

# Anca Ruxandra Rădulescu

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## EDUCATION

Ph.D. (2005), MS (2001)      Mathematics, Advisor: John Milnor  
Stony Brook University, NY

B.S. (1998)                      Mathematics, Advisor: Kostake Teleman  
University of Bucharest, Romania

Programming degree (1994)    Computer Science High School, Bucharest, Romania

## EMPLOYMENT

Aug. 2010 – present          Instructor, Mathematics, University of Colorado, Boulder

Sept. 2009 – Aug. 2010      Senior Postdoc. Assoc., Biomedical Engineering, Stony Brook University

June 2009 – May 2010      Assistant Professor Adjunct, Psychology, University of Colorado, Boulder

Aug. 2006 – May 2009      Instructor, Applied Mathematics, University of Colorado, Boulder

Sept. 2005 – July 2006      Visiting Assist. Prof., Mathematics, City University of New York

Apr. 2005 – Oct. 2005      Postdoctoral Fellow, Biomedical Engineering, Stony Brook University

May 2004 – Aug. 2004      Summer Research Internship, Cold Spring Harbor Laboratory, NY

May 2003 – May 2005      Graduate Student, Institute of Mathematical Sciences, Stony Brook

Sept. 1998 – May 2003      Graduate Student, Mathematics, Stony Brook University

## RESEARCH INTERESTS

Dynamical Systems – nonlinear dynamics, computational entropy, complexity  
Theoretical Neuroscience – synaptic plasticity, neural network dynamics, learning algorithms  
Clinical Neuroscience – mathematical models of brain dynamics and mental disease processes

## GRANTS AND FUNDING

**Project title:** Collaborative Research Travel Grant: “A dynamical system approach to brain profiling in schizophrenia, based on imaging data.”

**Role:** PI; **Source of support:** Burroughs Wellcome Fund

**Award period covered:** 06/01/2011 – 08/31/2012

**Amount:** \$ 9,403. **Status:** Awarded.

**Project title:** Collaborative Research: “Using a multi-scale network model to study how brain connectivity affects dynamics and emotional regulation in schizophrenia.”

**Role:** Lead PI; **Source of support:** National Science Foundation

**Award period covered:** 09/01/2014 – 08/31/2017

**Amount:** \$1,065,445. **Status:** Recommended by the panel in 2012; resubmitted and pending.

**Project title:** Butcher Award: “Mechanisms, models and therapeutic implications of cooperative induction of negative feedback control of inflammation by the glucocorticoid receptor and NF- $\kappa$ B.”

**Role:** coPI; **Source of support:** BioFrontiers Institute, University of Colorado.

**Award period covered:** 06/04/2014 – 06/03/2016

**Amount:** \$14,868. **Status:** Pending.

## GRANTS AND FUNDING (CONTINUED)

**Project title:** Data-Driven Discovery Initiative: “Using a network approach to localize and estimate brain dysregulation in psychopathic convicts.”

**Role:** PI; **Source of support:** Gordon and Betty Moore Foundation .

**Award period covered:** 09/01/2014 – 08/31/2019

**Amount:** TBD. **Status:** In course of begin submitted.

## HONORS AND AWARDS

University of Colorado Arts and Sciences Fund for Excellence Award, 2013

“Woman Who Makes a Difference” Award, University of Colorado Women Resource Center, 2012

Burroughs Wellcome Fund Collaborative Research Travel Grant, 2011-2012

Schizophrenia Research Society Travel Fellow, 2010

Association of Women in Mathematics Travel Award, 2008

Research Assistantship, Stony Brook University, Summer 2003 - 2005

Teaching Assistantship, Stony Brook University, Fall 1998 - Spring 2003

National Scholarship for Exceptional Results, University of Bucharest, Romania 1994 -1998

Selected for the National Mathematics Team, 1990 - 1994

First, second and third prizes at the National Mathematics Olympics, Romania, 1987 - 1990

## REFEREED PUBLICATIONS

- A. Rădulescu, Lilianne Mujica-Parodi, 2013. *Network connectivity modulates power spectrum scale invariance*. *NeuroImage*. 90; 436-448.
- A. Rădulescu, 2014. *Input statistics and Hebbian cross-talk effects*. *Neural Computation*. 26 (4).
- A. Rădulescu, L.R. Mujica-Parodi, 2013. *Human gender differences in the perception of conspecific alarm chemosensory cues*. *PLoS ONE*. 8(7): e68485.
- A. Rădulescu, P. Adams, 2013. *Hebbian Crosstalk and Input Segregation*. *Journal of Theoretical Biology*. 337; 133-149.
- A. Rădulescu, D. Rubin, H. Strey, L.R. Mujica-Parodi, 2011. *Power spectrum scale invariance identifies prefrontal dysregulation in paranoid schizophrenia*. *Human Brain Mapping*. 33 (7); 1582-1593.
- A. Rădulescu, 2011. *Quantifying the dynamics of central systemic degeneration in schizophrenia*. Book chapter in: *Handbook of Schizophrenia Spectrum Disorders*. 1st Edition. Volume I: Conceptual Issues and Neurobiological Advances. Springer [Ed. Ritsner, Michael].
- A. Rădulescu, 2011. *Intuitive coding – vision and delusion*. *Philosophical Psychology*. 24 (2); 145-157.
- A. Rădulescu, 2010. *Mechanisms explaining transitions between tonic and phasic firing in neuronal populations as predicted by a low dimensional firing rate model*. *PLoS ONE* 5 (9); e12695.
- A. Rădulescu, L.R. Mujica-Parodi, 2009. *A principal component network analysis of prefrontal-limbic fMRI time series in healthy controls and schizophrenia patients*. *Psychiatry Research: Neuroimaging*. 174(3); 184-194.
- A Rădulescu, 2009. *A multi-etiology model of dysregulation in schizophrenia*. *Journal of Theoretical Biology*. 259 (2); 269-279.
- A. Rădulescu, P. Adams, K. Cox, 2009. *Hebbian errors in learning: an analysis using the Oja model*. *Journal of Theoretical Biology*. 258 (4); 489-501.
- A. Rădulescu, Lilianne Mujica-Parodi, 2008. *A systems approach to prefrontal-limbic dysregulation in schizophrenia*. *Neuropsychobiology*. 57 (4); 206-216.
- A. Rădulescu, 2008. *Schizophrenia - a parameters' game?* *Journal of Theoretical Biology*. 254 (1); 89-98.
- A. Rădulescu, 2008. *Computing topological entropy in a space of quartic polynomials*. *Journal of Statistical Physics*. 130 (2); 373-385.
- A. Rădulescu, 2007. *On complexity of quartic polynomials and the Connected Isentropes Conjecture*. *Discrete and Continuous Dynamical Systems, Series B*. 19 (1); 139-175.
- A. Rădulescu - *The Connected Isentropes Conjecture in a space of quartic polynomials*, Ph.D. thesis, 2005.

## WORK IN PROGRESS

- A. Rădulescu. *Neural network function, density or geometry?* Under review. Preprint: arXiv:1304.5232
- A. Rădulescu, Sergio Verduzco. *Nonlinear network dynamics under perturbations of the underlying graph.* Preprint available upon request.
- A. Rădulescu. *Synchronization in non-symmetrically coupled Wilson-Cowan oscillators.*
- A. Rădulescu, E. Hannon. *Using dynamic invariants on fMRI data to find differences in brain regulation between individuals with different levels of stress resilience.*
- A. Rădulescu, Kent Keihl. *Using nonlinear measures to quantify abnormal neural dynamics in criminal psychopathy.*
- A. Rădulescu. *Combinatorics of sawtooth families and neural networks.*

## INVITED TALKS

- Network coupling dynamics and emotional responses*, Applied Mathematics Colloquium, Colorado School of Mines, 2013.
- Neural network function – density, geometry and dynamics*, American Mathematical Society Joint International Meeting, Alba Iulia, 2013
- Density and geometry in a system of coupled nonlinear oscillators*, Kopell group, Boston University, 2013
- Density and geometry in a system of coupled nonlinear oscillators*, Martinos Imaging Center, Harvard University, Boston, 2013
- Mathematical modeling of neural dynamics*, Mind Research Network, University of New Mexico, 2013
- A firing rate model of bursting in neuronal populations*, Mathematics, Arizona State University, 2009
- Entropy of interval maps and connected isentropes*, Mathematics Colloquium, CU Boulder, 2009
- Dynamic brain parameter profiling in schizophrenia*, ICS Colloquium, CU Boulder, 2009
- The multiple personality of schizophrenia*, Mathematics Colloquium, Colorado Springs, 2008
- A dynamics model of schizophrenia*, Kopell group, Boston University, 2007
- Complexity, entropy computability and a model of schizophrenia*, CUNY Graduate Center, 2006
- Topological entropy in a space of quartic polynomials*, Applied Mathematics, CU Boulder, 2006
- A formal versus a clinical model of cognition*, Psychology Department, CU Boulder, 2006
- Mathematical models in Neuroscience. Analytical and computational challenges*, Mathematics/Computer Science workshop, Lehman College, 2006
- On entropy of quartic polynomials*, Stevens Institute of Technology, Hoboken, 2003

## CONFERENCE PRESENTATIONS

- Effects of connectivity on dynamic behavior in neural networks.* Joint AMS Meetings, Baltimore 2014.
- Network coupling, dynamics and emotional responses.* Cell Symposia – The Networked Brain (SFN satellite meeting), San Diego, 2013.
- Network connectivity modulates power spectrum scale invariance.* Butcher Symposium, CU BioFrontiers Institute, Westminster, 2013.
- Network connectivity modulates power spectrum scale invariance.* The Coleman Institute Annual Conference, Westminster, 2013.
- Neural network function – density or geometry?* Workshop on Rhythms and Oscillations, Mathematical Biosciences Institute, Ohio State, 2013.
- Neural network function – density or geometry?* Dynamics Days, Denver, 2013.
- Network connectivity modulates power spectrum scale invariance.* The Coleman Institute Annual Conference, Westminster, 2012.

- A connectivity model explains why fMRI power spectral signatures discriminate among individuals based on anxiety levels.* Butcher Symposium, Biofrontiers Institute, CU Boulder, 2011.
- A connectivity model explains why fMRI power spectral signatures discriminate among individuals' anxiety levels.* The Coleman Institute Annual Conference, Westminster, 2011.
- A mathematical model of schizophrenia.* CIMBposium, Bridging Disciplines: Interdisciplinary Bioscience, CU Boulder, 2010.
- Frequency spectra of fMRI time series identify prefrontal dysregulation in schizophrenia.* The Coleman Institute Annual Conference, Westminster, 2010.
- Power spectrum scale invariance identifies prefrontal dysregulation in paranoid schizophrenia.* Schizophrenia International Research Society Conference, Florence, 2010.
- Dynamic brain parameter profiling in mental illness,* 6th Annual World Congress for Brain Mapping and Image Guided Therapy, Harvard Medical Center, 2009
- Dynamic brain parameter profiling,* Advances in Low-dimensional Dynamics, Stony Brook, 2009
- A systems approach to schizophrenia,* Coleman Institute Annual Meeting, Boulder, 2008
- Brain dynamics and mental illness,* Dynamical systems in physiological modeling, Purdue University, 2008
- Bifurcations in a schizophrenia model,* Schizophrenia International Research Society, Venice, 2008
- The psychology of oral assessments,* Ideas and Issues in Calculus Instruction, Denver, 2008
- A systems approach to schizophrenia,* International Conference on Complex Systems, Boston, 2007
- Schizophrenia – a parameters' game?,* Coleman Institute and REARC Annual Meeting, Westminster, 2007
- A systems approach to schizophrenia,* 8th International Conference on Systems Biology, Long Beach, 2007
- A systems approach to schizophrenia,* Mt. Sinai International Congress on Schizophrenia Research, Colorado Springs, 2007
- Hebbian inspecificity in unsupervised learning,* Comp. and Systems Neuroscience, Salt Lake City, 2007
- A generalized algorithm of unsupervised learning,* 4th Annual Bioinformatics Meeting, Snowmass, 2006
- Mathematics of schizophrenia,* Coleman Institute and REARC Annual Meeting, Broomfield, 2006
- Lyapunov stability for Oja's rule of unsupervised learning,* Prodyn, Göttingen, 2001

## SEMINAR PRESENTATIONS

- Network coupling dynamics and emotional responses,* Mathematics Colloquium, CU Boulder, 2013.
- Does connectivity dictate dynamics in neural networks?,* Dynamics seminar, Boulder, 2012.
- The dynamics of the brain – from toy models to real data.* Math Club presentation, Boulder, 2010.
- A firing-rate model of bursting in neural populations,* Dynamics seminar, Boulder, 2009
- Is schizophrenia more than one person?,* Dynamics seminar, Boulder, 2008
- A model of emotional dysregulation,* UC Health Science Center, Denver, 2008
- A systems approach to schizophrenia,* Applied Mathematics Colloquium, Boulder, 2008
- A dynamical systems model of schizophrenia,* Psychology seminar, Boulder, 2007
- A time-series analysis of complexity and attractor dimension,* Dynamics seminar, Boulder, 2007
- Is topological entropy computable?,* Dynamics seminar, Boulder, 2006
- The mathematical brain,* Complex analysis seminar, CUNY Graduate Center, 2005
- On entropy of polynomials,* Complex analysis seminar, CUNY Graduate Center, 2005
- Bones and topological entropy for quartic polynomials,* Dynamics seminar, Stony Brook, 2004
- A rigidity theorem for real polynomials,* minicourse, Stony Brook, 2004
- The dynamics of learning,* Graduate student seminar, Stony Brook, 2004
- The Connected Isentrope Conjecture for polynomials,* minicourse, Dynamics seminar, Stony Brook, 2003
- On the entropy and monotonicity of real polynomials,* minicourse, Dynamics seminar, Stony Brook, 2003

## AFFILIATIONS

|                             |   |
|-----------------------------|---|
| 1998 – 2005, 2014           | American Mathematical Society                   |
| 2004 – 2005                 | Cognitive Neuroscience Society                  |
| 2006 – present              | Rocky Mountains Regional Bioinformatics Group   |
| 2007 – present              | International Schizophrenia Research Society    |
| 2007 – present              | Schizophrenia Research Forum                    |
| 2000 – 2001, 2008 – present | Association of Women in Mathematics             |
| 2010-present                | International Society for Computational Biology |

## CURRENT RESEARCH COLLABORATIONS

1. Paul Adams, Professor, Neurobiology and Behavior, Stony Brook University
2. Olusola Ajoilore, Assistant Professor, Psychiatry, University of Illinois at Chicago
3. Debra Goldberg, Assistant Professor, Computer Science, University of Colorado
4. Anthony Gerber, Associate Professor, Medicine, National Jewish Health
5. Anthony Grace, Distinguished Professor, Neuroscience, University of Pittsburgh
6. Kent Kiehl, Professor, Mind Research Network, University of New Mexico
7. Alex Leow, Assistant Professor, Psychiatry / Bioengineering, University of Illinois at Chicago
8. Francois Meyer, Professor, Electrical Engineering, University of Colorado, Boulder
9. Lilianne R. Mujica-Parodi, Associate Professor, Bioengineering, Stony Brook University  
& Martinos Center for Biomedical Imaging, Harvard University
10. Randall O'Reilly, Professor, Institute of Computational Neuroscience, University of Colorado, Boulder
11. Sergio Verduzco, Postdoctoral Fellow, Psychology, University of Colorado, Boulder

## TEACHING

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|------------------------|--|
| University of Colorado | Mathematics, Fall 2010 – present:<br>Instructor: Calculus I, Analytic geometry and calculus II and III, Analysis I<br>Course coordinator: Calculus I, Spirits and Uses of Mathematics<br><br>Applied Mathematics, 2006-2009:<br>Instructor: Calculus I, Calculus II, Calculus III, Differential equations<br>Course coordinator: Calculus I, Introduction to chaos and nonlinear dynamics,<br>Applied linear algebra |
| Brooklyn College       | Transformational geometry (graduate course)<br>Course coordinator: Precalculus, Calculus I,  |
| Stony Brook            | Teaching Assistant: Introduction to calculus, Calculus A,<br>Multivariable calculus with applications<br>Instructor: Overview of calculus, Calculus I, Calculus A, Calculus B,<br>Multivariable calculus<br>Course coordinator: Overview of calculus, Calculus I, Calculus II  |

## PROGRAMMING SKILLS AND SOFTWARE USED

Dynamical systems and modeling: C, Maple, MATLAB, TOCSY, TISEAN, Matcont, Eureka  
Imaging software: SPM, DCM  
Statistics tools: Excel, SPSS  
Teaching visualization tools: MVT, MATLAB

## OTHER PROFESSIONAL ACTIVITIES

Faculty member of the CU Mathematics Department Diversity Committee, awarded the University of Colorado Diversity and Excellence Grant, 2013-2014.

Journal reviewer for *Physica A* and *D*, *Entropy*, *Journal of Theoretical Biology*, *Schizophrenia Research*, *Schizophrenia Bulletin*

Book reviewer for Elsevier

Conference reviewer for the International Multi-Conference on Complexity, Informatics and Cybernetics, 2010 and 2011

Undergraduate and graduate research advisor on dynamical systems and physiological modeling of the brain (2006-present). UROP and Independent Study mentor of two female students performing research in mathematical neuroscience (2013-2014). This recent work was presented at the Nebraska Conference for Undergraduate Women in Mathematics, 2014.

Freshman Calculus Course and Oral Assessments Coordinator (2006-2009)

Graduate of the 2008 annual Mini Med School, Health Sciences Center, Denver, CO (2008)

### OUTREACH ACTIVITIES

Faculty advisor for the UNICEF at CU Campus Initiative (2011-present)

Performed the mathematical analysis and participated in the filming of an episode of the Discovery Channel TV show “Curiosity” (2009)

Volunteer mathematics tutor for *Attention Homes* teen shelter (2008)

### REFERENCES

1. Distinguished Professor John Milnor, Director, Institute of Mathematical Sciences, Mathematics Department, Stony Brook University, [jack@math.sunysb.edu](mailto:jack@math.sunysb.edu)
2. Professor Mikhail Lyubich, Institute of Mathematical Sciences, Mathematics Department, Stony Brook University, [mlyubich@math.sunysb.edu](mailto:mlyubich@math.sunysb.edu)
3. Professor Paul Adams, Department of Neurobiology, Stony Brook University, [padams@notes.cc.sunysb.edu](mailto:padams@notes.cc.sunysb.edu)
4. Professor James Curry, Applied Mathematics Department, University of Colorado at Boulder, [James.H.Curry@colorado.edu](mailto:James.H.Curry@colorado.edu)
5. Associate Professor Lilianne Mujica-Parodi, Director, Laboratory for Computational Neurodiagnostics, Departments of Biomedical Engineering and Psychiatry, Stony Brook University Health Sciences Center, [lmujicaparodi@gmail.com](mailto:lmujicaparodi@gmail.com)
6. Professor Randall O’Reilly, Department of Psychology & Center for Neuroscience, University of Colorado, [oreilly@psych.colorado.edu](mailto:oreilly@psych.colorado.edu)
7. Professor François Meyer, Electrical and Computer Engineering, University of Colorado, [fmeyer@colorado.edu](mailto:fmeyer@colorado.edu)
8. Professor Jeanne Clelland, Mathematics Department, University of Colorado at Boulder, [jnc@euclid.colorado.edu](mailto:jnc@euclid.colorado.edu)
9. Professor Harvey Segur, Applied Mathematics Department, University of Colorado at Boulder, [Harvey.Segur@colorado.edu](mailto:Harvey.Segur@colorado.edu) (addressing teaching)
10. Professor Eric Stade, Mathematics Department, University of Colorado at Boulder, [stade@euclid.colorado.edu](mailto:stade@euclid.colorado.edu) (addressing teaching)