000**, 2005.
 - Cymbalyuk G. and Shilnikov A. (Co-PI) GRA Brains & Behaviors fellowships for K. Mokhov, **\$21,900** annually, 2005-2008
 - Cymbalyuk G. and Shilnikov A. (Co-PI) Brains & Behaviors seed grant: The Bifurcation Analysis of Neuronal Rhythmogenesis, **\$30,000**. 2004-2005.
 - Shilnikov A. (PI) GRA Brains & Behaviors fellowships for P. Channell and C. Chen, **\$66,000**, 2004-2006.
 - Shilnikov A., Summer Brains & Behaviors assistantship. **\$2,000**, 2004.
 - Arav, M., Miller V., Patterson N., Shilnikov A. (Co-PI), Smirnova, A. and Vidakovic, D., Mobile Classroom for Teaching Mathematics and Statistics. GSU Tech Fee Grant Program **\$105,045**, 2004.
 - Cymbalyuk G. and Shilnikov A. (Co-PI) GSU Research Team Grant Dynamics of Bursting Behaviors in Neural Models, **\$15,000**, 2004-2005.
-

Professional service and recognition

Editorship

- Editor for J. Mathematical Neuroscience, Springer
- Editor for J. Discontinuity, Nonlinearity and Complexity, L&H Scientific Publishing
- Editor for Trends in Neurodynamics: Meta and multistability in cells and networks: models and experiments," World Scientific Pub, 2013.
- Guest Editor for J. Bifurcations and Chaos, 15(11), 2005
- Guest Editor for J. Bifurcations and Chaos, 2000
- Editor for a Volume: Contempt. Problems in Nonlinear Dynamics, 1996

Reviewer:

All major journals in dynamical systems, applied mathematics and theoretical physics, biophysics, computational biology and mathematical neuroscience, including:

- Reviewer and Curator for Scholarpedia
- Reviewer for J. Nonlinearity
- Reviewer for J. Physics Review Letters
- Reviewer for J. Physica D
- Reviewer for J. Physics Review E
- Reviewer for J. Mathematical Neuroscience
- Reviewer for J. of Bifurcations and Chaos
- Reviewer for J. Regular and Chaotic Dynamics
- Reviewer for J. of Nonlinear Science
- Reviewer for J. of Nonlinear Dynamics
- Reviewer for J. of Complexity
- Reviewer for IOP Journal of Physics: Conference Proceedings
- Reviewer for J. Mathematics and Mathematical Sciences
- Reviewer for IEEE J. Circuits and Systems
- Reviewer for J. Physics A: Mathematical and Theoretical
- Reviewer for J. Chaos
- Reviewer for J. Circuits and Systems
- Reviewer for SAIM J. Applied Dynamical Systems
- Reviewer for IEEE Transactions on Biomedical Engineering
- Reviewer for J. Nonlinear Analysis
- Reviewer for Acta Biotheoretica J.
- Reviewer for Neural Network J.
- Reviewer for J. Biological Cybernetic
- Reviewer for J. Physics Letter A
- Reviewer for J. Communications in Nonlinear Science and Numerical Simulations
- Reviewer for J. Dynamic Systems and Control Conference
- Reviewer for J. Applied Mathematics and Computation
- Reviewer for J. Computers and Mathematics with Applications
- Reviewer for J. Physica A
- Reviewer for J. Neuroendocrinology
- Reviewer for J. Nonlinear Mechanics
- Reviewer for European Physics Journal B
- Reviewer for SAIM J. Applied Mathematics
- Reviewer for Inter. J. Neural Systems
- Reviewer for J. Neurocomputing
- Reviewer for J. Computational Neuroscience

Organizational leadership

- 2012-2014 Neurodynamics Workshops in Atlanta, NSF Math Biology, \$39,504. Pending (External funding)
- A co-organizer of “Mutistability and rhythmogenesis: basic motifs and network dynamics” Minisymposium. 2011 SIAM Conference on Application of Dynamical Systems, Snowbird, Utah, May 21-26, 2011. Joint with M. Bazhenov (UCR)
- A co-organizer of “Symbolic and Computational Algorithms for Chaos Explorations” Minisymposium. 2011 SIAM Conference on Application of Dynamical Systems, Snowbird, Utah, May 21-26, 2011. Joint with R.Barrio (Zaragossa, Spain)
- A co-organizer of Atlanta Computational Neuroscience Workshop, GSU, April 8, 2010.
- A co-organizer of “Lorenz equation revisited.” Minisymposium. 2009 SIAM Conference on Application of Dynamical Systems, Snowbird, Utah, May 17-21 2009. Joint with R.Barrio (Zaragossa, Spain)
- A co-organizer of Minisymposium “Polyrhythms of central pattern generators.” 2009 SIAM Conference on Application of Dynamical Systems, Snowbird, Utah, May 17-21 2009. Joint with I.Rybak (Drexel)
- A co-organizer of Atlanta Computational Neuroscience Workshop, GSU, April 8, 2008.
- A co-organizer of a mini-symposium Exotic bifurcations in slow fast systems at SIAM Conference on Applications of Dynamical Systems, Salk Lake City, Utah, May 28-June 2, 2007
- A co-organizer of a mini-symposium Complex dynamics of systems with multiple time scales at SIAM Conference on Applications of Dynamical Systems, Salk Lake City, Utah, May 22-26, 2005
- A co-organizer of a mini-symposium The Geometry of Spiking and Bursting at 2004 SIAM Conference on the Life Sciences. Portland, Oregon, July 11-14, 2004
- A co-organizer of a mini-symposium Bursting in Mappings at SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 27-31, 2003
- A co-organizer of the meeting Contemporary Problems in Dynamical Systems Theory, Nizhny Novgorod, Russia, June 2-4, 1996

IV. Instruction

Courses developed at Georgia State University:

- New course “Applied Dynamical Systems” This 4000/6000 level course is cross-listed with the Department of Physics, and Neuroscience Institute.
- New course “Mathematical Biology” proposed together with Dr. Belykh and Dr. Smirnova (Math). This 4000/6000 level course is cross-listed with the Department of Biology.
- New course “Advanced Topics in Ordinary Differential Equations and Dynamical Systems” proposed together with Dr. Belykh (Math).
- New graduate level course "Dynamical Foundations of Neuroscience" proposed together with Dr. Belykh (Math).

Courses taught at Georgia State University

Undergraduate

- Math 1101: *Mathematical modeling*

Fall 2006, 2008, Summer 2010

- Math 1113: *Precalculus* Maymester 2004
- Math 2211: *Calculus I* Maymester 2001, Fall 2000 and 2001
Spring 2002, Fall & Spring 2001,
Spring 2007
- Math 2215: *Calculus III* Spring 2001, Summer 2001,
Spring 2003, 05, Fall 2006
- Math 3260: *Ordinary Diff. Eqs* Fall 2001-2, 2004-5, 2007-09
Spring 2008, 2010
- Math 3435 *Linear Algebra I* Spring 2004, Summer 2008, Spring 2010
- Math 4010 *Math Biology* Spring 2009
- Math 4391 *Introductory Differential Geometry* Spring 2007
- Math 4258: *Vector Calculus* Spring 2008
- Math 4265: *Partial Differ. Equations* Summer 2003
- Math 4435 *Linear Algebra II* Fall 2003, Spring 2011
- Math 4661: *Advanced Calculus I* Fall 2002
- Math 4662: *Advanced Calculus II* Spring 2003
- Math 4275: *Applied Dynamical Systems* Spring 2004, 2006, 2010, 2011
- Math 4258: *Vector Calculus* Spring 2008

Graduate

- Math 6010 *Math Biology* Spring 2009
- Math 6258: *Vector Calculus* Spring 2008
- Math 6391 *Introductory Differential Geometry* Spring 2007
- Math 6435 *Linear Algebra II* Fall 2003
- Math 6258: *Vector Calculus* Spring 2008
- Math 6661: *Advanced Calculus I* Fall 2002
- Math 6662: *Advanced Calculus II* Spring 2003
- Math 6265: *Partial Differ. Equations* Summer 2003
- Math 6275: *Applied Dynamical Systems* Spring 2004, 2006, 2010
- Math 8510: *Applied Mathematics* Spring 2005
- Math 8510: *Advanced Topics Dyn Systems* Fall 2009
- Math 8515: *Dynamic Principles of Neuroscience* Fall 2008, 2010
- Math 8999: *Thesis Research* 2004-2011

Courses taught at Cornell University

- *Ordinary Differential Equations using Dynamical Systems Approach* Spring 2000
- *Multivariable Calculus* Spring 2000

Courses taught at Georgia Tech

- *Linear Algebra I* Spring 1999

Courses taught at Department Mathematics of Academy for Transport Engineers, Nizhny Novgorod, Russia

- *Calculus I and II, Probabilistic Theory and Elements of Statistics*

Direction of student work

Emanuel Thomas (Math), Dane Allen (Math, NSF REU), Joseph Youker (Math, NSF REU), Rene Gordon (Math), Jeremy Wojcik (Physics), Kristie Young (Actuarial Science)

Ph.D. Students

- Sajiya Jalil, Ph.D. Defense "Stability analysis of phase-locked bursting in inhibitory neuron networks." Department of Mathematics and Statistics and Neuroscience Institute, Georgia State University, March 2012.
- Jeremy Wojcik, Ph.D. Defense "Neural Cartography: Computer assisted Poincare return maps for biological oscillators ." Department of Mathematics and Statistics and Neuroscience Institute, Georgia State University, May 8, 2012.
- Tingly Xing, since 2011, work in progress
- Summer (Xia) Hu, since 2010, transferred University of Maryland.

Member of the committee:

- Tatiana Malashchenko: A mechanism of coexistence of bursting and silent regimes of activity of a neuron (Physics and Astronomy), April 2011. She co-authored 2 research papers with me.

Master's Thesis

- Matt Brooks, Multistability in bursting patterns in a model of multifunctional central pattern generator, Department of Mathematics and Statistics, December 2009.
- Paul Channell, Poincare mapping for complex slow fast dynamics in an interneuron model, Brain and Behaviors program, Department of Mathematics and Statistics, December 2009
- Jeremy Wojcik, moved to PhD program
- Tatiana Malashchenko: A mechanism of coexistence of bursting and silent regimes of activity of a neuron, co-directed with Dr. Cymbalyuk (Physics and Astronomy) July 2007
- Konstantin Mokhov "The role of Ca²⁺ dynamics in generation of oscillatory activity of a neuron", co-directed with Dr. Cymbalyuk (Physics and Astronomy) December 2004
- C. Chen - B&B GRA, 2004

Member of the committee:

- Malcolm Devoe (Mathematics and Statistics), May 2012.
- William Barnet (Physics and Astronomy), May 2009.
- Oleksiy Pochapinsky (Biology, May 2007.

Honors Projects

- Joseph Youker (Mathematics & Statistics) "Reduced phase models of CPGs" B&B Summer Fellowship \$2,000 and NSF REU, Summer 2011
- Dane Allen (Mathematics & Statistics) "CPG model of the Melibe", funded through NSF REU. Summer 2011
- Emmanuel Thomas (Mathematics & Statistics) "Reduced phase models of networked interneurons",

\$2,000 Presidential stipend, 2009-10

- Rene Gordon (Mathematics & Statistics) “Polyrhythmic synchronization in bursting network motifs” B&B Summer Fellowship \$2,000, 2009
- Robert Burnham (Mathematics & Statistics) “Phasic models of a neuron”, B&B Summer Fellowship \$1600, 2009.
- Rene Gordon (Mathematics & Statistics) B&B Summer Fellowship \$1,600, 2007
- Jeremy Wojcik (Mathematics & Statistics) B&B Summer Fellowship \$1,600, 2007

Post-Doctoral visitors

- Dr E. Gunay 2011-2
 - Dr. J. Schwabedal, 02-04/2011.
 - Dr O. Burylko (Institute of Mathematics of Ukrainian Academy of Science), 06-08/2008.
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V. Service

Affiliations and Membership

- Faculty of Center for Nonlinear Science at GaTech (2001-present)
- Faculty of Center for GSU Behavioral Neuroscience (2008-present)
- American Mathematical Society (AMS)
- Society for Industrial Mathematics (SIAM)
- Dynamical Systems group at SIAM
- Nizhny Novgorod Mathematical Society

College, university and university system committees

- GSU Senate, member (2006-2011)
- GSU Senate IS&T Committee, member (2007-2011)
- GSU Senate Research Committee, member (2006-211)
- GSU Senate Supercomputing Committee, member (2010-resernt)
- GSU Senate Admission and Standard Committee, member (2007-2009)
- GSU Senate IS&T Committee, member (2007-presernt)
- GSU Senate Internal Grants Subcommittee, member (2006-2007)
- Brains and Behavior Scientific Committee, member (2004-2009)

Departmental committees

- Neuroscience Institute Undergraduate Committee (2009)
- Neuroscience Institute P&T Committee (2009-present)
- Math P&T Committee (2009-present)
- Math System Administration Advisory committee, head (2001-2009)
- Math Graduate Program Committee, member (2000-present)
- Bioinformatics Faculty Recruitment Committee, member (2004-2006)
- Visiting Instructors and Lecturers Committee, member, head (2004-2009)
- PhD Program Development Committee, member (2002-2008)

- Research Committee, member (2002-present)
- Web design committee, chair (2004)
- Math Colloquium committee, member (2001-2009)
- Mathematics Undergraduate Subcommittee, member (2004-present)
- Mathematics Graduate Committee, member (2004-present)
- Webmaster, Department of Mathematics and Statistics at GSU, 2004-present
- Mathematics Lecturer Search Committee, member, (2011)