CAMS

Center for Applied Mathematics and Statistics

ANNUAL REPORT

2012-2013

NJIT New Jersey's Science & Technology University

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I. FROM THE DIRECTOR

This is the 28th year that the Center for Applied Mathematics and Statistics (CAMS) has supported research and training in the mathematical sciences at NJIT. This annual report marks a significant change for CAMS, in that Daljit S. Ahluwalia will be stepping down as Director of the Center on September 4, 2013.

Professor Ahluwalia, who we affectionately call Daljit, is the founding Director of CAMS and has been the head of the center for more than 27 years. He has been an upbeat, energetic, and forceful proponent for research in the mathematical sciences at NJIT. Daljit played a large role in the founding of the Capstone Laboratory, the formation of the CAMS Computation Center, and the acquiring of our first massively parallel computer cluster "Hydra" in 2005 (the MRI grant was the largest in the country for any math department. He was instrumental in pushing forward our successful Undergraduate Mathematics and Biology Training Program (UBM) and the program on Computational Science Training for Undergraduates in the Mathematical Sciences (CSUMS), both funded by the National Science Foundation. Daljit is a main force behind our hosting of our popular ``Frontiers in Applied and Computational Mathematics'' conference, which just celebrated its 10th edition (see below). Daljit's service to NJIT was honored by a university resolution in 2011, which noted his "decisive role in the evolution of the Mathematical Sciences Department into a nationally recognized center of excellence in research and education". On a personal level, I think each of us has at one time or another heard Daljit say, "tell me what you need to do your research", and then watched in wonderment as he would successfully follow through on the request. We will miss his optimism and energy, but know it will continue to be put to good use, and wish him well in future pursuits.

As noted last year, we take particular pride in the undergraduate research supported by CAMS, which has been especially encouraged by our current Provost and former Dean, Fadi Deek. Recently, CAMS faculty have combined with faculty from the Department of Computer Science and researchers in industry to propose to NSF a five year "EXTREEMS" program, which will significantly enhance the exposure of undergraduate mathematical science students to topics in computational and data enabled science and engineering. The proposal was funded, and we look forward to starting a successful program in the fall.

Some of the other highlights and significant achievements of this past year include:

•The awarding of nine new grants from NSF and other agencies, which is an admirable achievement in this age of dwindling research funds. CAMS receives substantial funding for graduate student and faculty research from sources such as the National Science Foundation, National Institutes of Health, Office of Naval Research, Department of Defense, NASA, Newark Beth Israel Medical Center, NJ Meadowlands Commission and private industry.

•Hosting of the 10th Frontiers in Applied and Computational Mathematics (FACM) conference. The conference was held on May 31-June 2, 2013. The three day meeting focused on application of mathematics to fluid dynamics, wave propagation, and mathematical biology, as well as applied statistics, and attracted over 175 participants.

•The purchase of a 156 core extension (including 2 GPU's) to our newest computer cluster, Stheno. This nearly doubles its capabilities for a second year in a row.

As always, the accomplishments of CAMS have been built with the support and dedication of many individuals. We are grateful to Fadi Deek, Provost and Sr. Executive Vice President, Jonathan Luke, Interim Dean of CSLA, and Don Sebastian, Sr. Vice President for Research, for encouraging CAMS through their strong support of scientific research. Finally, we thank President Joel Bloom, who has been a constant source of support for CAMS and its mission. We look forward to continued fruitful interactions with these individuals in the upcoming year.

Michael Siegel, Associate Director

II. MISSION STATEMENT

The Center for Applied Mathematics and Statistics (CAMS) is an interdisciplinary research center dedicated to supporting applied research in the mathematical sciences at NJIT. CAMS was established in 1986 to promote research in the mathematical sciences at the New Jersey Institute of Technology. Members of the Department of Mathematical Sciences naturally form the core of CAMS membership, but the importance of mathematics for science and technology has made CAMS an interdisciplinary organization.

CAMS brings researchers from academia, industry, and government to NJIT by organizing interdisciplinary workshops and by bringing together researchers with common goals whose strengths are complementary. CAMS activities also include support for the submission of research proposals, which is done through dissemination of information, organization of group projects, collegial advice and assistance with application documents. Graduate student research is encouraged through the CAMS Summer Research Program and support for students to attend conferences. CAMS sponsors an annual conference, "Frontiers in Applied and Computational Mathematics," which has become a leading forum for the presentation of new research in applied mathematics and the sciences.

In the future, CAMS hopes and expects to maintain its high standards of professionalism and scholarship and plans to extend its activities to include fostering more research by undergraduate students and developing long-term relationships with industry.

Department of Mathematical Sciences

Advisory Board - 2013

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Dr. Richard Silberglitt	Rand Corporation
Dr. Anne-Sophie Vanroyen	Modus Quantitative Advisors
Dr. Benjamin White	Exxon Research & Engineering

III. MEMBERS AND VISITORS

Department of Mathematical Sciences

Afkhami, Shahriar
Ahluwalia, Daljit S.
Andrushkiw, Roman
Bechtold, John
Blackmore, Denis
Booty, Michael
Bose, Amitabha
Boubendir, Yassine
Bukiet, Bruce
Bunker, Daniel
Choi, Wooyoung
Cummings, Linda
Deek, Fadi
Dhar, Sunil
Dios, Rose
Golowasch, Jorge
Goodman, Roy
Guo, Wenge
Horntrop, David
Jain, Aridaman
Jiang, Shidong
Johnson, Kenneth
Kappraff, Jay
Kondic, Lou
Kriegsmann, Gregory A.
Loh, Ji Meng
Luke, Jonathan
Matveev, Victor
Michalopoulou, Zoi-Heleni
Milojevic, Petronije
Miura, Robert M.
Moore, Richard
Muratov, Cyrill
Nadim, Farzan
Perez, Manuel
Petropoulos, Peter
Rotstein, Horacio
Russell, Gareth
Siegel, Michael
Subramanian, Sundar
Sverdlove, Ronald
Turc, Catalin
Young, Yuan-Nan

Department of Civil and Environmental Engineering: Meegoda, Jay

Department of Mechanical Engineering: Rosato, Anthony

Federated Department of Biological Sciences: Holzapfel, Claus (Rutgers University)

CAMS Research Professors

Huang, Huaxiong	York University, Toronto, Canada
Papageorgiou, Demetrios	Imperial College, London
Wylie, Jonathan	City University of Hong Kong

CAMS External Faculty Members

Booth, Victoria	University of Michigan, Ann Arbor
Diez, Javier	University Nacional del Centro, Tandil, Argentina
Erneux, Thomas	Université Libre de Bruxelles, Belgium
Tao, Louis	Peking University, China
Vanden-Broeck, Jean-Marc	University College London

IV. COLLOQUIA AND SEMINARS

Department of Mathematical Sciences Colloquium

September 7, **Richard Moore**, NJIT, *Optimal Control in Data Assimilation*

September 21, **Jun Zhang**, New York University, *Understanding Biolocomotion in Fluids: from Passive to Active*

September 28, **Pushpendra Singh**, NJIT, *Dispersion of Particles on Fluid-Liquid Interfaces*

October 5, **Panayotis Kevrekidis**, University of Massachusetts, *Stability and Dynamics of Solitary Waves and Vortices in Superfluids: From Theory to Experiments*

October 12, **Philip Rack**, University of Tennesee, Knoxville, *Directed, Liquid Phase Assembly of Patterned Metallic Films by Pulsed Laser Dewetting*

October 19, **German Mato**, Balseiro Institute, Argentina, *Temporal Coding in Spiking and Bursting Neurons*

October 26, **David Edwards**, University of Delaware, *Increasing the Utilities of Optical Biosensors*

November 2, **Yixin Guo**, Drexel University, *A Model of Thalamocortical Relay Neuron and the Parkinsonian Network*

November 9, **Edsel A. Pena**, University of South Carolina, *Multiple Decision-Making in the Face of Uncertainty*

November 16, **Mikko Haataja**, Princeton University, *Compositional Interface Dynamics within Symmetric and Asymmetric Planar Lipid Bilayer Membranes*

November 30, **Yoichiro Mori**, University of Minnesota, *A Model of Electrodiffusion and Osmosis in Cells and Tissues*

December 7, **Gregor Kovacic**, RPI, *Is Our Sensing Compressed?*

January 25, **Shidong Jiang**, NJIT, *Integral Equation Methods for Fourth Order PDEs*

February 1, **Anita Layton**, Duke University, *Simulating Fluid Flow and Solute Transport in a Compliant Tube*

February 8, **Michael Miksis**, Northwestern University, *Drying Process*

February 15, **Marty Golubitsky**, Ohio State University, *Patterns of Phase-Shift Syncrhony*

February 22, **Yixin Guo**, Drexel University, *A Model of Thalamocortical Relay Neuron and the Parkinsonian Network*

March 1, **Phil Holmes**, Princeton University, *The Neuromechanics of Insect Locomotion: How Cockroaches Run Fast and Stably without Much Thought*

March 8, **Howard Stone**, Princeton University, *Variations on Familiar Flows: (i) Marangoni Flows with Surfactants and (ii) Trapping of Bubbles in Stagnation Point Flows*

March 15, **Walter Craig**, McMaster University, Canada, *On the Surface Signature of Internal Waves*

April 5, **Gang Bao**, Michigan State University*, Inverse Scattering in Wave Propagation*

April 12, **Fernando Muzzio**, Rutgers University, *The Physics of Powders Flow - Dilation, Segregation, and Jamming - Where is the Math?*

April 19, **Stefan Llewellyn Smith**, University of California, San Diego, *Hollow Vortices*

April 26, **Petia Vlahovska**, Brown University, *Electromechanics of Biomimetic Membrane*

May 3, **Kevin Hall**, Laboratory of Biological Modeling, NIDDK, National Institute of Health, *Quantitative Physiology of Human Metabolism and Bodyweight Dynamics*

May 7, **Orest Diachok**, Johns Hopkins University, *Bioacoustic Absorption Spectroscopy*

Applied Statistics Seminar

September 12, **Zhiying Qiu**, NJIT, *A Class of Generalized Fixed Sequence Procedures Controlling the FWER under Dependence*

September 27, **Antai Wang**, Columbia University, *Goodness-of-fit Tests for Archimedean Copula Models*

October 11, **Shoubhik Mondal**, NJIT, *Model Assisted Cox Regression*

October 25, **Chuanhua Xing**, Boston University, *Inverse-probability Weighted Estimating Equations for Analyzing Secondary Phenotypes in Case-control Genetic Association Studies*

November 8, **Yu Ryan Yue**, Baruch College, The City University of New York, *Bayesian General Linear Model for fMRI Data*

November 15, **Yang Feng**, Columbia University, *Consistent Cross-validation for Tuning Parameter Selection in High-dimensional Variable Selection*

November 29, **Zhigang Zhang**, Memorial Sloan-Kettering Cancer Center, *Statistical Analysis of Interval-censored Data using Semi-parametric Models and Empirical Likelihood Approaches*

December 6, **Sundar Subramanian**, NJIT, *Semiparametric Likelihood Ratio Confidence Intervals for Survival Probabilities*

December 13, **Lee Dicker**, Rutgers, *Residual Variance and the Signal-to-noise Ratio in High-Dimensional Linear Models*

January 30, **Biao Zhang**, The University of Toledo, *Semiparametric ROC Curve Analysis under Density Ratio Models*

January 31, **Dylan Small**, Wharton School, University of Pennsylvania, *Case Definition and Design Sensitivity in Case Control Studies*

February 6, **Antai Wang**, Columbia University, *Goodness of Fit Tests for Archimedean Copula Models*

February 13, **Ning Hao**, University of Arizona, *Identify Interactions for High Dimensional Data*

February 20, **Xu Han**, Temple University, *False Discovery Control under Arbitrary Dependence*

February 27, **Jin Liu**, Yale University, *Integrative Analysis of Prognosis Data on Multiple Cancer Subtypes Using Compound Group Bridge*

April 11, **Gavin Lynch**, NJIT, *On Procedures Controlling the FDR for Testing Hierarchically Ordered Hypotheses*

April 17, **Jichun Xie**, Temple University, *Optimal High Dimensional Multiple Testing Under Linear Models*

April 25, **Mike Tortorella**, Rutgers University, *Flows in Networks with Unreliable Elements*

Mathematical Biology Seminar

September 25, **Erol Gelenbe**, Imperial College, *The Random Neural Network: Theory and Applications*

October 9, **Sashi Marella**, NJIT, *Neuromodulation of Cortical Interneurons in Epileptic Animal Models*

October 23, **Allen Tannenbaum**, University of Alabama-Birmingham, *Mathematical Methods in Medical Image Computing*

October 30, **Katherine Newhall,** New York University, *Synchronous Firing Events in Stochastic Neuronal Network Models*

November 6, **Dirk Bucher**, University of Florida, Joint Seminar with Department of Biological Sciences

November 20, **Markus A. Dahlem**, Humboldt University Berlin, *Migraine: A Dynamical Disease*

November 27, UBM Student Presentations

December 4, **Tomasz Smolinski**, Delaware State University, *Analyzing Conductance Correlations Involved in Recovery of Bursting after Neuromodulator Deprivation in Lobster Stomatogastric Neuron Models*

December 11, UBM Student Presentations

January 22, **Katherine Newhall**, New York University, *Synchronous Firing Events in Stochastic Neuronal Network Models*

January 24, **Xaq Pitkow**, University of Rochester, *Efficient Coding and Beyond in the Early Visual System*

January 29, **Marian Gidea**, Institute of Advanced Studies, *Topology and Dynamics: From Mechanical to Biological Systems*

February 5, **Joyce Lin**, University of Utah, *Modeling the Electrical Activity in Cardiac Tissue*

February 12, **Casey Diekman**, Ohio State University, *Linking Gene Expression Rhythms to*

Membrane Dynamics in the Circadian Clock

February 14, **Michael Chevalier**, University of California at San Francisco, *Quantifying Stochastic and Spatio-temporal Effects in Biological Signaling Pathways*

February 19, **Peter Thomas**, Case Western University, *Noise and the Single Neuron*

February 20, **Sridhar Raghavachari**, Duke University, *Quantifying Negative Feedback Regulation by MicroRNAs*

March 5, **Sorinel Oprisan**, College of Charleston, *How does the brain keep track of time?*

March 26, **Sarah Muldoon**, INSERM, France, *The Structure of Synchrony in Chronically Epileptic Networks: A Multi-scale Approach*

April 2, **Miranda I. Teboh-Ewungkem**, Lafayette College, *Complex Dynamics in a Model for the Vector-Borne Disease Malaria*

April 16, **Yuriy Polyakov**, US PolyResearch, *Analysis of Brain Activity Signals: Application to the Diagnosis of Schizophrenia and Photosensitive Epilepsy*

April 23, **Josh Chang**, Ohio State University, *Gaussian Integrals for Inverse Problems*

Fluid Mechanics Seminar

September 10, **Yeng-Long Chen**, Academic Sinica, *Flow and Fractionation of Soft Deformable Particles in Microchannels*

September 24, **Kellen Petersen**, NYU, *Finding Minimum Energy Paths of Droplets on Superhydrophobic Surfaces: A Phase Field Approach*

October 1, **Christopher Batty**, Columbia University, *Computer Animation of Thin Liquid Splashes and Sheets*

October 8, **Aleksandar Donev**, NYU, *Coupling a Fluctuating Fluid with Suspended Structures*

October 22, **Gabriel Chaves**, NJIT, *Survey of Micromagnetic Modelling Techniques*

November 5, **Carlo Fazioli**, NJIT, *Overlapping Patches for Dynamic Problems*

November 12, **Marc Kjerland**, University of Illinois at Chicago, *Linear Response Closure Approximation for Chaotic Multiscale Systems*

November 19, **Enkeleida Lushi**, Imperial College London, *Collective Dynamics in Suspensions of Motile Micro-particles*

January 31, **Len Pismen**, Israel Institute of Technology, Rheology of Cytoskeleton: *From Mesoscopic Mechanics to Macroscopic Instabilities*

February 11, **Chun Liu**, Penn State, *Ionic Fluids and Their Transport: From Kinetic Descriptions to Continuum Models*

February 18, **Gideon Simpson**, University of Minnesota, *Numerical Analysis of Parallel Replica Dynamics*

February 25, **Hassan Masoud**, New York University, *Bio-Inspired Locomotion in Newtonian Fluids: Crawling, Flying, and Swimming*

March 25, **Shahab Shojaei Zadeh**, Rutgers, *Capillary-Induced Interactions between Janus Particles at Liquid-Fluid Interfaces*

April 1, **Robert Style**, Yale University, *Drops on Squishy Surfaces*

April 8, **Nick Moore**, Courant Institute of Mathematical Sciences, *Reduced-order Modeling of Fluid-structure Interactions*

April 15, **Ivan Christov**, Princeton University, *Diffusion in Flows of Granular Materials*

April 22, **Jose Ignacio Tello**, Universidad Politecnica de Madrid, *Some Inverse Problems in Lubrication Theory*

April 29, **Manman Ma**, NJIT, *A Numerical Method for Electro-osmotic Flow with Deformable Interfaces*

May 6, **Herve Nganguia**, NJIT, *Electro-deformation of a Surfactant-laden Viscous Drop*

Waves Seminars

September 9, **Catalin Turc**, Mathematics, NJIT, *Efficient Solutions of Periodic Scattering Problems*

September 10, **Richard McLaughlin**, UNC Chapel Hill, *Lagrangian Tori Induced by Precessing Bent Rods in Viscous Dominated Flows*

October 24, **Weiqing Ren**, Singapore University, *The String Method for the Study of Rare Events*

November 28, **Matthew Williams**, PACM, Princeton, *Exploiting Low Dimensionality in Nonlinear Optics and Other Physical Systems*

December 5, **Victor Dominguez**, Universidad Publica de Navarra, Spain, *Robust Methods for Highly Oscillatory Integrals*

December 12, **Bill Schultz**, University of Michigan, *Oscillating Contact Lines*

March 13, **Alex Barnett**, Mathematics, Dartmouth College, *Efficient and Robust Integral Equation Methods for 3D Acoustic Scattering from Doubly-periodic Media*

April 17, **Andreas Kloeckner**, Mathematics, NYU, *Quadrature by Expansion: A New Method for the Evaluation of Layer Potentials*

April 24, **Catalin Turc**, Mathematics, NJIT, *Regularized Combined Field Integral Equations for Solution of Scattering Problems in the Frequency Domain*

V. PUBLICATIONS, PRESENTATIONS, AND REPORTS

A. PUBLICATIONS

JOURNAL PUBLICATIONS

Shahriar Afkhami

Directed Assembly of One- and Two-dimensional Nanoparticle Arrays from Pulsed Laser Induced Dewetting of Square Waveforms (with N. A. Roberts, J. D. Fowlkes, K. Mahady, L. Kondic, and P. D. Rack), ACS Applied Materials & Interfaces, Vol. 5, pp. 4450-4456, 2013.

John Bechtold

Asymptotic Structure of Laminar Diffusion Flames at High Pressure (with D. Fong and C.K. Law), Physics of Fluids, Vol. 24, 093602, pp. 1-17, 2012.

Denis Blackmore

A Vertex Operator Representation of Solutions to a Gurevich--Zybin Hydrodynamical System (with Y. Prykarpatsky, J. Golenia, and A. Prykarpatsky), Opuscula Math, Vol. 33 (1), pp. 139-149, January 2013.

Invariant Measures for Discrete Dynamical Systems and Ergodic Properties of Generalized Boole Type Transformations (with Y. Prykarpatsky, J. Golenia, and A. Prykarpatsky), Ukr. Math. J., Vol. 65 (1), pp. 44-57, February 2013.

New Vortex Invariants in Magneto-hydrodynamics and a Related Helicity Theorem (with A. Prykarpatsky), Chaotic Modeling and Simulation, Vol. 2, pp. 239-245, February 2013.

Victoria Booth

Contrasting Existence and Robustness of REM/non-REM Cycling in Physiologically-based Models of REM Sleep Regulatory Networks (with C. Diniz Behn and A. Anathasubramaniam), SIAM J Appl Dyn Sys, Vol. 12, pp. 279-314, 2013.

A Dynamical Role for Acetylcholine in Synaptic Renormalization (with C.G. Fink, G.G. Murphy, and M. Zochowski), PLOS Comput Biol, Vol. 9 (3), e1002939, 2013.

Michael Booty

Semi-Analytical Solutions for Two-Dimensional Elastic Capsules in Stokes Flow (with M. Higley and M. Siegel), Proceedings of the Royal Society Series A, Vol. 468, pp. 2915-2938, October 2012.

Analytical and Computational Methods for Two-Phase Flow with Soluble Surfactant (with Kuan Xu and M. Siegel), SIAM J. Appl. Math., Vol. 73 (1), pp. 523-548, 2013.

Yassine Boubendir

Domain Decomposition Methods for Solving Stokes-Darcy Problems with Boundary Integrals (with S. Tlupova), SIAM Journal on Scientific Computing, Vol. 35, No. 1, pp. 82-106, 2013.

Wave-number Estimates for Regularized Combined Field Boundary Integral Operators in Acoustic Scattering Problems with Neumann Boundary Conditions (with C. Turc), IMA Numerical Analysis, doi: 10.1093/imanum/drs038, March 2013.

Daniel Bunker

Trait-dependent Response of Dung Beetle Populations to Tropical Forest Conversion at Local and Regional Scales (with E. Nichols, M. Uriarte, M.E. Favila, E.M. Slade, K. Vulinec, T. Larsen, F. Vaz-de-Mello, J. Louzada, S. Naeem, and S. Spector), Ecology, Vol. 94(1), pp. 180-189, January 2013.

Wooyoung Choi

Breaking Waves in Deep and Intermediate Waters (with M. Perlin and Z. Tian), Ann. Rev. Fluid Mech., Vol. 45, pp. 115-145, January 2013.

Evolution of Deep-water Waves under Wind Forcing and Wave Breaking Effects: Numerical Simulations and Experimental Assessment (with Z. Tian), Eur. J. Mech./B Fluids, Vol. 41, pp. 11-22, June 2013.

Linda J. Cummings

Asymptotic Solutions of Glass Temperature Profiles during Steady Optical Fiber Drawing (with M. Taroni, C.J.W. Breward, and I.M. Griffiths), Journal of Engineering Mathematics, Vol. 80, Issue 1, pp. 1-20, June 2013.

Towards an Optimal Model for a Bistable Nematic Liquid Crystal Display Device (with C. Cai and L. Kondic), Journal of Engineering Mathematics, Vol. 80, Issue 1, pp. 21-38, June 2013.

Mathematical Model of Growth Factor Driven Haptotaxis and Proliferation in a Tissue Engineering Scaffold (with J. Pohlmeyer and S.L. Waters), Bulletin of Mathematical Biology, Vol. 75, Issue 3, pp. 393-427, March 2013.

Sunil K. Dhar

The Application of Bayesian Adaptive Design in Clinical Trials (with Xiaoyu Lu), American Journal of Mathematics and Statistics, Vol. 3 (2), pp. 67-72, 2013.

Modeling with Bivariate Geometric Distributions (with Jing Li), Communications in Statistics - Theory and Methods, Vol. 42, pp. 252–266, 2013.

Additional Hemodynamic Measurements with an Esophageal Doppler Monitor: A Preliminary Report of Compliance, Force, Kinetic Energy, and Afterload in the Clinical Setting (with Glen Atlas, David Brealey, Gerhard Dikta, and Meryvn Singer), Journal of Clinical Monitoring and Computing, Vol. 26, pp. 473-482, 2012.

Comparisons of Concurrent Vision Dysfunctions in Convergence Insufficiency with Traumatic Brain Injury Patients Optometry and Vision Science (with Tara L. Alvarez, Eun H. Kim, Vincent R. Vicci, Bharat B. Biswal, and A. M. Barrett), Vol. 89 (12), pp. 1740-51, 2012.

Javier Diez

Stability of a Liquid Ring on a Substrate (with A. G. Gonzalez and L. Kondic), J. Fluid Mech., Vol.

718, pp. 246-269, February 2013.

Competition between Collapse and Breakup in Nanometer-sized Thin Rings using Molecular Dynamics and Continuum Modeling (with J. T. Dac Nguyen, M. Fuentes-Cabrera, J. D. Fowlkes, A. G. González, L. Kondic, and P. D. Rack), Langmuir, Vol. 28, pp. 13960–13967, 2012.

Parallel Assembly of Particles and Wires on Substrates by Dictating Instability Evolution in Liquid Metal Films (with J. Fowlkes, L. Kondic, A. G. Gonzalez, Y. Wu, N. Roberts, C. McCold, and P. Rack), Nanoscale, Vol. 4, pp. 7376-84, October 2012.

Thomas Erneux

Complex Dynamics of Semiconductor Quantum Dot Lasers Subject to Delayed Optical Feedback (with C.Otto, B.Globisch, K. Lüdge, and E. Schöll), Int. J. Bif. Chaos, Vol. 22, 1250246, October 2012.

Direct Modulation of Semiconductor Ring Lasers: Numerical and Asymptotic Analysis (with S. Takougang Kingni, G. Van der Sande, L. Gelens, and J. Danckaert), JOSA B, Vol. 29, pp. 1983–1992, August 2012.

Delay-periodic Solutions and Their Stability using Averaging in Delay-differential Equations, with Applications (with T.W. Carr and R. Haberman), Physica D, Vol. 241, pp. 1527–1531, September 2012.

Phase and Intensity Dynamics of a Two-frequency Laser Submitted to Resonant Frequency-shifted Feedback (with J. Thévenin, M. Romanelli, M. Valet, and M. Brunel), Phys. Rev. A, Vol. 86, 033815, September 2012.

Strongly Asymmetric Square-waves of Time Delayed Systems (with L. Weicker, O. d'Huys, J. Danckaert, M. Jacquot, Y. Chembo, and L. Larger), Phys. Review E, Vol. 86, 055201(R), November 2012.

Strong Feedback Limit of the Goodwin Circadian Oscillator (with A. Woller and D. Gonze), Phys. Review E, Vol. 87, 032722, March 2013.

Intradot Time Scales Strongly Affect the Relaxation Dynamics in Quantum Dot Laser (with M. Abusaa, J. Danckaert, and E. A. Viktorov), Phys. Rev. A, Vol. 87, 063827, June 2013.

Wenge Guo

Analysis of High Dimensional Data using Pre-defined Set and Subset Information, with Applications to Genomic Data (with Mingan Yang, Chuanhua Xing, and Shyamal Peddada), BMC Bioinformatics, Vol. 13, p. 177, July 2012.

Claus Holzapfel

Ecological and Environmental Issues Faced by a Developing Tibet (with C. Yu, Y. Zhang, R. Zheng, X. Zhang, and J. Wang), Environmental Science and Technology, Vol. 46, pp. 1979-1980, 2012.

The Association of Native and Non-native Annual Plants with Larrea Tridentata (Creosote Bush) in the Mojave and Sonoran Deserts (with J.L. Schafer, E.L. Mudrak, C.E. Haines, H.A. Parag, and K.A. Moloney), Journal of Arid Environments, Vol. 87, pp. 129-135, 2012.

The Relative Abundances of Native and Non-native Emydid Turtles across an Urban to Rural Habitat Gradient in Central New Jersey (with T. Duchak), Bulletin, New Jersey Academy of Sciences, Vol. 56, pp. 23-28, 2012.

Huaxiong Huang

Optimal Retirement Consumption with a Stochastic Force of Mortality (with M.A. Milevsky and T.S. Salisbury), Insurance: Mathematics and Economics, Vol. 51, pp. 282-291, September 2012.

Valuation and Hedging of the Ruin- Contingent Life Annuity (RCLA) (with M.A. Milevsky and T.S. Salisbury), Journal of Risk and Insurance, DOI: 10.1111/j.1539- 6975.2012.01509.x, April 2013.

Shidong Jiang

Integral Equation Methods for Unsteady Stokes Flow in Two Dimensions (with S. Veerapaneni and L. Greengard), SIAM J. Sci. Comput., Vol. 34, (4), pp. A2197-A2219, August 2012.

A Fast Multipole Method for the Rotne-Prager-Yamakawa Tensor and Its Applications (with Z. Liang, Z. Gimbutas, L. Greengard, and J. Huang), J. Comput. Phys., Vol. 234, pp. 133-139, February 2013.

A Bootstrap Method for Sum-of-Poles Approximations (with K. Xu), J. Sci. Comput., Vol. 55, pp. 16-39, April 2013.

Lou Kondic

Persistence of Force Networks in Compressed Granular Media (with M. Kramar, A. Goullet, and K. Mischaikow), Phys. Rev. E, Vol. 87, 042207, pp. 1-10, April 2013.

Directed Assembly of One- and Two-dimensional Nanoparticle Arrays from Pulsed Laser Induced Dewetting of Square Waveforms (with N. Roberts, J. Fowlkes, K. Mahady, S. Afkhami, and P. Rack), ACS Applied Materials & Interfaces, Vol. 5, pp. 4450-58, March 2013.

Towards an Optimal Model for a Bistable Nematic Liquid Crystal Display Device (with L. Cummings and C. Cai), J. Eng. Math. Vol. 80, 21-40, March 2013.

Stability of a Liquid Ring on a Substrate (with A. G. Gonzalez and J. Diez), J. Fluid Mech., Vol. 718, pp. 246-269, February 2013.

Particle Scale Dynamics in Granular Impact (with A. Clark and R. P. Behringer), Phys. Rev. Lett., Vol. 109, 238302, pp. 1-4, November 2012.

Parallel Assembly of Particles and Wires on Substrates by Dictating Instability Evolution in Liquid Metal Films (with J. Fowlkes, J. Diez, A. G. Gonzalez, Y. Wu, N. Roberts, C. McCold, and P. Rack), Nanoscale, Vol. 4, pp. 7376-84, October 2012.

Competition between Collapse and Breakup in Nanometer-sized Thin Rings using Molecular Dynamics and Continuum Modeling (with T. Nguyen, M. Fuentes-Cabrera, J. Fowlkes, J. Diez, A. G. Gonzalez, and P. Rack), Langmuir, Vol. 28, 13960-70, September 2012.

Ji Meng Loh

Auditing Data Streams for Correlated Glitches (with T. Dasu), International Journal of Information Quality, Vol. 3, pp. 85-106, May 2013.

Bayesian Nonparametric Estimation of Pair Correlation Function for Inhomogeneous Spatial Point Processes (with Y. Yue), Journal of Nonparametric Statistics, Vol. 25, pp. 463-474, February 2013.

Human Mobility Characterization from Cellular Network Data (with R. Becker, R. Caceres, K. Hanson, Isaacman, B. Martonosi, Rowland, S. Urbanek, A. Varshavsky, and C. Volinsky), Communications of the ACM, Vol. 56, pp. 74-82, January 2013.

Jay Meegoda

Microscopic Investigation of Air Sparging - Dynamic Two-phase Flow (with S. Gao and L. Hu), Transport in Porous Media, Vol. 96, Issue 1, pp. 173-192, 2013.

Two Methods for Pore-Network of Porous Media (with S. Gao and L. Hu), International Journal for Numerical and Analytical Methods in Geomechanics, Vol. 36, Issue 18, pp. 1954-1970, December 2012.

Effect of Soil Fabric on Transport of a LNAPL through Unsaturated Fine Grained Soils: A Centrifugal Model Study (with Y.A. Pasha, E. Aflaki, and L. Hu), Soil and Sediment Contamination an International Journal, Vol. 22 (1), pp. 223-240, 2013.

A Rapid Method for Soil-Water Characteristic Curve using Centrifugal LNAPL Transport Data (with Y.A. Pasha, L. Hu, and T. Ebadi), Geotechnical Testing Journal, Vol. 36 (3), pp. 301-309, 2013.

Zoi-Heleni Michalopoulou

Geophysical Signal Processing using Sequential Bayesian Techniques (with C. Yardim and P. Gerstoft), Geophysics, Vol. 78, pp. V87-V100, April 2013.

Particle Filtering for Arrival Time Tracking in Space and Source Localization (with R. Jain), Journal of the Acoustical Society of America, Vol. 132, pp. 3041-3052, November 2012.

Richard O. Moore

Effects of Nonlinear Phase Modulation on Bragg Scattering in the Low-conversion Regime (with L. Mejling, D. S. Cargill, C. J. McKinstrie, and K. Rottwitt), Opt. Express, Vol. 20, pp. 27454-27475, November 2012.

Cyrill Muratov

Self-similarity and Long-time Behavior of Solutions of the Diffusion Equation with Nonlinear Absorption and a Boundary Source (with P. V. Gordon), Netw. Heterog. Media, Vol. 7, pp. 767-780, December 2012.

Local Accumulation Times for Source, Diffusion and Degradation Models in Two and Three Dimensions (with P. V. Gordon and S. Y. Shvartsman), J. Chem. Phys., Vol. 138, pp. 104121, March 2013.

On an Isoperimetric Problem with a Competing Non-local Term. I. The Planar Case. (with H. Knuepfer), Commun. Pure Appl. Math., Vol. 66, pp. 1129-1162, April 2013.

Multiplicity of Supercritical Fronts for Reaction-diffusion Equations in Cylinders (with P. V. Gordon and M. Novaga), Calc. Var. PDE, Vol. 47, pp. 683–709, June 2013.

Farzan Nadim

Modeling Neuromodulation of Short-term Synaptic Dynamics by Proctolin in the Crab Pyloric Network (with M Oh and V Matveev), J. Computational Neuroscience, Vol. 33, pp. 573-585, December 2012.

Peter G. Petropoulos

On the Time-Domain Response of Havriliak-Negami Dielectrics (with M.F. Causley), IEEE Transactions on Antennas and Propagation, Vol. 61, No. 6, pp. 3182-3189, June 2013.

Anthony D. Rosato

Evolution of Solids Fraction Surfaces in Taping: Simulation and Dynamical Systems Analysis (with V. Ratnaswamy, D. Blackmore, X. Tricoche, N. Ching, and L. Zuo), Granular Matter, Vol. 14, pp. 163-168, 2012.

Horacio G. Rotstein

Dynamic Mechanisms of Generation of Oscillatory Cluster Patterns in a Globally Coupled Chemical System (with H. Wu), J Chem Phys, Vol. 137, 104908, 2012.

Swing, Release, and Escape Mechanisms Contribute to the Generation of Phase-locked Cluster Patterns in a Globablly Coupled FitzHugh-Nagumo Model (with H Wu), Phys Rev E, Vol. 86, 066207, 2012.

Michael Siegel

Analytical and Computational Methods for Two-phase Flow with Soluble Surfactant (with K. Xu, and M. R. Booty), SIAM J. Appl. Math., Vol. 73 (1), pp. 523-548, 2013.

A Small-scale Decomposition for 3D Boundary Integral Computations with Surface Tension (with D. M. Ambrose and S. Tlupova), J. Comp. Phys., Vol. 247 (6), pp. 168-191, 2013.

Semi-analytical Solutions for Two-dimensional Elastic Capsules in Stokes Flow (with M. Higley and M. R. Booty), Proc. Roy. Soc. A, Vol. 468, pp. 2915-2938, October 2012.

Sundar Subramanian

Bootstrap Based Model Checks with Missing Binary Response Data (with G. Dikta and T. Winkler), Statistics and Probability Letters, Vol. 83, pp. 219-226, April 2013.

Model-based Confidence Bands for Survival Functions (with P. Zhang), Journal of Statistical Planning and Inference, Vol. 143, pp. 1166-1185, July 2013.

Ronald Sverdlove

A Proposal to Improve U.S. Housing Market Incentives: A Response to the Federal Reserve White Paper of January 2012 (with M. A. Ehrlich, C. Beauchamp, R. Thomas, and M. Stockman), J. Applied Corporate Finance, Vol. 24(4), pp. 46-58, December 2012.

The Pricing of Soft and Hard Information: Economic Lessons from Screenplay Sales (with S. A. Ravid, S. A., W. Goetzman, and V. Pons-Sanz), J. Cultural Economics, Vol. 37(2), pp. 271-307, May 2013.

Louis Tao

Live Cell Imaging Analysis of the Epigenetic Regulation of the Human Endothelial Cell Migration at Single Cell Resolution (with C. Zheng, Z. Yu, Y. Zhou, Y. Pang, T. Chen, X. Zhang, H. Qiu, H. Zhou, Z. Chen, and Y. Huang), Lab on a Chip, Vol. 32, pp. 3063-3072, September 2012.

Catalin Turc

Wavenumber Estimates for Regularized Combined Field Boundary Integral Operators in Acoustic Scattering Problems with Neumann Boundary Conditions (with Y. Boubendir), IMA Journal of Numerical Analysis, doi: 10.1093/imanum/drs038, March 2013.

Jean-Marc Vanden-Broeck

Steady Dark Solitary Flexural Gravity Waves (with P.A. Milewski and Z. Wang), Proc. Roy. Soc. London, Vol. 469, 2150201220485, February 2013.

Jonathan Wylie

Periodic Orbits of Inelastic Particles on a Ring (with R. Yang and Q. Zhang), Phys. Rev. E, Vol. 86, pp. 026601, August 2012.

BOOKS AND BOOK CHAPTERS

Thomas Erneux

Quantum Dot Laser Tolerance to Optical Feedback (with Ch. Otto, K. Lüdge (Ed.), and E. Viktorov), In: Nonlinear Laser Dynamics, Wiley-VCH Weinheim, Germany, pp. 139-160, 2012.

Optically Injected Single-Mode Quantum Dot Lasers (with B. Kelleher, D. Goulding, S. P. Hegarty, G. Huyet, and E. A. Viktorov), Wang, Zhiming M. (Ed.), In: Quantum Dot Devices, Lecture Notes in Nanoscale Science and Technology, Vol. 13, pp. 1-22, 2012.

Wenge Guo

Astronomical Transient Detection Controlling the False Discovery Rate (with Nicolle Clements and Sanat Sarkar), In: Statistical Challenges in Modern Astronomy, (Feigelson, E.D. and Babu, G.J. Eds.), Lecture Notes in Statistics, Vol. 209, Part 4, Springer-Verlag, 383-396, 2012.

Claus Holzapfel

Scale Dependent Ecosystem Service (with Y. Zhang, and X. Yuan), In: Wratten, S. Sandhu, H. Cullen, R. and Costanza R. (Eds.), Ecosystem Services in Engineered Systems. Wiley-Blackwell, Oxford, 2012.

PROCEEDINGS PUBLICATIONS

Roman I. Andrushkiw

A Method of Breast Cancer Screening Based on Fractal Analysis (with D. Klyushin, E. Golubeva, and N. Boroday), Proceedings of the 2012 International Conference on Bioinformatics and Computational Biology, Vol. 2, pp. 280-282, Las Vegas, July 2012.

Linda J. Cummings

Modeling of Three Dimensional Nematic Droplets (with T.-S. Lin and L. Kondic), Proceedings of the 24th International Liquid Crystal Conference, Mainz, Germany, July 2012.

Ji Meng Loh

Effect of Data Repair on Mining Network Streams (with T. Dasu), IEEE 12th International Conference on Data Mining, Data Mining in Networks Workshop, pp. 226-233, December 2012.

Zoi-Heleni Michalopoulou

Time-frequency Analysis with Bayesian Filtering Methods for Dispersion Tracking and Geoacoustic Inversion in the Ocean (with Nattapol Aunsri), Proceedings of the International Congress in Acoustics, Vol. 19, pp. 055071-055074, June 2013.

Sampling Methods for Uncertainty Quantification in Source Localization and Geoacoustic Inversion in the Ocean (with Tao Lin), Proceedings of the International Congress in Acoustics, Vol. 19, pp. 055086-055089, June 2013.

Richard O. Moore

Incorporating Control in the Assimilation of Data: Gliders on a Mission (with E. Fagerstrom, L. McCormick, L. Safranek, E. Shvarts, T. Wang, Y. Wang, and M. Wentworth), Proceedings of the 2013 Graduate Student Mathematical Modeling Camp, Troy, NY, June 2013.

Modeling of Abrasive WaterJet for Precision Machining (with D. Brady, C. Breward, R. Cao, I. Christov, J. Gambino, A. Hungria, P. Liu, G. Miller, W. Pickering, C. Please, M. Polin, L. Rossi, D. Schwendeman, B. Tilley, Z. Wei, and S. Xu), Proceedings of the Twenty-Ninth Annual Workshop on Mathematical Problems in Industry, Worcester, MA, June 2013.

Catalin Turc

Efficient Solutions of Three Dimensional Periodic Scattering Problems (with O.Bruno, S. Shipman, and S. Venakides), Mathematisches Forschungsinstitut Oberwolfach, DOI: 10.4171/OWR/2013/3, 2013.

B. PRESENTATIONS

Roman I. Andrushkiw

July 2011: WORLDCOMP'11, Las Vegas, NV
A Method of Breast Cancer Screening Based on Fractal Analysis

Denis Blackmore

November 21, 2012: Center for Solar-Terrestrial Research Seminar, NJIT
New Vortex Invariants for MHD and a Related Helicity Theorem

April 24, 2013: Center for Solar-Terrestrial Research Seminar, NJIT
Adiabatic Invariants: Theory and Applications I

May 1, 2013: Conference on Multi-scale Modeling and Characterization of Innovative Materials & Structures, Cetara, Italy
Dynamical Modeling and Simulation Synergy for Granular Flows

May 20, 2013: Minisymposium on Granular Flow from a Dynamical Systems Perspective, SIAM Snowbird Conference on Applications of Dynamical Systems, Snowbird Resort, UT
Analysis of a Dynamical Systems Model for Granular Flow

May 20, 2013: Minisymposium on Granular Flow from a Dynamical Systems Perspective, SIAM Snowbird Conference on Applications of Dynamical Systems, Snowbird Resort, UT (joint work with Aminur Rahman and Hao Wu - H. Wu invited to make presentation)
Analysis and Simulation of the BSR Model

June 6, 2013: Journal of Nonlinear Mathematical Physics 20th Anniversary Conference, Sophus Lie Center, Nordfjordeid, Norway
Integrability and Existence of Wave-like Solutions of BSR Systems

Victoria Booth

July 2012: CNS*2012, 21st annual Computational Neuroscience Meeting, Atlanta, GA
Acetylcholine and Synaptic Homeostasis

August 2012: SIAM Conference on the Life Sciences, San Diego, CA
Coupled Flip-flops: Noise and Analysis for a Sleep-wake Cycle Model in minisymposium on Hysteresis in Neuroscience: Bursting and Beyond

November 2012: Applied and Interdisciplinary Mathematics seminar, University of Michigan, Ann Arbor, MI
Dynamics of Sleep-Wake Regulation

November 2012: Molecular, Cellular and Developmental Biology seminar, University of Michigan, Ann Arbor, MI
Modeling Neuronal Regulation of Sleep-Wake Behavior

November 2012: 42nd Annual Meeting of the Society for Neuroscience, New Orleans, LA
Acetylcholine and Synaptic Homeostasis

May 2013: Opening speaker and co-organizer of featured minisymposium on Dynamics and Control of Neurons and Networks at the SIAM Conference on Applications of Dynamical Systems, Snowbird, UT
From Neuron Dynamics to Network Plasticity

June 2013: 27th Annual Meeting of the Associated Professional Sleep Societies, Baltimore, MD
Implications of a Mutually Inhibitory Network Structure for Ultradian Cycling in Human Sleep

Bruce Bukiet

October 2012: Curriculum, Learning and Assessment Systems Workshop, NJIT
Enhancing Student Interest of STEM Disciplines Using Technology (with Joya Clark and Joseph Geissler)

October 2012: Midwest Noyce Regional Conference, Indianapolis, IN
A Survey of Technologies that Can Be Used to Enhance Student Interest in, and Understand of STEM Disciplines

May 2013: NJ Association of Mathematics Teacher Educators, Ewing, NJ
Infusing Computation into Urban High School Math and Science Classes (with J. Lipuma)

Daniel Bunker

February 2013: NJIT Undergraduate Research Showcase, Newark, NJ
Dynamical Robustness and Stability of Ecological Systems with Different Types of Trophic Interactions

August 2012: Ecological Society of America Annual Meeting, Portland, OR
1) Pollinator Species Richness is Correlated to Flowering Plant Richness: A Meta-analysis

2) Strategies for Successful Aggregation and Integration of Ecological Data – Lessons from Other Research Domains

Wooyoung Choi

July 2012: Workshop on nonlinear ocean waves, Univ. of Tokyo, Japan
Evolution of Deep Water Waves under Wind Forcing and Wave Breaking Effects

July 2012: Seminar at the Japan Agency for Marine-Earth Science & Technology, Japan
Large Amplitude Internal Solitary Waves and Their Surface Expressions

October 2012: Mathematical Modeling & Analysis, Fondation des Treilles, France
A Combined Experimental and Numerical Study on the Evolution of Nonlinear Wave Packets

March 2013: Minisymposium at the 8th IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena, Athens, GA
Nonlinear Water Waves in Shear Flows

April 2013: IUTAM Symposium 2013: Nonlinear Interfacial Wave Phenomena from Micro to the Macro-scale, Cyprus
A Theoretical and Experimental Study of the Generation of Internal Solitary Waves in a Two-layer System

May 2013: Thematic Program on the Mathematics of Oceans: Workshop on Ocean Wave Dynamics, Toronto, Canada
Evolution of Nonlinear Wave Packets with and without Wave Breaking

Linda J. Cummings

November 2012: International Focus Workshop on Multiscale Complex Fluid Flows and Interfacial Phenomena, Max Planck Institute for Physics of Complex Systems, Dresden, Germany
3D Models for Thin Nematic Films

December 2012: Thin Liquid Films and Fluid Interfaces: Models, Experiments & Applications, Banff International Research Station, Banff, Alberta, Canada
3D Models for Thin Nematic Films

February 2013: SIAM Meeting on Computational Science & Engineering, Boston, MA
Drawing of Optical Fibers: A Problem brought to the MPI Workshop

June 2013: SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, PA
3D Modeling of Thin Flowing Nematic Films

Javier Diez

November 2012: XII Reunion sobre Recientes Avances en Fisica de Fluidos y sus Aplicaciones, Buenos Aires, Argentina
1) Nanometric Rings: Molecular Dynamics and Continuum Modelling
2) Linear Structures of Nanodrops Generated from Patterned Filaments

Thomas Erneux

September 2012: Nonlinear Dynamics in Semiconductor Lasers, WIAS, Berlin, Germany
New Analytical Studies of Optically Injected Semiconductor Lasers

November 2012: Symposium en l'honneur de Pierre Glorieux "Du monde quantique à la dynamique non-linéaire", Lille, France
Dynamique à retard

May 2013: University of British Columbia, Vancouver, BC, Canada
1) Singular Perturbation Methods for Delay Differential Equations Exhibiting a Large Delay
2) Delay: Friend or Enemy?

Roy Goodman

July 2012: 2nd Conference on Localized Excitations in Nonlinear Complex Systems (LENCOS'12), Seville, Spain
Complex Hamiltonian Dynamics in Small Systems of Coupled Waveguides

January 2013: Partial Differential Equations and Applied Math Seminar, Drexel University, Philadelphia, PA
Complex Low-dimensional Dynamics in Nonlinear Schrodinger Systems

March 2013: Center for Computational Science Seminar, Tulane University, New Orleans, LA
Complex low-dimensional Dynamics in Nonlinear Wave Dynamics

May 2013: SIAM Conference on Applications of Dynamical Systems, Snowbird, UT
Low-dimensional Dynamics in Nonlinear Wave Systems

Wenge Guo

July 2012: The 2012 Joint Statistical Meetings, San Diego, CA
Further Results on Controlling the False Discovery Proportion

June 2013: Department of Statistics, University of California, Riverside
The Control of False Discovery Rates in Fixed Sequence Multiple Testing

Claus Holzapfel

August 2012: American Ornithologist's Union 2012 Meeting, Vancouver, British Columbia, Canada
Urban Green Spaces: Traps or Havens for Migratory Birds? (with Rondon J., Newhouse, M.)

August 2012: Ecological Society of America, Annual Meeting, Portland, OR
1) Invasive Non-native Annuals use Novel Source-sink Strategies in North American Deserts (with Marjolein Schat, Schafer J.L., Mudrak E.L. , Haines, C.E., Parag, H.A., and Moloney, K.A.)
2) Predictive Modeling of Spatial Patterns of Soil Nutrients Associated with Fertility Islands in the Mojave and Sonoran Deserts (with E. Mudrak and K. Moloney)
3) Heavy Metal Bioaccumulation and Avian Frugivory in an Urban Forest (with M.E. Litwhiler, P. Weis and F.J. Gallagher)

September 2012: Ecosummit 2012, Columbus, OH
Clonal Diversity and Resistance to Invasion in Urban, Remnant Salt Marsh Patches, invited symposium contribution (with Kirby E.G. ,Wu T.M., Plank K., Wadhwa S.)

April 2013: Ecological Society of America - Annual Mid-Atlantic Meeting, Dover, DE
1) Urban Habitats: Attractive, but Bad for Nature? On Fruits, Metals, and Birds" (with Litwhiler M E., Gallagher F.J., Weis P.)
2) Comparing Brownfield and Old-field Floras of New Jersey: Do Non-native Plants Make up a Higher Proportion of Brownfield Floras?" (with J. Perzley)
3) A Novel Defense? Understanding the Plant Competition Role of the Enzyme Polyphenol Oxidase in the Invasive Genus Bromus (with Plank K., Kafkewitz D.)

David J. Horntrop

July 2012: SIAM Annual Meeting, Minneapolis, MN
Variance Reduction in the Simulation of Stochastic Differential Equations

Huaxiong Huang

June 2013: CAIMS Annual Meeting, Quebec, Canada
Applications of Immersed Boundary Method: Drops and Endocytosis

Shidong Jiang

July 2012: SIAM Annual Meeting, Minneapolis, MN
Integral Equation Methods for Unsteady Stokes Flow in Two Dimensions

January 2013: NJIT Math Department Colloquium, Newark, NJ
Integral Equation Methods for Fourth Order PDEs

February 2013: SIAM CSE Conference, Boston, MA
Debye Potentials for the Time Dependent Maxwell Equations

March 2013: Math department of Rutger Camden Campus, Camden, NJ
Fast Algorithms for Brownian Dynamics Simulation with Hydrodynamic Interactions

May 2013: National University of Singapore, Singapore
Fast Algorithms for Brownian Dynamics Simulation with Hydrodynamic Interactions

May 2013: Nanyang Technological University, Singapore
Integral Equation Methods for Fourth Order PDEs

May 2013: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Fast Algorithms for Vector Spherical Harmonic Transforms (poster)

June 2013: Second International Conference on Interdisciplinary Applied and Computational Mathematics, Hangzhou, China
Second Kind Integral Equation Formulation for the Modified Biharmonic Equation and its Applications

June 2013: Beijing Computational Science Research Center, Beijing, China
Integral Equation Methods for Unsteady Stokes Flow in Two Dimensions

June 2013: Invited talk at the Math Department of Tsinghua University, Beijing, China
Extension of the Debye-Lorenz-Mie Formalism for Electromagnetic Scattering to the Time Domain

Lou Kondic

June 2013: Seminar, Center for Mathematical Research, Barcelona, Spain
Films, Rings and Rivulets: Instabilities of Liquid Metals on Nanoscale

June 2013: SIAM Meeting on Mathematical Aspects of Material Science, Philadelphia, PA
1) A Numerical Study of Nanoscale Drop Assembly via Square-wave Breakup
2) Stability of Liquid Rings

June 2013: Northeastern Granular Materials Workshop, New Haven, CT
Mechanical Response of Granular Matter Exposed to Impact

June 2013: Frontiers in Applied and Computational Mathematics, Newark, NJ

1) Thin Film Nematic Liquid Crystal Down an Incline Substrate: Two Dimensional Flow
2) Bifurcation Properties of Nematic Liquid Crystals Exposed to an Electric Field: Switchability, Bistability and Multistability
3) Long-wave Approximation of a Ferrofluid Film under an External Magnetic Field
4) Combined Mesoscopic-Macropsopic Computations of Thin Films and Contact Lines

May 2013: Colloquium, Department of Physics, Universidad Tecnologica Nacional, La Plata, Argentina
Understanding Dense Particulate Matter

May 2013: Seminar, Department of Physics, University of Buenos Aires, Buenos Aires, Argentina
Understanding Dense Particulate Matter

May 2013: XIII Surfaces and Nanostructures Workshop, Mar del Plata, Argentina
Rupture of Liquid Cu Films on SiO$_2$ Substrates

March 2013: Seminar, Department of Physics, Universidad Tecnologica Nacional, La Plata, Argentina
Persistence of Force Networks in Compressed Granular Media

December 2012: BIRS Workshop on Thin Liquid Films and Fluid Interfaces, Banff, Alberta, Canada
1) Films, Rings, and Rivulets: Instabilities of Liquid Metals on Nanoscale
2) Nanometric Rings: Molecular Dynamics and Continuum Modeling
3) Linear Structures of Nanodrops Generated from Patterned Filaments

November 2012: Division of Fluid Mechanics of Argentine Physical Society Annual Meeting, Buenos Aires, Argentina
1) Thin Fluid Films on Nanoscale: Spreading, Breaking, Jumping
2) Nanometric Rings: Molecular Dynamics and Continuum Theory
3) Breakup of Filaments

November 2012: American Physical Society-Division of Fluid Dynamics Annual Meeting, San Diego, CA
What is the Granular Response to a High-speed Impact?

November 1012: Seminar, Department of Applied Mathematics and Applied Physics, Columbia University, New York, NY
From Energy Propagation to Force Networks in Dense Granular Matter

September 2012: International Workshop on Computational Mechanics of Materials (IWCMM 2012), Baltimore, MD
Persistence of Force Networks in Compressed Granular Media

August 2012: International Liquid Crystal Conference (ILCC 2012), Mainz, Germany
Modeling of Three Dimensional Nematic Droplets

July 2012: 8th European Solid Mechanics Conference (ESMC 2012), Graz, Austria
1) On Microstructure of Particulate Matter Exposed to Impact and Compression
2) Dynamics of Granular Material

Ji Meng Loh

November 2012: Statistics seminar, Baruch College, City University of New York
K-scan for Anomaly Detection in Spatial Point Patterns

December 2012: IEEE 12th International Conference on Data Mining, Data Mining in Networks Workshop, Brussels, Belgium

Effect of Data Repair on Mining Network Streams

June 2013: Spatial Statistics conference, Columbus, OH
Bayesian Estimation of the Intensity of Inhomogeneous Point Patterns

June 2013: Astrostatistics Summer School, Penn State University
Lecture on Spatial Statistics

Victor Matveev

April 2013: Workshop on Cellular and Subcellular Systems, Mathematical Biosciences Institute, Columbus, OH
Calcium Buffering as a Mechanism of Short-term Synaptic Plasticity

March 2013: Laboratory for Biological Modeling Seminar, Bethesda, MD
Qualitative Impact of Cooperative Calcium Buffering for Cell Calcium Dynamics

October 2012: Annual Meeting of the Society for Neuroscience, New Orleans, LA
Non-local Amplification of Calcium Signals by Calcium Buffer Saturation: A Computational Study

Zoi-Heleni Michalopoulou

June 2013: Meeting of the Acoustical Society of America and ICA Congress, Montreal, Canada
1) Time-frequency Analysis with Bayesian Filtering Methods for Dispersion Tracking and Geoacoustic Inversion in the Ocean
2) Sampling Methods for Uncertainty Quantification in Source Localization and Geoacoustic Inversion in the Ocean

November 2012: Meeting of the Acoustical Society of America, Seattle, WA
1) Sound Speed Estimation and Source Localization with Particle Filtering and a Linearization Approach
2) Optimizing Receiver and Source Positioning in the Ocean: Lessons from Nature

June 2013: Underwater Acoustic Measurements – ECUA, Corfu, Greece
1) Considerations for Sonar Detection and Localization Algorithm Design in Shallow Water Waveguides
2) A Signal Processing Approach for Source Localization and Sound Speed Estimation with Sequential Filtering and Linearization

Robert M. Miura

August 2012: SIAM Conference on Life Sciences, San Diego, CA
Neurovascular Coupling During Cortical Spreading Depression: A Mathematical Model

February 2013: Mathematical Biosciences Colloquium, Ohio State University
Cortical Spreading Depression and Neurovascular Coupling

June 2013: Graduate Seminar, Department of Mathematical Sciences, NJIT
Cortical Spreading Depression and Neurovascular Coupling

Richard O. Moore

September 2012: Applied Mathematics Colloquium, NJIT, Newark, NJ
Optimal Control in Data Assimilation

March 2013: Symposium on Instantons and Rare Events, CUNY Graduate Center, New York, NY
Large Deviation Theory for Importance Sampling in Wave Equations

May 2013: SIAM Conference on Application of Dynamical Systems, Snowbird, UT
Controlled Lagrangian Data Assimilation (poster presented by D. McDougall)

June 2013: 10th Annual Graduate Student Mathematical Modeling Camp, RPI, Troy, NY
Incorporating Control in the Assimilation of Data

Cyrill Muratov

September 2012: Workshop on Geometric Partial Differential Equations, De Giorgi Center for Mathematical Research, Scuola Normale Superiore, Pisa, Italy
On Shape of Charged Drops: An Isoperimetric Problem with a Competing Non-local Term

October, 2012: PDE Seminar, Department of Mathematics, University of Wisconsin
On Shape of Charged Drops: An Isoperimetric Problem with a Competing Non-local Term

October, 2012: AMS Sectional Meeting, Akron, OH
Front Propagation in Stratified Media: A Variational Approach

November 2012: Mini-workshop on reaction-diffusion equations, Global COE Program, Graduate School of Mathematical Sciences, University of Tokyo
On Shape of Charged Drops: An Isoperimetric Problem with a Competing Non-local Term

November 2012: Workshop on Singularities in Nonlinear Problems, Kansai Seminar House, Kyoto, Japan
Front Propagation in Stratified Media: A Variational Approach

January 2013: Oberseminar in Analysis, Hausdorff Center for Mathematics, University of Bonn, Germany
On Shape of Charged Drops: An Isoperimetric Problem with a Competing Non-local Term

February 2013: Applied Math Seminar, Department of Mathematics, Duke University
On Shape of Charged Drops: An Isoperimetric Problem with a Competing Non-local Term

June 2013: Minisymposium talk, SIAM Materials Meeting, Philadelphia, PA
Front Propagation in Stratified Media: A Variational Approach

June 2013: PDE seminar, Department of Mathematics, University of Athens
Front Propagation in Stratified Media: A Variational Approach

Farzan Nadim

July 2012: Computational Neuroscience Annual Meeting Workshop on Dynamics of Rhythm Generation, Decatur, GA
1) The Central Role of Linear Conductances in Pacemaker Activity
2) Modeling and Prediction of Conduction Delay in an Unmyelinated Axon

November 2012: Society for Neuroscience Annual Meeting
Conduction Velocity in an Unmyelinated Axon Depends on Both Short- and Long-term History of Activity

August 2012, Small Circuits and Behavior Meeting, Univ Penn School of Medicine
Do Preferred Frequencies Tell Us Anything Useful?

December 2012, Research Seminar in Neuroscience, Univ Conn Medical Center
What Do Preferred Frequencies Tell Us about an Oscillatory Neural Network?

January 2013, Swartz Seminar in Neuroscience, Yale University School of Medicine
What Preferred Frequencies Tell Us about an Oscillatory Neural Network

May 2013, Seminar in Mathematical Biology, UC Davis
Do Preferred Frequencies Tell Us Anything Useful?

Anthony D. Rosato

May 2013: Symposium on Granular Flows from a Dynamical Systems Perspective, SIAM Conference on Applications of Dynamical Systems, Snowbird, UT
Analysis of a Dynamical Systems Model for Granular Flow (with D. Blackmore, K. Urban, X. Tricoche, H. Wu, and K. Urban)

May 2013: International Workshop on Multiscale Modeling of Innovative Materials and Structures, Cetara, Italy
Dynamical Modeling and Simulation Synergy for Granular Flow Analysis (with D. Blackmore)

October 2012: Society of Engineering Science Meeting, Atlanta, GA
DEM Calculations of Radial Stresses in a Granular Column (with A. Spiridonov)

July 2012: 8th European Solid Mechanics Conference, Graz, Austria
Density Waves in Tapped, Monodisperse Granular Systems (with D. Blackmore, V. Ratnaswamy, and X. Tricoche)

Horacio G. Rotstein

October 2012: Mathematical Biosciences Institute, Columbus, OH
Mechanism of Generation of Theta Spiking Resonance in a Hippocampal Circuit (with E. Stark and G. Buzsaki)

October 2012: Society for Neuroscience (SFN), New Orleans, LA
Dynamic Compensatory Mechanisms in Conductance Correlation Models (with M. Olarinre and J. Golowasch)

April 2013: Dana Knox Student Research Showcase, NJIT
1) Membrane Resonance of Bursting Neuron Captured with an Ica/Ih Model using a Multi-objective Evolutionary Algorithm (with D. Fox, H. Tseng and F. Nadim)
2) Dynamic Compensatory Mechanisms in Conductance Correlation Models (with M. Olarinre and J. Golowasch)

May 2013: Neuroscience Minisymposium, Center for Molecular and Behavioral Neuroscience
Dynamic Compensatory Mechanisms in Conductance Correlation Models (with M. Olarinre and J. Golowasch)

May 2013: Department of Mathematical Sciences, NJIT
Mechanisms of Frequency Preference in Neural Systems (with F. Nadim)

May 2013: Frontiers in Applied and Computational Mathematics (FACM), Newark, NJ
1) Membrane Resonance of Bursting Neuron Captured with an ICa/Ih Model using Multi-objective Evolutionary Algorithms (with D. Fox, H.-A Tseng and F. Nadim)
2) A Modeling Study of Conductance Co-regulation in Neuronal Models (with M. Olarinre and J. Golowasch)
3) Mechanism of Generation of Theta Spiking Resonance in a Hippocampal Network (with E. Stark and G. Buzsaki)

June 2013: Rhythmic Dynamics and Cognition, Boston, MA
Mechanism of Generation of Theta Spiking Resonance in a Hippocampal Network (with E. Stark and G. Buzsaki).

Michael Siegel

June 2013: Workshop on Water Waves: Computational Approaches for Complex Problems, Banff, Alberta
An Efficient Boundary Integral Method for Free-surface Flow with Surface Tension

July 2012: Conference on Nonlinear Wave Equations and Evolution Phenomena, Athens, GA
A Small Scale Decomposition for 3D Boundary Integral Computations with Surface Tension

April 2012: Conference on Nonlinear Wave Phenomena from the Micro to the Macro Scale Limmasol, Cyprus
A Numerical Method for Induced Charge Electro-kinetic Flow

November 2012: Math Colloquium, Drexel University, Philadelphia, PA
Elastic Capsules in Stokes Flow

Sundar Subramanian

July 2012: Statistics Seminar, Department of Mathematical Sciences and Center for Applied Mathematics and Statistics, NJIT
Semiparametric Likelihood Ratio Confidence Intervals for Survival Probabilities

December 2012: Statistics Seminar Series, Department of Mathematical Sciences and Center for Applied Mathematics and Statistics, NJIT
Semiparametric Likelihood Ratio Confidence Intervals for Survival Probabilities

Ronald Sverdlove

September 2012: Leir Center for Financial Bubble Research Conference on Government Role in Bubbles, Ridgefield, CT
Regulation of Swaps Markets and Bubbles

October 2012: Financial Management Association Annual Meeting, Atlanta, GA
The Central Bank and the Risk Sharing Network for Financial Institutions (with M. A. Ehrlich and P. Chou)

June 2013: The Economics of Intellectual Property, Software, and the Internet, TIGER Forum on Economic Growth: Challenges for Regulatory Change, Toulouse School of Economics, Toulouse, France
Intellectual Property Contracts: Theory and Evidence from Screenplay Sales (with M. Harris, S. A. Ravid, and S. Basuroy)

Catalin Turc

February 2013: SIAM CSE, Boston, MA
High-order Solvers for Scattering Problems in Domains with Geometric Singularities

January 2013: Oberwolfach, Germany
Efficient Solvers for the Solution of Wave Propagation Problems in Periodic Media

January 2013: WONAPDE 2013, Concepcion, Chile
Efficient Solvers for the Solution of Wave Propagation Problems in Periodic Media

October 2012: Colorado School of Mines, Golden, CO
Efficient Solvers for the Solution of Wave Propagation Problems in Periodic Media

October 2012: University of Delaware, Newark, DE
Efficient Solvers for the Solution of Wave Propagation Problems in Periodic Media

Jean-Marc Vanden-Broeck

November 2012: Applied Mathematics Seminar at Birmingham University
New Types of Waves Propagating under An Ice Sheet

Yuan-Nan Young

October 2012: Applied Math Laboratory Seminar, Courant Institute, New York University
Modeling the Interaction between Fluid and an Elastic Filament: Two Examples in Biology

April 2013: Applied Math Seminar, University of Michigan, Ann Arbor
Nonlinear Dynamics of an Inextensible Elastic Membrane under An Electric Field

C. TECHNICAL REPORTS

REPORT 1213-1: *On the Time-Domain Response of Havriliak-Negami Dielectrics*
Matthew F. Causley and Peter G. Petropoulos

REPORT 1213-2: *On Equality in Distribution of Some Ratios Involving the Sum of Components of a Random Vecto*r
Manish C. Bhattacharjee and Sunil K. Dhar

REPORT 1213-3: *Generalized Linear Model under the Extended Negative Multinomial Model and Cancer Incidence*
S. Lahiri & Sunil K. Dhar

REPORT 1213-4: *Persistence of Force Networks in Compressed Granular Media*
M. Kramar, A. Goullet, L. Kondic, K. Mischaikow

REPORT 1213-5: *Stability of a Liquid Ring on a Substrate*
A. G. Gonzalez, J. A. Diez and L. Kondic

REPORT 1213-6: *Directed Assembly of One- and Two-dimensional Nanoparticle Arrays from Pulsed Laser Induced Dewetting of Square Waveforms*
N. A. Roberts, J. D. Fowlkes, K. Mahady, S. Afkhami, L. Kondic, P. D. Rack

REPORT 1213-7: *On the Dewetting of Liquefied Metal Nanostructures*
S. Afkhami and L. Kondic

REPORT 1213-8: *Optimal Data Assimilation Control for Ocean Gliders*
Richard Moore

VI. EXTERNAL ACTIVITIES AND AWARDS

A. FACULTY ACTIVITIES AND AWARDS

Shahriar Afkhami

Panel review member for National Science Foundation

Co-organizer and chair (with L. Cummings and L. Kondic, NJIT): Minisymposium, Advances in Modeling and Computation of Thin Liquid Films in Materials Science, SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, Pennsylvania, June 2013.

Organizer and chair: Minisymposium, Two-Phase Flows, Frontiers in Applied and Computational Mathematics (FACM) international conference at NJIT, June 2013.

Organizer of an invited session and chair: Simulation of Interfaces in Two-Fluid Flows, the American Physical Society March Meeting, Baltimore, Maryland, March 2013.

Roman I. Andrushkiw

US Patent 8,265,359 B2 awarded 9/11/2012: Computer-Aided Cytogenetic Method of Cancer Diagnosis (with D.A. Klyushin, N.V. Boroday, and Y.I. Petunin).

John Bechtold

Excellence in Service Award: College of Science and Liberal Arts

Denis Blackmore

Associate Editor, Mechanics Research Communications (2007 -)

Editorial Board, Atlantis/Springer Advanced Book Series: Studies in Mathematical Physics: Theory and Applications (Editor-in-Chief, Norbert Euler), (2011 -)

Editorial Board, Journal of Nonlinear Mathematical Physics (2010 -)

Editorial Board, Recent Patents in Space Technology (2009 -)

Editorial Board, Differential Equations and Applications (2008 -)

Editorial Board, Regular and Chaotic Dynamics (2006 -)

Editorial Board, Mathematical Bulletin of the Shevchenko Scientific Society (2005 -)

Served on NSF Panel: March 2013.

Organizer, Minisymposium on Granular Flow from a Dynamical Systems Perspective, SIAM Snowbird Conference on Applications of Dynamical Systems, Snowbird Resort, Utah, May 19-23, 2013.

Organizing Committee, Journal of Nonlinear Mathematical Physics 20th Anniversary Conference, Sophus Lie Center, Nordfjordeid, Norway, June 4-14, 2013.

Victoria Booth

Advisory Board member, CHAOS: An Interdisciplinary Journal of Nonlinear Science, 2013-2016

Program Committee, Society for Industrial and Applied Mathematics, 2011-2014

Treasurer, Organization for Computational Neuroscience, 2011-2014

Advisory Committee, Activity Group on Dynamical Systems in the Society for Industrial and Applied Mathematics, 2012-2013

Workshop co-organizer, Diseases of the Nervous System, at the Mathematical Biosciences Institute, Ohio State University, February 2013 (with Steven Schiff, Jonathan Rubin, Liam Paninsky and Charlie Wilson).

Workshop co-organizer, Mathematics for Human Physiology and Disease, at the Association for Women in Mathematics Research Symposium 2013, Santa Clara University, March 2013 (with Trachette Jackson).

Wooyoung Choi

WCU Visiting Professor, Korea Advanced Institute of Science and Technology, August 2012-July 2013

Javier Diez

Councelor in the Superior Council of Universidad Nacional del Centro (elected for the period 2012-2013).

Wenge Guo

Editorial Board of PLOS ONE.

Editorial Board of the Journal of Biometrics and Biostatistics.

Claus Holzapfel

Member of Editorial Board, Perspectives in Plant Ecology, Evolution and Systematics

Aridaman K. Jain

Chair of the American Society for Quality (ASQ) Writing Committees.

Judge at the Thirtieth Annual North Jersey Regional Science Fair at Rutgers University, New Jersey, March 16, 2013.

Zoi-Heleni Michalopoulou

Associate Editor, Journal of the Acoustical Society of America

Robert M. Miura

Co-Editor-in-Chief (July-December 2012), Honorary Co-Editor-in-Chief (January-June 2013) Analysis and Applications, World Scientific.

Editorial Board, Canadian Applied Mathematics Quarterly.

Editorial Board, SIAM Book Series on Monographs on Mathematical Modeling and Computation.

Report on the AIM SQuaREs: 2010, 2011, and 2012 on Modeling Cortical Spreading Depression (with H. Huang), American Institute of Mathematics, Palo Alto, California, October 2012.

Richard O. Moore

2012-2013: Advisor, SIAM Student Chapter at NJIT

2013-2014: Secretary, SIAM Activity Group on Nonlinear Waves and Coherent Structures

June 2013: Mentor, 10th Annual Graduate Student Mathematical Modeling Camp, RPI, Troy, NY

June 2013: Participant and Member of Organizing Committee, 29th Annual Mathematical Problems in Industry Workshop, WPI, Worcester, MA

Cyrill Muratov

Associated Editor, Networks and Heterogeneous Media

Farzan Nadim

Reviewing Editor, Journal of Neuroscience

Review Editor, Frontiers in Neural Circuits

Chair, NIH Sensorimotor Integration Study Section

Board of Directors, Organization of Computational Neuroscience

Anthony D. Rosato

Editor-In-Chief, Mechanics Research Communications, Elsevier (April 2007 – present)

Editorial Board of the Americas, KONA – Powder and Particle (May 2012 – present)

International Hoover Award Board, ASME representative (2010 – present)

ASCE Engineering Mechanics Institute, Inelasticity Committee (Elected 6/07/2011)

MIUR (Ministero dell'Instruzione, della Università e della Ricerca) – External Reviewer to evaluate the quality of scholarly work of Italian research institutions (July 2012 - present)

Co-Organizer and Sponsor - International Workshop on "Multiscale Behavior of Innovative Materials and Structures", May 1 -5 , 2013, Cetara, Italy.

Fellow of the American Society of Mechanical Engineers

International Mobility Fellowship: Visiting Professorship, University of Salerno (Funded by the Provinces of Salerno and Avellino (Italy): May 16, 2012 – Sept. 16, 2012

Horacio G. Rotstein

May 31 - June 2, 2013: Frontiers in Applied and Computational Mathematics (FACM), Newark, NJ, USA. Member of the Organizing Committee.

Editorial Activity: Chaos, An Interdisciplinary Journal of Nonlinear Science, Focus Issue on Rhythms and Dynamic Transitions in Neurological Disease: Modeling, Computation and

Experiment (with T. Kaper and M. Kramer)

Michael Siegel

Member of Editorial Board, SIAM Journal of Applied Mathematics

Member of Organizing Committee, Conference on Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ, May 2013

Sundar Subramanian

Chair of Statistics Minisymposium (Censored Survival Data Analysis), Frontiers of Applied and Computational Mathematics 2013, NJIT, Newark, NJ

B. FACM'13 CONFERENCE ON FRONTIERS IN APPLIED AND COMPUTATIONAL MATHEMATICS

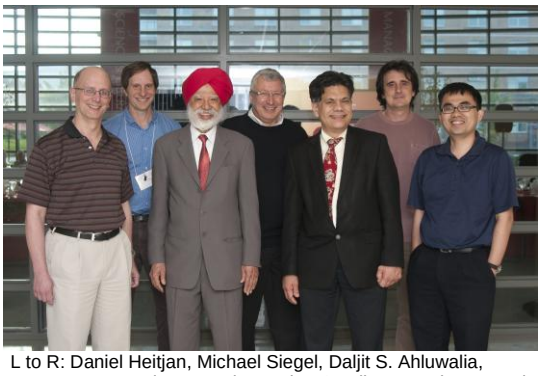
The Tenth Conference on Frontiers in Applied and Computational Mathematics (FACM '13) at the New Jersey Institute of Technology was held on May 31-June 2 and was focused on wave propagation and electromagnetics, mathematical biology, fluid dynamics, and applied statistics.

The conference featured 4 plenary talks, 70 minisymposium talks (many of which were given by junior faculty), and 15 contributed talks by postdocs and graduate students. The contributed talks were selected from a large number of applications and were presented in the same sessions as the invited talks, giving young researchers a chance to showcase their research results. One such session featured talks by recent NJIT PhD's Qiming Wang (now at York University), Lin Zhou (NYIT), and Jacek Wrobel (Tulane) who garnered very positive feedback from several of the senior faculty in attendance. In addition to the talks, there were 36 posters on a variety of research topics. A reception was held on the first night during poster session and a banquet was held on the second night of the conference.

Front row (L to R): Luis Rivero, Daljit S. Ahluwalia, Mrs. Joel Bloom, President Joel Bloom, Eliza Michalopoulou
Back row (L to R): Alejandro Aceves, Michael Booty, Panagotis Panayotaros, Yvon Maday, and Yassine Boubendir

(L to R): Jonathan Luke, Eliza Michalopoulou, Linda Cummings, and Daljit S. Ahluwalia

President Joel Bloom


L to R: Daniel Heitjan, Michael Siegel, Daljit S. Ahluwalia, Yvon Maday, Jonathan Luke, Catalin Turc, Ji Meng Loh

The plenary speakers for the conference were Pam Cook (University of Delaware), Daniel Heitjan (University of Pennsylvania), Yvon Maday (Jacques-Luis Lions Laboratory), and Esteban Tabak (Courant Institute of Mathematical Sciences).

A special minisymposium on nonlinear optics was organized by Alejandro Aceves of Southern Methodist University and Panagotis Panayotaros from UNAM in Mexico City. There was also a special minisymposium on swarming behavior in ecology organized with the help of new NJIT biology faculty member Simon Garnier.

The organizing committee for this years conference was Daljit S. Ahluwalia and Jonathan Luke (Co-Chairs), Linda Cummings, Ji Meng Loh, Horacio Rotstein, Michael Siegel, and Catalin Turc. Full program details are online at: http://m.njit.edu/Events/FACM13/ .

VII. FUNDED RESEARCH

A. EXTERNALLY FUNDED RESEARCH

CONTINUING FUNDED PROJECTS

Statistical Consulting for Data Analysis
Newark Beth Israel Medical Center: January 11, 2012 – January 10, 2013
Daljit S. Ahluwalia and Aridaman Jain

Conferences on Frontiers of Applied and Computational Mathematics
National Science Foundation: June 1, 2011 - June 30, 2014
Daljit S. Ahluwalia and Michael Siegel

Statistical Data Analysis
NJ Meadowlands Commission: November 1, 2006 - December 31, 2013
Daljit S. Ahluwalia and Aridaman Jain

MRI: Development Neural and Visual Assessment Equipment
National Science Foundation: 2012-2014
T. Alvarez and S.K. Dhar

Nonlinear Dynamics of Flames with Applications at High Pressure
National Science Foundation: July 1, 2008 - June 30, 2013
John Bechtold

Collaborative Research: A Unified Dynamical Systems-Simulation-Visualization Approach to Modeling and Analyzing Granular Flow Phenomena
National Science Foundation - CMMI Dynamical Systems Program: September 1, 2010 - August 31, 2013
Denis Blackmore (PI at NJIT), Anthony Rosato (Co-PI at NJIT), and Xavier Tricoche (PI at Purdue)

Linear Conductance-based Mechanisms Underlying Oscillations in Neuronal Networks
National Science Foundation: October 1, 2012 – September 30, 2015
Amitabha Bose, Jorge Golowasch, and Farzan Nadim

Hybrid Algorithms for Wave Propagation
National Science Foundation: September 15, 2010 - August 31, 2013
Yassine Boubendir

Professional Development Program for STEM Teachers
Roche: December 1, 2012 – December 31, 2013
Bruce Bukiet and James Lipuma

TECHS-NJ Teacher Education Collaboration for High-Need Schools
NJ National Science Foundation-Division of Undergraduate Education: August 2006 - September 2012
Bruce Bukiet, Arthur B. Powell, Gayle Griffin, and Ismael Calderon

Computation and Communication: Promoting Research Integration in Science and Mathematics (C2PRISM)
National Science Foundation: March 2007 – February 2013
Bruce Bukiet, David Lubliner, and Fadi Deek

Bridge to the Doctorate
National Science Foundation: September 1, 2012 - August 31, 2013
Ian Gatley (PI), co-PIs Marino Xanthos, Basil Baltzis, Charles Brooks, Barry Cohen, Bruce Bukiet, and Norman Loney

Modeling and Analysis of Nematic Liquid Crystals in Thin Geometries: Bistable Configurations and Free Surface Instabilities
National Science Foundation: September 15, 2009 – August 31, 2013
Linda Cummings and Lou Kondic

Collaborative Research: The MPI Workshop and GSMM Camp
National Science Foundation: March 1, 2012 – February 28, 2014
Linda Cummings and Richard Moore

Role of Neuromodulators and Activity in the Regulation of Ionic Currents and Neuronal Network Activity
National Institute of Mental Health: March 31, 2009 – March 30, 2014
Jorge Golowasch

Nonlinear Waves and Dynamical Systems
National Science Foundation: July 1, 2008 - June 30, 2013
Roy Goodman

Collaborative Research: Constructing New Multiple Testing Methods
National Science Foundation: June 1, 2010 - May 31, 2014
Wenge Guo

Integral-Equation-Based Fast Algorithms and Graph-Theoretic Methods for Large-Scale Simulations
National Science Foundation: July 15, 2009 - June 30, 2014
Shidong Jiang

Microstructure and Fluidization in Granular Media
Department of Defense Basic and Applied Sciences Directorate: April 2010 - March 2015
Lou Kondic, Robert P. Behringer (Duke University), Corey O'Hern (Yale University), and Wolfgang Losert (University of Maryland)

Computational Homology, Jamming, and Force Chains in Dense Granular Flows
National Science Foundation: October 1, 2008 - September 30, 2012
Lou Kondic

Calcium Dynamics in Exocytosis and Synaptic Facilitation
National Science Foundation: August 1, 2008 - July 31, 2013
Victor Matveev

Group Undergraduate Biology and Mathematics Training Program at NJIT
National Science Foundation: September 1, 2009 - August 31, 2013
Victor Matveev (PI), Gareth Russell (Co-PI), and Jorge Golowasch (Co-PI).
Investigators: Linda J. Cummings, Amit K. Bose, Farzan Nadim, Horacio Rotstein, Robert M. Miura, Andrew V. Hill, Camelia Prodan, Daniel E. Bunker

Efficient Inversion in Underwater Acoustics with Iterative and Sequential Bayesian Approaches
Office of Naval Research: January 1, 2010 – July 15, 2013
Zoi-Heleni Michalopoulou

Restricted Diffusion in Cellular Media: Application to Cortical Spreading Depression
National Science Foundation: October 1, 2010 - September 30, 2013
Robert M. Miura (PI), Huaxiong Huang (Co-PI), Jonathan J. Wylie (Co-PI)

Collaborative Research: Mathematical and Computational Methods for Stochastic Systems in Nonlinear Optics
National Science Foundation: September 1, 2011 - August 31, 2014
Richard O. Moore

Winding Domain Walls in Thin Ferromagnetic Films
National Science Foundation: September 1, 2009 - August 31, 2013
Cyrill Muratov

Collaborative Research: Dynamics of Morphogen Gradients
National Science Foundation: October 1, 2011 - September 30, 2014
Cyrill Muratov, Peter Gordon, and Stanislav Shvartsman

Strongly Non-equilibrium Phenomena at H2 and Ox Phase Boundaries
NASA: January 1, 2012 - September 30, 2013
Cyrill Muratov

Regulation of Neuronal Oscillation by Synaptic Dynamics
National Institutes of Health: February 1, 2012 – November 30, 2016
Farzan Nadim

Collaborative Research: Efficient Surface-based Numerical Methods for 3D Interfacial Flow with Surface Tension
National Science Foundation: October 1, 2010 - September 30, 2013
Michael Siegel

Numerical Methods and Analysis for Interfacial Fluid Flow with Soluble Surfactant
National Science Foundation: October 1, 2010 - September 30, 2013
Michael Siegel, Michael Booty, and Yuan-Nan Young

Propagation and Scattering by Complex Arrangements of Dielectrics and Conductors Phase II, with MathSys Inc., STTR Phase II
Air Force Office Scientific Research (AFOSR), FA9550-12-C-0029: January 2012 – January 2014
Catalin Turc

Efficient, Accurate and Rapidly Convergent Algorithms for Solutions of Wave Propagation Problems in Configurations Complex Material and Geometric Features
National Science Foundation (NSF) DMS-1008076: July 2010 - June 2013
Catalin Turc

PROJECTS FUNDED DURING PRESENT FISCAL YEAR

EAGER: Climate Change and Phenological Mismatch - An Experimental Test with Cavity Nesting Bees, Cleptoparasites, and Floral Resources
National Science Foundation: February 15, 2013 - January 31, 2015
Daniel E. Bunker

Collaborative Research: Expanding links with Industry through Collaborative Research & Education in Applied Mathematics
National Science Foundation - Division of Mathematical Sciences: April 1, 2013 - March 31, 2016
Linda J. Cummings and Richard Moore

Experimental and Computational Study of the Instabilities, Transport, and Self Assembly of Nanoscale Metalic Thin Films and Nanostructures
National Science Foundation: September 1, 2012 - August 31, 2015
Lou Kondic

Modeling and Analysis of Nematic Films: Flow Substrate Interactions
National Science Foundation: September 1, 2012 - August 31, 2015
Linda Cummings and Lou Kondic

CREATIV: Nonlinear Data Reduction Applied to Dense Granular Media
National Science Foundation: September 1, 2012 - August 31, 2015
Lou Kondic, Konstantin Mischaikow (Rutgers), Robert Behringer (Duke)

Pan-American Advanced Study Insitute (PASI) on Frontiers on Particular Media: From Fundamentals to Applications
National Science Foundation: January 1, 2013 - December 31, 2014
Lou Kondic and Robert Behringer (Duke)

Symposium on Methods to Predict the Structural and Mechanical Properties of Dense Granular Media
National Science Foundation: July 1, 2012 - June 30, 2013
Lou Kondic and Robert Behringer (Duke)

Efficient Inversion in Ocean Acoustics with Iterative, Sequential, and Analytical Methods
Office of Naval Research: January 1, 2013 - July 15, 2015
Zoi-Heleni Michalopoulou

Collaborative Proposal: Mathematical and Experimental Study of Lipid Bilayer Shape and Dynamics Mediated by Surfactants and Proteins
National Science Foundation: September 1, 2012 - August 31, 2015
Yuan-Nan Young

B. PROPOSED RESEARCH

PROJECTS PROPOSED DURING PRESENT FISCAL YEAR

A New Computational Method for Viscoelastic Two-phase Flows
National Science Foundation: 2013-2016
Shahriar Afkhami

Direct Computation and Modeling of Nanoscale Fluid Problems including Fluid-Solid Interaction, Thermal Effects and Phase Change
Department of Energy-Advanced Scientific Computing Research, 2013-2016
Shahriar Afkhami

Efficient Methods for Electromagnetic and Acoustic Problems
National Science Foundation: July 15, 2013 - June 30, 2016
Yassine Boubendir

Smartphone Apps for Ecological Interpretation
Delano Foundation, Private, $10,000.00, Date Submitted: March 2, 2011
Daniel E. Bunker

CAREER: Experimental Manipulation of Phenological Mismatch Among Cavity Nesting Bees, Cleptoparasites, and Floral Resources
National Science Foundation: January 1, 2013 - December 31, 2017
Daniel E. Bunker

Collaborative Research: CyberSEES:Type 1: Unmasking the Hidden Webs of Life: Persuasive Technology for Environmental Awareness
National Science Foundation: June 1, 2014 - May 31, 2016
Daniel E. Bunker (Co-Principal), Gareth J. Russell (Principal), Taro Narahara (Co-Principal), Andrzej Zarzycki (Co-Principal), and Blair MacIntyre (Co-Principal)

FRG: Collaborative Research: Modern Applications of Geometric Structure, Analytic Functions and Singularities: Modeling, Theory and Computation
National Science Foundation: July 1, 2013 – June 30, 2016
Linda J. Cummings

Model for Ischemic Postconditioning
National Science Foundation/National Institutes of Health: March 1, 2013 – February 28, 2016
Linda J. Cummings and Raquel Perez-Castillejos

Low Dimensional Hamiltonian Models in Nonlinear Waves
National Science Foundation: July 1, 2013 - June 30 2016
Roy Goodman

Collaborative Research: New Directions for Research on Some Large-Scale Multiple Testing Problems
National Science Foundation: July 15, 2013 - June 30, 2016
Wenge Guo

EXTREEMS-QED: Research and Training in Computational and Data-Enabled Science and Engineering for Undergraduates in the Mathematical Sciences at NJIT
National Science Foundation: January 1, 2014 - December 31, 2018
Michael Siegel, David J. Horntrop, Ji Meng Loh, Zoi-Heleni Michalopoulou, Marvin Nakayama, Peter Petropoulos, Catalin Turc, Richard Moore, and Shidong Jiang

Collaborative Research: CDS&E: Fast Algorithms for Large Scale Simulations with Spatial Correlations
National Science Foundation CDS&E program: July 2013 - June 2016
Shidong Jiang

Integral Equation Based Fast and High Order Algorithms for Unsteady Stokes Flow in Complex Geometries
National Science Foundation Computation Math program: July 2013 - June 2016
Shidong Jiang

Instabilities and Nano-assembly of Laser-irradiated Metallic Materials
Department of Energy: August 1, 2013 - June 30, 2016
Lou Kondic and Shahriar Afkhami

Liquid Metals on Nanoscale: Modeling and Computation
National Science Foundation: July 1, 2013 - June 30, 2016
Shahriar Afkhami and Lou Kondic

Role of Cooperative Calcium Buffering in Cell Calcium Dynamics and Synaptic Plasticity
National Science Foundation: July 1, 2013 - June 31, 2016
Victor Matveev

Research Training Group - Training, Mentoring, and Research in Mathematical Biology and Biofluiddynamics at NJIT
National Science Foundation: September 1, 2014 - August 31, 2019
Robert M. Miura (PI), Amit Bose (Co-PI), Ji Meng Loh (Co-PI), Horacio Rotstein (Co-PI), Michael Siegel (Co-PI)

Cortical Spreading Depression Waves: Instigation, Propagation, and Tissue Recovery
National Science Foundation: October 1, 2013 - September 30, 2016
Robert M. Miura

Non-local Geometric Problems of Calculus of Variations
National Science Foundation: July 1, 2013 - June 30, 2016
Cyrill Muratov

Deterministic and Stochastic Magnetization Dynamics in Thin Ferromagnetic Films and Devices
National Science Foundation: July 1, 2013 - June 30, 2016
Cyrill Muratov

The Effects of Ionic Conductance Correlations on Neuronal Activity
National Institutes of Health: Sep 1, 2013 - August 31, 2017
Horacio G. Rotstein

Mechanisms of Frequence Preference in Neurons and Networks: Biophysics and Dynamics
National Science Foundation: Jun 1, 2013 - May 31, 2016
Horacio G. Rotstein

Model-based Confidence Bands for Survival and Quantile Functions
National Security Agency: June 1, 2013 – May 31, 2015
Sundar Subramanian

Novel Simultaneous Confidence Bands for Survival and Quantile Functions
National Science Foundation: July 1, 2013 – June 30 2016
Sundar Subramanian

Efficient Integral Equation Solvers for Large-scale Frequency Domain Electromagnetic Scattering Problems
NSF Applied Mathematics: September 2013- June 2016
Catalin Turc

An Integrated Approach to Understand Primary Cilium and its Sub-axonemal Compartment
National Science Foundation: August 1, 2013 - July 31, 2016
Yuan-Nan Young

PROPOSED PROJECTS - NOT THROUGH CAMS

Temporal Fidelity of Axonal Action Potential Conduction and its Neuromodulation
National Science Foundation: December 1, 2012 – November 30, 2016
Dirk Bucher and Farzan Nadim

The Role of Axons in Neural Coding
NIH: March 15, 2013 - February 28, 2018
Dirk Bucher and Farzan Nadim

Interdisciplinary Undergraduate Program in Nanotechnology at NJIT: Linking K-12 through Graduate Education via Nanotechnology
National Science Foundation: January 1, 2014 to December 31, 2015
PI: Raquel Perez-Castillejos, Co-PIs: Haim Grebel, John Carpinelli, Somenath Mitra, and Zoi-Heleni Michalopoulou

CONTINUING PROJECTS — NOT THROUGH CAMS

Dynamics of Sleep-Wake Regulation
National Science Foundation, Division of Mathematical Sciences
October 1, 2011 – September 30, 2014
Victoria Booth and Cecilia Diniz Behn

Science Education Workshops
Roche: Dec. 1, 2011 - Dec. 31, 2012
Bruce Bukiet, James Lipuma, and Roumiana Petrova

NJIT Science Education Program
HSBC Bank USA: Oct. 2011 - Sept. 2012
Bruce Bukiet and James Lipuma

Understanding and Combating the Fire-enhancing Impact of Non-native Annuals in Desert Scrub through the Tools of Population and Landscape Ecology
Strategic Environmental Research and Development Program (SERDP)/DoD, 2010 -2014
Claus Holzapfel and Kirk Moloney

Effects of Climate Change on Tibetan High Altitude Vegetation
Visiting Professorship for Senior International Scientist of the Chinese Academy of Science - since June 2011 (ongoing)
Claus Holzapfel

Modeling Cortical Spreading Depression
American institute of Mathematics: November 2008 - August 2012
Robert M. Miura and Huaxiong Huang

Cerebral Blood Flow, Neurovascular Coupling, and Cortical Spreading Depression
Focussed Research Group, Banff International Research Station: October 2011 - June 2013
Robert M. Miura and Huaxiong Huang

Stretching of Viscous Threads
Research Grants Council of the Hong Kong Special Administrative Region, China, City University of Hong Kong: 2011-2014
Jonathan J. Wylie, Huaxiong Huang, and Robert M. Miura

Elsevier Distinguished Lectures in Mechanics
2008 – present
Anthony D. Rosato

PROJECTS FUNDED DURING PRESENT FISCAL YEAR - NOT THROUGH CAMS

The Role of Axons in Neural Coding
NIH: March 15, 2013 - February 28, 2018
Dirk Bucher and Farzan Nadim

Inestabilidades en Peliculas Liquidas Conformadas: Formacion de Gotas Submilimetricas y Nanometricas
Consejo Nacional de Investigaciones Cientificas y Tecnicas (CONICET, Argentina): July 2012 - July 2014
Javier Diez

Nonlinear Hydroelastic Waves with Applications to Ice Sheets
Engineering and Physical Sciences Research Council: November 12, 2012- November 11, 2015
Jean-Marc Vanden-Broeck

VIII. COMMITTEE REPORTS AND ANNUAL LABORATORY REPORT

A. COMPUTER FACILITIES

High quality facilities supporting numerical computation are essential for the Department of Mathematical Sciences (DMS) and the Center of Applied Mathematics and Statistics (CAMS) at NJIT to fulfill their educational and research missions. Thus, DMS and CAMS, with SCREMS, UBM, and MRI grants from NSF and the generous support of NJIT, have maintained the CAMS/Math Computation Laboratory (CMCL) for the research needs of their members since 1989.

Computational support provided by CMCL for the proposers takes the form of the desktop PC's made available to investigators in their offices and the shared facilities of the CMCL. In addition, there is a network of Sun Workstations, and PCs running Windows available to the faculty, postdoctoral associates, and students.

Major computational facilities include an AMD Opeteron cluster that was purchased with the support of an NSF Major Research Instrumentation (MRI) grant, and expanded with an NSF Computational Science Training for Undergraduates in the Mathematical Sciences (CSUMS) grant. The system is a 77 node (174 processor) Beowulff type cluster, and features AMD Opteron processors running at 2.4 GHz with a fast Myrinet interconnect. The cluster has been operational since March 30, 2005.

In 2010, a 32 core system was purchased with department funds. The system uses AMD Opteron processors running at 2.3 GHz, and a total 64GB memory. More recently, a 96 core system was purchased with department funds and became operational in November 2011. The system uses Intel Xeon processors running at 2.53 GHz, and a total 768GB memory. This computer is intended for jobs that require large memory, and parallel computations using OpenMP. An extension to this cluster which effectively doubles its capabilities has been purchased with departmental funds and went online in September 2012. All computational facilities are maintained by the University Computing Systems (UCS), headed by David Perel, Director of UCS.

A further addition to this cluster was made in August 2013 using departmental funds. This addition includes 13 nodes/156 cores with Intel Xeon E5-2630 2.3 GHz processors (10 GHz memory per core) and 2 NVIDIA GPU processors.

Meeting rooms

A conference room and the CAMS Reading Room are available for formal and informal research meetings.

B. STATISTICAL CONSULTING LABORATORY REPORT (July 2012 - June 2013)

The Mathematical Sciences faculty serves the NJIT community and outside individuals and organizations as statistical consultants. Here are some examples of such consulting activities.

Date: July - August 2012, Client: Adam Sivitz (Beth Israel Hospital)
Description: For patients who have symptoms of appendicitis, analyzed the differences between two methods of detecting appendicitis - ultrasound and radiological techniques. Assessed the accuracy of ultrasound technique and the stenographers. For the tested patients, analyzed the demographic differences between the false positive (diagnostic said yes but was a false indicator) and positive groups with respect to the following variables: age, gender, fever, nausea, vomiting, rebound, rlq tender, migratory pain, cough hop, anorexia, symptom duration, VAS likelihood, wbc.
Consultant: Professor Ken Johnson

Date: July - August 2012, Client: Cena Tejani (Beth Israel Hospital)
Description: Analyzed the proportion of infection and dehiscence risk factors and identified the differences that are statistically significant. The difference that is statistically significant at $\alpha = 0.05$ is private insurance; the rate of occurrence of infection is 2.16% for those with private insurance and 5.23% for those without private insurance. The medical history is marginally significant with a p-value of 0.095 for Fisher's exact test; the rate of occurrence of infection is 9.30% for those with medical history and 3.82% for those without medical history. Provided the results for each risk factor for infection and dehiscence as well as the corresponding p-value.
Consultant: Professor Aridaman Jain

Date: July – August 2012, Client: Shima Goswami (Beth Israel Hospital)
Description: Compared the pre and post results for patency. Provided confidence interval for the proportion of patients who had a decrease greater than 40%. Provided the results of sensitivity analysis for different sample sizes.
Consultant: Professor Aridaman Jain

Date: July - December 2012, Client: Francisco Artigas (New Jersey Meadowlands Commission – Environmental Research Institute) and Erin Ihde (Hackensack University Medical Center)
Description: Provided statistical consulting support on a research study of the association of environmental factors for the NJ DEP designated contaminated sites with the residential location of children in New Jersey at the time of autism diagnosis at a pediatric developmental center at a tertiary care children's hospital. Guided the development of regression models for prevalence rates of autism spectrum disorders (ASD).
Consultants: Professors Ji Meng Loh and Aridaman Jain

Date: July - December 2012, Client: Francisco Artigas (New Jersey Meadowlands Commission – Environmental Research Institute)
Description: Analyzed the CO_2 measurements collected during June '11 – June '12 and related them to environmental conditions. This project is related to the creation of the Regional Greenhouse Gas Initiative (RGGI) to cap and trade GHGs by the United States. Developed the following four models by considering day and night periods for the growing and leaf off seasons: growing season / day, growing season / night, leaf off season / day, and leaf off season / night. The growing season consists of months May through October while the leaf off season consists of months November through April. The distinction between night and day was determined based on solar radiation where daytime hours ranged from 6:00 AM to 8:30 PM. Evaluated the predictive ability of these four models by dividing the data sets into a training data set consisting of 80% of the observations which were chosen at random and a testing data set consisting of the remaining 20% of the observations. The mean squared error (MSE), the average squared difference between the actual Net Ecosystem Exchange (NEE) and predicted NEE, for the training data set was quite close to the predicted squared error (PSE), the average squared difference between the actual NEE and predicted NEE, for the testing data set, which confirmed that the fitted models have predictive capability.

Consultants: Gavin Lynch and Professor Aridaman Jain

Date: September 2012– February 2013, Client: Adam Sivitz (Beth Israel Hospital)
Description: For patients who have symptoms of appendicitis, conducted a follow up analysis of the differences between two methods of detecting appendicitis - ultrasound and radiological techniques. Compared the documentation accuracy between the stenographer and the experienced doctor, using the Bland Altman technique. For sensitivity, specificity, accuracy, PPV and NPV, a 95% proportional difference was constructed to compare the metric performances between the ED and Radiology as well as within the ED. Provided detailed results to the client including brief descriptions of the statistical tools used in each analysis. Provided 95% confidence intervals for the continuous variables.
Consultant: Professor Ken Johnson

Date: December 2012, Client: Richard Gioscia (Vice President, ECC)
Description: Conducted an analysis of the easy-to-obtain eye estimates of truck load volumes with the actual load volumes and computed 95% confidence interval for the difference of the two means for three sizes of shipments (up to 25 cubic feet, 26-55 cubic feet, and over 55 cubic feet). Examined the association between percent load and load volume for 10, 071 loads. Usually, the reported load percentages are rounded to multiples of 5. We examined the effect of rounding off of load percentages to the nearest multiple of 5 by considering a uniform distribution for the true percent load.
Consultants: Sonia Bandha and Professor Aridaman Jain

Date: April– May 2013, Client: Michael Corbett (Beth Israel Hospital)
Description: Analyzed the difference between ABX <= 3 and ABX > 3, when the sampling frame is a list of medical charts, where ABX is a judgmental decision about the path an emergency patient would take for care. Tested for the statistical significance of the difference between the two samples. For the continuous variables, tested for normality and performed the applicable parametric and non- parametric tests and associated confidence intervals. For the qualitative variables, performed tests by using either Chi-Square Test or a Fisher Exact Test.
Consultant: Professor Ken Johnson

Date: April – May 2013, Client: Urvi Thakker (Beth Israel Hospital)
Description: Examined the relationship between OTC pediatric cough/cold medicine purchase and patient characteristics such as age and education level and the awareness of the FDA recommendation. Provided detailed results to the client including the p-values that indicate the level of statistical significance for each of the relationships that were examined. It was found that OTC medicine purchase is independent of age and education level. Similarly, it was found that awareness of FDA recommendation is independent of age and education level.
Consultant: Professor Aridaman Jain

Date: April – May 2013, Client: Ami Patel (Beth Israel Hospital)
Description: Analyzed the relationship between the outbreak of Legion Ella disease and the patient characteristics such as age and sex as well as the time of the year. Also examined the relationship between the length of the stay in the hospital and the number of days it took to diagnose this disease.
Consultant: Professor Aridaman Jain

IX. CURRENT AND COLLABORATIVE RESEARCH

A. RESEARCH AREAS IN CAMS

Mathematical Biology

Researchers in CAMS working on problems related to Mathematical Biology: Booth, Bose, Bukiet, Dhar, Golowasch, Holzapfel, Nadim, Matveev, Miura, Muratov, Perez, Rotstein, Russell, Siegel, Tao, and Young.

Mathematical Biology broadly refers to the branch of mathematics that is devoted to the study of biological processes. Recently, there has been quite a bit of emphasis on the intersection of mathematics with developmental biology, neurophysiology, and especially genomics. Moreover, mathematicians are applying their modeling and analytical skills to the study of various diseases, such as diabetes, Parkinson's disease, multiple sclerosis, Alzheimer's disease, and HIV-AIDS. The kinds of mathematics needed to describe and address problems in these areas of Mathematical Biology are quite vast and include dynamical systems, partial differential equations, fluid dynamics, mechanics, and statistics, to name only a few. Researchers in Mathematical Biology at NJIT have strong interdisciplinary research programs since most of them have active collaborations with experimentalists. This group of Mathematical Biologists is the largest in a department of mathematics in North America.

A primary focus of the Mathematical Biology group is in experimental, computational, and mathematical Neuroscience. The experimental research in neuroscience within CAMS is headed up by Jorge Golowasch and Farzan Nadim. Both researchers run labs in which they conduct experiments on various aspects of the crustacean stomatogastric nervous system (STNS). Various aspects of Computational and Mathematical neuroscience are being studied by Victor Matveev, Horacio Rotstein, Louis Tao, Amitabha Bose, and Robert Miura. Matveev studies mechanisms responsible for short-term synaptic plasticity. He is particularly interested in understanding the role of residual calcium in synaptic facilitation. Tao is interested primarily in the modeling and analysis of the dynamics of neuronal networks, with application to visual cortex and other large-scale cortical networks. He focuses on developing analytical techniques to study networks in simplified settings and on identifying possible biological functions of emergent network dynamics. Bose is interested in developing mathematical techniques to understand the role of short-term synaptic plasticity in producing multi-stable periodic solutions within neuronal networks. He is also interested in developing models for persistent localized activity in excitatory networks. Miura has worked extensively on modeling and analysis of models for electrical activity in excitable cells, including neurons and pancreatic beta-cells. He is currently working on mathematical models for spreading depression, a slowly propagating chemical wave in the cortex of various brain structures, which has been implicated in migraine with aura.

In the area of Developmental Biology, Cyrill Muratov is interested in developing models that describe the patterning events leading to the formation of dorsal appendages during Drosophila egg development. He studies a system of coupled reaction-diffusion equations driven by a localized input and characterizes the oocyte phenotype by the number of peaks in the signaling pattern. Gareth Russell studies complex ecological systems, including predictive models of wading bird species in the Everglades National Park.

Fluid Dynamics

Researchers in CAMS working on problems related to Fluid Dynamics: Afkhami, Bechtold, Booty, Bukiet, Choi, Cummings, Diez, Huang, Jiang, Kondic, Luke, Papageorgiou, Petropoulos, Rosato, Siegel, Vanden-Broeck, Wang, Wylie, and Young.

There are ten faculty members within the Department of Mathematical Sciences (DMS) and Center for Applied Mathematics and Statistics (CAMS) whose research is in fluid dynamics or the closely related area of combustion. This group of fluid dynamics scientists is one of the largest contained within a department of mathematics in the United States.

Fluid dynamics is concerned with the motion of fluids and gases. Many beautiful and striking phenomena occur in fluid flows. Familiar examples include the giant vortices shed by airplane wings, the persistent red spot of Jupiter, and the formation of crystalline patterns in solidifying fluids (i.e., snowflakes).

The basic equations of inviscid fluid dynamics have been known for over 250 years and viscous flow equations were derived over 180 years ago. They are nonlinear partial differential equations and are simply written. However, analyzing the solutions to these equations is extremely challenging. Mathematicians have played a leading role in the development of analytical, asymptotical and numerical methods for solving the equations of fluid dynamics. Mathematical techniques originally developed to study fluid phenomena have found wide application in other areas of science and engineering. Examples include asymptotic methods, the inverse scattering transform, numerical methods such as boundary integral methods and level set methods, and theoretical techniques to study the qualitative nature of solutions to nonlinear differential equations. Mathematical research in fluid dynamics continues to drive broad advances in mathematical methods, numerical methods and mathematical analysis.

The fluid dynamics group in the Department of Mathematical Sciences at NJIT has an active research program covering interfacial fluid dynamics (Afkhami, Booty, Cummings, Huang, Kondic, Papageorgiou, Siegel, and Vanden-Broeck), thin films (Cummings, Diez, and Kondic), electrohydrodynamics (Papageorgiou, Petropoulos, and Vanden-Broeck), hydrodynamic stability theory (Papageorgiou), sedimentation (Luke), granular flow (Kondic and Rosato) and combustion (Bechtold, Booty, and Bukiet). A particular focus for several of the faculty members (Afkhami, Booty, Choi, Cummings, Huang, Kondic, Papageorgiou, Siegel, Vanden-Broeck, Wang, Wylie, and Young) is the study of free and moving boundary problems. These are particularly challenging problems in that partial differential equations have to be solved in a region which is not known in advance, but must be determined as part of the solution. A famous example is the Stefan problem for melting ice or freezing water, but also the dynamics of bubbles, jets, shock waves, flames, tumor growth, crack propagation and contact problems all can be classified under this heading. CAMS fluid dynamics researchers are also pursuing applications of their work in Biology and Nanotechnology.

Wave Propagation

Researchers in CAMS working on problems related to Wave Propagation: Ahluwalia, Booty, Boubendir, Choi, Erneux, Goodman, Jiang, Kriegsmann, Michalopoulou, Miura, Moore, Petropoulos, and Turc.

The analysis of wave propagation has a long and storied tradition in the history of applied mathematics, and the exploration of wave behavior has been a source of countless problems that have changed our understanding of acoustics, hydrodynamics, electromagnetics, optics, and even matter itself. These studies also have led to the development of powerful new mathematical and computational techniques, which have on occasion revolutionized entire fields of study. Several members of the CAMS faculty have research interests in the area of wave propagation; the following is a brief overview of the field and of their particular interests.

One field that has been affected very profoundly by the relatively new science of nonlinear waves is optical communications. Richard Moore is currently using perturbation theory and statistical techniques to develop efficient ways to characterize the effect of perturbations on solitons used for optical communications. Roy Goodman uses Hamiltonian mechanics and asymptotic methods to explore how light can be slowed, delayed, or "trapped"' by engineering defects in nonlinear periodic structures.

The treatment of transient electromagnetic signals such as those arising in signal analysis, spectroscopic applications, and the nondestructive testing of structures requires sophisticated numerical techniques that are stable, fast, and accurate, and that have reasonable memory requirements. Peter Petropoulos is conducting research on a variety of approaches that address these restrictions, including high-order finite difference schemes, boundary integral methods, and perfectly matched layers. Shidong Jiang investigates nonreflecting boundary conditions and scattering problems for acoustic and electromagnetic waves by open surfaces. He employs fast algorithms, including the fast multipole method, iterative solvers, and integral equation formulation of boundary value problems for such problems and for related large-scale problems in physics and engineering. Yassine Boubendir and Catalin Turc develop multi-scale and efficient methods, including domain decomposition methods, for the study of wave scattering.

Even in cases where deterministic wave propagation is relatively well understood, the related inverse problem is far more challenging. The identification of certain characteristics of a source of acoustic waves, such as its location and intensity, is of obvious use in national defense, in environmental studies, in seismology, etc. Zoi-Heleni Michalopoulou has developed a localization-deconvolution approach based on Gibbs sampling that explores the space of allowable configurations with improved speed and accuracy over conventional approaches.

Finally, the propagation of waves through materials is often influenced by parameters that depend on the waves in a way that requires fundamentally different physics. The microwave heating of ceramics or the passage of optical fields through photorefractive crystals, for instance, couples hyperbolic equations to parabolic equations governing the evolution of thermal profiles and chemical species. Gregory Kriegsmann and Richard Moore are investigating asymptotic and numerical methods to treat such coupled hyperbolic-parabolic systems.

Dynamical Systems

Researchers in CAMS working on problems related to Dynamical Systems: Blackmore, Bose, Golowasch, Jiang, Kappraff, Kriegsmann, Matveev, Miura, Moore, Nadim, Papageorgiou, Rotstein, Siegel, Tao, and Young.

Today's research in the theory and applications of dynamical systems all have their roots in the work of early innovators in differential equations and mathematical modeling.

A major revolution in dynamical systems research took place during the late nineteenth and early twentieth century characterized by innovations in the study of integrability such as those of Kovalevskaya, and culminating in the ground-breaking work of Poincare on nonintegrable Hamiltonian systems. Poincare brought a new infusion of topological methods to dynamical systems research that has illuminated and served as a source of inspiration for virtually all subsequent investigations. In the process, he introduced a new perspective on nonlinearity and complex motion that predated chaos theory. This new topological trend continued and was greatly advanced by such notables as Birkhoff, Kolmogorov, Arnold, and Moser.

Then in the 1960's, the face of dynamical systems research was dramatically altered by Smale and others with the introduction of a variety of techniques from differential topology that provided amazing new insights into the nature of chaotic dynamics. At about the same time, a dramatic advance in research on infinite-dimensional Hamiltonian systems was occuring as a result of

several extraordinary discoveries concerning integrability, solitons, and the inverse scattering transform made by the likes of Gardner, Greene, Kruskal, Lax, and our own Robert Miura. These remarkable breakthroughs established the foundations of what has come to be known as the modern theory of dynamical systems, and catalyzed an explosion of applied and fundamental research in nonlinear dynamics.

Dynamical systems research in CAMS has a decidedly applied focus, and is extremely active in a wide and diverse range of areas including mathematical biology, fluid dynamics, wave propagation, computational topology, nonlinear optics, and quantum field theory and its applications to such things as quantum computing. There are a significant number of researchers who employ techniques from nonlinear dynamics in their work, and a smaller but sizeable core group whose interests are centered around dynamical systems and their applications. This includes Denis Blackmore, who applies nonlinear dynamics to study the motion of vortices and vortex filaments in fluids and particles in granular flows, the chaotic evolution of biological populations, the computational topological nature of certain geometric objects, and quantum computing. He also does fundamental research in bifurcation theory, chaos theory, and algebraic and differential integrability analysis of infinite-dimensional Hamiltonian dynamical systems. Dynamical systems methods applied to nonlinear waves and optics is the focus of Roy Goodman's research. A key ingredient in his work is the development of methods for obtaining insights from finite-dimensional reductions of infinite-dimensional systems such as the nonlinear Schrodinger equation.

Numerical Methods

Researchers in CAMS working on problems related to Numerical Methods: Afkhami, Boubendir, Bukiet, Choi, Goodman, Horntrop, Jiang, Kondic, Luke, Matveev, Michalopoulou, Moore, Muratov, Papageorgiou, Petropoulos, Rosato, Siegel, Tao, Turc, and Young.

Given the rapid development of the power of computers in recent decades, the use of computation as a means of scientific inquiry has also greatly increased and now is ubiquitous in most areas of applied mathematics. CAMS researchers are involved in all aspects of this scientific revolution from the development of new, more efficient and accurate numerical algorithms to the creation of computational packages for use by researchers throughout the world. The computational work of CAMS researchers is supported by state of the art facilities including numerous workstations and a 134 processor cluster.

Virtually every CAMS member uses computation in some aspect of their research. Some of the specific computational tools that are being used and developed by CAMS researchers are described below. Boundary integral methods are being used to study moving interfaces in materials science and fluid dynamics. Computational solutions of nonlinear partial differential equations are used in studies of the formation of finite-time singularities in aerodynamic and interfacial problems. A wide variety of finite difference methods for ordinary and partial differential equations, often in conjunction with iterative solvers and conjugate gradient methods, are used in studies of advection-diffusion problems, wave propagation, blood circulation, the visual cortex, as well as synaptic function and intracellular spatio-temporal calcium dynamics. Level set methods are used to study interfaces in materials. Novel techniques for differential difference equations are also used to better understand materials. Convergence of fast multipole methods is analyzed and these methods are used to study wave propagation. Novel techniques to remove spurious reflections of waves at computational boundaries are being developed. Signal detection and estimation techniques rely upon global optimization techniques used and developed by CAMS researchers. Finite element methods are used to study mechanical systems; the immersed boundary method is being developed and refined in order to improve computational accuracy and efficiency near interfaces.

Stochastic computation also receives a great deal of attention by CAMS researchers. Monte Carlo methods based upon the principles of statistical mechanics are used in studies of granular materials. Monte Carlo simulation is used to study molecular biology and bioinformatics.

Stochastic models of sedimentation are being developed and refined through a combination of analysis and simulation. Markov Chain Monte Carlo methods are used in studies in statistics and biostatistics. Simulations taking advantage of variance reduction techniques are being used to study the effects of stochastic perturbations on solitons. New computational techniques for stochastic partial differential equations based upon spectral methods are being developed and applied to multiscale models of surface processes.

Statistics

Researchers in CAMS working on problems in Applied Probability and Statistics: Dhar, Dios, Guo, Jain, Johnson, Loh, and Subramanian.

Applied Probability and Statistics/Biostatistics is concerned with the study of processes in which uncertainty plays a significant role. In today's data driven environment, the utility and need for modeling and statistical analysis of uncertainty is assuming increasing importance in virtually every field of human interest. Typical examples are in the comparative study of DNA databases, evaluation of drug safety and effectiveness, design and analysis of modern communication protocols, stochastic models in finance, study of aging and performance analysis of components and complex systems.

While Applied Probability and Statistics/Biostatistics are driven by the need to solve applied problems, their progress and development comes from basic research and from their applications to solve specific problems arising in practice. This interplay of basic and applied research has benefited both. Real life applied problems have often posed new theoretical challenges which had to be solved by developing new methods (e.g., survival analysis and clinical trials). Conversely, theoretical ideas and methods which were developed in a specific applied context were later seen to be of much broader applicability (e.g., nonparametric aging ideas which owe their origins to research in stochastic modeling of reliability of physical systems were later seen as useful constructs in many other areas such as in the study of queuing systems, stochastic scheduling, branching processes as well as in modeling economic inequality). Biostatistics, an increasingly important area of statistics, focuses on developing new statistical methods, as well as applying existing techniques, to interpret data about the medical and life sciences. The importance of biostatistics stems from its wide use in the pharmaceutical and health-care industries, and in medical schools, e.g. in the area of cell biology and molecular medicine empirical survival distributions of mice in both placebo and treatment groups are typically compared to look for significant difference in new chemical treatments when compared with placebo.

The Statistical Consulting Laboratory (SCL), which operates under the umbrella of CAMS, provides data analysis and statistical modeling consulting services to the University community, as well as to external clients. Consulting on statistical and biostatistics problems channeled through the SCL, are provided by statistics faculty. The current coordinator of the SCL is Ari Jain.

The current research interests of the Statistics faculty are in the following broad and overlapping areas: applied probability models (Dhar), bioinformatics and computational biology (Guo), bootstrap methods (Subramanian), censored time-to-event data analysis (Dhar and Subramanian), computational statistics (Guo and Subramanian), discrete multivariate distribution/reliability models and inverse sampling (Dhar), distribution theory and statistical inference (Dhar and Subramanian), empirical processes (Dhar, Subramanian), high dimensional inference (Guo), minimum distance estimation (Dhar), multiple imputations methods (Subramanian), multiple testing (Guo), orthogonal arrays in experimental designs (Dios), semiparametric estimation and inference (Dhar and Subramanian), statistical issues in clinical trials (Guo and Dhar), statistical theory of reliability and survival analysis (Dhar and Subramanian), and survey sampling (Jain).

Several CAMS members have active research programs in Biostatistics. This includes the application of non- and semi-parametric statistical inference and computational methods, such as the bootstrap, in biostatistics.

B. RESEARCH DESCRIPTIONS

Shahriar Afkhami

Shahriar Afkhami's research focuses on computational and mathematical modeling of real-life engineering phenomena including biomedical systems, polymers and plastics, microfluidics, and nanomaterials. His current research thrusts include studies of existence of solutions, flow stability, asymptotic behavior, and singularities of complex flow problems. Currently, he is working on 3D computations of drop dynamics and breakup in polymer processing, microfluidics, and electrowetting. Motivated by biomedical and pharmaceutical applications, he has been studying the dynamics of magnetic particles in a blood flow for drug delivery applications. His current materials related projects involve directed assembly of metallic nanostructures.

Daljit S. Ahluwalia

The research of Daljit S. Ahluwalia is in the field of applied mathematics, mainly in the areas of asymptotics and wave propagation. Using analytic and asymptotic methods, he has addressed a wide range of phenomena including scattering, diffraction, reflection, guided waves, dispersion and shock waves. Applications of this work include ocean acoustics, water waves, electromagnetics, and elastic waves.

Roman Andrushkiw

The research of Roman Andrushkiw has focused on the spectral theory of operator-valued functions and the analysis of free boundary problems, with application to numerical modeling in the area of cryosurgery and medical diagnostics. His study of operator-valued functions deals with spectral theory and approximation methods for eigenvalue problems that depend nonlinearly on the spectral parameter. His study of Stefan-type free boundary problems is concerned with modeling of heat transfer phenomena in the freezing of living tissue, involved in cryosurgery. His current projects include the development of a variational method for approximating the eigenvalues of polynomial differential operator pencils, and the study of a pattern recognition algorithm in medical diagnostics related to breast cancer.

John Bechtold

The research of John K. Bechtold has focused on the modeling and analysis of physical problems, primarily in the area of theoretical combustion. His studies cover a wide range of topics in both premixed and non-premixed combustion, including stability, ignition, extinction, and complex flame/flow interactions. His current projects include the development of new generalized models of near-stoichiometric flames, stability of expanding and converging flames, and radiation-driven flows in microgravity.

Denis Blackmore

Dynamical systems (nonlinear dynamics) theory is a rich amalgam of techniques from algebra, analysis, chaos theory, differential equations, differential geometry, differential topology, fractals, geometry, singularity theory, and topology, and has important applications in every branch of science and engineering. Denis Blackmore's research is primarily in the theory and applications of dynamical systems and closely related fields. He has studied a plethora of applications in such areas as acoustics, automated assembly, biological populations, computer aided geometric design, fluid mechanics, granular flows, plant growth (phyllotaxis), relativistic and quantum physics, and rough surface analysis. His theoretical work includes fundamental results on solution properties and integrability of differential equations, and analysis of hypersurface singularities. Among his current projects are acoustically generated particle flows, biocomplexity of marshes, competing species dynamics, dynamical models in economics, integrability of infinite-dimensional

dynamical systems (PDEs), particle dynamics, phyllotaxis, virtual reality systems, vortex dynamics, and weak shock waves.

Victoria Booth

Victoria Booth is interested in applying mathematical modeling techniques to further our understanding of the brain. Her research focuses on different spatial and temporal scales of brain function, from single neuron spiking, to activity of large-scale spiking neuron networks, to networks of interacting neuronal populations. The consistent theme of her research is to utilize mathematical modeling to understand the physiological mechanisms generating experimentally observed neural activity, thus providing the neuroscience community with quantitative support of experimental hypotheses and a rigorous theoretical framework for exploring and developing experimentally-testable predictions. Mathematically, understanding the mechanisms generating specific model behaviors requires complete analysis of stable and unstable solutions to the nonlinear ordinary differential equations of the model system. For this analysis, she utilizes numerical simulations and analysis techniques from dynamical systems, singular perturbation theory and bifurcation theory.

Currently, her research activities are primarily concentrated in two major directions: construction and analysis of mathematical models of the sleep-wake regulatory network and investigation of the interactions of single neuron properties and network structure on spatio-temporal activity patterns in large-scale spiking neuron network models.

Michael Booty

Michael Booty's research interests are in mathematical modeling and analysis, by approximate or exact analytical techniques or by numerical methods. Much of his work is motivated by applications in fluid mechanics, including heat transfer, chemical, and electromagnetic effects. His studies on combustion have focused on time-dependent and multidimensional dynamics of reaction waves in mixed and multiphase systems, prototype reaction-diffusion models, dynamics of fast reaction waves, and droplet burning. He has also studied conditions that minimize pollutant formation in the thermal oxidation of common materials, in collaboration with faculty of the Department of Chemistry and Environmental Science at NJIT. Current research interests include: studies on interfacial flows with surfactants, elastic membranes, and electrostatic fields (with Michael Siegel and Yuan-Nan Young), and thermal waves in microwave heating and processing (with Greg Kriegsmann).

Amitabha Bose

The research of Amitabha Bose focuses on the applications of dynamical systems to mathematical neurophysiology. His studies in neurophysiology include modeling sleep rhythms in the thalamocortical system, phase precession of hippocampal place cells, and the development of rigorous mathematical techniques to analyze such problems. His current projects include modeling phase maintenance in the pyloric network of crustaceans, persistent activity in cortical circuits and rhythmogenesis in frog ventilatory systems.

Yassine Boubendir

Yassine Boubendir's general interests are in the numerical and the mathematical analysis of Partial Differential Equations. More specifically, he is interested in the design, implementation and analysis of numerical algorithms for problems of electromagnetic, acoustic and elastic wave propagation. In recent years, he introduced a new non-overlapping domain decomposition algorithm that combines a boundary element and finite element methods. In addition, he developed an appropriate krylov subspace method, at high frequency regime, in the context of multiple scattering situations. Currently, his research is devoted to the acceleration of the iterative methods corresponding to these two algorithms.

Daniel Bunker

Global change poses a strong challenge to ecologists, environmental scientists, and conservation biologists: even as our natural and managed ecosystems become more stressed by the forces of global change, humans require that these ecosystems produce both a greater quantity and a greater variety of ecosystem services. For instance, we may expect a forested ecosystem to produce timber, provide clean water, sequester carbon, support wildlife, and provide recreational opportunities, yet at the same time the forest community is being buffeted by climate change, invasive species, and land-use change. In order to ensure that our ecosystems provide the services society demands, we must be able to predict how ecological communities will respond to these global forces, and in turn how changes in community composition will affect ecosystem services. To develop this predictive framework, I employ a mix of observation, experimentation, modeling and synthesis, within a diverse array of biological communities.

Bruce Bukiet

Bruce Bukiet's research concerns mathematical modeling of physical phenomena. He has studied the dynamics of detonation waves, including curved detonations and detonation models of discrete mixtures. He currently uses his expertise in this area to study issues related to homeland security. Prof. Bukiet also researches biological systems and has done work modeling stresses in the heart, blood flow in arteries, and air flow in the lungs, and currently works in the area of postural stability. The goal of this work is in diagnosis of balance problems and evaluation of treatment options. Finally, he works on understanding and optimizing aspects of baseball from a mathematical modeling perspective.

Wooyoung Choi

Wooyoung Choi's research interest lies mainly in fluid mechanics and nonlinear waves, in particular, with applications to geophysical flow problems. His recent research focuses on the development of simple but accurate mathematical models to describe various physical processes in the ocean and, in collaboration with physical oceanographers, their validation with field and laboratory measurements. His current research projects include the development of new asymptotic models and efficient numerical methods to study the short-term evolution of nonlinear ocean surface waves with enhanced physical parameterizations of wave breaking and wind forcing, and the dynamics of large amplitude internal waves in density stratified oceans and their surface signatures.

Linda Cummings

Linda Cummings works on a variety of physically-motivated free boundary problems, mostly fluid-dynamical in nature, many of which arise in industrial or biological applications. On the biological side her current work includes studies of fluid flow, nutrient transport and cell growth in tissue engineering applications; flow dynamics and bacterial biofilm formation in prosthetic devices such as urethral catheters and ureteric stents; and dynamics of lipids in cell membranes. Her current industrially-relevant projects include modeling and analysis of "bistable" nematic liquid crystal display devices; modeling of bubble dynamics in the manufacture of glass fibers; and the flow of thin liquid films (both Newtonian and non-Newtonian). She also works on classical low Reynolds number free boundary flows, such as Stokes flows and Hele-Shaw flows. Her mathematical approaches are wide-ranging, encompassing skills of mathematical modeling, discrete and continuum mechanics, complex analysis, and asymptotic and numerical methods.

Fadi P. Deek

Fadi Deek’s primary research interest is in learning systems and collaborative technologies, with applications to software engineering, and in computer science education. His approach to research involves a mixture of theoretical development, software system implementation, controlled experimental evaluation, and ultimately deployment of the systems developed. His interest in learning systems revolves around the development of new technologies that take into

consideration the cognitive behavior and needs of end-users. The specific types of learning systems that he is interested in are related to computing which has motivated his work in software engineering. Because both learning and software engineering are highly collaborative activities, he has also become interested in understanding how collaboration works, ranging from the dynamics of collaborative groups to the technologies required for computer-supported work. His original interest in learning systems was sparked by a long standing interest in computer science education which continues to engage him. These underlying interests in learning systems and collaboration are the unifying theme for his publications, dissertation advisement, system development and professional involvement. Most of this research has been supported by grants where he has been the principal or co-principal investigator.

Sunil K. Dhar

The research focus of Sunil Dhar has been on model building and inference. His ongoing research involves proving existence, computing and developing robust and efficient minimum distance estimators such as L2-distance type, under the following models: linear, AR [k], the additive effects outliers, and the two-sample location model. He also developed functional least squares estimators under the additive effects outliers model. An optimization technique for the general class of sums of absolute multivariate linear functionals has been developed by him. He extended the negative multinomial distribution; this new model has many applications. His ongoing research in multivariate lifetime reliability models involves deriving new multivariate geometric and generalized discrete analogs of Freund's models, with demonstrated applications. Other discrete models developed by him are in the area of models of order k. He has acquired statistical consulting experience.

Javier Diez

Javier Diez's research focuses on free surface flows and interface phenomena. He is particularly interested in coating flows and the dynamics of the contact line, where the liquid, the solid substrate and the surrounding environment (gas or liquid) intersect. Current projects include using a combination of experimental measurements (usually by means of optical techniques) and numerical simulations of the fluid dynamic equations, with particular emphasis on the inclusion of intermolecular forces to account for hydrodynamical effects in nanoscale phenomena.

Rose Dios

The research of Rose Dios has focused upon statistical design of experiments with particular emphasis on the study of the existence of balanced fractional factorial designs arising from orthogonal and balanced arrays. She also has applied statistical modelling techniques to research problems in remote sensing, environmental engineering, and clinical medicine, including cardiac risk analysis and recurrence of cancer.

Thomas Erneux

The research of Thomas Erneux is mainly concerned with laser dynamical instabilities and their practical use in applications. More recently, he became interested in delay differential equations appearing in different areas of science and engineering. The response of lasers can be described by ordinary, partial, or delay diffential equations. He uses a combination of numerical and singular perturbation techniques to investigate their solutions. A large part of his research is motivated by specific collaborations with experimental groups.

Jorge Golowasch

The research of Jorge Golowasch focuses mainly on the cellular and network mechanisms of long-term regulation of electrical activity in a simple model neural network, the pyloric network of the stomatogastric ganglion of crustaceans. An undesirable consequence of plasticity is the potential instability of the system. In the nervous system, the activity of neurons and neural networks remains quite stable over very long periods of time. Conductances, however, also

express plasticity. How this plasticity contributes to stability, however, is a question largely unexplored. Using both electrophysiological and computational tools, he and his students in the laboratory study mechanisms of neuronal plasticity and homeostasis of the ionic currents that determine the excitability and electric activity of neurons and simple neural networks. He is also interested in how neurons interact to form rhythmic pattern generating networks.

Roy Goodman

Roy Goodman's research focuses, broadly, on nonlinear wave phenomena. The tools he uses consist mainly of asymptotic methods, dynamical systems analysis, and numerical simulation. Physical applications he has studied include storm propagation in the atmosphere at middle latitudes and the interaction of light pulses in telecommunications optical fibers. Recently, he has been investigating the interaction of nonlinear waves with localized changes to the media through which they propagate. This includes the enticing possibility of "light trapping" at specified locations in optical fibers, as well as more abstract studies of classical nonlinear wave equations.

Wenge Guo

Wenge Guo's research interests include large-scale multiple testing, high-dimensional inference, bioinformatics, machine learning, and statistical methods for clinical trials. The new theories and methods he derived are mainly used for controlling the false discovery rate (FDR) and other genereralized error rates in large-scale multiple testing. Their main applications are on bioinformatics and computational biology. His current research projects include estiamte and control of the FDR under dependence and development of new multiple testing methodologies for different biomedical areas such as microarray data analysis, design and analysis of clinical trials, and high throughput screening assay.

Claus Holzapfel

As a community ecologist Claus Holzapfel is fascinated by the intriguing ways of how species interact with each other. Within that topic his research addresses ecological and evolutionary processes and their outcome in plant populations and communities. The leading question is whether communities are more than simple chance assemblies. Perturbed systems - systems that are altered from their pristine state - are ideal study objects to address such a question, since here possible coevolved interactions are likely disrupted. Good examples are plant communities that are invaded by non-native organisms or systems otherwise heavily impacted by human activity (climate change, land-use change).

David J. Horntrop

The research of David J. Horntrop has focused on the development and numerical simulation of stochastic models of physical phenomena for problems ranging from materials science to fluid dynamics. His studies of turbulent diffusion were based on random field models for the advection of passive scalars and involved asymptotics, stochastic analysis, and the creation of novel wavelet-based Monte Carlo numerical schemes for the simulation of random fields. His current studies of materials involve the development and use of mesoscopic models to describe surface processes in order to gain insight on the importance of small scale phenomena on the creation of large scale patterns. He is presently developing and validating new spectral methods for the numerical solution of stochastic partial differential equations for these studies.

Huaxiong Huang

Huaxiong Huang's research interests include Fluid Mechanics, Scientific Computing, Mathematical Modeling and Industrial Mathematics. Recently, he has been working on problems on stress/defects reduction of InSb crystals, ruin probability and asset allocation related to personal finance, multiphase mass and heat transport problems in cloth assemblies, bread baking, and multiphase bubbly flow related to water purification; extensional viscous flow related to optical fiber drawing and pulling of microelectrodes; and finally in biologically related problems

such as the spatial buffering and viral membrane fusion.

Shidong Jiang

The research of Shidong Jiang has mainly focused on fast numerical algorithms for PDEs and their applications to large scale problems in physics, chemistry and engineering. He has developed a fast and accurate numerical algorithm for the nonreflecting boundary conditions for the Schrodinger equation. He also developed a stable second integral equation formulation for scattering by open surfaces in two dimensions. When the SKIE formulation is combined with a Fast Multipole Method and iterative solver, a fast and stable numerical algorithm has been developed for large scale open surface problems arising in biology and antenna and radar design. Recently, he has derived analytical solutions for the hyperpolarizabilities for the one dimensional infinite single electron periodic systems which showed that the overall symmetry in nonlinear optics is actually broken.

Lou Kondic

The research of Lou Kondic has concentrated on modeling and numerical simulations of two groups of physical systems: a) two fluid flows with emphasis on the interfacial dynamics, as well as free surface flows, and b) dynamics of granular systems. His studies of supersonic dynamics of gas bubbles in liquids exposed to acoustic radiation involved analytical and computational modeling of the convective and radiative energy transfer between fluids, and were applied predominantly to the effect of single bubble sonoluminescence. His research in the field of granular materials consisted of developing analytical models, as well as molecular dynamics simulations of 2D and 3D granular systems, with emphasis on the collective effects. His work on the dynamics of thin liquid films involved performing large-scale computational simulations with the goal of understanding contact line instabilities and resulting pattern formation. Currently, he is involved in modeling and simulations of granular materials in a microgravity environment, and in the development of numerical methods for highly nonlinear partial differential equations related to the flows of thin liquid films.

Gregory A. Kriegsmann

The research of Gregory A. Kriegsmann has focused on the modeling, analysis, and numerical simulations of physical problems arising in industrial and technological settings. His studies in microwave heating of materials describe the nonlinear interaction between electromagnetic waves and materials, and the effect of cavity geometry. His research on acoustic and electromagnetic scattering theory includes applications to radar, structural acoustics, and acoustics in flows. His studies in circuit theory cover the design and analysis of oscillators and power supplies. His current work is focused on microwave assisted chemical vapor infiltration, thermal patterns in microwave heating experiments, and microwave assisted ceramic sintering.

Ji Meng Loh

Ji Meng Loh's primary research interest is in spatial statistics, in particular the analysis of spatial point patterns. He has developed methods for bootstrap of spatial data, anomaly detection and assessing data quality. Ji Meng has worked on statistical applications in many fields including cosmology, public health, fMRI analysis and telecommunication.

Jonathan H. C. Luke

The research of Jonathan H. C. Luke has focused on the modeling and analysis of physical problems primarily in the areas of low-Reynolds-number fluid dynamics and wave propagation in complex media. His studies in sedimentation theory cover the topics of velocity fluctuations, renormalization, the method of reflections, cluster dynamics, and variational and numerical methods. His studies of electromagnetic waves in highly dispersive media mainly concern energy deposition and numerical methods. His current projects include analysis of the stability of numerical implementations of no-slip boundary conditions for the Navier-Stokes equations in

streamfunction-vorticity form, simulation and analysis of energy deposition from electromagnetic waves in dispersive materials, and effective boundary conditions for heating and scattering problems in microwave cavities.

Victor Matveev

The research of Victor Matveev is in the area of computational neuroscience, and is focused primarily on biophysical modeling and numerical simulations of synaptic function and its mechanisms. In his work, Victor Matveev employs analytical methods as well as a variety of computational techniques, from stochastic modeling to numerical solution of partial and ordinary differential equations. Victor Matveev performs most of his work in collaboration with experimental neurophysiologists, and develops models to explain and fit the experimental data. His current projects include the study of the mechanisms of short-term synaptic facilitation and other calcium-dependent processes involved in neurotransmitter secretion, and the modeling of presynaptic calcium diffusion and buffering. To facilitate his research, Victor Matveev also has been working on the development of a software application designed for solving the reaction-diffusion equation arising in the study of intracellular calcium dynamics ("Calcium Calculator").

Jay Meegoda

Jay Meegoda's research can be best described as mechanics of geo-environmental engineering where he utilizes scientific concepts and engineering technologies in real world applications. Under the heading of mechanics of geo-environmental engineering, his research can be further subdivided into five main trust areas: engineering properties of contaminated soils; centrifugal modeling of contaminant transport; micro-mechanics of civil engineering materials; reuse of contaminated soils; and ultrasound research. Micro-mechanic models were used to explain the mechanical behavior of civil engineering materials. He received the best practice paper award in 2001 from the Environmental Multimedia Council of the Environmental and Water Resources Institute (EWRI) of the American Society of Civil Engineers (ASCE) for a publication resulting from the above research. Currently, his research is focused on use of a laser to detect segregation in asphalt pavements and development of smart pipes for drinking and waste water distributions.

Zoi-Heleni Michalopoulou

The research of Zoi-Heleni Michalopoulou focuses on inverse problems in underwater acoustics. Currently, new global optimization approaches based on the tabu methodology are being developed for matched-field source localization and geoacoustic inversion. Also, arrival time and amplitude estimation in uncertain environments is pursued via a novel Gibbs sampling scheme.

Petronije Milojevic

The research of P.S. Milojevic is focused on studying semilinear and (strongly) nonlinear operator equations using a combination of topological, approximation, and variational methods and applications to ordinary and partial differential equations. He has developed various fixed point results for condensing and A-proper maps. His studies of semilinear operator equations with monotone and (pseudo) A-proper maps involve nonresonance and resonance problems with Fredholm and hyperbolic-like perturbations of singlevalued and multivalued nonlinear maps, and Hammerstein equations. He has widely applied these abstact theories to BVPs for (contingent) ordinary and elliptic PDEs, to periodic and BVPs for semilinear hyperbolic and parabolic equations and to nonlinear integral equations. His study of nonlinear and strongly nonlinear operator equations is concerned with the existence and the number of solutions of such equations involving condensing, monotone, and various types of approximation maps. His current research deals with Hammerstein equations and weakly inward A-proper and pseudo A-proper maps and applications to differential and integral equations.

Robert M. Miura

The research of Robert M. Miura covers several areas in mathematical physiology, especially in neuroscience. The techniques used are mathematical modelling, mathematical analysis, approximation methods, and numerical simulations. His research on excitable biological cells, including neurons, cardiac cells, and pancreatic beta-cells, is aimed at understanding ionic electrical effects on cell function and signalling. These studies involve detailed investigations of membrane electrical properties, subthreshold resonance, stochastic resonance, signal propagation on dendrites, and mechanisms leading to bursting electrical activity. His recent studies on spreading cortical depression, and more generally, on intercellular communication via ion flows, include analysis and simulations of partial differential equation models of wave propagation in the brain, of spatially coupled discrete neurons, and of restricted diffusion.

Richard O. Moore

Richard Moore's research focuses on wave phenomena in optical communication systems and optical devices. He is particularly interested in how such systems and devices are disturbed by a variety of influences relevant to their operating environments. Current projects include using a combination of perturbation methods and importance sampling to simulate rare events in optical communication lines, and using dynamical systems techniques and rigorous reduction methods to analyze the impact of heating due to optical field absorption in devices that convert optical frequencies using parametric gain media.

Cyrill B. Muratov

The main research direction of Cyrill B. Muratov is pattern formation, self-organization, and non-linear dynamics in systems described by coupled reaction-diffusion equations, with primary applications to biological systems and materials science. He uses dynamical systems theory, singular perturbation techiniques, matched asymptotics, non-local eigenvalue problems, as well as exact analytic, variational, and numerical methods, to study traveling wave solutions, interfacial patterns, and more complicated spatiotemporal patterns. Current ongoing projects with biological applications include analytical studies of excitability, pulse propagation, and spiral waves in excitable biological cells, and modeling and computational analysis of autocrine loops in cell signaling networks. His research in materials science involve studies of the kinetics of domain pattern formation in systems with long-range interactions and polymer-liquid crystal systems, as well as formation of hot spots in ceramic and other materials.

Farzan Nadim

Farzan Nadim studies rhythmic motor activity generated in the central nervous system by combining experiments and computational techniques. Nadim has a joint appointment with the Federated Department of Biological Sciences and runs a laboratory that conducts experiments on isolated nervous systems of crustacea. These experiments involve elecrophysiological recordings from multiple nerves and neurons, pharmacological manipulations of the system, and immunohistology. The neuronal circuits studied all produce oscillatory output of various frequencies. The lab also models these systems both at the detailed biophysical level and using analytic mathematical techniques. His current focus is on contribution of synaptic dynamics to network output and the interaction between multiple oscillatory systems.

Demetrios T. Papageorgiou

The research of Demetrios T. Papageorgiou focuses on the modeling, analysis, and computation of physical and technological problems that involve fluid dynamics and aerodynamics. His studies in surface tension driven flows cover the stability, dynamics, and breakup of single and compound liquid jets, both in the presence and absence of surface active agents, which affect interfacial tension. Analysis of finite-time-singularities has been used to motivate experiments for rheological measurements. His studies in bubble dynamics are a theoretical and experimental collaborative research effort to control the drag on rising bubbles using surfactants. Current

projects include jet and bubble dynamics, nonlinear stability of core-annular flows when surfactants are present, nonlinear stability of electrified liquid films, and study of viscous flows in pulsating channels or tubes by construction of Navier-Stokes solutions both numerically and analytically with particular emphasis on chaotic regimes and their influence on applications.

Manuel Perez

The research of Manuel Perez is in the areas of heat transfer, drying of porous media, expert systems, medical diagnosis by computer, and mechanical properties of fibrous webs. He is now working on survival studies of prostate cancer patients, and on evaluating the efficacy of surgical procedures and radiation treatment for various stages of the disease.

Peter G. Petropoulos

The research of Peter G. Petropoulos has focused on the numerical modeling and asymptotic analysis of physical problems in the areas of transient electromagnetic wave propagation in complex media. His studies of pulsed electromagnetic waves in dispersive media mainly concern the asymptotic and numerical methods for studying the response of relaxing (Debye) and fractionally-relaxing (Cole-Cole) dielectrics, as well as the development fourth-order accurate finite difference methods for the time-domain Maxwell equations with discontinuous coefficients. His current projects include analysis of the error in problems where impedance boundary conditions are employed, development of numerical techniques to simulate pulse propagation in Cole-Cole dielectrics, analysis of perfectly matched absorbing boundary conditions in relation to exact absorbing boundary conditions, and the development of fourth-order accurate schemes in the presence of curved boundaries.

Anthony D. Rosato

Anthony Rosato's research is concerned with granular flows as related to the solids handling and processing industries. The flows are modeled using dissipative molecular dynamics simulations to identify governing mechanisms that affect observable behavior. Currently, he is studying the development of velocity field structures in boundary-driven flows, and how they may influence segregation behavior in polydisperse systems. He is also interested in the application of dynamical systems modeling to these systems.

Horacio G. Rotstein

The research of Horacio G. Rotstein focuses mainly on the study of the biophysical and dynamic mechanisms underlying the generation of rhythmic oscillatory activity in the brain, particularly in the hippocampus and entorhinal cortex. Rhythmic oscillations at theta (8 - 12 Hz) and gamma (30 - 80 Hz) frequencies in these areas of the brain have been correlated with various forms of learning and memory. In addition, alteration in particular sorts of brain rhythmic oscillations have been shown to correlate with the existence and progression of a variety of neuropsychiatric conditions, including schizophrenia and dementia. Rhythms differ not only in their frequency range, but also in the underlying biophysical mechanisms by which they are generated. These mechanisms usually vary in different brain areas, and may operate at a single cell level or may involve the coherent activity of many cells and cell types in a network. The primary goal of my research is to uncover and understand the underlying biophysical and dynamic principles that govern the generation of rhythmic activity in the brain. As secondary goals I hope to understand the functional implications for brain functioning of the previous results, the relation between disruption of rhythmic activity and diseases of the nervous system, and the effects that changes at a subcellular level have on rhythms observed at the single cell and network levels.

Michael Siegel

The research of Michael Siegel is focused on the analysis and numerical computation of moving boundary problems that arise in fluid mechanics, materials science, and physiology. His research in fluid dynamics covers singularity formation on interfaces for inviscid and low Reynolds number

(Stokes) flow, the dynamics of drops and bubbles (including the influence of surfactant), and effect of small regularization--such as surface tension--on mathematically ill-posed interfacial flow problems. His studies in materials science primarily involve crystal growth and diffusion controlled moving boundary problems. In physiology, he has studied optimal suturing patterns for skin wounds and formulated models for determining the stress and strain distribution in the heart wall that occur due to changes in heart geometry.

Sundar Subramanian

The research of Sundar Subramanian focuses on non- and semi-parametric statistical inference for censored time-to-event-data analysis. His investigations involve study of the large sample behavior of estimators using techniques from counting processes and martingales, empirical processes, kernel estimation, and information bound theory. His interests on the computational side include bootstrap methods for model selection and bandwidth computation, and mis-specification studies using simulation. The procedures have strong theoretical basis and find applications in Biostatistics.

Ronald Sverdlove

Ronald Sverdlove's research interests are in the areas of corporate finance, fixed income securities, and the overlap of the two. In the fixed income area, he studies the Credit Default Swap (CDS) market and its relations to the bond and stock markets. He uses price data in all three markets to determine the effectiveness of models for predicting future prices. In corporate finance, he studies how corporations make decisions about various aspects of their financing, in particular the seniority level of newly issued bonds. A second corporate decision is the relative importance of using "soft" or "hard" information in deciding on investments to be made. Hard information consists of those things that can be objectively measured in a reproducible way, while soft information is more subjective and often based on personal relationships. Different kinds of institutions make different choices between the two. A third type of corporate decision is particularly relevant in the financial industry, where institutions must decide how to structure themselves according to the regulations that will apply to each possible structure. Current work involves modeling the process by which a financial institution makes the decision whether or not to become a regulated bank, trading off the ability to offer deposit insurance to customers against the reduced amount of risk and leverage that can be used by an unregulated institution. Techniques of game theory are used to analyze many of these decisions involving negotiations between two or more institutions.

Louis Tao

The research of Louis Tao focuses on large-scale scientific computation, through a combination of numerical simulations, bifurcation theory, and asymptotics. He is mainly interested in the modeling and analysis of the dynamics of networks, with applications to specific problems in neuroscience and mathematical biology. His work in computational neuroscience has been in two distinct areas: a) how neurons in the visual cortex process elementary features of the visual scene and b) how recurrent networks perform computations. His current projects include the modeling of orientation selectivity in cortex and the analysis of the network dynamics that arises.

Catalin Turc

Catalin Turc’s research interests belong to the broad area of computational electromagnetics and acoustics. The main goal is the design and implementation of numerical methods that can be used for efficient simulation of electromagnetic and acoustic wave interactions with complex material structures. During the past few years, he has worked on a variety of problems related to fast, high-order frequency domain integral equation methods for acoustic and electromagnetic scattering problems in domains with complex material and geometrical features. He has developed analytical and computational tools that enable solutions for problems of fundamental significance involving applications such as electromagnetic interference and compatibility (electronic circuits), dielectric/magnetic coated conductors, composite metamaterials (photonic

crystals and negative index materials), and solar cells.

Jean-Marc Vanden-Broeck

Jean-Marc Vanden-Broeck's research is concerned with fluid mechanics and the theory of free boundary problems. He uses a combination of numerical and asymptotic methods to investigate new properties of nonlinear solutions. A large part of his research focuses on the effects of surface tension and on the computations of waves of large amplitude. Interfacial flows generated by moving disturbances, three dimensional solitary waves, waves on electrified fluid sheets, and the stability of Stokes flows in the presence of electric fields are among his recent interests.

Yuan-Nan Young

The research of Yuan-Nan Young focuses on the multiphase flows in computational fluid dynamics (CFD), and relevant issues in numerical treatment of moving boundary problems. In particular he has numerically investigated how surfactants, both soluble and insoluble, can affect the pinch-off of bubbles in viscous fluids. He also investigates numerical schemes to optimize the accuracy of regularization of surface tension force in CFD codes. His current projects also include an investigation on the hysteretic behavior of drop deformation in highly viscous straining flows.

C. COLLABORATIVE RESEARCH

Shahriar Afkhami

Liquid Metal on Surfaces, Lou Kondic (NJIT)

Dynamics of Ferrofluidic Systems, Amir Hiras (RPI)

Non-coalescence of Sessile Drops from Different but Miscible Liquids, Len Pisman (Technion - Israel Institute of Technology)

Modeling of Viscoelastic Two-phase Flows, Yuriko Renardy and Michael Renardy (Virginia Tech)

Roman I. Andrushkiw

Study of Recognition Algorithms in Cytogenetic Method of Cancer Diagnosis, D. Klyushin (Kyiv National Taras Shevchenko University) and N. Boroday (R.E. Kavetsky Institute of Experimental Pathology, Oncology and Radiobiology, Kyiv).

John Bechtold

New Theories of Flames at Elevated and High Pressures, C. K. Law (Princeton University)

Denis Blackmore

Dynamical Analysis of Granular Flows, A. Rosato (NJIT), X. Tricoche (Purdue), and K. Urban (NJIT)

Magnetic Reconnection, K. Urban (NJIT)

Integrability of Infinite-dimensional Hamiltonian Systems, A. Prykarpatsky (AGH-Krakow), N. Bogolubov (Moscow State), and V. Samoylenko (Lviv)

Dynamical Modeling and Analysis of Nonlinear Phenomena, Y. Joshi (Kingsborough) and A. Rahman (Delaware)

Indices for Detecting Periodicity in Hamiltonian Dynamical Systems, C. Wang (ECC) and X. Wang (Beijing Univ.)

Emergency Scale Modeling and Analysis, E. Rohn (Ben Gurion U.)

Computing Fractal Dimensions, A. Zaleski (NJIT)

Bruce Bukiet

Fluid Flow with Application to Manual Medicine, H. Chaudhry (NJIT), Z. Ji (NJIT), T. Findley (VA Hospital, East Orange), M. Roman (NJIT), A. Stecco (U. of Padua, Italy)

Roy Goodman

Interaction of Vortices in Bose-Einstein Condensates, Panayotis Kevrekidis (Massachusetts) and Ricard Carretero (San Diego State)

Instability and Dynamics of Nonlinear Waves, Jeremy Marzuola (North Carolina) and Michael Weinstein (Columbia)

Wenge Guo

New Directions for Research on Some Large-Scale Multiple Testing Problems, Sanat Sarkar (Temple University)

The Control of Directional Errors in Stepwise Procedures under Dependence, Joseph Romano (Stanford University)

David J. Horntrop

Packing of Granular Materials, A. Rosato (New Jersey Institute of Technology)

Lou Kondic

Dense Granular Systems and Topology, Robert Behringer (Duke University), Konstantin Mischaikow (Rutgers University)

Breakup of Finite Fluid Films and Rivulets, Javier Diez, Alejandro Gonzalez (UNCPBA, Argentina)

Instabilities of Nano-scale Metal Structures, Philip Rack (U. Tennessee and Oak Ridge National Laboratory)

Victor Matveev

Dynamics of Phasic and Tonic Neurotransmitter Release in Retinal Photoreceptor Cells, J. Singer (University of Maryland at College Park)

Localization of Calcium Influx during Exocytosis in Neurons and Endocrine Cells, R. Bertram (FSU) and A. Sherman (NIH)

Role of Short-term Synaptic Plasticity in Rhythmic Neural Activity, A. Bose and F. Nadim (NJIT)

Zoi-Heleni Michalopoulou

Tracking with Invariance Striations, Lisa Zurk (Portland State University)

Passive Fathometer Processing for Reflector Tracking, Peter Gerstoft and Caglar Yardim

(Scripps Institution of Oceanography, UCSD)

Signal Propagation in Dispersive Waveguides, Leon Cohen (Hunter College, CUNY)

Robert M. Miura

Asymptotic Analysis of a Falling Viscous Drop, J.J. Wylie (City University of Hong Kong, Hong Kong) and H. Huang (York University, Toronto, Canada)

Modeling Cortical Spreading Depression and Neurovascular Coupling, H. Huang (York University, Toronto, Canada), W. Yao (Fudan University, Shanghai, China), J.J. Wylie (City University of Hong Kong, Hong Kong), K.C. Brennan (UCLA, Los Angeles, USA), Josh Chang (UCLA, Los Angeles and MBI, Ohio State, USA), T. David (University of Cantebury, Christ Church, NZ), S. Tagaki (University of Tokyo, Tokyo, Japan), and X. Gong (Jiaotong University, Shanghai, China)

Discovery and Assessment of New Target Sites for Anti-HIV Therapies , N. Madras (York University, Toronto, Canada), C. Breward (University of Oxford, Oxford, UK), J. Hefernan (York University, Toronto, Canada), M.P. Soerensen (Tech. University of Denmark, Lyngby, Denmark), and S. Qazi (Gustavus Adolphus College, St. Peter, MN, USA)

Mathematical Modeling of Alternative Polyadenylation of CSTF3, Y. Cheng (Neuchatel, Switzerland) and B. Tian (UMDNJ, Newark, NJ, USA)

Richard O. Moore

Mathematical and Computational Methods for Stochastic Systems in Nonlinear Optics, Tobias Schafer (CUNY Staten Island)

Data Assimilation with Directed Observations, Damon MacDougall (University of Texas) and Christopher K. R. T. Jones (University of North Carolina)

Large Deviation Principles Applied to Nonlinear Wave Equations, James Nolen (Duke University) and Chia Yee Lee (SAMSI/Duke University)

Cyrill Muratov

Modeling and Analysis of Morphogen Dynamics, P. V. Gordon (NJIT) and S. Y. Shvartsman (Princeton University).

Pattern Formation in Micromagnetics, G. Chaves (NJIT) and H. Knuepfer (University of Heidelberg, Germany).

A Variational Approach to Traveling Waves and Propagation Phenomena for Ginzburg-Landau and Combustion Problems in Infinite Cylinders, A. Cesaroni (University of Padova, Italy) and M. Novaga (University of Pisa, Italy)

Geometric Variational Problems for Systems with Competing Short-range and Long-range Interactions, H. Knuepfer (University of Heidelberg, Germany) and M. Novaga (University of Pisa, Italy)

Modeling the Behavior of Cryogenic Fluids in the Context of Rocket Propulsion, V. Osipov and V. Smelyanskiy (NASA Ames Research Center).

Ground States for Classical and Quantum Systems, Jianfeng Lu (Courant Institute for Mathematical Sciences) and Vitaly Moroz (Department of Mathematics, Swansea University, UK).

The Gamma-limit of the Two-dimensional Ohta-Kawasaki Energy, Dorian Goldman (Laboratoire Jacques-Louis Lions, Paris, France) and Sylvia Serfaty (Laboratoire Jacques-Louis Lions, Paris,

France)

Farzan Nadim

Temporal Fidelity of Action Potential Conduction in Axons, D. Bucher (University of Florida)

Peter G. Petropoulos

Development and Analysis of Numerical Methods for Solving the Time-domain Maxwell Equations in Dielectrics Exhibiting Fractional Relaxation, M. F. Causley (Michigan State University)

Control and Suppression of the Rayleigh-Taylor Instability using Electric Fields, D. T. Pagaeorgiou (Imperial College London, UK) and L. Barannyk (University of Idaho)

Time-domain Integral Equations for the Numerical Solution of Maxwell's Equations in Dispersive/Lossy Dielectrics, C. Turc (NJIT)

Development of the CFS-PML as a Laplace Preconditioner in the FEM Solution of Elliptic Scattering Problems, Y. Boubendir (NJIT)

Horacio G. Rotstein

Frequency Preference in Neuron and Neuronal Networks, Farzan Nadim (NJIT), Nancy Kopell (Boston University), John White (University of Utah), and Gyorgy Buzsaki (NYU Medical School)

Effect of Ionic Conductance Correlations on Neuronal Network Activity, (Jorge Golowasch)

Michael Siegel

Numerical Methods and Analysis for Interfacial Fluid Flow with Soluble Surfactant, Michael Booty (NJIT), Jacek Wrobel (NJIT), Qiming Wang (UBC), and Yuan Young (NJIT)

Efficient Surface-based Numerical Methods for 3D Interfacial Flow with Surface Tension, David Ambrose (Drexel), Svetlana Tlupova, (U. of Michigan), and Carlo Fazioli (NJIT)

Jean-Marc Vanden-Broeck

Ship Hydrodynamics, M. Perlin (University of Michigan)

Electrohydrodynamics, E. Parau, M.Blyth (University of East Anglia), Demetrius Papageorgiou (Imperial College), and M. Hunt (University College London)

Hydroelasticity, P. Milewski (University of Bath) and Z. Wang (University College London)

Yuan-Nan Young

Interaction between Membrane and Charged Nano-particles, Howard Stone (Princeton University)

Interaction between Membrane and Cholesterols, Jinglei Hu (Institute of Complex Systems, Forschungzentrum Juelich, Germany)

Interaction between Membrane and Proteins, Shravan Veerapaneni (University of Michigan, Ann Arbor)

X. STUDENT ACTIVITIES

A. UNDERGRADUATE ACTIVITIES

Zoi-Heleni Michalopoulou, Director of Undergraduate Studies

Math Club

The Math Club met regularly to prepare for the national Putnam math contest. Four students took the test, with a top score of 19. This puts that student in the top 1000 examinees nationwide.

Pi Mu Epsilon Mathematics Honor Society

Pi Mu Epsilon is a national mathematics honor society. It was founded at Syracuse University and incorporated at Albany, New York on May 25, 1914. The purpose of Pi Mu Epsilon is the promotion and recognition of mathematical scholarship among students in postsecondary institutions. It aims to do this by electing members on an honorary basis according to their proficiency in mathematics and by engaging in activities designed to promote the mathematical and scholarly development of its members.

The NJIT Chapter of the Pi Mu Epsilon honor society, headed by Professor Goodman, inducted eight new members this year. The ceremony took place on April 24, 2013. The students who were inducted in 2013 are: Tejpal S. Ahluwalia, Thomas Anderson, Thomas Dougher, Scott Lieberman, Kelsey McGowan, Jhon Osorno, Utkarsh Raj, and Kelvin Rivera.

UBM – Undergraduate Biology and Mathematics Training Program, 2012-2013

Program Supervisors and Mentors: Victor Matveev (Math), Gareth Russell (Biology), Dan Bunker (Biology), Jorge Golowasch (Biology), Daniel Bunker (Biology), Camelia Prodan (Physics), and Amitabha Bose (Math)

In 2012 the last UBM cohort of six NJIT sophomore and junior students has completed the Program, which culminated in the submission of a final research report and a presentation of research results at the NJIT Mathematical Biology Seminar in November 2012. As in past years, UBM student projects covered a broad range of Mathematical Biology disciplines, including Cell Biophysics, Neuroscience, and Quantitative Ecology:

Lab: Dr. Jorge Golowasch
Students: Diane Avecillas (Math) and Corrado Mancini (Electrical Engineering)
Sensitivity to Proctolin Increases after Decentralization of the Central Pattern Generator Network

Lab: Dr. Daniel Bunker
Student: Thomas Anderson (Math)
Parameter Variation and its Effect on Species Diversity in Differential Ecological Systems

Lab: Dr. Daniel Bunker
Student: Rambert Yan (Mechanical Engineering)
Ontological Modeling of a Four-Population Ecological System with Diverse Trophic Interactions

Lab: Dr. Camelia Prodan
Students: Sundas Fatima (Biomedical Engineering) and David Izquierdo (Math)

Understanding The Effect Of Osmotic Pressure At The Cellular Level

Apart from full-time research work, the summer phase of the 2012 UBM program involved two weekly meetings attended by all students and their research mentors: one of the meetings was devoted to weekly student presentations of their research results, which helped to develop student's communication skills, while the second meeting, lead by Dr. Matveev, continued student training in mathematical modeling and MATLAB programming. All UBM research activities are documented on the UBM Program webpage: http://web.njit.edu/~matveev/UBM/

Finally, one more student, Fremy Santana (Math) was recruited in 2013 to work on a research project with Prof. Amitabha Bose in the final year of the UBM Program. Fremy will work on developing and analyzing mathematical models of small neuronal networks to determine how synaptic and membrane resonance contributes to bursting activity in neuronal cells.

Attesting to the success of the Program, many of the UBM students continued their involvement in research after the completion of the Program. Of the 18 students completing the UBM Program in 2009-2012, 5 students continued their research in NJIT labs upon completion of the Program, and 3 students were admitted to outside summer research internships. Speaking to longer-term benefit of the Program for participants' future careers, 3 of the UBM students have applied or are applying to Medical Schools, with one student already admitted to UMDNJ; further, 3 students are already enrolled in Graduate Schools (NJIT and Northwestern University), and 1 student is enrolled in an Optometry School.

Report on Undergraduate Studies

In addition to the UBM program, the undergraduate program of the Department of Mathematical Sciences was very active during the past academic year with many successes. Josh Bracewell and Tejpal Ahluwalia presented work on Research Experience for Undergraduates (REU) opportunities at the Joint Mathematics Meetings, San Diego, CA, and at the Undergraduate Research Showcase at NJIT. This work had been performed at the University of Nebraska-Lincoln and WPI, respectively. Josh Bracewell is presently an Actuarial Consulting Intern at Lewis and Ellis Actuarial Consultants in Dallas, TX, and Tejpal Ahluwalia is a Barclays Sales and Trading Summer Analyst at Barclays Global Markets. Thomas Anderson is attending an REU program at the University of Nebraska and presented his NJIT UBM work at the Undergraduate Research Showcase at NJIT. Anthony Zaleski, starting his PhD studies at Rutgers University in fall 2013, participated in a research project on “Euler-Lagrange Equations: Shapes of Charged Droplets” under the guidance of Professor Muratov. Kelsey McGowan was the recipient of the Casualty Actuaries of the Middle Atlantic Region scholarship and Thomas Tu took the Putnam Exam with excellent performance. Also, Sean Naughton, Namrata Patel, and Ivana Seric, now graduates of our BS in Mathematical Sciences program, conducted research on “Instability of Gravity Driven Flow of Liquid Crystal Film” under the guidance of Professors Cummings and Kondic, with their work published in a peer-reviewed journal. A number of other students participated in research projects during the academic year and are currently pursuing internships and research opportunities. Furthermore, several graduates of our program are attending graduate programs at prestigious institutions.

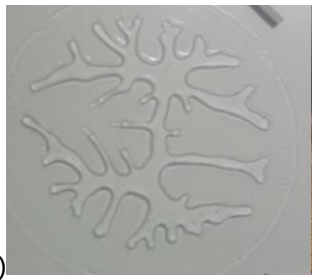
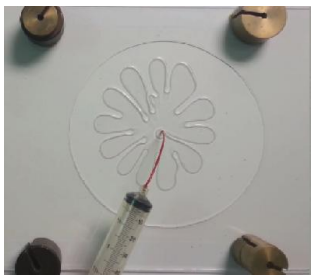
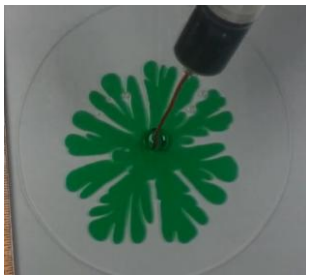
CAPSTONE LABORATORY PROJECTS

In Spring 2013 two Capstone projects were offered, under the supervision of Professor Linda Cummings and Professor Roy Goodman.

Professor Cummings' project was on flow and instabilities of Glycerol and of Nematic Liquid Crystal within a Hele-Shaw cell, with and without an applied electric field. Participating students (senior Applied Math majors) were Hasnaa Benlkorchi, Heather Glenn, Emma Guerino, Blake Nixon, Yasmeen Othman, Michael Petretta, Snehal Rana, David Rios, Mihir Sanghavi, and Aneta Wnorowski. Michael Lam was the laboratory assistant.

The project focused on the fingering instabilities that form when air or some other low-viscosity fluid is injected into a narrow space between two parallel glass plates, which is initially filled with more viscous fluid (glycerol, or nematic liquid crystal, in our experiments) - a Hele-Shaw cell. Students also studied the "squeeze film" geometry in which the behavior of a trapped air bubble, or of a viscous blob of fluid, is observed as the plates of the cell are squeezed together or pulled apart. Some images from the experiments with glycerol are show in the figure: (a) shows what happens when plates are squeezed together with a trapped (initially circular) air bubble; (b) shows injection of an air bubble into a blob of glycerol; and (c) shows injection of dyed green water into glycerol. Excellent agreement with linear stability analysis, predicting the expected number of fingers, was obtained.

Students then moved on to build a small Hele-Shaw cell with transparent conducting plates (coated with Indium Tin Oxide, ITO), to be filled with nematic liquid crystal. Nematic Liquid Crystals (NLCs) are typically composed of rod-like molecules, imparting anisotropy to the fluid. These rod-like molecules align in an applied electric field. The plates of the cell were treated to ensure parallel anchoring of the molecules of the NLC, and then the air-bubble injection experiment was carried out with electric fields of varying strengths (from 0 V to 2 kV) applied across the plates. As the field is increased, the molecules align with it, breaking the planar anchoring at the plates, and changing the resistance to the injected bubble. Students inferred the effective viscosity by applying linear stability theory, which predicts the number of fingers that should form as a function of fluid viscosity. They observed an increase in effective viscosity as the applied field was increased, as expected.

(a)  (b)  (c) 

The instructor acknowledges help from Prof. Peter Palffy-Muhoray of Kent State University. The project was in part supported by NSF Grant No. DMS-1211713 (PI: L.J. Cummings).

Prof. Goodman’s students studied the mathematics and physics necessary to understand waves and patterns in a large array of coupled pendulums. A diagram and photograph of the experimental apparatus are shown in figure 1. The pendulums are wooden beads on V-shaped strings mounted to a metal hoop. Each string is attached to its two neighbors at the points where they cross. The hoop is the attached to a stereo speaker. When a signal is sent to the speaker, the hoop is oscillated vertically. When a signal with the correct (resonant) frequency and amplitude is generated, this causes the pendulums to swing. Digital movies of the motion were then analyzed using Matlab’s Image Processing Toolbox and compared with analytical and computational results.

To model the experiment, the students learned elements of classical mechanics, dispersive and nonlinear wave theory, and asymptotic and numerical methods useful in these areas. They showed that the dynamics of the pendulum array, described by a large system of ordinary differential equations for the angles, have a wave envelope that is well-approximated by a solution to the defocusing cubic nonlinear SchrÃdinger equation with damping and driving.

From this, the analysis makes two predictions. At low amplitude, the system will undergo motion that is sinusoidal in time and space. As the frequency of the drive is increased, the wavelength in space decreases. At higher amplitude, long wavelength solutions are subject to the modulational

instability, which causes the solution to cluster into localized solutions called solitons, while short wavelength solutions remain stable. The short wavelength solutions may also be modulated, leading to solutions with phase singularities or kings. Mathematically, it is predicted that the width of these kinks decreases with the amplitude of the solutions.

In our experiments, we were able to find sinusoidal solutions at low amplitudes (figure 2). At high amplitudes, we were unable to demonstrate solitons, but we were able to show the existence of kinks and the dependence of their widths on amplitudes (figure 3)

The instructor acknowledges help from Prof. Victor Sanchez-Morcilla of Universitat Politecnica de Valencia.

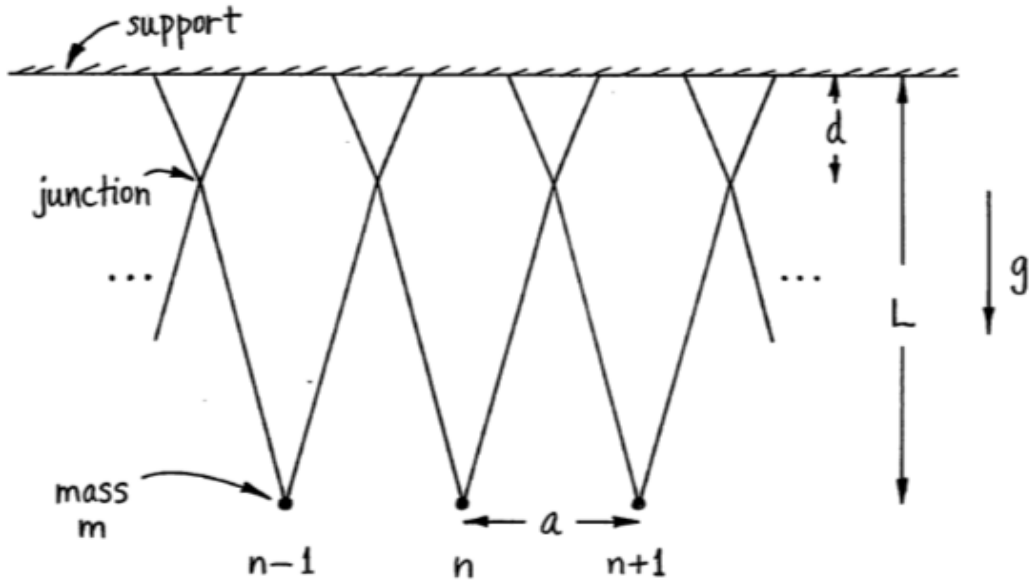


Figure 1: Diagram of experimental apparatus, from Denardo Ph.D. Thesis, UCLA 1989.

Figure 2: Spatially sinusoidal solution at small amplitude.

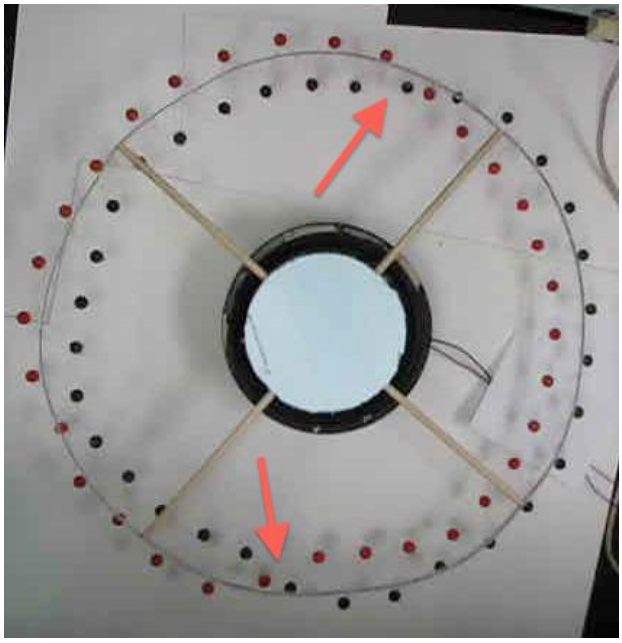


Figure 3: At high amplitude and resonant frequency, a solution with the highest wavenumber and with phase singularities (kinks) at the two indicated locations.

B. GRADUATE STUDENT RESEARCH PROGRAMS

Linda Cummings, Director of the Graduate Program

PhDs awarded in the period covered by the report:

Chenjing Cai
Thesis: *Mathematical Models for Bistable Nematic Liquid Crystal Displays*
Advisors: L.J. Cummings and L. Kondic

Dan Cargill
Thesis: *Analytical and Computational Methods for the Study of Phase Fluctuations in Optical Solitons*
Advisor: R.O. Moore

Feiyan Chen
Thesis: *Goodness-of-fit Tests for Geometric Models*
Advisor: S. Dhar

Xiaoyu Lu
Thesis: *The Application of Bayesian Adaptive Design and Finite Markov Chain Model in Clinical Trials*
Advisor: S. Dhar

Manman Ma
Thesis: *A Numerical Method for Electrokinetic Flow with Deformable Interfaces*
Advisors: M. Booty and M. Siegel

Jeff Pohlmeyer
Thesis: *Mathematical Modeling of Proliferation in a Tissue Engineering Perfusion Bioreactor*
Advisor: L.J. Cummings

Xing Zhong
Thesis: *Energy Methods for Reaction-Diffusion Problems*
Advisor: C. Muratov

Publications, Presentations & Conference Participation

Sonia Bandha

Presentations:

May 2013: IIE (Institute of Industrial Engineers) Annual Conference, San Juan, Puerto Rico
Copula-based Modeling and Computational Solutions of Warranty Cost Management Problems (with D. Horntrop & M. Bhattacharjee)

Chenjing Cai

Publications:

Towards an Optimal Model for a Bistable Nematic Liquid Crystal Display Device (with L.J. Cummings & L. Kondic), J. Eng. Math., Vol. 80, pp. 21-38, 2013.

Bifurcation Properties of Nematic Liquid Crystals Exposed to an Electric Field: Switchability, Bistability and Multistability. To Appear in Phys. Rev. E, 2013.

Manman Ma

Presentations:

April 2013: Fluid Dynamics Seminar Series, NJIT, Newark, NJ
A Numerical Method for Electro-osmotic Flow with Deformable Interfaces

April 2013: Dana Knox Student Research Showcase, NJIT, Newark, NJ
A Numerical Method for Electrokinetic Flow with Deformable Interfaces

Kyle Mahady

Presentations:

June 2013: SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, PA
A Numerical Study of Nanoscale Drop Assembly via Square-wave Breakup (with S. Afkhami and L. Kondic)

April 2013: Dana Knox Student Research Showcase, NJIT, Newark, NJ
Combined Mesoscopic/Macroscopic Computations of Thin Films and Contact Lines (with S. Afkhami and L. Kondic)

Shoubhik Mondal

Presentations:

October 2012: Statistics Seminar Series, NJIT, Newark, NJ
Model for Assisted Cox Regression (with S. Subramanian)

Jing Li

Publications:

Modeling with Bivariate Geometric Distributions (with S. Dhar), Communications in Statistics - Theory & Methods, Vol. 42, pp. 252-266, 2013.

Xiaoyu Lu

Publications:

The Application of Bayesian Adaptive Design in Clinical Trials (with S. Dhar), American Journal of Mathematics & Statistics, Vol. 3, pp. 67-72, 2013.

Motolani Olarinre

Presentations:

April 2013: Dana Knox Student Research Showcase, NJIT.
Dynamic Compensatory Mechanisms in Conductance Correlation Models (with H. Rotstein and J. Golowasch).

May 2013: Neuroscience Minisymposium, Center for Molecular and Behavioral Neuroscience
Dynamic Compensatory Mechanisms in Conductance Correlation Models (with H. Rotstein and J. Golowasch).

Jeff Pohlmeyer

Publications:

Mathematical Model of Growth Factor Driven Haptotaxis and Proliferation in a Tissue Engineering Scaffold (with L.J. Cummings and S.L. Waters), Bull. Math. Biol. 75, pp. 393-427, 2013.

Hao Wu

Presentations:

May 2013: Minisymposium on Granular Flow from a Dynamical Systems Perspective, SIAM Snowbird Conference on Applications of Dynamical Systems, Snowbird Resort, Utah
Analysis and Simulation of the BSR Model (with Aminur Rahman and D. Blackmore)

Xing Zhong

Publications:

Threshold Phenomena for Symmetric Decreasing Solutions of Reaction- diffusion Equations (with C.B. Muratov), Nonlin. Diff. Equations Appl., Online First, 2013.

CONTRIBUTIONS TO THE FRONTIERS IN APPLIED & COMPUTATIONAL MATHEMATICS, 2013 MEETING

The tenth annual FACM conference was held from May 31 to June 2, 2013. Mathematical Sciences graduate students made a number of valuable contributions, which are listed below.

Contributed Talks:

Gavin Lynch (with W. Guo), On procedures for Controlling the False Discovery Rate for Testing Hierarchically-ordered Hypotheses

Posters:

Chenjing Cai (with L.J. Cummings & L. Kondic), Bifurcation Properties of Nematic Liquid Crystals Exposed to an Electric Field: Switchability, Bistability and Multistability
Kyle Mahady (with S. Afkhami & L. Kondic), Combined Mesoscopic/Macroscopic Computations of Thin Films and Contact Lines
Motolani Olarinre (with H. Rotstein and J. Golowasch), A Modeling Study of Conductance Co-regulation in Neuronal Models
Ivana Seric (with S. Afkhami & L. Kondic), Long-wave Approximation for Thin Ferrofluid Film in Magnetic Field
Oleksiy Varfolomiyev (with M. Siegel & M. Booty), A Non-stiff Boundary Integral Method for Internal Waves

PARTICIPATION IN WORKSHOPS

GSMMC. The 10th annual Graduate Student Mathematical Modeling Camp was held at Rensselaer Polytechnic Institute from June 11 to June 14, 2013. The following Mathematical Sciences graduate students participated: Lenka Kovalcinova, Christeen Bisnath, Emel Khan, Pejman Sanaei, and Amin Rahman.

MPI. The twenty-ninth annual workshop on Mathematical Problems in Industry was held at Worcester Polytechnic Institute from June 17 to June 21, 2013. The following Mathematical Sciences graduate students participated: Lenka Kovalcinova, Amin Rahman, and Rui Cao.

GRADUATE STUDENT-FACULTY SEMINARS

Co-sponsored by the Graduate Student Association Mathematical Sciences Group and the NJIT-SIAM Student Chapter.

The aim of the seminars is to provide an opportunity for graduate students to present their research work to their peers and to faculty, and for faculty to introduce graduate students to their area of research specialization. It aims to promote the general level of awareness of research among the graduate student body.

May 21 Cyrill Muratov, *Spatiotemporal Dynamics of Morphogens*
May 23 Nattapol Aunsri, *Particle Filtering Approach for Frequency Estimation*
May 23 Tao Lin, *An Inversion Technique Based on Newton's Method*
May 29 Horacio Rotstein, *Mechanisms of Frequency Preference in Neural Systems*
May 30 Dawid Midura*, Perfectly Matched Layer and Domain Decomposition for the Solution of a Scattering Problem*
May 30 Sonia Bandha, *Copula-based Modeling & Computational Solutions of Warranty Cost Management Problems*
June 3 Roy Goodman, *What do I do with all these numerical simulations?*
June 4 Oleksiy Varfolomiyev, *A Non-stiff Boundary Integral Method for Internal Waves*
June 4 Yang Zhang, *An Empirical Equation for Predicting the History-dependence of Conduction Delay in Axons*
June 6 Hao Wu, *Investigation of an Integro-PDE Model for Granular Flow*
June 6 Zeynep Ackay, *Effects of Synaptic Plasticity on Phase and Period Locking of a Network of Two Oscillatory Neurons*
June 9 Catalin Turc, *Regularized Integral Equations and Fast High-order Solvers*
June 11 Gavin Lynch, *A Direct Comparison Method for Detecting Copy Move Forgeries*

June 11 Amin Rahman, *On Peixoto's Structural Stability and Density Theorems*
June 13 Michael Lam, *Modeling Flow of Nematic Liquid Crystal Down an Incline*
June 13 Shaobo Wang, *Fast Algorithms for Vector Spherical Harmonic Transforms*
June 17 Victor Matveev, *Modeling of Calcium Ion Diffusion Inside Neurons and Synapses*
June 18 Ji-Meng Loh, *Semiparametric Bayesian Estimation of the Intensity Function*
June 20 Nanyi Dong, *A Simulation of Metal Film Breaks up into Drops*
June 20 Szu-Pei Fu, *Hydrodynamic Interaction in Polymer Chains - Stochastic Simulation of DNA in Flows*
June 24 Robert Miura, *Cortical Spreading Depression and Neurovascular Coupling*
June 25 Kyle Mahady, *A Numerical Study of Nanoscale Drop Assembly via Square-wave Breakup*
June 25 Lenka Kovalcinova, *Randomness in the Particle Chains*
June 27 Shoubhik Mondal, *Model Assisted Cox Regression*
June 27 Zhiying Qui, *A Class of Generalized Fixed Sequence Procedures Controlling the FWER under Dependence*
July 1 Richard Moore, *The Application of Large Deviation Theory to Exit Problems in Lasers*
July 2 Antai Wang, *On the Nonidentifiability Property of Archimedean Copula Models under Dependent Censoring*
July 3 Ivana Seric*, Long-wave Approximation of a Ferrofluid Film under an External Magnetic Field*
July 3 Nubyra Ahmed, *Simultaneous Confidence Bands from Two-sample Censored Data*
July 8 Amit Bose, *Anti-phase Bursting Solutions in a Simple Neuronal Network*
July 9 Casayndra Basarab, *An Introduction to the DNLS Equation and Lie Algebra*
July 9 Rianka Bhattacharya, *Two Sample Location-Scale Problem using Semiparametric Estimator*
July 11 Ensela Mema, *Director Gliding in a Bistable Nematic LCD Device*
July 11 Anjana Grandhi, *An Introduction to Multiple Testing and On Control of Directional Errors*

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