CURRICULUM VITAE

Paul So
Professor and Chair
Department of Physics and Astronomy
George Mason University, Fairfax, Virginia 22030

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Education

Doctor of Philosophy in Physics, University of Maryland,
College Park, Maryland, May of 1995 - Advisor: Edward Ott, Ph.D.
Bachelor of Science in Physics and Mathematics, Harvey Mudd College,
Claremont, California, May of 1988.
Bachelor of Arts in Studio Arts (fulfilled all requirements for the degree), Scripps College, Claremont, California, May of 1988.

Dissertation

P. So, "Observing and Controlling Chaotic Systems and Wave Chaos Statistics,"
Ph.D. dissertation, University of Maryland, May 1995.

Administrative Experience

Chair, Department of Physics and Astronomy, George Mason University, fall 2016-present.

Associate Chair, Department of Physics and Astronomy, George Mason University, summer 2015- summer 2016.

Director for the Physics PhD Program, Department of Physics and Astronomy, George Mason University, fall 2008-spring 2016.

Research Experience

Professor, Department of Physics and Astronomy and the Krasnow Institute for Advanced Study, George Mason University, Fairfax, Virginia, 2015-present.

Associate Professor, School of Physics, Astronomy, Computational Sciences and the Krasnow Institute for Advanced Study, George Mason University, Fairfax, Virginia, 2003-2015.

Assistant Professor, Department of Physics and Astronomy and the Krasnow Institute for Advanced Study, George Mason University, Fairfax, Virginia, 1998-2003.

Assistant Professor of Pediatrics, George Washington University School of Medicine and the Children's Research Institute of the Children's National Medical Center, Washington, D.C., 1998.

Research Assistant Professor in Pediatrics, Children's Research Institute of the Children's National Medical Center and the George Washington University School of Medicine, Washington D.C, 1997-1998.

Postdoctoral Research Assistant, Center for Neuroscience, Children's Research Institute of the Children's National Medical Center, Washington D.C., 1995 - 1997.

Graduate Research Assistant, Institute for Plasma Research, University of Maryland, College Park, Maryland, 1991 - 1995.

Graduate Research Assistant, NASA Goddard Space Flight Center, Greenbelt, Maryland, Summer 1989.

Teaching Experience

Professor, Department of Physics and Astronomy and the Krasnow Institute for Advanced Study, George Mason University, Fairfax, Virginia, 2015-present.

Associate Professor, School of Physics, Astronomy, and Computational Science, and the Krasnow Institute for Advanced Study, George Mason University, Fairfax, Virginia, 2003-2015.

Assistant Professor, Department of Physics and Astronomy, George Mason University, Fairfax, Virginia, 1998-2003.

Graduate Teaching Assistant, Department of Physics, University of Maryland, College Park, Maryland, 1988 - 1991.

Grants Received

"SOFALAB2 (Science of Art Laboratory 2): Science Talks to Art/ Art Talks to Science", Role: Principal Investigator (Co-PIs: Helen Fredrick and Shanti Norris), Funder: Center for Consciousness and Transformation, George Mason University: - Amount of Award: $34,997.50 (Sept. 1, 2010 – June 30, 2012)

"SOFALAB (Science of Art Laboratory): Science Talks to Art/ Art Talks to Science", Role: Principal Investigator (Co-PIs: Helen Fredrick and Shanti Norris), Funder: Center for Consciousness and Transformation, George Mason University: - Amount of Award: $10,000 (Summer and Fall 2009).

"Dynamics and Control of Neuronal Pattern Formation", Role: Co-Principal Investigator: Led the theoretical effort of the collaborative team. (Principal Investigator: Steven Schiff, Co-PIs: Bruce Gluckman and Paul So), Funder: NIH (RO1): - Amount of Award: $1,900,000 (Oct. 1, 2003 – Sept. 30, 2008)

"A Dynamical Framework for Transient Neuronal Patterns", Role: Co-Principal Investigator: Led the theoretical effort of the collaborative team. (Principal Investigator: Steven Schiff, Co-PIs: Bruce Gluckman and Paul So), Funder: NIH (RO3): - Amount of Award: $50,000 (Dec. 1, 2003 – Jan. 30, 2005)

"Electric Field as a Novel Neuronal Interface", Role: Co-Principal Investigator:, Led the theoretical effort of the collaborative team. (Principal Investigator: Bruce Gluckman, Co-PIs: Steven Schiff and Paul So), Funder: NIH (RO1): - Amount of Award: $1,400,000 (June1, 2003 – May 31, 2007)

"A New Thermodynamics Formalism for Neuronal Ensemble – Supplement to an ongoing NSF grant", Role: Principal Investigator (Co-PIs: Steven Schiff and Bruce Gluckman), Funder: National Science Foundation: Computational Neuroscience Program (IBN-9727739) – Amount of Additional Award: $39,980 (Sept. 1, 1998 – June 30, 2002)

"A New Thermodynamics Formalism for Neuronal Ensemble", Role: Principal Investigator (Co-PIs: Steven Schiff and Bruce Gluckman), Funder: National Science Foundation: Computational Neuroscience Program (IBN-9727739) – Amount of Award: $219,451 (Sept. 1, 1998 – June 30, 2002)

"Electric Field Suppression of Epileptic Seizures", Role: Co- Principal Investigator: Led the theoretical effort of the collaborative team. (Principal Investigator: Bruce Gluckman, Co-PIs: Steven Schiff and Paul So), Funder: Whitaker Foundation (100159) – Amount of Award: $210,000 (May 1, 2000 – April 30, 2003)

"Nonlinear Dynamics of Neuronal Ensembles", Role: Co-Principal Investigator: Led the theoretical effort of the collaborative team. (Principal Investigator: Steven Schiff, Co-PIs: Bruce Gluckman and Paul So), Funder: National Institute of Health (2RO1MH5006-06A1) – Amount of Award: $849,099 (June 25, 1998 – June 24, 2003)

"Establishing the Sensitivity of Neurons and Networks to Electric Fields through Nonlinear Dynamical Measures", Role: Co-Principal Investigator: Led the theoretical effort of the collaborative team. (Principal Investigator: Bruce Gluckman, Co-PIs: Steven Schiff and Paul So), Funder: US Dept. of Energy (85X-SX516V) – Amount of Award: $139,901 (May 1997 – Feb. 1999)

Funds Raised for GMU PHYS & NEUR PhD Programs

"Provost PhD Program Award" (renewal): GTA/GRAs for Physics PhD program, Funder: Provost Office, George Mason University: Amount of Award: $426,482 (Fall 2014 – Spring 2017)

"Provost PhD Program Award": GTA/GRAs for Physics PhD program, Funder: Provost Office, George Mason University: Amount of Award: $414,180 (Fall 2011 – Spring 2014)

"Bernard C. Cotton Jr. Endowed Fellowship": Graduate Fellowship Grants for PHYS PhD Students, Donor: Ms. Nancy Davenport (in memory of Dr. Bernard C. Cotton), Pledge Amount: $100,000 (May 2012).

"Yu Yuen Kit Graduate Fellowship Fund": Graduate Fellowship Grants for PHYS & NEUR PhD Students, Donor: Ms. Yu Yuen Kit, Donated Amount: $146,273.15 (May 2011).

Fellowships

Institute for Plasma Research/Naval Research Laboratory Graduate Fellowship, 1994 - 1995.

Professional Memberships

1. American Physical Society
2. Society for Industrial and Applied Mathematics (Activity Group: Dynamical Systems and Life Sciences)
3. American Association for the Advancement of Science
4. The Mathematical Association of America
5. Society for Neuroscience

Departmental Service

Chair, Department of Physics and Astronomy, George Mason University, fall 2016-present.

Associate Chair, Department of Physics and Astronomy, George Mason University, summer 2015- summer 2016.

Director for the Physics PhD Program, Department of Physics and Astronomy, George Mason University, fall 2008-spring 2016.

Graduate Coordinator for the Masters Program in Applied/Engineering Physics, Department of Physics and Astronomy, George Mason University, fall 1999-spring 2016.

Physics and Astronomy Graduate Admissions Committee (chair), School of Physics, Astronomy, and Computational Sciences, fall 1999-spring 2016.

Physics & Astronomy Graduate Program Committee (chair), School of Physics, Astronomy, and Computational Sciences, fall 1999-spring 2016.

Physics Qualifying Examination Committee (chair), School of Physics, Astronomy, and Computational Sciences, fall 2008-spring 2010.

Director of the Physical Science PhD Program, School of Physics, Astronomy, and Computational Sciences, George Mason University, fall 2008-spring 2013.

Deputy Director of the Physical Sciences PhD Program, Department of Physics and Astronomy and Department of Chemistry and Biochemistry, George Mason University, fall 2006-spring 2008.

Other University Service

Term Faculty Committee, George Mason University, 2019-present.

College of Science Space Committee, George Mason University, 2017-present.

Krasnow Director Search Committee, George Mason University, summer 2015-2016.

Academic Program Review Committee, George Mason University, 2013- 2015.

Krasnow Institute Grievance Committee, Krasnow Institute for Advanced Study, fall 2012-present.

P & T Committee, School of Physics, Astronomy, and Computational Science, fall 2012.

Co-Director, Center for Neural Dynamics, George Mason University, fall 2006-2013.

Krasnow Institute Director Reappointment Review Committee, George Mason University, fall 2010-spring 2011.

Science & Tech II (Exploratory Hall) Renovation Art Installation Committee, George Mason University, spring 2010-spring 2012.

P & T Committee, Department of Physics and Astronomy, fall 2009.

Organizer for Krasnow Annual Scientific Retreat, Krasnow Institute for Advanced Study, George Mason University, spring 2008.

P & T Committee, Department of Physics and Astronomy, fall 2008.

P & T Committee, Department of Physics and Astronomy, fall 2004.

Faculty Senate, George Mason University, fall 1999-spring 2002.

University Grievance Committee, George Mason University, fall 2001-spring 2002.

Professional Activities

Board Member, Math for America DC (http://www.mathforamerica.org/dc), Washington DC, 2011-2015.

Founder and Executive Director, Hamiltonian Artists (a non-profit fellowship program for emerging artists), Washington DC, 2007-present.

Nonlinear Science Group Seminar series, George Mason University, 1998-present.

Co-Organizer for "Mini-Symposium on Complex Collective Dynamics of Oscillator Networks: Part I and II," SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 2015.

Organizing Committee, Dynamics Days 2012, Baltimore MD, January 5-12, 2012.

Organizer of the Department of Physics and Astronomy Seminar series, George Mason University, fall 2001-spring 2005.

Organizer for the "Minisymposium on Problems in Nonlinear Synchrony," The Sixth SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 2001.

NSF External Reviewer - Division of Integrated Biology and Neuroscience, April 2001.

NSF Review Panel - Division of Mathematical Physics, March 2000.

Organizer of the "Minisymposium on Beyond Generalized Synchrony," The 2000 Pacific-Rim SIAM Dynamical Systems Conference, Maui, Hawaii, August 2000.

Co-organizer for "Complex Synchrony in Neurosciences," Krasnow Institute for Advanced Study, George Mason University, May 2000.

Organizer of the "Minisymposium on Topological Entropy and Average Expansion Rates, Communication, Synchrony, and Dimension," Fifth SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 1999.

Co-organizer for "Periodic Orbits Theory in Biology," Krasnow Institute for Advanced Study, George Mason University, July 1998.

Reviewer for Physical Review Letters, Physical Review E, Physica D, Physics Letters, Chaos, International Journal of Bifurcation and Chaos, New Journal of Physics, Europhysics Letters, Philosophical Transaction A, IEEE Transaction on Biomedical Engineering, Neural Computation, the National Science Foundation, and the U.S. Civilian Research and Development Foundation (CRDF), Journal of Computational Neuroscience, Communication in Nonlinear Sciences & Numerical Simulations, SIAM Journal on Applied Dynamical Systems, SIAM Journal of Applied Mathematics, International Journal of Modern Physics, Medical Physics, Frontiers in Computational Neurosciences

Visitors Hosted

Co-Hosted a one-year visit of Dr. Muhammet Uzuntarla, Associate Professor, Department of Biomedical Engineering, Bulent Ecevit University, Turkey, May 2015 – May 2016

Co-Hosted a three-months visit of Dr. Javier Used, Assistant Professor, Department of Physics, Universidad Rey Juan Carlos, Spain, Summer 2013.

Co-Hosted a three-months visit of Dr. Alexandre Wagemakers, Assistant Professor, Department of Physics, Universidad Rey Juan Carlos, Spain, Summer 2012.

Co-Hosted a three-months visit of Dr. Muhammet Uzuntarla, Assistant Professor, Department of Biomedical Engineering, University of Karaelmas, Turkey, Spring 2012.

Hosted a week-long visit of Dr. Irene Moroz, Oxford Centre for Industrial and Applied Mathematics, Mathematical Institute, University of Oxford, United Kingdom, Spring 2005.

Postdoctoral Research Directed

Alexander Komendantov, PhD – 2007-2012
Stepan Kruglikov, PhD, 2004
Eun-Hyoung Park, PhD – 2001-2003
Ernest Barreto, PhD – 1998-2000

PhD Research Directed

<u>After Formation of GMU PHYS PhD Program</u>

Scott Watson, PhD candidate (PHYS), George Mason University – 2012-2018 (degree awarded May 2018)
Robert Reznik, PhD candidate (CSI), George Mason University, 2009 – 2015 (degree awarded May 2015)
Tanushree B. Luke, PHYS PhD George Mason University – 2010 – 2014 (degree awarded December 2013)
Bernie Cotton, PHYS PhD George Mason University – 2005 – 2010 (degree awarded posthumously May 2011)
Stacy Jones, PhD candidate (PHYS), George Mason University – 2010-2012 (exited program)

Before Formation of GMU PHYS PhD Program
Clayton Fan, PhD candidate (NEURO), George Mason University – 2005 – 2008 (exited program)
Karen Graver, PhD candidate (PSCI), George Mason University – 2005 – 2008 (exited program)
Mark Allan Chevillet, PhD (Neuroscience), Georgetown University – 2005 (external visiting student)
Jonathan Steidel, PhD candidate (PSCI), George Mason University – 2002 – 2003 (exited program)
Jennifer C. Chubb, PhD candidate (PSCI), George Mason University – 1999 – 2001 (switched to Applied Mathematics, currently Assistant Professor at University of San Francisco)
Joseph T. Francis, PhD (Neuroscience), George Washington University – 1998 – 2001 (degree awarded 2001, currently Professor at SUNY Down State Medical School)
Theoden Netoff, PhD (Neuroscience), George Washington University – 1998 – 2001 (degree awarded 2001, currently Professor at University of Minnesota)

MS Research Directed

Robert M. Johnson, MS Research, George Mason University – 2014 - 2015
Kevin Pick, MS Thesis, George Mason University – 2009 – 2010
Mark Hannum, MS Thesis, George Mason University – 2004 – 2006
Bernie Cotton, MS Thesis, George Mason University – 2005 - 2007
Karen Graver, MS Thesis, George Mason University – 2004 -2005
Matthew Picket, MS Thesis, George Mason University – 2003 - 2004

Undergraduate Research Directed

Aadith Vittala, Computational Neuroscience Project, Thomas Jefferson HSST, spring 2015-summer 2015
Lucas Lin, Computational Neuroscience Project, Thomas Jefferson HSST, summer 2014 – summer 2015
Jason E. Pina, Senior Thesis, George Mason University – 2010 – 2011
Steve Richardson, Senior Thesis, George Mason University – 2001 - 2002
Heather Bloemhard, Undergraduate Research, summer 2007

Dissertation Committees

James McCracken, PhD in Physics (awarded 2015), Advisor Dr. Robert Weigel
Zrinka Greguric, PhD in Physics (awarded 2015), Advisor Dr. John Cressman
Lang Wither – PhD in Physics (awarded 2015), Advisor Dr. Frank Narducci (Naval Air Systems Command)
Tanushree B. Luke, PhD in Physics (awarded 2014), Advisor Dr. Paul So
Mahmoud Lababidi, PhD in Physics (awarded 2013), Advisor Dr. Erhai Zhao
Greg Byrne, PhD in Computational Sciences and Informatics (awarded 2013), Advisor Dr. Juan Cebral
Bernard C. Cotton, PhD in Physics (posthumously awarded 2012), Advisor Dr. Paul So
David Prescott, PhD in Physical Science (awarded 2010), Advisor Dr. Karen Sauer
Scott Watson, PhD in Physics (awarded 2018), Advisor Dr. Paul So
Vandana Saini, PhD in Mathematics (awarded 2020), Advisor Dr. Evelyn Sander
Keivan Moradi, PhD in Neuroscience (awarded 2021), Advisor Dr. Giorgio Ascoli

Courses Taught
(Number of times taught, semesters) [class size, student evaluation class score/departmental average]

PHYS 106 Physics for the Life Sciences
PHYS 262 University Physics III
PHYS 262H University Physics III (Honors Section)
PHYS 262 University Physics III (Recitations)
PHYS 266 Introduction to Thermodynamics
PHYS 266 Introduction to Thermodynamics (Recitations)
PHYS 408 Honor Senior Thesis
PHYS 510 Computational Physics
PSCI 703 Seminar in Physical Sciences
PHYS 705 Classical Mechanics
PHYS 796 Direct Reading and Research
PHYS 998 Doctoral Dissertation Proposal
PHYS 999 Doctoral Dissertation

Publications

Literature citations as of July 2021 are reported below. The number was obtained from Google Scholar.

Total citations = 2575
h-Index = 23

<u>Papers in Refereed Journals</u>

1. M. Uzuntarla, J.J. Torres, P. So, M. Ozer, E. Barreto, "Double Inverse Stochastic Resonance with Dynamic Synapses," Physical Review E 95 (1) 012404 (2017). Citations: 38

2. R. Reznik, E. Barreto, E. Sander, and P. So, "Effect of Polarization Induced by Non-weak Electric Fields on the Excitability of Elongated Neurons with Active Dendrites," Journal of Computational Neuroscience, DOI: 10.1007/s10827-015-0582-4 (2016). Citations: 4

3. T. Luke, E. Barreto, and P. So, "Macroscopic Complexity from an Autonomous Network of Networks of Theta Neurons," Frontiers in Computational Neuroscience, 8:145 (2014). Citations: 24

4. A. Wagemakers, E. Barreto, M. A. F Sanjuán, and P. So, "Control of Collective Network Chaos," Chaos, 24: 023127 (2014). Citations: 7

5. P. So, Tanushree B. Luke, and E. Barreto, "Networks of Theta Neurons with Time-Varying Excitability: Macroscopic Chaos Multistability, and Final-State Uncertainty," Physica D, 267: 16-26 (2014). Citations: 66

6. Tanushree B. Luke, E. Barreto, and P. So, "Complete Classification of the Macroscopic Behavior of a Heterogeneous Network of Theta Neurons," Neural Computation, 25: 3207-3234 (2013). Citations: 109

7. P. So, and E. Barreto, "Generating Macroscopic Chaos in a Network of Globally Coupled Phase Oscillators," Chaos, 21: 033127 (2011). Citations: 41

8. E. A. Martens, E. Barreto, S.H. Strogatz, E. Ott, P. So, and T.M. Antonsen, "Exact Results for the Kuramoto Model with a Bimodal Frequency Distribution," Physical Review E, 79: 026204 (2009). Citations: 247

9. P. So, B. C. Cotton, E. Barreto, "Synchronization in Interacting Populations of Heterogeneous Oscillators with Time-Varying Coupling," Chaos, 18: 037114 (2008). Citations: 69

10. E. Barreto, B. Hunt, E. Ott, P. So, "Synchronization in Networks of Networks: The Onset of Coherent Collective Behavior in Systems of Interacting Populations of Heterogeneous Oscillators," Physical Review E, 77: 036107 (2008). Citations: 134

11. E. Sander, E. Barreto, S. J. Schiff, and P. So, "Dynamics of Noninvertibility in Delay Equations, Discrete and Continuous Dynamical Systems," Supplemental Volume, 768-777 (2005). Citations: 4

12. E.-H. Park, E. Barreto, B. J. Gluckman, S. J. Schiff, and P. So, "A Model of the Effects of Applied Electric Field on Neuronal Synchronization," Journal of Computational Neuroscience, 19: 53-70 (2005). Citations: 69

13. E.-H. Park, P. So, E. Barreto, B. J. Gluckman, and S. J. Schiff, "Electric Field Modulation of Synchronization in Neuronal Networks," Neurocomputing, 52: 169-175 (2003). Citations: 22

14. E. Barreto, K. Josic, C. J. Morales, E. Sander, and P. So, "The Geometry of Chaos Synchronization," Chaos, 13: 151 (2003). Citations: 39

15. E. Ott, P. So, E. Barreto, T. Antonsen, "The Onset of Synchronization in Systems of Globally Coupled Chaotic and Periodic Oscillators," Physica D, 173: 29 (2002). Citations: 39

16. P. So, E. Barreto, K. Josic, E. Sander, and S. J. Schiff, "Limits to the Experimental Detection of Nonlinear Synchrony," Physical Review E, 65: 046225 (2002). Citations: 40

17. J. Chubb, E. Barreto, P. So, and B. J. Gluckman, "The Breakdown of Synchronization in Systems of Non-identical Chaotic Oscillators: Theory and Experiment," International Journal of Bifurcation and Chaos, 11: 2705 (2001). Citations: 17

18. J. T. Francis, P. So, B. J. Gluckman, and S. J. Schiff, "Differentiability Implies Continuity in Neuronal Dynamics," Physica D, 148: 175 (2001). Citations: 3

19. E. Barreto, and P. So, "Mechanisms for the Development of Unstable Dimension Variability and the Breakdown of Shadowing in Coupled Chaotic Systems," Physical Review Letters, 85: 2490 (2000). Citations: 54

20. E. Barreto, P. So, Bruce J. Gluckman, Steven J. Schiff, "From Generalized Synchrony to Topological Decoherence: Emergent Sets in Coupled Chaotic systems," Physical Review Letters, 84: 1689 (2000). Citations: 37

21. P. So, E. Barreto, and B. Hunt, "Box-Counting Dimension without Boxes: Computing D_0 from Average Expansion Rates," Physical Review E, 59: 378 (1999). Citations: 73

22. B. J. Gluckman, P. So, T. I. Netoff, M. L. Spano, and S. J. Schiff, "Stochastic Resonance in Mammalian Neuronal Networks," Chaos, 8: 588 (1998). Citations: 35

23. P. So, J. T. Francis, T. I. Netoff, B. J. Bluckman, and S. J. Schiff, "Periodic Orbits: A New Language for Neuronal Dynamics," Biophysical Journal, 74: 2776 (1998). Citations: 141

Chinese translation: Yang Qian, "Periodic Orbits: A New Language for Neuronal Dynamics," Advances in Mechanics, 29 121 (1999)

24. P. So, E. Ott, T. Sauer, B. J. Gluckman, C. Grebogi, and S. J. Schiff, "Extracting Unstable Periodic Orbits from Chaotic Time Series Data," Physical Review E, 55: 5398 (1997). Citations: 169

25. S. J. Schiff, P. So, T. Chang, R. E. Burke, and T. Sauer, "Detecting Dynamical Interdependence and Generalized Synchrony through Mutual Prediction in a Neural Ensemble," Physical Review E, 54: 6708 (1996). Citations: 475

26. P. So, E. Ott, S. J. Schiff, D. T. Kaplan, T. Sauer, and C. Grebogi, "Detecting Unstable Periodic Orbits in Chaotic Experimental Data," Physical Review Letters, 76: 4705 (1996). Citations: 212

27. R. N. Oerter, E. Ott, T. M. Antonsen, Jr., and P. So, "Spectral Statistics for Quantum Chaos with Ray Splitting," Physics Letters A, 216: 59 (1996). Citations: 14

28. P. So and E. Ott, "Controlling Chaos Using Time Delay Coordinates via Periodic Orbits," Physical Review E, 51: 2955 (1995). Citations: 114

29. P. So, S. M. Anlage, E. Ott, and R. N. Oerter, "Wave Chaos Experiments with and without Time Reversal Symmetry: GUE and GOE Statistics," Physical Review Letters, 74: 2662 (1995). Citations: 180

30. P. So, E. Ott, and W.P. Dayawansa, "Observing Chaos: Deducing and Tracking the State of a Chaotic System from Limited Observation," Physical Review E, 49: 2650 (1994). Citations: 87

31. P. So, E. Ott, and W.P. Dayawansa, "Observing Chaos: Deducing and Tracking the State of a Chaotic System from Limited Observation," Physical Letters A, 176: 421 (1993). Citations: 23

Other Publications

32. T. Luke, E. Barreto, P. So, "A Complete Dynamical Study of Time-Varying and Interconnected Networks of Pulse-Coupled Theta Neurons," *BMC Neuroscience* 14 (Suppl 1): P371, (2013).

33. T. Luke, E. Barreto, P. So, , "A Dynamical Study of Pulse-Coupled Oscillators in the Brain," *BMC Neuroscience* 13 (Suppl 1): O12, (2012).

34. E. Sander, P. So. and E. Barreto, "Noninvertibility," *Scholarpedia*, 4(8):2242 (2009).

35. P. So, "Unstable Periodic Orbits," *Scholarpedia*, 2(2):1353 (2007). Citations: 2

36. E. Ott, P. So, E. Barreto, and T. Antonsen, "The Onset of Synchronism in Globally Coupled Ensembles of Chaotic and Periodic Dynamical Units" in Chaotic Dynamics and Transport in Classical and Quantum Systems, Proceedings of the NATO Advanced Study Institute on International Summer School on Chaotic Dynamics and Transport in Classical and Quantum Systems, Cargèse, Corsica, 18 - 30 August 2003, Series: NATO Science Series II: Mathematics, Physics and Chemistry, Vol. 182, Collet, P.; Courbage, M.; Métens, S.; Neishtadt, A.; Zaslavsky, G. (Eds.), Springer, (2005).

37. E. Ott, P. So, E. Barreto, T. Antonsen, "Synchrony in Globally Coupled Chaotic, Periodic, and Mixed Ensembles of Dynamical Units," in *Synchronization: Theory and Application*, eds. A. Pikovsky and Y. Maistrenko, (Kluwer Academic Publications, Netherlands, 2003).

38. E. Barreto, and P. So, "The Breakdown of Synchronization and Shadowing in Coupled Chaotic Systems: Analysis via the Subsystem Decomposition, Space-Time Chaos: Characterization, Control, and Synchronization," S. Boccaletti et. al. eds, (World Scientific, Singapore, 2001).

39. P. So, E. Ott, and W.P. Dayawansa, "Observing Chaos: Deducing and Tracking the State of a Chaotic System from Limited Observation," *Coping with Chaos*, editors, Edward Ott, Tim Sauer, and James A. Yorke, (John Wiley and Sons, New York, 1994).

40. P. So, S. M. Anlage, and E. Ott, "Experiments on Quantum Chaos with and without Time Reversal Symmetry," Proceedings to the Second Experimental Chaos Conference, Arlington, Virginia, November, 1993.

Manuscripts in Preparation

41. S. Watson, E. Barreto, B. Cotton, P. So, "Consequence of Symmetry Breaking in Two Coupled Kuramoto Networks."

42. L. Lin, E. Barreto, M. Hannum, P. So, "Suppression of Complex Collective Dynamics in a Network of Theta Neurons by Coupling Diversity"

Articles Written on My Work

J. Glanz, "Mastering the Nonlinear Brain," *Science* **277**, 1758 (1997).

Presentations

Invited Scientific Presentations

1. "Modeling the Collective Dynamics of the Brain," The International Workshop on Dynamics of Coupled Oscillators: 40 Years of the Kuramoto Model, Max-Planck Institute for the Physics of Complex Systems, Dresden, Germany, July 2015.

2. "Modulating Complex Collective Dynamics in Networks of Theta Neurons by Synaptic Diversity," SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 2015.

3. "Building a Canonical Model for the Collective Dynamics of the Brain," Krasnow Institute Annual Scientific Retreat, George Mason University, August 2014.

4. "Complex Collective Dynamics in Networks of Phase Oscillators," NJIT Applied Mathematics Colloquium, New Jersey Institute of Technology, Newark, NJ, February 2014.

5. "Complex Collective Dynamics and Control in Networks of Phase Oscillators," ME Graduate Seminar, The University of New Mexico, Albuquerque, NM, November 2013.

6. "Macroscopic Chaos, Multistability, and Final-State Uncertainty in Networks of Theta Neurons," *SIAM Conference on Applications of Dynamical Systems*, Snowbird, Utah, May 2013.

7. "Complete Classification of Macroscopic states for a Heterogeneous Network of Theta Neurons," *The 9th AIMS Conference on Dynamical Systems, Differential Equations and Applications*, Orlando, Florida, July 2012.

8. "Exact Meanfield Behavior for a Network of Excitable Theta Neurons," *Krasnow Institute Annual Scientific Retreat*, George Mason University, Fairfax Virginia, May 2012.

9. "Exact Meanfield Solution for a Network of Type-I Excitable Theta Neurons," *Applied Dynamics Seminar*, University of Maryland, College Park, Maryland, May 2012.

10. "Periodic Doubling and Macroscopic Chaos in a Time-Varying Network of Globally Coupled Phase Oscillators," Minisymposium on Evolving Dynamical Networks, *SIAM Conference on Applications of Dynamical Systems*, Snowbird, Utah, May 2011.

11. "Collective Synchrony and Chaos in Phase Oscillator Networks," Physics Colloquium, Emory University, Atlanta, Georgia, November 2010.

12. "The Emergence of Macroscopic Chaos and Crisis in a Network of Globally Coupled Phase Oscillators," Applied and Computational Math Seminar, George Mason University, October 2010.

13. "Synchronization in Interacting Populations of Oscillators with Time-Varying Coupling," Minisymposium on Dynamics of Time-varying Networks, *SIAM Conference on Applications of Dynamical Systems*, Snowbird, Utah, May 2009.

14. "Synchronization in Interacting Populations of Oscillators with Time-Varying Coupling," Applied Dynamics Seminar, University of Maryland, College Park, March 2009.

15. "Dynamical Systems and Neuroscience," Krasnow Institute Annual Scientific Retreat, George Mason University, May 2008.

16. "Model of Electric Field Modulation on Neuronal Synchrony and Wave Propagation," School for Computational Sciences Colloquium, George Mason University, September 2005.

17. "Model of Electric Field Modulation on Neuronal Synchrony and Wave Propagation," *International Seminar and Workshop: Nonlinear Dynamics in Biophysics*, Max-Planck-Institut für Physik Komplexer Systeme, Dresden, Germany, June-July 2005.

18. "Controlling Neuronal Synchronization and Waves with Electrical Fields," Minisymposium on Pattern Formation and Wave Dynamics in the Brain, *SIAM Conference on Applications of Dynamical Systems*, Snowbird, Utah, May 2005.

19. "Synchrony in Nature: From Clocks to Neurons," Learning in Retirement, Osher Lifelong Learning Institute, George Mason University, Fairfax VA, October 2004.

20. "Synchrony in Nature: From Clocks to Neurons," The Krasnow Institute Seminars, The Krasnow Institute for Advanced Study, George Mason University, Fairfax VA, May 2004.

21. "Synchrony in Nature: From Clocks to Neurons," The Philosophical Society of Washington, John Wesley Powell Auditorium: 2169th Meeting, Cosmos Club, Washington DC, December 2003.

22. "The Onset of Synchronism in Globally Coupled Ensembles of Chaotic and Periodic Oscillators," Minisymposium on Stability and Pattern Formation in Dynamics on Networks, *SIAM Conference on Applications of Dynamical Systems*, Snowbird, Utah, May 2003.

23. “Synchrony in Model Neurons in an Electric Field,” Minisymposium on Synchrony in Neuroscience – Part I, *SIAM Conference on Applications of Dynamical Systems*, Snowbird, Utah, May 2003.

24. “The Onset of Synchrony in Globally Coupled Chaotic Systems,” *Physics and Astronomy Colloquium (Joint with Nonlinear Science Group Seminar)*, George Mason University, Fairfax, November 2001.

25. “Limits to Detecting Nonlinear Synchrony,” *Gordon Research Conference on Nonlinear Sciences*, Mt. Holyoke, Massachusetts, June 2001.

26. “Limits to Detecting Nonlinear Synchrony,” Minisymposium on Problems in Nonlinear Synchrony, *The Sixth Conference on Applications of Dynamical Systems*, Snowbird, Utah, May 2001.

27. "What Can You Expect from Nontrivial Collective Behavior in Coupled Systems?" School for Computational Sciences Colloquium, George Mason University, April 2001.

28. “Limits to the Detection of Nonlinear Synchrony,” *The BioDynamics Seminar*, Center for Biodynamics, Boston University, Boston, Massachusetts, December 2000.

29. “Limits to the Detection of Nonlinear Synchrony,” Minisymposium on Beyond Generalized Synchrony, *The 2000 SIAM Pacific Rim Dynamical Systems Conference*, Maui, Hawaii, August 2000.

30. “Box-Counting Dimension without Boxes: Computing D_0 from Average Expansion Rates,” Chaos and Complexity Center Lectures, Mathematics Department, US Naval Academy, Annapolis, September 1999.

31. “Nonlinear Dynamics in Neuronal Ensembles,” *Dynamics Days 1999 Como Italy*, Villa Olmo, Como, Italy, June 1999.

32. “Box-Counting Dimension without Boxes: Computing D_0 from Average Expansion Rates,” Minisymposium on Topological Entropy Average Expansion Rates: Communication, Synchrony, and Dimension, *Fifth SIAM Conference on Applications of Dynamical Systems*, Snowbird, Utah, May 1999.

33. “Box-Counting Dimension without Boxes: Computing D_0 from Average Expansion Rates,” Applied Dynamics Seminar, University of Maryland at College Park, April 1999.

34. “Metamorphoses of Periodic Orbits in Desynchronizing Chaotic Systems,” Institute for Computational Sciences and Informatics Colloquium, George Mason University, April 1999.

35. "Periodic Orbits Metamorphosis for Coupled Chaotic Systems," Mathematical Tools for Neural System Analysis, Defense Advanced Research Projects Agency, Arlington, Virginia, July 1998.

36. "From Generalized Synchrony to Topological Decoherence," *International Conference on Periodic Orbits Theory in Biology*, Krasnow Institute for Advanced Study, George Mason University, Fairfax, Virginia, July 1998.

37. "Periodic Orbits: A New Language for Neuronal Dynamics," George Mason University, Fairfax, Virgina, November 1997.

38. "Detecting Unstable Periodic Orbits in Chaotic Experimental Data," *International Workshop on Nonlinear Techniques in Physiological Time Series Analysis*, Max Planck Institute for Physics of Complex Systems, Dresden, Germany, October 1995.

Contributed Scientific Presentations

39. "Networks of Theta Neurons with Time-Varying Excitability: Macroscopic Chaos, Multistability, and Final-State Uncertainty," Society for Neuroscience Conference, Washington DC, May 2014.

40. "Networks of Theta Neurons with Time-Varying Excitability: Macroscopic Chaos, Multistability, and Final-State Uncertainty," *Nonlinear dynamics and stochastic methods: from neuroscience to other biological applications*, University of Pittsburgh, Pittsburgh, PA, March 2014.

41. "Dynamics of Interacting Kuramoto Systems with Time-Dependent Coupling," *SIAM Conference on Applications of Dynamical Systems*, Snowbird, Utah, May 2007.

42. "A Model for Electric Field Modulation of Propagating Neuronal Activity," *Mechanisms of Epilepsy & Neuronal Synchronization* (Gordon Conference) Colby College, Maine, August 2006.

43. "The Breakdown of Synchronization and Shadowing in Coupled Chaotic Systems: Analysis via the Subsystem Decomposition," *International School on Space Time Chaos: Characterization Control and Synchronization*, Pamlona, Spain, June 2000.

44. "Mechanisms for the Development of Unstable Dimension Variability and the Breakdown of Shadowing in Coupled Chaotic Systems," *Workshop on: Complex Synchronization in Neuroscience* , Krasnow Institute for Advanced Study, George Mason University, Fairfax, Virginia, May 2000.

45. "Synchrony, Emergent Sets, and Topological Decoherence," *Dynamics Days Asia Pacific*, Hong Kong, China, July 1999.

46. "Average Expansion Rates and Dimension of Strange Nonchaotic Attractors," *Fifth SIAM Conference on Applications of Dynamical Systems*, Snowbird, Utah, May 1999.

47. "Box-Counting Dimension without Boxes: Computing D_0 from Average Expansion Rates," *Centennial Meeting of the American Physical Society*, Atlanta, Georgia, March 1999.

48. "Characterization of Complex Neuronal Dynamics by Unstable Periodic Orbits," *Gordon Research Conference on Bioelectrochemisty*, New England College, NH, July 1998.

49. "Characterization of Complex Neuronal Dynamics by Unstable Periodic Orbits," *American Physical Society Annual Meeting*, Los Angeles, CA, March 1998.

50. "Periodic Orbits Analysis in Mammalian Neuronal Ensemble," *Sixth Annual Computational Neuroscience Meeting*, Big Sky, MT, July 1997.

51. "Detecting Unstable Periodic Orbits in Chaotic Experimental Data," *The Fourth SIAM Conference on Applications of Dynamical Systems*, Snow Bird, UT, May 1997.

52. "Detecting Unstable Periodic Orbits in Chaotic Experimental Data," *American Physical Society Annual Meeting*, St. Louis, MI, March 1996.

53. "Detecting Dynamical Interdependence and Generalized Synchrony through Mutual Prediction in a Neural Ensemble," *American Physical Society Annual Meeting*, St. Louis, MI, March 1996.

54. "Controlling Chaos using Time Delay Coordinates via Stabilization of Periodic Orbits," *The Third SIAM Conference on Applications of Dynamical Systems*, Snow Bird, UT, May 1995.

55. "Experiments on Quantum Chaos with and without Time Reversal Symmetry," *4th Drexel Symposium on Quantum Nonintegrability*, Drexel University, Philadelphia, PA, September 1994.

56. "Experiments on Quantum Chaos with and without Time Reversal Symmetry," *The 2nd Experimental Chaos Conference*, Arlington, VA, October 1993.

<u>Invited Presentations on Art & Science</u>

1. "MFA and Onward…", MFA Professional Practice Seminars, Maryland Institute College of Art, Baltimore, MD, April 22 2013.

2. "Bridging Science and Art", Special Invited Lecture for AVT599, School of Art, George Mason University, March 29 2013.

3. "Science and Art as Creative Capitals", TEDxWDC (http://tedxwdc.com): *The Creative City: Creativity, Entrepreneurship and Innovation*, Washington DC, April 2012.

4. "The Videos of Julia Oldham: Fundamental Constants", G Fine Art, Washington DC, September 22, 2010.

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September 2019