JUSTYNA SIGNERSKA-RYNKOWSKA

justyna-hanna.signerska@college-de-france.fr

Mathematical Neuroscience Lab, CIRB - Collège de France
and INRIA Paris-Rocquencourt, EPI MYCENAE

11, Place Marcelin Berthelot
75005 Paris, FRANCE

Education

2009 - 2013 **Ph. D. studies** at the Institute of Mathematics of the Polish Academy of Sciences (acclaimed as **Leading National Research Centre** for 2012-2017 by Ministry of Science and Higher Education in Poland) in the field of *Mathematics* under supervision of prof. Wacław Marzantowicz (the Ph.D. advisor) and prof. Feliks Przytycki (co-advisor), **Ph.D. in *Mathematics*** in June 2013; title of Ph. D. Thesis "Dynamical properties of maps arising in some models of neuron activity and electrical circuits"

2004 - 2009 Gdańsk University of Technology (Poland), Faculty of Applied Physics and Mathematics, **M. Sc. Eng. in *Applied Mathematics*** in July 2009 (with final grade *excellent*); title of Master Thesis: "Mathematical Analysis of Some Simple Spiking Neuron Models"

2000 - 2004 International Baccalaureate School No 0704 in Gdynia (Poland) (International Baccalaureate Diploma)

Employment

Since 2014 post-doctoral position at INRIA Paris-Rocquencourt (EPI MYCENAE) and Mathematical Neuroscience Lab, CIRB - Collège de France

2013 - 2014 post-doctoral position at the Institute of Mathematics of the Polish Academy of Sciences (Department of Dynamical Systems)

2012 - 2014 Organization and Training Coordinator in the Project "Center for Applications of Mathematics" at Gdańsk University of Technology

2009 - 2012 lecturer at the Faculty of Applied Physics and Mathematics, Gdańsk University of Technology (Department of Non-linear Analysis)

Research Interests

- dynamical systems, chaos theory, topological methods in dynamical systems
- application of dynamical systems theory to modelling of biological phenomena, especially applications in neuroscience

Publications (in peer-reviewed journals)

- J. Signerska-Rynkowska, *Analysis of interspike-intervals for the general class of integrate-and-fire models with periodic drive*, Mathematical Modeling and Analysis, 20 (2015), 529–551

- W. Marzantowicz, **J. Signerska**, *On the interspike-intervals of periodically-driven integrate-and-fire models*, Journal of Mathematical Analysis and Applications, 423 (2015), 456–479
- W. Marzantowicz, **J. Signerska**, *Distribution of the displacement sequence of an orientation preserving circle homeomorphism*, Dynamical Systems: An International Journal, 29 (2014), no. 2, 153-166
- G. Graff, A. Kaczkowska, P. Nowak-Przygocki, **J. Signerska**, *Lefschetz periodic point free self-maps of compact manifolds*, Topology and its Applications, 159 (2012), 2728-2735
- W. Marzantowicz, **J. Signerska**, *Firing map of an almost periodic input function*, Discrete and Continuous Dynamical Systems, Supplement 2011-2 (2011), 1032-1041

Short-term scientific visits

- 15-29 January 2014, Instituto de Ciências Matemáticas e de Computação, **Universidade de São Paulo**, São Carlos –SP, Brasil: visiting the group of Ali Tahzibi and working on the project about geometrical properties of curlicues generated by circle maps and other dynamical systems
- 2-11 December 2013, Center for Interdisciplinary Research in Biology, **Collège de France**, Paris: visiting the group of Jonathan Touboul and working on the project "Wild dynamics in nonlinear integrate-and-fire neurons: mixed-mode bursting, spike adding and chaos"
- 7-11 January 2013, **Ecole Normale Supérieure**: visiting the group of Romain Brette in theoretical and computational neuroscience

Grants and Awards

- co-investigator in the "OPUS" grant Topological Invariants and Complexity Measures in Action, awarded by National Science Centre in Poland in May 2015
- pre-doctoral grant "PRELUDIUM" awarded by National Science Centre in Poland in December 2011 for executing the project *Properties of dynamical systems used in mathematical modelling of neurons activity and electrical circuits*;
  duration: 24 months; position: grant holder
- Scholarship of the Ministry of Science and Higher Education for academic achievements in academic years 2006/2007, 2007/2008, 2008/2009
- Scholarship of the Marshal of Pomeranian Voivodeship for academic achievements in academic years 2007/2008, 2008/2009 and of Mayor of Gdynia/Gdańsk in 2006/2007, 2007/2008

Memberships

Since 2014 Polish Mathematical Society

Attended Conferences and Workshops (selected)

- 8-10 June 2015, Antibes (France), **1st International Conference on Mathematical Neuroscience**, **poster** *A geometric mechanism for mixed-mode bursting oscillations in a hybrid neuron model*

- 25-30 May 2015, Będlewo (Poland), **Between Theory and Applications: Mathematics in Action**; **chairman and organizer of session** *Dynamical systems in modeling of neural activity*; **lecture** *Discontinuous interval mappings in analysis of integrate-and-fire models*
- 16-21 May 2015, Snowbird (Utah, USA), **SIAM Conference on Applications of Dynamical Systems; poster** *A geometric mechanism for mixed-mode bursting oscillations in a hybrid neuron model*
- 25-30 August 2014 and 16-22 June 2013, Będlewo (Poland), **Between Theory and Applications: Mathematics in Action** (Scientific and Organizing Committee)
- 12-16 May 2014, Toruń (Poland), **Ergodic Theory and Dynamical Systems; poster** *Curlicues generated by circle homeomorphisms*
- 12-14 December 2013, Gdańsk (Poland), **Applied Mathematics and Mathematical Methods in Physics** (Scientific and Organizing Committee)
- 27 May – 7 June 2013, Będlewo (Poland), **International Conference Beyond Uniform Hyperbolicity**
- 1-5 October 2012, Salou (Spain), **New Trends in Dynamical Systems**; **poster** *Firing map for periodically and almost-periodically driven integrate-and-fire models: a dynamical systems approach*
- 23-27 September 2012, Krynica Morska (Poland), **XVIII National Conference Application of Mathematics to Biology and Medicine**; **presentation** *Firing map for periodically and almost-periodically driven integrate-and-fire models: a dynamical systems approach*
- 22 - 28 April 2012, Będlewo (Poland), **Ergodic Methods in Dynamics**
- 27 June - 24 July 2011, Będlewo (Poland), **Modern Dynamics and its Interaction with Analysis, Geometry and Number Theory**
- 28 June - 2 July 2011, Cracov, **8th European Conference on Mathematical and Theoretical Biology**; **presentation** *Firing map for integrate-and-fire models with almost-periodic stimulus*
- 5 - 8 May 2011, Będlewo (Poland), **Spring School of Dynamical Systems 2011**; **presentation** *Displacement sequence of an orientation preserving circle homeomorphism*
- 15 - 19 November 2010, Warsaw, **CODY Autumn in Warsaw. ``Low dimensional dynamics''**
- 25 - 28 May 2010, TUD Dresden, **The 8th AIMS Conference on Dynamical Systems, Differential Equations and Applications**; **presentation** *Firing maps for differential equations with almost periodic coefficients*
- 23-26 April 2009, Będlewo (Poland), **2nd Interdyscyplinary Mathematical Workshop**; **presentation** *Rotation number and the Poincare Classification Theorem*
- 5-9 May 2008, Cargese (Corsica), International Workshop-School "**Chaos and Dynamics in Biological Networks**"; **poster** (coauthored with J. Pyrzowski) *Disorder-induced phase transitions in neural network models*
- 13-15 March 2008, Warsaw, **Mathematical modelling of cellular biosystems** - international workshop
- 15-20 July 2007, Sovata (Romania), **International Workshop on Complex Systems and Networks**; **presentation** (coauthored with J. Pyrzowski) *Plasticity and Self Organization in Neural Network Models*

Seminars given (in 2012-2015, selected)

1) **Centre interdisciplinaire de recherche en biologie, College de France, Paris**, "Dynamics of spiking neuron models"
2) **Instituto de Ciências Matemáticas e de Computação, Universidade de São Paulo**, **São Carlos** (Brasil), "Displacement sequence of an orientation preserving circle homeomorphism" and "Firing map and interspike-intervals for one-dimensional integrate-and-fire models"

3) **Institute of Mathematics of PAS, Warsaw**, *Dynamical systems* seminar, "Firing map for periodically and almost-periodically driven integrate-and-fire models: a dynamical systems approach" and "Curlicues generated by circle maps"
4) **Jagiellonian University in Cracov**, *Dynamical systems* seminar, "Analysis of a neuron dynamics model with a periodic and almost periodic input function"
5) **Gdansk University of Technology**, seminar *Topological Methods in Nonlinear Analysis*, "Analysis of a neuron dynamics model with an almost periodic input function"
6) **Adam Mickiewicz University in Poznan**, *Seminar in Nonlinear Analysis*, "Analysis of a neuron dynamics model with an almost periodic input function"

Skills and Techniques

- Knowledge of C++, Mathematica and Matlab programming
- Languages: English (Certificate in Advanced English-CAE); German (Goethe-Zertifikat C1); French (intermediate)