CAMS

Center for Applied Mathematics and Statistics

ANNUAL REPORT
2013 – 2014

NJIT
New Jersey's Science & Technology University

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I. FROM THE DIRECTOR

The Center for Applied Mathematics and Statistics (CAMS) moves into its 29th year as a vehicle for research in applied mathematics and statistics at NJIT. CAMS supports faculty research by organizing seminars and conferences and facilitating group and interdisciplinary research proposals. We take particular pride in the undergraduate research supported by CAMS. NJIT Provost Fadi Deek has encouraged increased efforts at undergraduate research university wide, and CAMS and the Department of Mathematical Sciences are happy to take a leading role in this endeavor. Recently, CAMS has combined with faculty from the Department of Computer Science and researchers in industry to obtain a five year NSF 'EXTREEMS' grant, which will significantly enhance the exposure of undergraduate mathematical science students to topics in computational and data enabled science and engineering. We look forward to starting our second year of this successful program in the fall.

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

- The awarding of 9 new grants from NSF and other agencies. CAMS receives substantial funding for graduate student and faculty research from sources such as the National Science Foundation, Office of Naval Research, Department of Defense, NASA, Newark Beth Israel Medical Center, NJ Meadowlands Commission and private industry (Alison: please update this list).

- Hosting of the 11th Frontiers in Applied and Computational Mathematics (FACM) conference. The two day meeting focused on mathematical biology, and attracted over 144 participants. The conference focused on the mathematical contributions of our colleague, Robert Miura. Many of the plenary and minisymposium talks were directly tied to the seminal work of Miura.

- Hosting of the Mathematical Problems in Industry (MPI) workshop. MPI is a problem solving workshop in which applied mathematicians and industrial participants interact on problems of interest to the companies. MPI rotates between NJIT, University of Delaware and WPI.

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. Vice President of Academic Affairs, Jonathan Luke, Department of Mathematical Sciences Chair, and Atam Dhawan, 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, Director • Cyril Muratov, 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 2014

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Dr. Benjamin White	Exxon Research & Engineering
Dr. John S. Abbott	Corning Incorporated

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
Diekman, Casey
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 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
Huang, Huaxiong	York University, Toronto, Canada
Papageorgiou, Demetrios	Imperial College, London
Tao, Louis	Peking University, China
Vanden-Broeck, Jean-Marc	University College London
Wylie, Jonathan	City University of Hong Kong

IV. COLLOQUIA AND SEMINARS

Applied Mathematics Colloquium/ Department of Mathematical Sciences Colloquium

September 6, **Jonathan E. Rubin**, University of Pittsburgh, *Unexpected Chaos in a Neural Model*

September 13, **Nick Trefethen**, Oxford University, United Kingdom, *How Chebfun Solves ODEs and Eigenvalue Problems*

September 20, **Qing Nie**, University of California, Irvine, *Robust and Stochastic Dynamics in Signal Transduction, Stem Cells, and Development Patterning*

September 27, **Victor Matveev**, New Jersey Institute of Technology, *Modeling of cell calcium dynamics in neuroscience and physiology: approaches and challenges*

October 4, **Jon Wilkening**, University of California, Berkeley, *Traveling-Standing Water Waves and Microseisms*

October 11, **Mahadevan Ganesh**, Colorado School of Mines, *an efficient model reduction algorithm for a class of stochastic configurations*

October 18, **Vladimir Rosenhaus**, California State University, Chico, *Infinite Symmetries and Infinite Conservation Laws*

October 25, **Alexander Kosovichev**, Big Bear Solar Observatory and New Jersey Institute of Technology, *Modeling of Solar Phenomena*

November 1, **Erik Bollt**, Clarkson University, *How can I say that a "toy" model reminds me of observations? A dynamical system's perspective of comparing non-conjugate systems*

November 8, **Steve Cox**, Rice University, *Neuronal Model Reduction: Cells, Junctions and Circuits*

November 15, **Shravan Veerapaneni**, University of Michigan, Ann Arbor, *Simulating Dense Suspensions of Soft Particulate Flows*

November 22, **George "Bud" Homsy**, University of British Columbia, Canada, *Particles at Interfaces: Capillary Attraction, Elasticity, and Coating Flows*

December 6, **Lou Kondic**, New Jersey Institute of Technology, *Statistics and Dynamics of Force Networks in Dense Particulate Systems*

January 24, **Prashant Purohit**, University of Pennsylvania, *Role of Thermal Fluctuations in Supercoiled DNA and Filament Networks*

January 31, **Cedric Beaume**, University of California, Berkeley, *Spatial localization in three-dimensional doubly diffusive convection*

February 7, **Alan Newell**, University of Arizona, *Phyllotaxis, pushed pattern fronts and optimal packing*

February 14, **Li-Shi Luo**, Old Dominion University, *Kinetic Methods for CFD*

February 21, **Paul So**, George Mason University, *Complex collective dynamics in networks of phase oscillators*

February 28, **Michel Boufadel**, ---, *Fate and Transport of Chemicals from the Micron-scale to the Kilometer Scale*

March 7, **Silas Alben**, University of Michigan, Ann Arbor, *Optimizing snake locomotion in the plane*

March 14, **Tsorng-Whay Pan**, University of Houston, *On the motion of a red blood cell in bounded Poiseuille flow*

March 28, **Christian Genest**, McGill University, Canada, *Tests of independence for sparse contingency tables and beyond*

April 4, **David Christini**, Cornell University, *Multiscale approach to illuminating the mechanisms of, and guiding therapy for, atrial fibrillation*

April 11, **Zhilin Li**, North Carolina State University, *A class of Cartesian methods: Augmented Immersed Interface Method and Applicaitons*

April 25, **Shyamal Peddada**, NIH/NIEHS, *Test for multivariate stochastic order among ordered experimental groups*

May 2, **Cyrill B. Muratov**, NJIT, *Winding domain walls in thin ferromagnets film*

Applied Statistics Seminar

September 26, **Yixin Fang**, Ph.D., NYU, Langone Medical Center *a New Criterion for Variable Selection in High Dimensional Problems*

October 3, **Guosheng Yin**, Ph.D., the University of Hong Kong, *Corrected Score Approach to Censored Quantile Regression with Covariate Measurement Errors*

October 10, **George C. Mytalas**, PhD., NJIT, *Analysis of different M/G/1 batch arrival queues subject to disasters*

October 17, **Yajuan Si, PhD.**, Department of Statistics, Columbia University, *Nonparametric Bayesian Multiple Imputation for Incomplete Categorical Variables in Large-Scale Assessment Surveys*

October 24, **Shoubhik Mondal**, NJIT, *Confidence bands for survival functions in Cox regression framework*

October 31, **Sandra M. Hurtado Rúa**, PhD., Cornell University, *A Transformation Class for Spatio-temporal Survival Data with a cure fraction*

November 7, **Sonia Bandha**, NJIT, *Copula-based modeling & Computational Solutions of Warranty Cost Management Problems*

November 14, **Yuping Zhang**, PhD., Yale University, *Principal Trend Analysis with Application to Time-course Genomic Data*

November 21, **Ian McKeague**, PhD., Columbia University, *Is there a needle in the haystack? ART and non-standard asymptotics*

December 5, **Zhengqin Ouyang**, PhD., The Jackson Laboratory for Genomic Medicine, University of Connecticut, *Reconstruct the RNA structurome from sequencing data*

January 22, **Donghui Yan**, Ph.D., WalmartLabs, *Statistical Methods for Tissue Array Images: Algorithmic Scoring, Data Contamination, and Blessings of Dimensionality*

January 30, **Yihui Zhou**, Ph.D., North Carolina State University, *Another look at statistical testing and integrative analysis in a big data era*

February 6, **Lisha Chen Ph.D.**, Yale University, *Ensemble Subsampling for Imbalanced Multivariate Two-Sample Tests*

March 7, **Andrada Ivanescu**, PhD, East Carolina University, *Computational Methods for Function-on-Function Regression*

April 10, **John Kolassa**, PhD, Rutgers University, *Infinite Parameter Estimates in Polytomous Regression*

April 17, **Zhiying Qiu**, MS, NJIT, ---

April 24, **George Mytalas**, PhD, NJIT, *Central Limit Theorem Approximations for the Number of Runs in Markov-Dependent Sequences*

May 1, **Sunil Kumar Dhar**, PhD, CAMS, NJIT, *GLM fitting under the generalized inverse sampling scheme for a cancer incidence data*

Mathematical Biology Seminar

September 24, **Gal Haspel**, NJIT, *C. elegans locomotion: Connectivity, Activity and Recovery from Injury*

October 8, **Peter Thomas**, Case Western University, *Analysis and Simulation of Hybrid Jump Markov Process Ion Channel Models*

October 15, **Jiawei Zhang**, New York University, *The Neural Mechanisms and Fluid Dynamics of Crustacean Swimming*

October 29, **Bart Krekelberg**, Rutgers University at Newark, *Recurrent neural networks in visual processing*

November 19, **Dirk Bucher**, NJIT, *Neuromodulation of axonal spike propagation*

December 3, **Erik Schomburg**, New York University, *Cross-frequency coupling in the rodent entorhinal-hippocampal circuit*

December 10, **Cristiano Dias**, NJIT, *Stability of protein structures*

February 18, **Haroon Anwar**, Rutgers University at Newark, *Determinants of intracellular calcium levels in dendrites*

February 25, **Carlos Luna**, University of Maryland, *Physical properties of lamprey spinal cord regeneration: Adaptive vs. Maladaptive recovery*

March 4, **Mohammad Rahimi**, Princeton University, *Shape dynamics and lipid hdrodynamics of bilayer membranes*

March 25, **Casey Diekman**, NJIT, *Multi-Level Organization of the Mammalian Circadian Clock*

April 8, **James R Kozloski**, IBM T.J. Watson Research Center, *Scalable Reaction Diffusion Calculations over Gap Junction Coupled, Branched Neuron Topologies in Neural Tissue Simulations of the Inferior Olive*

April 15, **Haroon Anwar**, Rutgers University at Newark, ---

April 22, **Jana Gevertz**, The College of New Jersey, *Predictive Mathematical Modeling of Tumor-Host Interactions with Implications for Treatment*

April 29, **Zeynep Akcay**, NJIT Thesis Defense

Fluid Mechanics Seminar

September 23, **Lucy Zhang**, Rensselaer Polytechnic Institute, *Using Fully-Coupled Dynamic Fluid-Structure Interaction Models to Study Bio-Mechanical Systems*

September 30, **Svetozar Nesic**, Universidad Carlos III de Madrid, *New spreading law of thin film liquids controlled by gravity and vdW forces under thermal fluctuations*

October 14, **Jie Yu**, North Carolina State University, *Waves Over Periodic Topographies*

October 28, **Daniel Anderson**, George Mason University, *Dynamics of Human Tear Films: Wetting, Evaporation and Contact Lenses*

November 4, **Shreyas Mandre**, Brown University, *Dissolution driven convection for carbon dioxide sequestration: the stability problem*

November 11, **Benjamin Seibold**, Temple University, *Jet Schemes and Gradient-Augmented Level Set Methods*

November 21, **Michael Hein**, Saarland University, *Droplet Based Microfluidics: Interface and Dynamics*

December 2, **Liping Liu**, Rutgers University, *Eshelby's solution and Stokes flow*

Waves Seminar Series

October 23, **George Hagstrom**, Courant, *Phase Space Pattern Formation and Stability of Inhomogeneous Equilibria of Hamiltonian Continuous Media Field Theories*

October 30, **Catalin Turc**, NJIT, *Well conditioned boundary integral equations for solution of frequency domain electromagnetic scattering problems at high frequencies*

November 6, **Matt Causely**, Mathematics, Michigan State, *Higher-order A-stable schemes for the wave equation through successive convolution*

November 13, **Bogdan Nita**, Mathematics, Montclair State, *Seismic imaging and inversion using scattering theory*

Fluid Mechanics and Waves Seminars

February 3, **David Shirokoff**, McGill, *High order penalty methods: a Fourier approach to solving PDE's on domains with curved boundaries*

March 10, **Young-Ju Lee**, Texas State University, *A Solver-Friendly Hybrid Mixed Finite Element Method*

March 24, **Maurizio Porfiri**, NYU Poly, *Fish'n robots: not a take-out food*

March 31, **Junshan Lin**, Auburn, *Scattering Resonances for Photonic Structures and Schrodinger Operators*

April 7, **Sangwoo Shin**, Princeton, *Growth of nanowires in porous structures: dynamics, morphological instabilities, and a control strategy*

April 22, **Philippe Guyenne**, Delaware, *Waves in ice sheets and in the bone*

April 28, **Mike Haslam**, York, *A High Order Method for the Scattering Problem from Layered Conducting Dielectric Media*

May 5, **Vlad Vicol**, Princeton, *Long time behavior of forced critical Surface Quasi-Geostrophic equation (SQG)*

V. PUBLICATIONS, PRESENTATIONS, AND REPORTS

A. PUBLICATIONS

JOURNAL PUBLICATIONS

Shahriar Afkhami

Numerical Simulation of Ejected Molten Metal Nanoparticles Liquified by Laser Irradiation: Interplay of Geometry and Dewetting (with L. Kondic), Physical Review Letters, Vol. 111, 034501, July 2013.

A Volume-of-Fluid Formulation for the Study of Co-Flowing Fluids Governed by the Hele-Shaw Equations (with Y. Renardy), Physics of Fluids, Vol. 25(8), 082001, August 2013.

Comparison of Navier-Stokes Simulations with Long-Wave Theory: Study of Wetting and Dewetting (with K. Mahady, J. Diez, and L. Kondic), Physics of Fluids, Vol. 25(11), 112103, November 2013.

Hierarchical Nanoparticle Ensembles Synthesized by Liquid Phase Directed Self-Assembly (with J. D. Fowlkes, N. A. Roberts, Y. Wu, J. A. Diez, A. G. Gonzalez, C. Hartnett, K. Mahady, L. Kondic, and P. D. Rack), Nano Letters, Vol. 14 (2), pp. 774-782, December 2014.

On the Dewetting of Liquefied Metal Nanostructures (with L. Kondic), Journal of Engineering Mathematics, DOI: 10.1007/s10665-013-9685-y, February 2014.

Denis Blackmore

A New Exactly Solvable Spatially One-Dimensional Quantum Superradiance Fermi-Medium Model and its Quantum Solitonic States (with A. Prykarpatsky), Condensed Matter Phys., Vol. 16 (2013), 23701, pp. 1-9, July 2013.

Mathematical Foundations of the Classical Maxwell-Lorentz Electrodynamic Model via Canonical Lagrangian and Hamiltonian Formalisms (with A. Prykarpatsky, N. Bogolubov Jr., J. Slawianowski), Univ. J. Phys. Appl., Vol. 1 (2), pp. 160-178, October 2013.

Hidden Symmetry Analysis of Lax Integrable Nonlinear Systems (with Y. Prykarpatsky, J. Golenia, A. Prykarpatsky), Applied Math, Vol. 4, pp. 96-116, October 2013.

Integrability of and Differential-Algebraic Structures for Spatially 1D Hydrodynamics Systems of Riemann Type (with Y. Prykarpatsky, N. Bogolubov Jr., A. Prykarpatsky), Chaos, Solitons & Fractals, Vol. 59, pp. 59-81, May 2014.

Analysis, Simulation and Visualization of 1D Tapping Dynamics via Reduced Dynamical Models (with A. Rosato, X. Tricoche, K. Urban, L. Zuo), Physica D, Vol. 273-274, pp. 14-27, April 2014.

Michael R. Booty

Long-Wave Equations and Direct Simulations for the Breakup of a Viscous Fluid Thread Surrounded by an Immiscible Viscous Fluid (with D.T. Papageorgiou, M. Siegel, and Q. Wang), IMA Journal of Applied Mathematics, Vol. 78 (4), pp. 851-867, August 2013.

Numerical Simulation of Drop and Bubble Dynamics with Soluble Surfactant (with Q. Wang and M. Siegel), Physics of Fluids, Vol. 26 (5), 052102, pp. 1-27, May 2014.

Amitabha Bose

Effects of Synaptic Plasticity on Phase and Period Locking of a Network of Two Oscillatory Neurons (with Z. Akcay and F. Nadim), J. Math. Neuro, Vol. 4 (8), 2014.

Yassine Boubendir

Well-Conditioned Boundary Integral Equation Formulations for the Solution of High-Frequency Electromagnetic Scattering Problems(with C. Turc), Computer Mathematics with Applications, Vol. 67, pp. 1772-1805, 2014.

Localized Adaptive Radiation Condition for Coupling Boundary and Finite Element Methods Applied to Wave Propagation Problems (with N. Zerbib), IMA J. Numer. Anal., Vol. 34 (3), pp 1240 - 1265, October 2013.

Bruce Bukiet

Mathematical Analysis of the Flow of Hyaluronic Acid Around Fascia During Manual Therapy Motions (with M. Roman, H. Chaudhry, A. Stecco, and T. Findley), J Am Osteopath Assoc., Vol. 113 (8), pp. 600-610, August 2013.

Daniel Bunker

Increasing the Precision of Canopy Closure Estimates from Hemispherical Photography: Blue Channel Analysis and Under-Exposure (with A. Brusa), Agricultural and Forest Meteorology, Vol. 195, pp. 102-107, 2014.

Wooyoung Choi

On Regularizing the Strongly Nonlinear Model for Two-Dimensional Internal Waves (with R. Barros), Physica D, Vol. 264, pp. 27-34, December 2013.

Linda Cummings

Extensional Flow of Nematic Liquid Crystal with an Applied Electric Field (with J. Low and T.G. Myers), European Journal of Applied Mathematics, Vol. 25, pp. 397-423, June 2014.

Cyclic Loading of Growing Tissue in a Bioreactor: Mathematical Model and Asymptotic Analysis (with J.V. Pohlmeyer), Bulletin of Mathematical Biology, Vol. 75, pp. 2450-2473, December 2013.

Note on the Hydrodynamic Description of Thin Nematic Films: Strong Anchoring Model (with T.S. Lin, A.J. Archer, L. Kondic and U. Thiele), Physics of Fluids, Vol. 25, 082102, August 2013.

Modeling Spreading Dynamics of Nematic Liquid Crystals in Three Spatial Dimensions (with T.S. Lin, L. Kondic and U. Thiele), Journal of Fluid Mechanics, Vol. 729, pp. 214-230, August 2013.

Bifurcation Properties of Nematic Liquid Crystals Exposed to an Electric Field: Switchability, Bistability & Multi Stability (with C. Cai and L. Kondic), Physical Review E, Vol. 88, 012509, July 2013.

Sunil K. Dhar

Generalized Linear Model under the Extended Negative Multinomial Model and Cancer Incidence, (Soumi Lahiri) Journal of the Indian Statistical Association, Vol. 52 (1), pp. 125-140, 2014.

Casey O. Diekman

Causes and Consequences of Hyperexcitation in Central Clock Neurons (with M. Belle, R. Irwin, C. Allen, H. Piggins, and D. Forger), PLOS Computational Biology, Vol. 9, e1003196, August 2013.

Irregular Activity Arises as a Natural Consequence of Synaptic Inhibition (with D. Terman and J. Rubin), Chaos, Vol. 23, 046110, November 2013.

Network Symmetry and Binocular Rivalry Experiments (with M. Golubitsky), Journal of Mathematical Neuroscience, Vol. 4 (12), May 2014.

Javier Diez

Instability of Liquid Cu Films on a Sio2 Substrate (with G. González, Y. Wu, D. Fowlkes, P. D. Rack, L. Kondic), Langmuir, Vol. 29, 9378, 2013.

Comparison of Navier-Stokes Simulations with Long-Wave Theory: Study of Wetting and Dewetting (with K. Mahady, S. Afkhami, L. Kondic), Physics of Fluids, Vol. 25, 112103, 2013.

Hierarchical Nanoparticle Ensembles Synthesized by Liquid Phase Directed Self–Assembly (with J. D. Fowlkes, N. A. Roberts, Y. Wu, A. G. González, C. Hartnett, L. Kondic, K. Mahady, S. Afkhami. P. D. Rack), Nanoletters, Vol. 14, 774, 2014.

Thomas Erneux

Turn-On Delay of QD and QW Laser Diodes: What is the Difference? (with G. S. Sokolovskii, V. V. Dudelev, E. D. Kolykhalova, A. G. Deryagin, M. V. Maximov, A. M. Nadtochiy, V. I. Kuchinskii, S. S. Mikhrin, D. A. Livshits, and E. A. Viktorov), Journal of Physics: Conference, Vol. 461, 012030, July 2013.

Nonlinear Dynamics of an Injected Quantum Cascade Laser (with V. Kovanis and A. Gavrielides), Phys. Rev., Vol. 88, 032907, September 2013.

85.7 Mhz Repetition Rate Mode-Locked Semiconductor Disk Laser: Fundamental and Soliton Bound States (with M. Butkus, E. A.Viktorov, C. J. Hamilton, G. Maker, G. P. A. Malcolm, and E. U. Rafailov), Optics Express, Vol. 21, pp. 25526-25531, October 2013.

Singular Hopf Bifurcation in a Differential Equation with Large State-Dependent Delay (with G. Kozyreff), Proc. R. Soc. A, Vol. 470 (2162), 20130596, December 2013.

An Analytical and Experimental Study of Two Delay-Coupled Excitable Units (with L. Weicker, L. Keuninckx, and J. Danckaert), Phys. Rev. E, Vol. 89, 012908, January 2014.

Relaxation and Square-Wave Oscillations in a Semiconductor Laser with Polarization Rotated Optical Feedback (with G. Friart, L. Weicker, and J. Danckaert), Optics Express, Vol. 22, pp. 6905–6918, March 2014.

Tuning the Period of Square-Wave Oscillations for Delay-Coupled Opto-Electronic Systems (with J. Martinez-Llinas and P. Colet), Phys. Rev. E, Vol. 89, 042908, April 2014.

Roy Goodman

High-Order Adaptive Method for Computing Two-Dimensional Invariant Manifolds of 3-D Maps (with J. K. Wrobel), Comm. Nonlin. Sci. and Num. Simul., Vol. 18, pp. 1734-1745, 2013.

Wenge Guo

Multiple Testing in a Two-Stage Adaptive Design with Combination Tests Controlling FDR, (with Sanat Sarkar and Jingjing Chen), Journal of the American Statistical Association, Vol. 108, pp. 1358-1401, December 2013.

Shidong Jiang

Second Kind Integral Equation Formulation for the Modified Biharmonic Equation and its Applications (with M. C. A. Kropinski, and B. Quaife), Journal of Computational Physics, Vol. 249, pp. 113-126, September 2013.

Lou Kondic

Directed Liquid Phase Assembly of Highly Ordered Metallic Nanoparticle Arrays (with Wu, Y., Dong, N., Fu, S., Fowlkes, J., Vincenti, M., de Ceglia, D., Rack, P.), ACS Applied Materials & Interfaces, Vol. 6, pp. 5836-5845, April 2014.

Hierarchical Nanoparticle Ensembles Synthesized by Liquid Phase Directed Self-Assembly (with Fowlkes, J., Roberts, N., Wu, Y., Diez, J., Gonzalez, A., Hartnett, C., Mahady, K., Afkhami, S., Kondic, L., Rack, P.), Nano Lett., Vol. 14, pp. 774 – 782, February 2014.

Simulations of Two Dimensional Hopper Flow, Granular Matter, Vol. 16, pp. 235 – 245, January 2014.

Comparison of Navier-Stokes Simulations with Long-Wave Theory: Study of Wetting and Dewetting (with K. Mahady, S. Afkhami), Phys. Fluids, Vol. 25, 112103, pp. 1-13, December 2013.

Numerical Simulation of Ejected Molten Metal-Nanoparticles Liquefied by Laser Irradiation: Interplay of Geometry and Dewetting (with S. Afkhami), Phys. Rev. Lett., Vol. 111, 034501, pp. 1-5, November 2013.

Bifurcation Properties of Nematic Liquid Crystals Exposed to an Electric Field: Switchability, Bistability and Multistability (with L. Cummings, C. Cai), Phys. Rev. E, Vol. 88, 012509, pp. 1 - 10, November 2013.

Note on the Hydrodynamic Description of Thin Nematic Films: Strong Anchoring Model (with T. Lin, L. Cummings, A. Archer, L. Kondic, U. Thiele), Phys. Fluids, Vol. 25, 082102, pp. 1 - 12, October 2013.

Instability of Liquid Cu Films on a Sio$_2$ Substrate (with A. Gonzalez, J. Diez, Y. Wu, J. Fowlkes, P. Rack), Langmuir, Vol. 29, 9378, August 2013.

Spreading Dynamics of Liquid Crystals in Three Spatial Dimensions (with T. Lin, U. Thiele, L. Cummings), J. Fluid Mech., Vol. 729, pp. 214 - 233, July 2013.

Ji Meng Loh

Spatial Detection of Anomalous Cellular Network Events, Statistical Analysis and Data Mining, Vol. 7, pp. 212-225, June 2014.

PDGF-Responsive Progenitors Persist in the Subventricular Zone Across the Lifespan (with L. Moore, J. M. Bain and S.W. Levison), ASN Neuro, Vol. 6, pp. 65 – 81, February 2014.

A Masking Index for Quantifying Hidden Glitches (with L. Berti and T. Dasu), IEEE 13th International Conference on Data Mining (ICDM), DOI:10.1109/ICDM.2013.16, December 2013.

Comparing Spatial Densities Characterizing Human Mobility Using Ratio Maps, Statistics and its Interface, Vol. 6, pp. 577-584, November 2013.

Zoi-Heleni Michalopoulou

Sound Speed Estimation and Source Localization with Linearization and Particle Filtering (with T. Lin), Journal of the Acoustical Society of America, Vol. 135, pp. 1115-1126, March 2014.

Richard O. Moore

An Application of Matrix Theory to the Evolution of Coupled Modes (with D.A. Edwards, J.D. Fehribach, and C.J. McKinstrie), SIAM Review, Vol. 55 (4), pp. 764 – 787, November 2013.

Trade-Off Between Linewidth and Slip Rate in a Mode-Locked Laser Model, Optics Letters, Vol. 39 (10), pp. 3042-3045, May 2014.

Cyrill Muratov

Micromagnetic Studies of the Effects of Crystalline Anisotropy on the Remanent Magnetization of Ferromagnetic Nanorings (with G. D. Chaves-O'Flynn), IEEE Trans. Magn., Vol. 49, pp. 3125-3128, July 2013.

The G-Limit of the Two-Dimensional Ohta–Kawasaki Energy. I. Droplet Density (with D. Goldman and S. Serfaty), Arch. Rat. Mech. Anal., Vol. 210, pp. 581–613, July 2013.

One-Dimensional Neel Walls under Applied Magnetic Fields (with M. Chermisi), Nonlinearity, Vol. 26, Pp. 2935–2950, October 2013.

The G-Limit of the Two-Dimensional Ohta-Kawasaki Energy. Droplet Arrangement at the Sharp Interface Level via the Renormalized Energy (with D. Goldman and S. Serfaty), Arch. Rat. Mech. Anal., Vol. 212, pp. 445–501, January 2014.

Asymptotic Properties of Ground States of Scalar Field Equations with a Vanishing Parameter (with V. Moroz), J. Eur. Math. Soc., Vol. 16, pp. 1081-1109, June 2014.

Peter G. Petropoulos

On the Control and Suppression of the Rayleigh-Taylor Instability Using Electric Fields (with R. Cimpeanu, D. Papageorgiou, P. Petropoulos), Phys. of Fluids, Vol. 26 (2), February 2014.

Horacio Rotstein

Abrupt and Gradual Transitions Between Low and Hyperexcited Firing Frequencies in Neuronal Models with Fast Synaptic Excitation: A Comparative Study, Chaos, Vol. 23, 046104, pp. 1-22, 2013.

Frequency Preference in Two-Dimensional Neural Models: A Linear Analysis of the Interaction Between Resonant and Amplifying Currents (with F. Nadim), J Comp Neurosci, Vol. 37, pp. 9-28, 2014.

Inhibition Induced Theta Resonance in Cortical Circuits (with E. Stark, R. Eichler, L. Roux, S. Fujisawa and G. Buzsaki), Neuron, Vol. 80, pp. 1263-1276, 2013.

Neurons and Neural Networks: Computational Models (with F. Nadim), Encyclopedia of Life Sciences - John Wiley & Sons, Ltd: Chichester, DOI: 10.1002/9780470015902.a0000089.pub2, 2013.

Preferred Frequency Responses to Oscillatory Inputs in an Electrochemical Cell Model: Linear Amplitude and Phase Resonance, Phys. Rev. E, Vol. (88), 062913, pp. 1-16, 2013.

Introduction to the Focus Issue: Rhythms and Dynamic Transitions in Neurological Disease: Modeling, Computation, and Experiment (with T. Kaper and M. Kramer), Chaos, Vol. 23, 046001, pp. 1-4, 2013.

Subthreshold Amplitude and Phase Resonance in Single Cells, Encyclopedia of Computational Neuroscience, DOI: 10.1007/978-1-4614-7320-6_598-1, 2014.

Frequency Preference Response to Oscillatory Inputs in Two-Dimensional Neural Models: A Geometric Approach to Subthreshold Amplitude and Phase Resonance, J Math Neurosci, Vol. 4 (11), pp. 1-41, 2014.

Michael Siegel

Numerical Simulation of Drop and Bubble Dynamics with Soluble Surfactant (with Q. Wang and M. R. Booty), Phys. of Fluids, Vol. 26, 052102, May 2014.

Detection of Complex Singularities for a Function of Several Variables (with K. Malakuti, R. E. Caflisch, and A. Virodov), IMA J. Appl. Math., Vol. 48 (4), pp. 714-728, 2013.

Long-Wave Equations and Direct Simulations for the Breakup of a Viscous Fluid Thread Surrounded by an Immiscible Viscous Fluid (with M. R. Booty, D. T. Papageorgiou, and Q. Wang), IMA J. Appl. Math., Vol. 48 (4), pp. 714-728, 2013.

Sundar Subramanian

Model Assisted Cox Regression (with S. Mondal), Journal of Multivariate Analysis, Vol. 123, pp. 281-303, January 2014.

Catalin Turc

Well-Conditioned Boundary Integral Equation Formulations for the Solution of High-Frequency Electromagnetic Scattering Problems (with Y. Boubendir), Computer Mathematics with Applications, Vol. 67, pp. 1772-1805, 2014.

Jonathan Wiley

Singular Perturbation Solutions of Steady-State Poisson-Nernst-Planck Systems (with X.-S. Wang, D. He, and H. Huang), Physical Review E, Vol. 89, 022722, February 2014.

Mathematical Approaches to Modeling of Cortical Spreading Depression (with R.M. Miura and H. Huang), Chaos, Vol. 23 (4), 046103, December 2013.

A Mathematical Model of the Metabolic and Perfusion Effects on Cortical Spreading Depression (with J.C. Chang, K.C. Brennan, D. He, H. Huang, R.M. Miura and P.L. Wilson), PLOS One, Vol. 8 (8), e70469, August 2013.

Antai Wang

Exploration of Genome-Wide Circulating Microrna in Hepatocellular Carcinoma : Mir-483-5p As A Potential Biomarker (with J. Shen, Q. Wang, I. Gurvich, A.B. Siegel, H. Remotti, and R.M. Santella), Cancer Epidemiology, Biomarkers & Prevention, Vol. 22 (12), pp. 2364-2373, December 2013.

An Evolving Paradigm for the Workup and Management of High-Risk Cutaneous Squamous Cell Carcinoma (with K. O'Bryan, W. Sherman, G.W. Niedt, B. Taback, S. Manolidis, D. Ratner), Journal of the American Academy of Dermatology, Vol. 69 (4), pp. 595-602, October 2013.

Effects of a Green Tea Extract, Polyphenon E, On Systemic Biomarkers of Growth Factor Signaling in Women with Hormone Receptor-Negative Breast Cancer (with K.D. Crew, K.A. Ho, P. Brown, H. Greenlee, T.B. Bevers, B. Arun, N. Sneige, C. Hudis, H.L. McArthur, J. Chang, M. Rimawi, T.L. Cornelison, J.

Cardelli, R.M. Santella, A. Wang, S.M. Lippman, D.L. Hershman), Journal of Human Nutrition and Dietetics, DOI: 10.1111/jhn.12229, March 2014.

Inhibition of NRF2 by PIK-75 Augments Sensitivity of Pancreatic Cancer Cells to Gemcitabine (H.Q. Duong, Y.W. Yi, H.J. Kang, Y.B. Hong, W. Tang, Y.S. Seong, I. Bae), International Journal of Oncology, DOI: 10.3892/ijo.2013.2229, December 2013.

Properties of the Marginal Survival Functions for Dependent Censored Data Under an Assumed Archimedean Copula?, Journal of Multivariate Analysis, Vol. 129, pp. 57-68, May 2014.

Yuan-Nan Young

Long-Wave Dynamics of an Inextensible Planar Membrane in an Electric Field (with S. Veerapaneni and M. Miksis), J. Fluid Mech., Vol. 751, pp. 406-431, 2014.

Equilibrium Electrodeformation of a Spheroidal Vesicle in an AC Electric Field (with Herve Nganguia), Phys. Rev. E., Vol. 88, 052718, 2013.

Equilibrium Electro-Deformation of a Surfactant-laden Viscous Drop (with Herve Nganguia, P. Vlahovska, J. Blawdziewicz, J. Zhang and H. Lin), Physics of Fluids, Vol. 25, 092106, 2013.

BOOKS AND BOOK CHAPTERS

Wenge Guo

Stepdown Procedures Controlling a Generalized False Discovery Rate (with Sanat Sarkar), Statistical Paradigms: Recent Advances and Reconciliations, edited by A. SenGupta, T. Samanta and A. Basu, Statistical Science and Interdisciplinary Research, Vol.14, World Scientific, 2014.

PROCEEDINGS PUBLICATIONS

Denis Blackmore

Dynamical Systems Models and Discrete Element Simulations of a Tapped Granular Column (with A. Rosato, X. Tricoche, K. Urban, L. Zuo), AIP Conf. Proc. 1541, pp. 317-320, September 2013.

Linda Cummings

Changes in Membrane Capture Efficiency Due to Folding (with D. Bramer, J. Brimlow, R.J. Dyson, C. Exley, E. Fagerstrom, A. Korn, S. Li, L. McCormick, A. Peace, M. Takeuchi, B. Tilley, M. Zemsky, M. Hurwitz, M. Lucey, Y. Shen), Proceedings of the 29th Mathematical Problems in Industry Workshop, Worcester Polytechnic Institute, September 2013.

Sunil Dhar

On Equality in Distribution of Ratios X/(X+Y) and Y/(X+Y) (with Manish C. Bhattacharjee), Contemporary Developments in Statistical Theory, Springer Proceedings in Mathematics & Statistics, S Lahiri et al. (eds.), Vol. 68, Springer International Publishing Switzerland, 2014.

B. PRESENTATIONS

Shahriar Afkhami

April 2015: SEAS SIAM
An Adaptive Volume-of-Fluid Method Coupled with Van Der Waals Interaction: A Mesoscopic Approach to Model Liquid/Solid Interaction

October 2013: Seminar, Brown University, Providence, RI
To Jump or Not to Jump?

Denis Blackmore

October 2013: Special Session on Difference Equations and Applications, AMS Meeting, Temple University, Philadelphia, PA
Two Types of Strange Attractors for Exponentially Decaying Dynamics

December 2013: Mathematics Colloquium, Yeshiva University, New York, NY
Some New Results on Strange Attractors

February 2014: Science Colloquium, Essex County College, Newark, NJ
Aspects and Applications of Fractal Geometry

March 2014: All-Ukrainian Seminar on Theoretical and Mathematical Physics Lutsk, Ukraine
The Classical Ampère and Lorentz Electromagnetic Laws Revisited – New Lagrangian and Hamiltonian Aspects of the Modern Electrodynamic Vacuum-field Theory Models

June 2014: Summer Mathematical Sciences Seminar Series, NJIT, Newark, NJ
New Directions in Strange Attractor Analysis

Michael R. Booty

October 2013: Levich Institute Fluid Mechanics, Seminar Series, City College, CUNY, NY, NY
Hybrid Numerical Methods for Computation of Some Type of Interfacial Flow

November 2013: Sixty-Sixth Annual Meeting of the American Physical Society Division of Fluid Dynamics, Pittsburgh, PA
A Numerical Method for Electrokinetic Flow with Deformable Fluid Interfaces

June 2014: Second International Conference on Numerical Methods in Multiphase Flow, Technische Universitat Darmstadt, Germany
A Hybrid Numerical Method for Two-Phase Flow with Soluble Surfactant

Amitabha Bose

October 2013: AMS Sectional Meeting, Philadelphia, PA
Role of Linear and Voltage-Dependent Ionic Currents in the Generation of Slow Wave Oscillations.

March 2014: AMS Sectional Meeting, Baltimore, MD
Phase Locking in Coupled Networks

Wooyoung Choi

May 2014: Seminar at the Naval Research Laboratory, Washington, D.C.
Modeling of Nonlinear Wave Packets

July 2013: Workshop on water waves, Banff, Canada
Unsteady Stokes Expansion and its Generalization

Linda Cummings

June 2014: OIST workshop: Dynamics at Interfaces, Okinawa Institute of Science and Technology, Okinawa, Japan
Free Surface Dynamics of Nematic Liquid Crystal

Sunil K. Dhar

May 2014: Statistics Seminars Series, Department of Mathematical Sciences, NJIT, Newark, NJ
GLM Fitting Under the Generalized Inverse Sampling Scheme for a Cancer Incidence Data

Casey O. Diekman

July 2013: Poster, Gordon Research Conference on Chronobiology, Newport, RI
Causes and Consequences of Hyperexcitation in Clock Neurons

August 2013: Seminar, University of Manchester, Manchester, England
Introduction to Nonlinear Dynamics

August 2013: Seminar, Northwestern University, Evanston, IL
Modeling the Link Between Membrane Dynamics and Gene Expression Rhythms in the Mammalian Circadian Clock

January 2014: Seminar, IBM T.J. Watson Research Center, Yorktown Heights, NY
Modeling Membrane Excitability and Gene Expression Rhythms in the Mammalian Circadian Clock

January 2014: Seminar, University of Manchester, Manchester, England
Introduction to Data Analysis in R: Effects of Daylength on Electrical Properties of Per1 Neurons

March 2014: New Jersey Institute of Technology, Newark, NJ
Mathematical Modeling of Daily Biological Timekeeping

March 2014: University of Pittsburgh, Pittsburgh, PA
Modeling Hyperexcitation in Circadian Clock Neurons

March 2014: Seminar, New Jersey Institute of Technology, Newark, NJ
Multi-Level Organization of the Mammalian Circadian Clock

May 2014: Seminar, New Jersey Institute of Technology, Newark, NJ
Mathematical Modeling of Circadian Clocks and Binocular Rivalry

June 2014: Society for Research on Biological Rhythms, Big Sky, MT
Modeling Circadian Transcription of Ion Channels and Cardiac Arrhythmogenesis

Javier Diez

October 2013: IX Ibero-American Workshop on Complex Fluids and their Applications, Maceió (Alagoas, Brasil)
Instabilities and Pattern Formation in Thin Liquid Films: From Micrometric to Nanometric Scales

November 2013: 66th Annual Meeting of Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Pittsburgh, Pennsylvania
Using Instability of Nanometric Liquid Cu Films on Sio2 Substrates to Determine the Underlying Van Der Waals Potential

November 2013: 66th Annual Meeting of Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Pittsburgh, Pennsylvania
Theoretical Models for the Stability of a Liquid Ring on a Substrate

November 2013: 2013 AIChE Annual Meeting: Global Challenges for Engineering a Sustainable Future, San Francisco, California
"Large-Scale Molecular Dynamics Study of Dewetting of Thin Liquid Films on Solid Substrates"

Thomas Erneux

October 2013: IS-PALD International Symposium on Physics and Applications of Laser Dynamics 2013, Paris, France
Nonlinear Delay Dynamics in Photonic Systems

December 2013: IFISC Palma de Mallorca, Spain
Square-Wave Delay Dynamics in Photonic Systems

March 2014: Mini-Colloque RNL 2014: Dynamique et optique non linéaires, hommage à Pierre Glorieux, Paris France
Pierre, Une Rencontre non Linéaire

April 2014: Workshop MURPHYS-HSFS-2014, Hysteresis and Slow-Fast Systems, at the WIAS, Berlin Germany
Square-Wave Delay Dynamics

May 2014: The Third International Colloquium on "Nonlinear dynamics and control of deep drilling systems", Minneapolis, MN, USA
Delay Differential Equations in Action

Roy Goodman

April 2014: Mathematics Seminar, Montclair State University, Montclair, NJ
Recent Projects in the NJIT Applied Math Capstone Lab

April 2014: Computational and Applied Mathematics Seminar, Rutgers University, NJ
Complex Low-Dimensional Dynamics in Nonlinear Schrödinger Systems

Wenge Guo

June 2014: The 2014 Joint Applied Statistics Symposium of International Chinese Statistical Association & Korean International Statistical Society, Portland, OR
On Procedures Controlling the False Discovery Rate for Testing Hierarchically Ordered Hypotheses

January 2014: School of Automation, Huazhong University of Science and Technology, Wuhan, China
The Control of the False Discovery Rate under Structured Hypotheses

January 2014: College of Science, Wuhan University of Science and Technology, Wuhan, China
The Control of the False Discovery Rate under Structured Hypotheses

October 2013: Department of Mathematics and Statistics, Acadia University, Wolfville, NS, Canada
The Control of the False Discovery Rate under Structured Hypotheses

October 2013: Student Seminar Series, Department of Statistics, Columbia University, New York, NY
The Control of the False Discovery Rate under Structured Hypotheses

David J. Horntrop

September 2013: New England Symposium on Statistics in Sports, Cambridge, MA
Golf Handicap Scores Modeled via Distribution of Averages of Moving Order Statistics
(with Sonia Bandha and Thomas Spencer III)

Shidong Jiang

June 2014: Seminar at Beijing Computational Science Research Center, Beijing, China
An Introduction to the Fast Multipole Method

May 2014: Poster at Frontiers in Applied and Computational Mathematics (FACM 2014), Newark, NJ
Efficient Sum-of-Exponentials Approximations for the Heat Kernel and Their Applications (with Shaobo Wang)

May 2014: Poster at Frontiers in Applied and Computational Mathematics (FACM 2014), Newark, NJ
A Fast Multipole Method for Coarse-grained Brownian Dynamics Simulations of a DNA with Hydrodynamic Interactions (with Szu-pei Fu and Yuannan Young)

Lou Kondic

June 2014: Conference of the 7th International Marangoni Association, Vienna, Austria
1) Instabilities of Liquid Crystal Films
2) Instabilities of Structured Metal Films on Nanoscale

May 2014: Seminar, The Physics of Fluids Group, Twente University, Enschede, The Netherlands
Instabilities of Thin Fluid Films

March 2014: WE-Heraeus Seminar on Wetting of structures with complex geometries, Bad Honnef, Germany
How Geometry Influences Instability of Liquid Metals on Nanoscale

March 2014: March Meeting of the American Physical Society, Denver, CO
1) Evolution of Force Networks in Dense Granular Matter
2) Effect of Mach Number on Granular Impacts
3) Instabilities of Structured Liquid Metal Geometries on Nanoscale

November 2013: American Physical Society Division of Fluid Mechanics Annual Meeting, Pittsburgh, PA
1) Statics and Dynamics of Force Networks in Dense Particulate Systems
2) Theoretical Models for the Stability of a Liquid Ring on a Substrate
3) Using Instability of Nanometric Liquid Cu Films on Sio2 Substrates to Determine the Underlying Van Der Waals Potential

October 2013: Northeast Complex Fluids and Soft Matter Workshop, Piscataway, NJ
Statics and Dynamics of Force Networks in Dense Particulate Systems

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

Seminar: Department of Mathematics, University of Barcelona, Spain
Instabilities of Liquid Metals on Nanoscale

Victor Matveev

June 2014: Jacques Monod Conference, Roscoff, Brittany, France
Presynaptic Calcium Dynamics at Cerebellar Mossy Fiber Boutons (with Igor Delvendahl, Lukasz Jablonski, and Stefan Hallermann)

November 2013: Annual Meeting of the Society for Neuroscience, San Diego, CA
Qualitative Impact of Cooperative Calcium Buffers on Intracellular Calcium Dynamics

September 2013: NJIT Applied Mathematics Colloquium, Newark, NJ
Modeling of Cell Calcium Dynamics in Neuroscience and Physiology: Approaches and Challenges

July 2013: Annual Meeting of the Organization for Computational Neuroscience, Paris, France
Calcium Buffering as a Mechanism of Short-Term Synaptic Plasticity

Zoi-Heleni Michalopoulou

December 2013: Meeting of the Acoustical Society of America, San Francisco, CA
An Inverse Method for Estimating Sediment Sound Speed

June 2014: Meeting of the Acoustical Society of America and ICA Congress, Providence, RI
Stochastic Characterization of Acoustic Signals for Sequential Dispersion Tracking and Geoacousticinversion

October 2013: William-Paterson University
Applied Math for Defense and Security: Ocean Acoustics and Explosive Detection

October 2013: IEEE Workshop on Underwater Acoustic Signal Processing, Kingston, RI
Sound Speed Estimation and Source Localization in the Ocean via Linearization and Particle Filtering

Richard O. Moore

July 2013: Faculty-Student Summer Seminar Series, NJIT, Newark, NJ
Exit Problems and Large Deviation Theory in Nonlinear Wave Equations

November 2013: Research Colloquium, Southern Methodist University, Dallas, TX
Exit Problems and Large Deviations in Optical Waves

November 2013: Instituto de Matematicas, Universidad Nacional Autonoma de Mexico, Mexico City, Mexico
Exit Problems and Large Deviations in Optical Waves

January 2014: NJIT EXTREEMS-QED Mentor Presentations, NJIT, Newark, NJ
Optimal Inference of Velocity Fields

March 2014: PDE and Applied Math Seminar, Drexel University, Philadelphia, PA
Sampling and Assimilating with Optimal Control

March 2014: AMS Spring Eastern Sectional Meeting, University of Maryland at Baltimore County, Baltimore, MD
Optimal Control in Lagrangian Data Assimilation

March 2014: SIAM Conference on Uncertainty Quantification, Savannah, GA
Assessing Uncertainty in Mode-Locked Lasers with Feedback

May 2014: Nonlinear Guided Waves VII, Kingussie, Scotland
Simulating Exits in Stochastic Laser Dynamics

May 2014: Conference on Frontiers in Applied and Computational Mathematics, Newark, NJ
Simulating Exits in Stochastic Laser Dynamics

June 2014: Faculty-Student Summer Seminar Series, NJIT, Newark, NJ
Sampling and Assimilating with Optimal Control

Cyrill Muratov

July 2013: invited talk, PDE seminar, Department of Mathematics, University of Heidelberg, Germany
Front Propagation in Stratified Media: A Variational Approach

November 2013: Invited talk, workshop on Mathematical Analysis of Pattern Formation Arising in Nonlinear Phenomena, RIMS, Kyoto University, Kyoto, Japan
Front Propagation in Sharp and Diffuse Interface Models of Stratified Media

December 2013: minisymposium talk, SIAM Conference on Analysis of PDEs, Orlando, FL
Front Propagation in Sharp and Diffuse Interface Models of Stratified Media

December 2013: minisymposium talk, SIAM Conference on Analysis of PDEs, Orlando, FL
Threshold Phenomena for Symmetric Decreasing Solutions of Reaction-Diffusion Equations

May 2014: invited talk, PDE seminar, Department of Mathematics, Universidad Autonoma de Mexico
Front Propagation in Sharp and Diffuse Interface Models of Stratified Media

Horacio Rotstein

July 2013: Computational Neuroscience Meeting (CNS-2013), Paris, France
Predicting the Firing Phase of an Oscillatory Neuron from its Impedance Profile (with D. Fox and F. Nadim)

July 2013: Computational Neuroscience Meeting (CNS-2013), Paris, France
Membrane Resonance of Bursting Neurons Captured with an Ica/Ih Model Using Multi-Objective Evolutionary Algorithms (with D. Fox and F. Nadim)

August 2013: Department of Physics, Faculty of Exact and Natural Sciences (Sigman lab), University of Buenos Aires, Argentina
Frequency Preference in Two-Dimensional Neural Models: A Linear Analysis of the Interaction Between Resonant and Amplifying Currents

August 2013: Department of Mathematics, University of Cordoba, Argentina
Frequency Preference in Two-Dimensional Neural Models: A Linear Analysis of the Interaction Between Resonant and Amplifying Currents

August 2013: Department of Mathematics, Universidad Nacional del Sur, Bahia Blanca, Buenos Aires, Argentina
Frequency Preference in Two-Dimensional Neural Models: A Linear Analysis of the Interaction Between Resonant and Amplifying Currents

August 2013: Department of Mathematics, Universidad Nacional del Sur, Bahia Blanca, Buenos Aires, Argentina
Frequency Preference Response to Oscillatory Inputs in Two-Dimensional Neural Models: A Dynamical Systems Approach to Subthreshold Amplitude and Phase Resonance

August 2013: Colloquium, Department of Mathematics, University of Buenos Aires, Argentina
A Dynamical Systems Approach to the Oscillatory Properties of Neurons

November 2013: Annual Meeting of the Society for Neuroscience (SFN-2013), San Diego, CA
Predicting the Firing Phase of an Oscillator from Its Subthreshold Impedance Profile (with D. Fox and F. Nadim)

November 2013: Annual Meeting of the Society for Neuroscience (SFN-2013), San Diego, CA
Membrane Potential Resonance of Bursting Neuron Captured with an Ica/I_H Biophysical Model Using Multi-Objective Evolutionary Algorithms (with D. Fox, H. Tseng and F. Nadim)

November 2013: Annual Meeting of the Society for Neuroscience (SFN-2013), San Diego, CA
Inhibition-Based Theta Resonance in Cortical Circuits (with L. Roux, E. Stark, R. Eichler, S. Fujisawa and G. Buzsaki

February 2013: Department of Biology, University of Maryland Baltimore County, MD
Frequency Preference Response to Oscillatory Inputs in Neuronal Models

March 2014: Fields Institute, Toronto, ON, Canada.
Periodic Forcing of Insulin-Secreting Glycolytic Oscillators: Entrainment and Synchronization Properties (with R. Leiser and C. Diekman)

March 2014: Courant Institute of Mathematical Sciences: Data, Information and Optimization Seminar, NYU, New York, NY
Neuronal Models: Firing Rates and Statistical Measures of Neural Activity

April 2014: Department of Mathematics: NaK Group Computational Neuroscience, Boston University, Boston, MA
Subthreshold Amplitude and Phase Resonance in Linearized and Quadratic-Type Models

May 2014: Open Source Brain Symposium on “Oscillation and resonance in CNS network loops", Alghero, Saridinia, Italy
Inhibition-Based Theta Resonance in a Hippocampal Network: A Modeling Study (with E. Stark and G. Buzsaki)

May 2014: Department of Mathematics, Weizmann Institute of Science, Rehovot, Israel
Frequency Preference Response to Oscillatory Inputs in Neuronal Models: A Geometric Approach to Subthreshold Resonance.

May 2014: Department of Neurobiology, Weizmann Institute of Science, Rehovot, Israel
Subthreshold Frequency Preference in Neuronal Systems: The Interplay of Resonant and Amplifying Currents

May 2014: Frontiers in Applied and Computational Mathematics (FACM-2014), Newark, NJ
Neuronal Membrane Resonance Influences Network Frequency Through Electrical Synapses (with Y. Chen and F. Nadim)

May 2014: Frontiers in Applied and Computational Mathematics (FACM-2014), Newark, NJ
Periodic Forcing of Insulin-Secreting Glycolytic Oscillators: Entrainment and Synchronization Properties (with R. Leiser and C. Diekman)

May 2014: Frontiers in Applied and Computational Mathematics (FACM-2014), Newark, NJ
Periodic Forcing of Insulin-Secreting Glycolytic Oscillators: Entrainment and Synchronization Properties (with R. Leiser and C. Diekman)

May 2014: Frontiers in Applied and Computational Mathematics (FACM-2014), Newark, NJ
The Mechanism of Generation of Oscillations in a Mixed System with Mixed Local-Diffusive and Global Coupling (with D. Kim and H. Wu)

May 2014: Department of Mathematics, Technion, Israel Institute of Technology
Frequency Preference Response to Oscillatory Inputs in Neuronal Models: A Geometric Approach to Subthreshold Resonance

May 2014: Department of Physiology and Cell Biology, Ben Gurion University of the Negev, Beersheba, Israel
Subthreshold Frequency Preference in Neuronal Systems: The Interplay of Resonant and Amplifying Currents

June 2014: Department of Mathematical Sciences, NJIT, Newark, NJ
Frequency Preference Response to Oscillatory Inputs in Neuronal Models: A Geometric Approach to Subthreshold Resonance

Michael Siegel

April 2014: International Workshop on Multiscale Modeling and Simulation, University of California, Los Angeles, CA
An Efficient Boundary Integral Method for 3D Free-Surface Flow with Surface Tension

March 2014: SIAM SEAS Conference, Florida Institute of Technology, Melbourne, FL
A Multiscale Numerical Method for Interfacial Flow with Soluble Surfactant

February 2014: Applied Math Seminar, University of California, Irvine, CA
A Small-Scale Decomposition for 3D Boundary Integral Computations with Surface Tension

August 2014: SJTU-INS Workshop on Fluid-Structure Interaction Problems, Shanghai, China
A Numerical Method for Induced-Charge Electro-Kinetic Flow with Deformable Interfaces

Ronald Sverdlove

April 2014: National Bureau of Economic Research Corporate Finance Program Meeting, Chicago, Illinois
Intellectual Property Contracts: Theory and Evidence from Screenplay Sales (with M. Harris, S. A. Ravid, and S. Basuroy)

Catalin Turc

September 2013: PDE Seminar, University of Houston, Houston, Texas
Dirichlet-to-Neumann Maps and Well-Posed Boundary Integral Equations for Frequency Domain Scattering Problems

Antai Wang

July 2013: Renming University, Beijing, China
On the Nonidentifiability Property of Archimedean Copula Models under Dependent Censoring

December 2013: Hong Kong Baptist University, Hong Kong, China
Properties of the Marginal Survival Functions for Dependent Censored Data under an Assumed Archimedean Copula

March 2014: Baltimore, MD
Model Selection and Goodness-of-fit Procedures for Copula Models

June 2014: Chengdu, Sichuan, China
Properties of the Marginal Survival Functions for Dependent Censored Data under an Assumed Archimedean Copula

Yuan-Nan Young

June 2014: Northeast Complex Fluids and Soft Matter Symposium, CCNY, New York, NY
Long-wave Dynamics of an Inextensible Planar Membrane in an Electric Field

January 2014: ASPEN Workshop on Complex Fluids, Aspen, CO
Long-wave Dynamics of an Inextensible Planar Membrane in an Electric Field

November 2013: APS Division of Fluid Dynamics, Pittsburgh
Long-wave Dynamics of an Inextensible Planar Membrane in an Electric Field
Equilibrium Electrodeformation of a Spheroidal Vesicle in an AC Electric Field

October 2013: ESAM Applied Math Colloquium, Northwestern University, Evanston, IL
Long-wave Dynamics of an Inextensible Planar Membrane in an Electric Field

July 2013: SES Technical Meeting, Brown University, Providence, RI
Equilibrium Electro-deformation of a Surfactant-laden Viscous Drop

C. TECHNICAL REPORTS

REPORT 1314-1: *A Masking Index for Quantifying Hidden Glitches*
L. Berti-Equille, J.M. Loh, T. Dasu

REPORT 1314-2: *New Strange Attractors for Discrete Dynamical Systems*
Y. Joshi, D. Blackmore

REPORT 1314-3: *Frequency Preference in Two-dimensional Neural Models: A Linear Analysis of the Interaction between Resonant and Amplifying Currents*
H. Rotstein, F. Nadim

REPORT 1314-4: *Abrupt and Gradual Transitions between Low and Hyperexcited Firing Frequencies in Neuronal Models with Fast Synaptic Excitation: A Comparative Study*
H. Rotstein

REPORT 1314-5: *Preferred Frequency Responses to Oscillatory Inputs in an Electrochemical Cell Model: Linear Amplitude and Phase Resonance*
H. Rotstein

REPORT 1314-6: *Neurons and Neural Networks: Computational Models*
H. Rotstein

REPORT 1314-7: *Subthreshold Amplitude and Phase Resonance in Single Cells*
H. Rotstein

REPORT 1314-8: *Mixed-mode Oscillations in Single Neurons*
H. Rotstein

REPORT 1314-9: *Multistability Arising from Synaptic Dynamics*
A. Bose, F. Nadim

REPORT 1314-10: *Effects of Synaptic Plasticity on Phase and Period Locking of a Network of Two Oscillatory Neurons*
Z. Akcay, A. Bose, F. Nadim

REPORT 1314-11: *Reduced Dynamical Models for 1D Tapping of Particle Columns*
D. Blackmore, A. Rosato, X. Tricoche, K. Urban, L. Zou

REPORT 1314-12: *Numerical Simulation of Drop and Bubble Dynamics with Soluble Surfactant*
Q. Wang, M. Siegel and M.R. Booty

REPORT 1314-13: *Network Symmetry and Binocular Rivalry Experiments*
C. Diekman, M. Golubitsky

REPORT 1314-14: *Generalized Linear Model under the Extended Negative Multinomial Model and Cancer Incidence*
S. Dhar, S. Lahiri

REPORT 1314-15: *Self-trapping and Josephson tunneling solutions to the nonlinear Schrödinger / Gross-Pitaevskii Equation*
R. Goodman, J. Marzuola, M. Weinstein

REPORT 1314-16: *Two-sample location-scale estimation from censored data*
R. Bhattacharya, S. Subramanian

REPORT 1314-17: *Simultaneous confidence bands using model assisted Cox regression*
S. Mondal, S. Subramanian

REPORT 1314-18: *A preliminary fractional calculus model of the aortic pressure flow relationship during* systole
G. Atlas, S. Dhar

REPORT 1314-19: *A Batch Arrival Queue System with Feedback and Unliable Server*
G. Mytalas, M. Zazanis

REPORT 1314-20: *Discovering Neuronal Connectivity from Serial Patterns in Spike Train*
C. Diekman, K. Dasgupta, V. Nair, K. Unnikrishnan

VI. EXTERNAL ACTIVITIES AND AWARDS

A. FACULTY ACTIVITIES AND AWARDS

Shahriar Afkhami

Panel review member for grants: National Science Foundation Graduate Research Fellowship Program, ACS Petroleum Research Fund

Ph.D. Advisor: Kyle Mahady, Ivana Seric, Valeria Barra

Travel support award: Workshop - Robust Discretization and Fast Solvers for Computable Multi-Physics Models, ICERM, Brown University, May 2014

New Jersey Institute of Technology, College of Science and Liberal Arts, Excellence in Teaching to Graduate Education Award, May 2014

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 two NSF Panels

Invited to give a short course on Infinite-Dimensional Dynamical Systems: Integrability and Near-Integrability at the CIMPA Research School on “Dynamical Systems and Applications: Geometrical, Topological and Numerical Aspects”, Abdus Salam School of Mathematical Sciences, Lahore, Pakistan, Nov. 10-21, 2014

Linda Cummings

Organizer, 30th Annual MPI (Mathematical Problems in Industry) workshop, NJIT, June 2014

Nominated for NJIT's Excellence in Graduate Education Award (March 2014)

Promoted to Full Professor (June 2014, effective Fall 2014)

Appointed to Editorial Advisory Board, Quarterly Journal of Mechanics & Applied Mathematics

Associate Editor, IMA Journal of Applied Mathematics (2011 - present)

Casey O. Diekman

Institute partner meeting representative: Mathematical Biosciences Institute, Ohio State University, Columbus, OH, February 2014

Organizer and chair: Minisymposium on Circadian Rhythms, Conference on Frontiers in Applied and Computational Mathematics (FACM), NJIT, Newark, NJ, May 2014

Javier Diez

Vice-director of "Centro de Investigaciones en Fìsica e Ingenierìa del Centro de la Provincia de Buenos Aires (CIFICEN)" (Research Center of CONICET and UNCPBA) (starting on 6/2013)

Director of "Instituto de Fìsica Arroyo Seco (IFAS)" (Research Center of Facultad de Ciencias Exactas, UNCPBA)

Wenge Guo

Editorial Board of PLOS ONE

Editorial Board of the Journal of Biometrics and Biostatistics

Editorial Board of Calcutta Statistical Association Bulletin

Zoi-Heleni Michalopoulou

Associate Editor, Journal of the Acoustical Society of America

Horacio Rotstein

Program Committee Member, International Joint Conference on Neural Networks (IJCNN), Dallas, TX, USA, August 4 - 9, 2013

Program Committee Member, Internatioal Neural Network Society & IEEE Computational Intelligence

Guest Editor, 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)

Guest Editor, Chaos, an Interdisciplinary Journal of Nonlinear Science

Richard O. Moore

2013-2014: Advisor, SIAM Student Chapter at NJIT

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

June 2013: Co-organizer (with L. Cummings) of 30th Annual Mathematical Problems in Industry Workshop, NJIT, Newark, NJ

Cyrill Muratov

Associated Editor, Networks and Heterogeneous Media

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 2014

B. FACM'14 CONFERENCE: FRONTIERS IN APPLIED AND COMPUTATIONAL MATHEMATICS

The Eleventh Conference on Frontiers in Applied and Computational Mathematics (FACM ’14) at the New Jersey Institute of Technology was held on May 22-23 and was focused on mathematical biology.

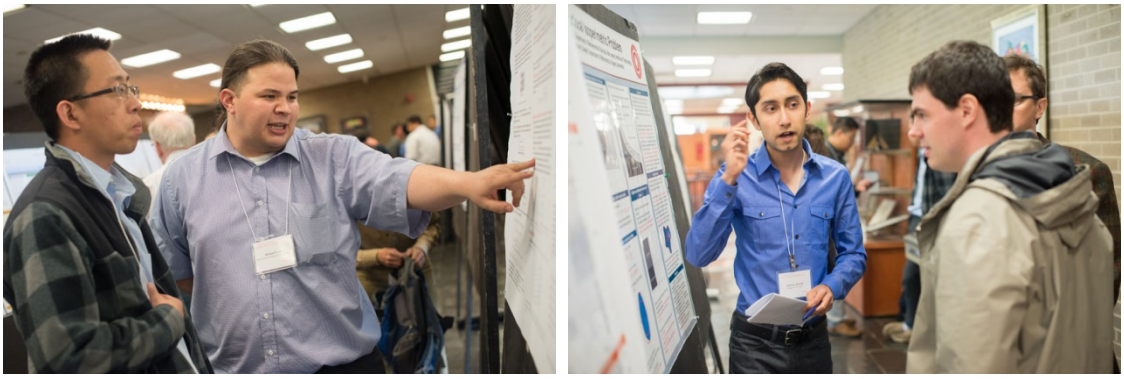
This year’s FACM conference was particularly noteworthy in that it celebrated the 75th birthday of NJIT Distinguished Professor Robert Miura. Professor Miura is well known for his seminal contributions to the inverse scattering transform and to mathematical neuroscience. The conference featured a special minisymposium devoted to areas in which Robert has made pioneering contributions, and recent results in these areas were presented by distinguished researchers. Many friends, collaborators, former colleagues, and students of Robert attended a special banquet to celebrate his contributions to applied mathematics.

The conference had 144 total participants, and featured 53 minisymposium talks, many of which were given by up and coming junior faculty. Contributed talks by postdocs and graduate students were selected form a large number of applications, and were presented in the same sessions as the invited talks, giving these young researchers a chance to showcase their research results. In addition to the talks, there were 37 posters on a variety of research topics.

The plenary speakers for the conference were John Rinzel (NYU), Peter Miller (University of Michigan), Huaxiong Huang (York University) and Jonathan Wylie (City University of Hong Kong).

The organizing committee for this year’s conference was Amit Bose (Chair), Gerda de Vries (University of Alberta), Roy Goodman, Victor Matveev, Michael Siegel, and Antai Wang.

Group Photo, FACM'14



Ph.D. Student Poster Presentation

VII. FUNDED RESEARCH

A. EXTERNALLY FUNDED RESEARCH

CONTINUING FUNDED PROJECTS

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

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

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, 2014
Denis Blackmore (PI at NJIT), Anthony Rosato (Co-PI at NJIT), Xavier Tricoche (PI at Purdue)

Numerical Methods and Analysis for Interfacial Fluid Flow with Soluble Surfactant
National Science Foundation - Division of Mathematical Sciences: October 1, 2010 - September 30, 2014
Michael Booty (Co-PI), Michael Siegel (PI), Yuan-Nan Young (Co-PI)

Collaborative Research: Expanding links with industry through collaborative research and education in Applied Mathematics
National Science Foundation - Division of Mathematical Sciences: April 1, 2013 - March 31, 2015
Linda Cummings and Richard Moore

Modeling & Analysis of Nematic Films: Flow-substrate Interactions
National Science Foundation - Division of Mathematical Sciences: August 1, 2012 - July 31, 2015
Linda Cummings and Lou Kondic

Collaborative Research: The MPI workshop and GSMM Camp
National Science Foundation - Division of Mathematical Sciences: March 1, 2012 - Feb 28, 2015
Linda Cummings

AF:Medium:Collaborative Research: Integral Equation Based fast algorithms and graph theoretic methods for large scale simulations
National Science Foundation: July 15, 2009 - June 30, 2014
Shidong Jiang (PI)

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

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

Pan-American Advanced Study Institute (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)

Microstructure and Fluidization in Granular Media
Department of Defense Basic and Applied Sciences Directorate, April 2010 - September 2014
Lou Kondic, Robert P. Behringer (Duke University), Corey O'Hern (Yale University), and Wolfgang Losert (University of Maryland)

Modeling and Analysis of Nematic Liquid Crystals in Thin Geometries: Bistable Configurations and Free Surface Instabilities
National Science Foundation: October 1, 2009 - September 30, 2013
Lou Kondic and Linda Cummings

Calcium Dynamics in Exocytosis and Synaptic Facilitation
National Science Foundation - Mathematical Sciences Division: 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, Gareth Russell, and Jorge Golowasch

Efficient Inversion in Underwater Acoustics with Iterative and Sequential Bayesian Approaches
ONR: January 1, 2010 - July 15, 2013
Zoi-Heleni Michalopoulou

Efficient Inversion in Ocean Acoustics with Iterative, Sequential, and Analytical Methods
ONR: January 1, 2013 - December 31, 2015
Zoi-Heleni Michalopoulou

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

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

Winding Domain Walls in Thin Ferromagnetic Films
National Science Foundation: September 1, 2009 - August 31, 2014
Cyrill Muratov

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

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

Collaborative Research: Efficient Surface-based Numerical Methods for 3D Interfacial Flow with Surface Tension
National Science Foundation: October 1, 2010 - September 30, 2014
Michael Siegel

Efficient integral equation solvers for large-scale frequency domain electromagnetic scattering problems
NSF Applied Mathematics: Sept 2013- June 2016
Catalin Turc

Analysis of Survival Data using Copula Models
National Science Foundation: July 15, 2011 – June 30, 2014
Antai Wang (PI)

Mathematical and experimental study of lipid bilayer shape and dynamics mediated by surfactants and proteins
National Science Foundation-Mathematical Sciences Division: August 15, 2012- August 31, 2015
Yuan-Nan Young (PI)

NEW TRAINING FUNDED PROGRAMS

INTERDISCIPLINARY UNDERGRADUATE PROGRAM IN NANOTECHNOLOGY AT NJIT: Linking K-12 through Graduate Education via Nanotechnology
National Science Foundation: January 1, 2014 - December 31, 2015
Zoi-Heleni Michalopoulou, Raquel Perez-Castilledos, John Carpinelli, Haim Grebel, and Somenath Mitra

EXTREEMS-QED: Research and Training in Computational and Data-enabled Science and Engineering
National Science Foundation: January 1, 2014 - December 31, 2018
Michael Siegel, David Horntrop, Ji Meng Loh, Zoi-Heleni Michalopoulou, and Marvin Nakayama

PROJECTS FUNDED DURING PRESENT FISCAL/ ACADEMIC YEAR

A New Computational Method for Viscoelastic Two-phase Fows
National Science Foundation, Division of Mathematical Sciences, Computational Mathematics:
September 1, 2013 - August 31, 2016
Shahriar Afkhami

Applications of Complex Variables: Modeling, Theory & Computation
Banff International Research Station: September 2013 - January 2015
Linda Cummings

Modeling Circadian Clock Mechanisms from Synapse to Gene
National Science Foundation: July 1, 2014 - June 30, 2017
Casey Diekman

Mathematics of Biological Timekeeping
Simons Foundation: September 1, 2014 – August 31, 2019
Casey Diekman

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

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

Modeling and Numerical Study of Explosive Boiling in Well Wetting Fluids Under Microgravity
University Space Research Association: April 1, 2014 – August 31, 2014
Cyrill Muratov

Mechanisms of Frequency Preference in Neurons and Networks: Biophysics and Dynamics
National Science Foundation: June 1, 2013 - May 31, 2016
Horacio Rotstein

MIMO Radar Clutter Modeling Phase II, coPI, with MathSys Inc., STTR Phase II,
Air Force Office Scientific Research: February 1, 2014 – January 31, 2016
Catalin Turc

B. PROPOSED RESEARCH

PROJECTS PROPOSED DURING PRESENT FISCAL YEAR

Direct Computation and Modeling of Nanoscale Fluid Problems Including Fluid-solid Interaction, Thermal Effects and Phase Change
DOE-Advanced Scientific Computing Research: 2013 - 2016
Shahriar Afkhami

Numerical Methods and Analysis for Induced-Charge Electrokinetic Flow with Deformable Interfaces
National Science Foundation: August 1, 2014 - September 30, 2017.
Michael Booty (Co-PI), Michael Siegel (PI), Yuan-Nan Young (Co-PI)

Applications of Complex Variables: Modeling, Theory & Computation
Banff International Research Station: September 2013 - January 2015
Linda Cummings

Dynamical Instabilities in Nonlinear Waves
National Science Foundation: July 1, 2014 - June 30, 2017
Roy Goodman

Collaborative Research: Multiscale Approaches for Nano-Scale Molecular Flows
National Science Foundation, $237,618: June 1, 2014 - May 30, 2017
Shidong Jiang (PI)

Collaborative Research: Efficient High-Order Parallel Algorithms for Large-Scale Photonics Simulation
National Science Foundation, $186,430: July 1, 2014 - June 30, 2017
Shidong Jiang (PI)

NRT: Sustainable Environment Sensing Research and Training Center
NSF: September 1, 2014 - August 31, 2019
Zoi-Heleni Michalopoulou, John Federici, Daniel Bunker, Simon Garnier, and Zafar Iqbal

The Effects of Ionic Conductance Correlations on Neuronal Activity
National Institutes of Health: September 1, 2014 - August 31, 2019
Horacio Rotstein

The Dynamics of Networks of Relaxation Oscillators
National Science Foundation: September 1, 2014 - August 31, 2017
Horacio Rotstein

Collaborative Research: Efficient Numerical Methods and Analysis for 3D Interfacial Flow with Surface Tension or Elastic Membrane Stress
National Science Foundation: September 1, 2014 - August 31, 2017
Michael Siegel and David Ambrose

Simultaneous Confidence Bands in Survival Studies
National Security Agency: June 1, 2014 - May 31, 2016
Sundar Subramanian (PI)

New Strategies to Analyze Survival Data Using Copula Models
National Science Foundation: July 1, 2014 - June 30 2017
Sundar Subramanian (Co-PI)

Analysis of High-Dimensional Longitudinal Data with Application to Microarray and fMRI
National Institutes of Health: February 1, 2015 - January 31, 2020
Antai Wang (PI)

Analysis of High-Dimensional Longitudinal Data with Application to Microarray and fMRI
National Science Foundation: July 1, 2014 – June 30, 2017
Antai Wang (Co-PI)

New Strategies to Analyze Survival Data using Copula Models
National Science Foundation: 2014 - 2017
Antai Wang (PI)

Statistical Analysis of High Dimensional Microarray and fMRI Data
National Science Foundation: 2014 - 2017
Antai Wang (PI)

Statistical Analysis of Survival Data using Copula Models
National Security Agency: 2015 - 2016
Antai Wang (PI)

Electrolyte-mediated electrohydrodynamics of lipid monolayer and bilayer membranes
National Science Foundation – CBET: September 1, 2014 - August 31, 2017
Yuan-Nan Young (PI)

EXTERNALLY FUNDED PROJECTS -- NOT THROUGH CAMS

Neurocomputational Properties of Mammalian Clock and Non-Clock Neurons
Burroughs Wellcome Fund: January 1, 2013 – December 31, 2014
Casey Diekman

Inestabilidades en Peliculas Liquidas Conformadas: Formacion de Gotas Submilimetricas y Nanometricas
Consejo Nacional de Investigaciones Cientificas y Tecnicas (CONICET, Argentina): July 2013 - July 2015
Javier Diez

Formación de Patrones por Inestabilidad de Películas Líquidas Hasta Escalas Nanométricas
Agencia Nacional de Promoción de la Ciencia y la Tecnología (ANPCyT, Argentina): July 2013 - July 2015
Javier Diez

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.

B. STATISTICAL CONSULTING LABORATORY REPORT (July 2013 - June 2014)

The Statistical Consulting Lab serves the NJIT community and external organizations and aims to offer high quality statistical consulting for the purposes of promoting research, collaboration and statistical education. Here are some examples of consulting activities in the past year:

Date: Dec 2013 - Mar 2014; Client: Francisco Artigas (New Jersey Meadowlands Commission - Environmental Research Institute

Description: Analysis of concentrations of metal contaminants found in sediment samples drawn from New Jersey creeks that were affected by Sandy in order to study variations in concentrations with distance from the creek flood-gates.
Consultants: Ji Meng Loh with PhD student Shoubhik Mondal

Date: Jan - Apr 2014; Client: Erin Idhe (Hackensack University Medical Center)
Description: Analysis of data to study the effectiveness of a new head lice treatment for removing live lice and viable lice eggs from subjects.
Consultants: Ji Meng Loh with PhD student Zhiying Qiu

Date: Jan -Jun 2014: Client: Erin Idhe (Hackensack University Medical Center)
Description: Analysis of data to determine correlations between environmental chemicals in the body and estrogen metabolism
Consultants: Ji Meng Loh with PhD student Sonia Bandha

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 occurring 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, Shahriar Afkhami 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 50 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-PI.

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.

Casey Diekman

Casey Diekman uses a combination of mathematical modeling, numerical simulation, and dynamical systems analysis to gain insight into biological systems. He is currently focused on creating a

mathematical framework to understand how dynamic changes in gene expression affect the electrical properties of neurons and ultimately animal behavior. Circadian (~24-hour) rhythms offer one of the clearest examples of the interplay between these different levels of organization, with rhythmic gene expression leading to daily rhythms in neural activity, physiology and behavior. Diekman develops mathematical models of the master circadian clock in the mammalian brain. These models and the mathematical theory associated with them have led to counterintuitive predictions that have since been validated experimentally by his collaborators. The primary goal of his research program in mathematical biology is to uncover mechanisms underlying biological timekeeping, neuronal rhythm generation, and the disruption of rhythmicity associated with certain pathological conditions including sleep disorders, Alzheimer's disease, breathing problems, and ischemic stroke.

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 differential 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. Another area of application is the interaction of vortices in Bose-Einstein condensates.

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 generalized error rates in large-scale multiple testing. Their main applications are on bioinformatics and computational biology. His current research projects include estimate 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 techniques, 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 electrophysiological 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. Current work considers contracts that corporations offer to creators of intellectual property for the purchase of that property and the reasons for the existence of contingent payments in those contracts. 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.

Antai Wang

Antai Wang's research mainly focuses on survival data analysis, high dimensional data analysis and cancer data analysis. Currently his research goal is to develop new strategies to model dependent censored data or multivariate survival data using frailty models, copula models and nonparametric methods. For high dimensional data, Antai develops new methodologies to conduct variable selections for longitudinal data based on a Procrustes criterion which is used to extract data information while keeping the original data structure. The new research strategies are important and useful for correlated survival data analysis and microarray data analysis in medical research.

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) and Philip Rack (UTennessee)

Dynamics of Ferrofluidic Systems, Amir Hiras (RPI)

Shape and Instability of Confined Liquid Filaments, Lou Kondic (NJIT) and Ralf Seemann (Saarland University)

Moving Contact Line Problems, Stephane Zaleski (UPMC Paris 6)

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

Denis Blackmore

Dynamical Analysis of Granular Flows, a. Rosato (NJIT), X. Tricoche (Purdue), 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 - Especially Strange Attractors and Logic Circuits, Y. Joshi (Kingsborough) and a. Rahman (NJIT)

Michael Booty

Numerical Methods and Analysis for Interfacial Fluid Flow with Surfactant, and Electrokinetic Flow for Deformable Interfaces, Michael Siegel (NJIT), Yuan-Nan Young (NJIT), Qiming Wang (York University, Ontario, Canada), and Jacek Wrobel (Tulane).

Magnetic Field Assisted Assembly for the Manufacture of Integrated Circuits, Anthony.T. Fiory (Physics, NJIT) and N.M. Ravindra (Physics, NJIT).

Casey O. Diekman

Dynamics of the Mammalian Circadian Clock, M. Belle and H. Piggins (University of Manchester)

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)

Control of the False Discovery Rate in Statistical Process Control, Jun Li (University of California, Riverside)

Multiple Testing Procedures for Multiple Pairwise Comparisons in Genomic Studies, Shyamal Peddada (National Institute of Environmental Health Sciences)

David J. Horntrop

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

Shidong Jiang

Fast and Accurate Evaluation of Nonlocal Coulomb and Dipole-Dipole Interactions via the Nonuniform FFT, L. Greengard (Courant Institute, New York University) and W. Bao (National University of Singapore)

The Solution of the Scalar Wave Equation in the Exterior of a Sphere, L. Greengard (Courant Institute, New York University) and T. Hagstrom (Southern Methodist University)

On the Integral Equation Derived from the Linearized BGK Equation for the Steady Couette Flow, L. Luo (Old Dominion University)

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 Neurotransmitter Release in Mammalian Cerebellar Synapses, S. Hallermann (Carl-Ludwig Institute for Physiology, Leipzig University, Germany)

Dynamics of Calcium-Controlled Insulin Release in Pancreatic Beta-Cells, M.-G. Pedersen (University of Padova, Italy) and a. Sherman (NIH)

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

Zoi-Heleni Michalopoulou

Passive Fathometer Processing for Reflector Tracking, Peter Gerstoft and Caglar Yardim (Scripps Institution of Oceanography, UCSD)

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

Richard O. Moore

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

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

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).

Horacio Rotstein

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

Dynamics of Networks of Relaxation Oscillators, Irving Epstein (Brandeis University)

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

Michael Siegel

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

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

Yuan-Nan Young

Mechanical Coupling Between a Mechano-Sensitive Channel (Mscl) and Membrane Dynamics, on Shun Pak and Howard Stone (Princeton University), Shravan Veerapaneni (University of Michigan)

Temperature-Controlled Growth of Nano Rods, Sangwoo Shin and Howard Stone (Princeton University)

Electrically Actuated Swimmer, Shravan Veerapaneni (University of Michigan) and Petia Vlahovska (Brown University)

X. STUDENT ACTIVITIES

A. UNDERGRADUATE ACTIVITIES

Zoi-Heleni Michalopoulou, Director of Undergraduate Studies

Report on Undergraduate Studies

The undergraduate program of the Department of Mathematical Sciences was very active during the past academic year with many successes. One of the highlights is the NSF funded EXTREEMS program, which began in January 2014. Seven students are currently involved, conducting research under the guidance of Shidong Jiang, Eliza Michalopoulou, and Richard Moore. The students are Jake Brusca, Shan Fung, Daniel Meldrim, Jacob Mooman, Armando Rosa, Fremy Santana, and Thomas Tu. The program is directed by David Horntrop and the PI is Michael Siegel.

Many more students have been involved in research since July 2013 and published and presented their work. Anthony Zaleski, who is now pursuing a PhD at Rutgers University, had a paper accepted for publication in the Annals of Global Analysis and Geometry. The paper is entitled "On an isoperimetric problem with a competing non-local term: Quantitative results." His mentor was Cyrill Muratov. Furthermore, Lucas Lamb spent the summer of 2013 conducting research with John Federici in the Physics Department. Currently he is conducting research under Rohit Prasankumar at the Los Alamos National Laboratories at Sandia National Laboratories. Andrea Roeser participated in the Provost's Undergraduate Summer Research Program during both summers of 2013 and 2014. Steve Susanibar was an NJIT McNair research program participant during the summer of 2013. In the summer of 2014, he participated in the Stanford Summer Research Early Identification Program (SSR-EIP 2014), working in the Laboratory for Advanced Materials. Thomas Anderson participated in the 2013 REU program at the University of Nebraska and Scott Lieberman participated in the Duke/CERN Research Experience for Undergraduates Program. Anderson also worked on a research project under the guidance of Peter Petropoulos during the 2013/2014 academic year and the summer of 2014. The title of the project is "A long-wave analysis of the effect of tangential electric fields on the viscous Rayleigh-Taylor instability." Joseph Zaleski, a recipient of the Provost's Summer Undergraduate Research Program Award, has been working under the guidance of Casey Diekman on "Mathematical Modeling of Daily Rhythms and Cardiac Arrhythmias." Hamza Ahmad, also mentored by Casey Diekman, is conducting research on "Circuit Dynamics of C. elegans locomotion." Gal Haspel from the NJIT Biology Department is Ahmad's co-mentor. Timothy Barnes is currently participating in an REU program at Purdue University and Philip Bartholomew is pursuing research in physics. Also Josef Mohrenweiser is working with Shahriar Afkhami on "Tracking Superparamagnetic Nanoparticles in Blood Flow for Magnetic Drug Targeting." Finally, Michael Petretta recently had an internship with Nomura Services in New York.

A number of other students participated in research projects during the academic year and summer months and several students in the Mathematics of Finance and Actuarial Science concentration are currently pursuing internships. Furthermore, graduates of our program are attending graduate programs at prestigious institutions and are employed in the finance and actuarial science industry.

B. GRADUATE STUDENT RESEARCH PROGRAMS

Linda Cummings, Director of the Graduate Program

PhDs Awarded in the Period Covered by the Report

Akcay, Z.
Thesis: Dynamics of Phase Locking in Neuronal Networks in the Presence of Synaptic Plasticity (May 2014).
Advisors: F. Nadim & A. Bose.

Aunsri, N.
Thesis: Particle filtering for frequency estimation from acoustic time-series in dispersive media (December 2013).
Advisor: Z.-H. Michalopoulou.

Bandha, S.
Thesis: Data Analysis and Simulation for Warranties and Golf Handicaps (May 2014).
Advisors: D. Horntrop & M. Bhattacharjee.

Lin, T.
Thesis: Inverse methods for sound speed estimation on the ocean (May 2014).
Advisor: Z.-H. Michalopoulou.

Lynch, G.
Thesis: The Control of the False Discovery Rate under Structured Hypotheses (December 2013).
Advisor: W. Guo.

Nganguia, H. (May 2014).
Thesis: Electro-Deformation of A Moving Boundary: A Drop Interface and a Lipid Bilayer Membrane.
Advisor: Y.-N. Young.

Qiu, Z. (May 2014).
Thesis: FWER controlling procedures for testing multiple hypotheses with hierarchical structure and applications in clinical trials.
Advisor: W. Guo.

Publications, Presentations, & Conferences (Including FACM Participation)

Zeynep Akcay

Publications:

Effects of Synaptic Plasticity on Phase and Period Locking of a Network of Two Oscillatory Neurons (with A. Bose and F. Nadim), J. Math. Neuro., Vol. 4 (8), DOI:10.1186/2190-8567-4-8, 2014.

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Creation of Bistable Phase Locking Solutions in Recurrent Neuronal Networks Through Short-Term Synaptic Depression

January 2014: Joint Mathematics Meeting, Baltimore, MD.
Effects of Synaptic Plasticity on Phase and Period Locking of a Network of Two Oscillatory Neurons

November 2013: Dynamic Neural Networks: The Stomatogastric Nervous System Meeting, San Diego, CA
Predicting Neuronal Network Activity with Synaptic Plasticity Using Numerical Phase Response Curves

October 2013: IXth Annual Graduate Student Research Day, NJIT, Newark NJ
Effects of Synaptic Plasticity on Phase and Period Locking in a Network of Two Oscillatory Neurons

June 2013: Student Seminar, Department of Mathematical Sciences, NJIT, Newark, NJ
Predicting Neuronal Network Activity with Synaptic Plasticity Using Numerical Phase Response Curves

Valeria Barra

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Linear Stability Analysis of Thin Viscoelastic Liquid of Jeffreys Type with Van Der Waals Interaction

Casayndra Basarab

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Hamiltonian Hopf Bifurcations in Schrodinger Trimers

Sonia Bandha

Presentations:

September 2013: New England Symposium on Statistics in Sports, Cambridge, MA
Golf Handicap Scores Modeled Via Distribution of Averages of Moving Order Statistics

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Copula-based modeling and Computational Solutions of Warranty Cost Management Problems

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Simulating Golf Handicaps Using Empirical and Fitted Data

Rianka Bhattacharya

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Two-Sample Location-Scale Estimation from Semi Parametric Random Censorship Models

October 2013: GSA 9th Graduate Student Research Day, NJIT, Newark, NJ
Inference for Two-Sample Location-Scale Using Semiparametric Random Censorship Models (Poster)

Chenjing Cai

Publications:

Bifurcation Properties of Nematic Liquid Crystals Exposed to an Electric Field: Switchability, Bistability & Multistability (with L. Cummings & L. Kondic), Physical Review E., Vol. 88, 012509, 2013.

Nanyi Dong

Publications:

Directed Liquid Phase Assembly of Highly Ordered Metallic Nanoparticle Arrays (with Yueying Wu, Shaofang Fu, Jason D. Fowlkes, Lou Kondic, Maria A. Vincenti, Domenico de Ceglia & Philip D. Rack), ACS Appl. Mater. Interfaces., Vol. 6 (8), pp. 5835-5843, 2014.

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ.
Formation of Drops from Structured Metal Geometries on Nanoscale

Szu-Pei Fu

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
AFast Multipole Method for Coarse-Grained Brownian Dynamics Simulations of a DNA with Hydrodynamic Interactions

Anjana Grandhi

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Control of Mdfdr in Testing of Hierarchically Structured Families of Hypotheses

Lenka Kovalcinova

Presentations:

March 2014: APS March Meeting, Denver, CO

Characterizing Dense Granular Systems by Percolation and Statistical Properties of Force Networks (with Dr. L Kondic, Dr. A. Goullet)

October 2013: GSA Graduate Student Research Day, NJIT, Newark, NJ
Properties of Force Networks of Slowly Compressed Granular Matter (with Dr. L Kondic, Dr. A. Goullet)

Soumi Lahiri

Publications:

Generalized Linear Model under the Extended Negative Multinomial Model and Cancer Incidence (with S. Dhar), Journal of the Indian Statistical Association, Vol. 52 (1), pp. 125-140, 2014.

Michael A. Lam

Publications:

Modeling Flow of Nematic Liquid Crystal Down an Incline (with L. Cummings, T.S. Lin & L. Kondic), J. Eng. Math., to appear (2014).

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Hele-Shaw instabilities of Newtonian and non-Newtonian two-phase flow

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Instabilities in the Flow of Nematic Liquid Crystal Films Down an Incline in Three Spatial Dimensions

Randolph Leiser

Presentations:

March 2014: Fields Institute, Toronto, ON, Canada
Periodic Forcing of Insulin-Secreting Glycolytic Oscillators: Entrainment and Synchronization properties

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Periodic Forcing of Insulin-Secreting Glycolytic Oscillators: Entrainment and Synchronization Properties

Tao Lin

Publications:

Sound Speed Estimation and Source Localization with Linearization and Particle Filtering (with Z.-H. Michalopoulou), Journal of the Acoustical Society of America, Vol. 135, pp. 1115-1126, 2014.

Presentations:

December 2013: Meeting of the Acoustical Society of America in San Francisco, San Francisco, CA

An Inverse Method for Estimating Sediment Sound Speed in the Ocean

T. S. Lin

Publications:

Note on the Hydrodynamic Description of Thin Nematic Films: Strong Anchoring Model (with L.J. Cummings, A.J. Archer, L. Kondic, U. Thiele), Physics of Fluids, Vol. 25, 082102, 2013.

Modelling Spreading Dynamics of Nematic Liquid Crystals in Three Spatial Dimensions (with L. Kondic, U. Thiele, L.J. Cummings), Journal of Fluid Mechanics, Vol. 729, pp. 214, 2013.

Gavin Lynch

Publications:

An Efficient Expanding Block Algorithm for Image Copy-Move Forgery Detection (with F. Shiha and H.-Y. Liao), Information Sciences, Vol. 239, pp. 253-265, 2013.

Presentations:

October 2013: The 2013 Nonclinical Biostatistics Conference, Villanova, PA
On Procedures Controlling the False Discovery Rate for Testing Hierarchically Ordered Hypotheses

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
A False Discovery Rate Controlling Procedure for Testing Hypotheses with Complex Structure

Kyle Mahady

Publications:

Comparison of Navier-Stokes Simulations with Long-Wave Theory: Study of Wetting and Dewetting (with S. Afkhami, L. Kondic, and J. Diez), Physics of Fluids, Vol. 25 (11), 112103.

Hierarchical Nanoparticle Ensembles Synthesized By Liquid Phase Directed Self-Assembly (with J. D. Fowlkes, N. Roberts, Y. Wu, J. A. Diez, A. G. Gonzalez, C. Hartnett, S. Afkhami, L. Kondic, and P. D. Rack), Nano Letters, Vol. 14 (2), pp. 774-782.

Presentations:

November 2013: APS Division of Fluid Dynamics, Pittsburgh, PA
Influence of Geometry on Instability: Breakup of Fluid Strips with Square-Wave Perturbations

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Contact Angles and Thin Film Rupture: Volume of Fluid Based Simulations of the Van Der Waals Interaction in Three-Phase Systems

K. Malakuti

Publications:

Detection of Complex Singularities for a Function of Several Variables (with R. E. Caflisch, M. Siegel & a. Virodov), I.M.A. J. Appl. Math., Vol. 78 (4), pp. 714-728, 2013.

Ensela Mema

Publications:

Electric-Field Variations Within a Nematic-Liquid-Crystal Layer (with L. Cummings, C. Cai & L. Kondic), Physical Review E. 90 012503 (2014).

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Substrate-Induced Gliding Effect in a Nematic Liquid Crystal Layer

Shoubhik Mondal

Publications:

Model Assisted Cox regression (with S. Subramanian), Journal of Multivariate Analysis, Vol. 123, pp. 281-303, 2014.

Presentations:

October, 2013: GSA 9th Graduate Student Research Day, New Jersey Institute of Technology, Newark, NJ
Model Assisted Cox Regression

Herve Nganguia

Publications:

Equilibrium Electro-Deformation of a Surfactant-Laden Viscous Drop (with Y.-N. Young), Physics of Fluids, Vol. 25, 092106, 2013.

Equilibrium Electrodeformation of a Spheroidal Vesicle in a Ac Electric Field (with Y.-N. Young), Physical Review E, Vol. 88, 052718, 2013.

Presentations:

July 2013: SES meeting, Brown University, RI
Electrodeformation of a Surfactant-Covered Viscous Drop Using the Spheroidal Model

November 2013: APS/DFD meeting, Pittsburg, PA.
Electrodeformation of a Vesicle Under a AC Electric Field

Aminur Rahman

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
A Scheme for Analyzing the Dynamics of Logical Circuits

Ivana Seric

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
3D Direct and Inverse Solver for Eddy Current Testing in Steam Generator

May 2014: Frontiers in Applied and Computational Mathematics 2014, NJIT, Newark, NJ
Interfacial Instability in Thin Ferrofluid films Under a Magnetic field (with S. Afkhami, and L. Kondic)

November 2013: American Physical Society, Division of Fluid Dynamics, Pittsburgh, PA
Numerical Simulations of a Ferrofluid Drop on a Substrate under a Applied Magnetic field (with S. Afkhami, and L. Kondic)

April 2014: Dana Knox Student Research Showcase, NJIT, Newark, NJ
Interfacial Instability in Thin Ferrofluid films Under a Magnetic field (with S. Afkhami, and L. Kondic)

Oleksiy Varfolomiyev

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
A Non-Stiff Numerical Method for 3D Interfacial Flow of Inviscid Fluids

May 2014: NJIT Summer Program Talk
A Non-Stiff Numerical Method for 3D Interfacial Flow of Inviscid Fluids

Zhiying Qiu

Publications:

A Class of Generalized Fixed Sequence Procedures for Controlling the FWER (with W. Guo and G. Lynch), Statistics in Medicine (under revision), 2014.

Shaobo Wang

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Efficient Sum-of-Exponentials Approximations for the Heat Kernel and Their Applications

Hao Wu

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
Investigation of Infinite Dimensional Dynamical Systems Models Applicable to Granular Flow

Yang Zhang

Presentations:

May 2014: Frontiers in Applied and Computational Mathematics, NJIT, Newark, NJ
A Empirical Equation for Predicting the History-Dependence of Conduction Delay in Axons

Participation in Workshops

Barra, V., 2014 Graduate Student Mathematical Modeling Camp, Rensselaer Polytechnic Institute.

Mahady, K., 2014 Mathematical Problems in Industry Workshop, New Jersey Institute of Technology.

Mema, E., 2014 Graduate Student Mathematical Modeling Camp, Rensselaer Polytechnic Institute.

Mema, E., 2014 Mathematical Problems in Industry Workshop, New Jersey Institute of Technology.

Pedneault, M., 2014 Mathematical Problems in Industry Workshop, New Jersey Institute of Technology.

Rahman, A., 2014 Mathematical Problems in Industry Workshop, New Jersey Institute of Technology.

Sanaei, P., 2014 Mathematical Problems in Industry Workshop, New Jersey Institute of Technology.

Seric, I., 2014 Mathematical Problems in Industry Workshop, New Jersey Institute of Technology.

PhD Summer Program Activities

Graduate Student Awards and Honors

Fu, S.-P., Summer 2014: NSF summer fellowship to conduct research in Taiwan for 9 weeks.

Lin, T., December 2013: Second place in the Best Student Paper Presentation at the Meeting of the Acoustical Society of America in San Francisco, CA.

Lynch, G., September 2013: The NJIT Excellence in Instruction by Teaching Assistant Award.

Lynch, G., November 2013: Ahluwalia Doctoral Fellowship of the Department of Mathematical Sciences of NJIT.

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