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Fields of Interest: Mathematical Biology, Differential Equations, Dynamical Systems, Mathematical Methods in Physics, Mathematical Modeling, Numerical Methods

Education:

- August 1999 Ph.D. in Applied Mathematics, *Cornell University, Ithaca, NY*,
Advisor: Richard Rand.
- August 1997 M.S. in Applied Mathematics, *Cornell University, Ithaca, NY*.
- May 1994 B.S. in Mathematics, With Honors, With Distinction,
University of Missouri–Kansas City.
- May 1994 B.S. in Physics, With Honors, With Distinction,
University of Missouri–Kansas City.

Academic Positions:

- Summer 2008 Research Faculty, Mathematical & Theoretical Biology Institute,
Arizona State University
- 2007 – present Associate Professor, Division of Mathematical & Natural Sciences,
Arizona State University
- 2007 – present Adjunct Associate Professor, Department of Mathematics and Statistics,
California State Polytechnic University, Pomona
- 2005 – 2007 Associate Professor, Department of Mathematics and Statistics,
California State Polytechnic University, Pomona
- 2005 – present Co-Director, Applied Mathematical Sciences Summer Institute (AMSSI),
California State Polytechnic University, Pomona & Loyola Marymount University
- 2003, Fall Visiting Scholar, Center for Nonlinear Studies, Los Alamos National Laboratory
- 2001 – 2004 Adjunct Assistant Professor, Department of Biological Statistics
and Computational Biology, Cornell University
- 2000 – 2005 Assistant Professor, Department of Mathematics and Statistics,
California State Polytechnic University, Pomona
- 2000, Spring Visiting Assistant Professor, Department of Mathematics, Cornell University
- 1999, Fall Teaching Associate; Department of Mathematics, Cornell University
- 1999 – 2003 Summer Director, Mathematical and Theoretical Biology Institute (MTBI),
Cornell University

Peer Reviewed Publications:

13. D. Daugherty, T. Roque-Urrea, J. Urrea-Roque, J. Troyer, S. Wirkus, M. Porter, “Mathematical Models of Bipolar Disorder,” *Communications in Nonlinear Science and Numerical Simulation*, 14: 2897-2908, 2009.

12. E. Camacho, S. Wirkus, “Diversifying the Research Experience: creating an REU environment that is conducive to the education of the whole person,” to appear in *Building Diversity in Advanced Mathematics: Models that Work*, American Mathematical Society, Providence, RI.

11. S. Wirkus, M. Porter, “Comment on ‘Bifurcation analysis of parametrically excited bipolar disorder model’,” *Communications in Nonlinear Science and Numerical Simulation*, 14: 2844, 2009.

10. F. Berezovskaya, E. Camacho, S. Wirkus, G. Karev, "Traveling Wave Solutions of Fitzhugh model with Cross-diffusion," *Mathematical Biosciences and Engineering*, 5(2): 239-260, 2008.
9. J. Abiva, E. Camacho, E. Joseph, A. Mikaelian, C. Rogers, J. Shelton, S. Wirkus, "Alcohol's Effect on Neuron Firing," *The Mathematical Scientist*, 32(1): 32-40, June 2007.
8. S. Wirkus, R. Swift, J. Switkes, "On Highway Relativity," *The Mathematical Scientist*, 31(2): 132-133, December 2006.
7. S. Wirkus, "Approximating the Time Delay in Coupled van der Pol Oscillators with Delay Coupling," *Stochastic Processes and Functional Analysis* Marcel Dekker, 483-493, 2004.
6. J. Switkes, S. Wirkus, I. Mihaila, R. Swift, "On the Means of Deterministic and Stochastic Populations," *The Mathematical Scientist*, 28(2): 91-98, December 2003.
5. R. Swift, J. Switkes, S. Wirkus, "Perceived Highway Speed," *The Mathematical Scientist*, 28(1): 29-36, June 2003.
4. S. Wirkus, R. Rand, "The Dynamics of Two Coupled van der Pol Oscillators with Delay Coupling," *Nonlinear Dynamics*, 30: 205-221, Nov 2002.
3. S. Wirkus, R. Rand, "Bifurcations in the Dynamics of Two Coupled van der Pol Oscillators with Delay Coupling," *Proceedings of the DETC'99, ASME Design Engineering Technical Conferences, Sept 13-16, 1999, paper no. DETC99/VIB-8318*.
2. S. Wirkus, R. Rand, A. Ruina, "How To Pump a Swing," *College Mathematics Journal*, 29(4): 266-275, Sept 1998.
1. S. Wirkus, R. Rand, "Dynamics of Two Coupled van der Pol Oscillators with Delay Coupling," *Proceedings of the DETC'97, ASME Design Engineering Technical Conferences, Sept 14-17, 1997, paper no. DETC97/VIB-4019*.

Books:

- R. Swift, S. Wirkus, *A Course in Ordinary Differential Equations*, Chapman & Hall/CRC Press, Boca Raton, FL, 667 pages, 2006.
- R. Swift, S. Wirkus, *Solutions Manual for A Course in Ordinary Differential Equations*, 245 pages, Chapman & Hall / CRC Press, 2007.

Peer Reviewed Publications (non-journal):

- R. Swift, J. Switkes, S. Wirkus, Analysis of the Game "Cover-Up" and Its Variations, *The Mathematical Spectrum*, accepted 2007.

Grants (as Principal Investigator [PI]):

- Enhancement of the Mathematics Component of the 2009-2010 SACNAS Conferences*, National Security Agency, \$628,312, submitted November 2008.
- Enhancement of the Mathematics Component of the 2008 SACNAS Conference*, National Security Agency, \$249,072, H98230-08-1-0114, 7/2008-11/2008.
- REU Site: Applied Mathematical Sciences Summer Institute (AMSSI)*, National Science Foundation, \$511,419, DMS-0453602, 4/2005-3/2008.
- Applied Mathematical Sciences Summer Institute (AMSSI)*, National Security Agency, \$75,000, MSPF-04IC-227, 3/2005-2/2006.

Grants (as co-PI):

- Applied Mathematical Sciences Summer Institute (AMSSI)*, National Security Agency, \$254,653, MSPF 07IC-043, 3/2007-2/2009.
- Applied Mathematical Sciences Summer Institute (AMSSI)*, National Security Agency, \$115,000, MSPF 06IC-022, 3/2006-2/2007.

Non-Peer Reviewed Publications:

10. C.Ambrose, K.Larson, J.Jones, L.Orozco, D.Uminsky, S.Wirkus, "A Mathematical Model of Political Affiliation," <http://www.amssi.org>, 2007.
9. E. Camacho, S. Wirkus, "The Applied Mathematical Sciences Summer Institute," in Gallian, J. (Ed.), Proceedings of the Conference on Promoting Undergraduate Research in Mathematics, pp. 9-14. American Mathematical Society, 2007.
8. J. Hunt, L. LaPlace, E. Miller, J. Pham, E. Camacho, S. Wirkus, "A Continuous Model of Gene Expression," <http://www.amssi.org>, 2005.
7. J.Abiva, E.Camacho, E.Joseph, A.Mikaelian, C.Rogers, J.Shelton, S.Wirkus, "Alcohol's Effect on Neuron Firing," <http://www.amssi.org>, 2005.
6. D. Daugherty, T. Roque-Urrea, J. Urrea-Roque, J. Snyder, S. Wirkus, M. Porter, "Mathematical Models of Bipolar Disorder," <http://arxiv.org/abs/nlin.CD/0311032>, 2004.
5. D. Daugherty, J. Urrea, T. Roque, S. Wirkus, "Models of Negatively Damped Harmonic Oscillators: the Case of Bipolar Disorder," *Cornell University Department of Biological Statistics and Computational Biology Technical Report*, 2002.
4. R. Hernandez, D. Lyles, D. Rubin, T. Voden, S. Wirkus, "A Model of Beta-cell Mass, Insulin, Glucose, and Receptor Dynamics with Applications to Diabetes," *Cornell University Department of Biological Statistics and Computational Biology Technical Report, BU-1579-M*, 2001.
3. N. Crisosto, C. Castillo-Chavez, C. Kribs-Zaleta, S. Wirkus, "Who Says We R_0 Ready for Change," *Cornell University Department of Biological Statistics and Computational Biology Technical Report, BU-1586-M*, 2001.
2. N. Anyadike, O. Ortega, A. Greenblatt, M. Engman, S. Wirkus, "Evolution of Fluconazole Resistance in *Candida albicans*," *Cornell University Biometrics Unit Technical Report, BU-1528-M*, 2000.
1. S. Wirkus, R. Rand, A. Ruina, "Modeling the Pumping of a Swing," *C*ODE*E Newsletter, Winter-Spring 1997*.

Selected Presentations:

- "Some Applications of Mathematics,"
February 2008, MGE@MSA, Arizona State University.
- "Modeling Molecular Systems with Differential Equations,"
November 2007, University of Puerto Rico, Rio Piedras, Natural Science Week Conference.
- "Gene Regulatory Network: A Continuous Nonlinear Model"
September 2007, Dept. of Math BioMath Seminar, Arizona State University, Tempe, AZ.
- "An Epidemiological Model of Collaborative Learning,"
March 2007, Loyola Marymount University Math Colloquium, Los Angeles, CA.
- "Natural Sciences Dissertation Workshop,"
October 2006, Ford Foundation Conference at the National Academies, Washington, DC,
October 2003, Ford Foundation Annual Conference, San Juan, PR,
December 2003, Center for Nonlinear Studies at Los Alamos National Laboratory, NM.
- "Numerical Solutions of Delay Differential Equations,"
July 2004, Hope College Summer Colloquium, Holland, MI,
July 2003, Mathematical Epidemiology Tutorial, Los Alamos, NM.
- "Evolution of Fluconazole Resistance in *Candida albicans*,"
December 2003, University of New Mexico Math Dept. Colloquium, Albuquerque, NM,
July 2003, SIAM Annual Meeting, Montreal, Canada.
- "Who Says We R_0 Ready for Change,"
July 2002, SIAM Annual Meeting, Philadelphia, PA.
- "Approximations of a Time Delay,"
January 2002, AMS/MAA Annual Meeting, San Diego, CA.
- "Complete Bifurcation Set of Two Coupled van der Pol Oscillators with Delay Coupling,"
March 2000, Center for BioDynamics, Boston University,
May 2000, David Blackwell / Richard Tapia Lecture Series, Ithaca, NY,

- March 2001, Loyola Marymount University, Los Angeles, CA.
- “The Dynamics of Two Coupled van der Pol Oscillators with Delay Coupling,”
October 1998, Ford Foundation Conference of Fellows, Irvine, CA,
October 1998, Center for Applied Math Student Talks, Ithaca, NY.
- “Bifurcations in the Dynamics of Two Coupled van der Pol Oscillators with Delay Coupling,”
April 1999, Dept. of Applied Mathematics, University of Colorado at Boulder,
May 1999, SIAM Annual Conference, Atlanta, GA.
- “The Mathematics of Pumping a Swing,”
October 1996, Ford Foundation Conference of Fellows, Irvine, CA,
May 2002, Cal Poly Pomona, Pomona, CA.
- “Unfolding a Degenerate Equilibrium,”
October 1997, Center for Applied Math Student Talks, Ithaca, NY.
- “Similarity Dimension and Fractals,”
April 1995, Northeast Chapter SACNAS Conference, Ithaca, NY.

Masters Thesis Students:

- “Mathematical Models in Education,” Supervised: Marco Sanchez (Cal Poly Pomona), 2003-present.
- “Time Delay in Numerical Methods,” Supervised: Touhida Haider (Cal Poly Pomona), 2003-present.
- “An Epidemiological Model of Collaborative Learning,” Supervised: Gia Nguyen (Cal Poly Pomona), 2006-2008.
- “Fitzhugh-Nagumo Equations,” Supervised: Fayez Khoury (Cal Poly Pomona), 2003-2006.
- “Mathematical Models of the SARS Epidemic,” Supervised: Mourshad Haider (Cal Poly Pomona), 2003-2006.
- “Filtering and Fourier Transforms,” Supervised: Cynthia Robles (Cal Poly Pomona), 2003-2005.

Undergraduate Projects Supervised (or Co-supervised):

- “The Effects of Estrogen and Chemotherapy on the Dynamics of Invasive Carcinoma of Breast Cancer Patients,” Supervised Cindy Jackson, Lindsey Lauderdale, Nicholas Millett, Samantha Smeed, Adrian Smith (MTBI Students), Summer 2008.
- “A Mathematical Model of Political Affiliation,” Supervised Carol Ambrose, Kurt Larson, Jennifer Jones, Lucila Orozco (AMSSI students), Summer 2007.
- “Alcohol’s Effect on Neuron Firing,” Supervised Charles Rogers, Jeannine Abiva, Edna Joseph, Arpy Mikaelian (AMSSI students), Summer 2005.
- “A Continuous Model of Gene Expression,” Supervised Elizabeth Miller, Jason Pham, Lissette LaPlace, Joseph Hunt (AMSSI students), Summer 2005.
- “A Mathematical Model of Photoreceptor Interactions,” Supervised Miguel Colon, Daniel Hernandez, Ubaldo Rodriguez-Bernier, Jon van Laarhoven (MTBI students), Summer 2003.
- “The Phase Coupling of van der Pol Oscillators,” Supervised: Darryl Daugherty (Undergraduate student at Cal Poly Pomona), 2002-2003.
- “Models of Negatively Damped Harmonic Oscillators: the Case of Bipolar Disorder,” Supervised: Darryl Daugherty, John Urrea, Tairi Roque (MTBI Students), Summer 2002.
- “Who Says We R_0 Ready for Change,” Supervised: Nicolas Crisosto (Summer 2001).
- “A Model of Beta-cell Mass, Insulin, Glucose, and Receptor Dynamics with Applications to Diabetes,” Supervised: Ryan Hernandez, Danielle Lyles, Daniel Rubin, Thomas Voden (MTBI Students), Summer 2001.
- “The Role of Time Delay in the Fitzhugh-Nagumo Equations: The Impact of Alcohol on Neuron Firing,” Supervised: Romel Franca, Ivy Prendergast, Eva-Shirley Sanchez, Marco Sanchez (MTBI Students), Summer 2001.
- “Evolution of Fluconazole Resistance in *Candida albicans*,” Supervised: Nnaemeka Anyadike, Omayra Ortega, Aaron Greenblatt (MTBI Students), Summer 2000.

“Differential Equation Models of Neoadjuvant Chemotherapeutic Treatment Strategies for Stage III Breast Cancer,” Supervised: Edith Aguirre, Nicolas Davidenko, Tametra Smith, Jennifer Stancil (MTBI Students), Summer 1999.

“Discussion of Difference Equation Model of Ventricular Parasystole as an Interaction Between Cardiac Pacemakers Based on the Phase Response Curve,” Supervised: Nandi Leslie, Miriam Nuno, Alicia Simms Del Castillo (MTBI Students), Summer 1998.

“A Mathematical Model of the Dynamics of *Rickettsia rickettsii* in Tick-Host Interactions,” Supervised: Mary Alderete, Carlos Castillo-Garsow, Carlos Lara, Gina Ramirez, Guarionex Jordan-Salivia, Monica Yichoy (MTBI Students), Summer 1996.

Organizational Activities:

Steering Committee for International or National Conferences

AIMS' Fifth International Conference Dynamical Systems and Differential Equations, Cal Poly Pomona (6/2004).

Ford Foundation Conference of Fellows, San Juan, Puerto Rico (10/2003).

Summer Undergraduate Research Institutes Organized & Directed

Co-Director, *Applied Mathematical Sciences Summer Institute (AMSSI)*, Cal Poly Pomona and Loyola Marymount University, (2005-present). Co-directed summer research program with Prof. Erika Camacho geared for undergraduate women and underrepresented minority students. Helped plan syllabus and homework assignments for nonlinear differential equations; co-organized and ran weekly staff meetings; invited guest speakers; co-organized tours of local industries; supervised research assistants; helped guide two group research projects which culminated in poster and oral presentations as well as Department of Mathematics & Statistics Technical Reports; tracked career progress of former AMSSI students.

Summer Director, *Mathematical and Theoretical Biology Institute (MTBI)*, Cornell University, (Summer 1999-2003). Co-directed summer research program with Prof. Carlos Castillo-Chavez geared for undergraduate Latino and other minority students. Planned syllabus and homework assignments for daily lectures on topics such as nonlinear difference and differential equations, probability, stochastic processes and linear algebra; advised math instructors; organized and ran computer lab sessions; organized and ran weekly staff meetings; lectured on nonlinear ode's; supervised teaching assistants; helped guide group research projects which culminated in poster and oral presentations as well as Department of Biometrics Technical Reports.

Research Sessions at National Conferences Organized

New Generation of Math Ph.D.s session at Society for Advancement of Chicanos and Native Americans in Science, Kansas City, MO in 2007, Tampa, FL in 2006, and Denver, CO in 2005.

Math REUnion session at Society for Advancement of Chicanos and Native Americans in Science, Tampa, FL in 2006 and Denver, CO in 2005.

Minisymposium "Applications of Discrete and Continuous Dynamical Systems" (MS56) at SIAM Annual Conference, Portland, OR (7/2004).

Minisymposium on Applications of Nonlinear Oscillators (MS14), SIAM Annual Conference, Montreal, Canada (6/2003).

Minisymposium on Theoretical Biology and Nonlinear Dynamics (MS29), SIAM Annual Conference, Montreal, Canada (6/2003).

Diversity Day, SIAM Annual Conference, Montreal Canada (6/2003).

Minisymposia on Theoretical Biology and Nonlinear Dynamics (MS30, MS46), SIAM Annual Conference, Philadelphia, PA (7/2002).

Chaired Sessions at National Conferences

Contributed Session “Bifurcation and Oscillation” (CS06), AIMS’ Dynamical Systems and Differential Equations Conference, Pomona, CA (6/2004).

Mathematics, Physical Science & Engineering Academic Exchange Session, Ford Foundation Conference for Fellows, Albuquerque, NM (10/2002).

Awards and Fellowships:

2006: Leader in Undergraduate Research Citation, National Security Agency

2002, 2003: Mentoring Recognition Award, Mathematical and Theoretical Biology Institute

2000: Mentoring Recognition Award, Blackwell/Tapia Distinguished Lecture Series

1998 – 1999: Cornell University Graduate Anonymous Donor Award

1995: Cornell University EMPO Director’s Award for Academic Excellence

Ford Foundation Fellow

Corning Foundation Graduate Fellow

NSF Graduate Engineering Education Fellow

Honor Society of Phi Kappa Phi Graduate Fellow

Memberships:

1991 – present: Golden Key National Honor Society

1992 – present: Honor Society of Phi Kappa Phi

1995 – present: Society for the Advancement of Chicanos and Native Americans in Science

1997 – present: Society for Industrial and Applied Mathematics

Selected Service:

Professional

- Reviewed book manuscripts for Chapman & Hall / CRC Press
- Refereed manuscripts for *Journal of Vibration & Control*

University

Arizona State University, Departmental Service:

Personnel Review Committee (2008-present); NCIAS Promotion & Tenure Committee (2007-present);

Applied Math Degree Implementation Committee (Chair, 2007-present); Tenure Committees (Member of 1, 2008);

Three Year Pre-tenure Review Committees (Chair of 1, 2007; Chair of 1, 2008);

Hiring Committee for Applied Computing (2007-2008), MSAC Math Lecturer Hiring Committee (Chair, 2007-2008).

Cal Poly Pomona, University Service:

Curriculum Committee (2001-2003); Commencement Committee (2002-2003); Reader for Graduate Writing Test (6 times during 2001-2004).

Cal Poly Pomona, Departmental Service:

Scholarship Committee (2000-2001); Instructional Assessment Committee (2000-2001, Chair 2001-

2002); Recruitment and Outreach Committee (2001-2005); RTP Document Review Committee

(2001-present, Chair 2003-2004); Academic Excellence Workshop Faculty Advisor (2000-present);

Science Educational Enhancement Services (SEES) Faculty Advisor (2003-present); Budget Com-

mittee (2002-2003, 2004-2005); Colloquium Committee (2002-2003; Chair in Fall 2002, Winter

2003); Computer Committee (2003-present; Chair 2004-present); Curriculum Committee (2003-

2004); Lecturer Evaluation Committee* (2005-2006); Nominating Committee (2005-2006); RTP

Committee* (2006-2007); Textbook Committee (2006-2007).

Cornell University, Center for Applied Mathematics Service:

Degree Requirements Committee Member (1998-1999); Bill Sears Seminar Committee Member (1995-1996).

* =Elected Committee