Comprehensive Curriculum Vitae of M. Gregory Forest
January 21, 2019

Present Positions:
Grant Dahlstrom Distinguished Professor of Mathematics
Joint Appointments: Applied Physical Sciences & Biomedical Engineering
Director, Carolina Center for Interdisciplinary Applied Mathematics
The University of North Carolina at Chapel Hill (UNC-CH)
Associate Director, NSF Statistical and Applied Mathematical Sciences Institute

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Major Fields: Mathematics of Complex Fluids; Diffusive & Hydrodynamic Transport Phenomena in Passive and Active Soft Matter; Lung Biology; Virology & Immunology; Molecular Cell Biology; Nano-Composite Processing, Flows, and Material Property Characterization

Educational History:
B.S., Mathematics, University of New Orleans, May 1972
M.S., Mathematics, University of New Orleans, December 1973
Ph.D., Mathematics, University of Arizona, August 1979
Ph.D. Adviser: David W. McLaughlin

Tenure-Track Faculty Positions:
University of North Carolina at Chapel Hill, 1996-present
Ohio State University, 1979-1996

Visiting Academic Positions:
- Department of Mathematics, University of California-Berkeley: March-May 1983
- Center for Nonlinear Studies, Los Alamos National Laboratory: January 1985; January-March 1986, 1989 & 1990; January-May 1987; February 1991-1993
- Department of Mathematics, Princeton University: September-December 1986
- Mathematical Sciences Research Institute, Berkeley: January '91, March '93 & '94
- Program in Applied Mathematics, University of Colorado-Boulder: August 1990
- Department of Mathematics, University of Utah: January-June 1995
- Institute for Mathematics & Its Applications, Univ. of Minnesota: Sept-Nov 2009

Administrative Positions Held (at UNC-CH):
Associate Chair of Applied Mathematics: 1996-1998, 2000-2004
Senior Associate Dean for the Sciences, College of Arts and Sciences: 1998-2000
Co-Director, Institute for Advanced Materials, 2002-2013
Director, Carolina Center for Interdisciplinary Applied Mathematics, 2012-present
Associate Chair, Department of Applied Physical Sciences, 2016-2017

Administrative Position:
Associate Director, NSF Statistical and Applied Mathematical Sciences Institute, 2018-

Scholarly Recognition:
Fellow of the Society for Industrial and Applied Mathematics, 2012

Mentoring Recognition:
UNC Chapel Hill Junior Faculty Mentoring Award, conferred by the Carolina Women's Leadership Council, February 24, 2017

Consulting Experience:
Los Alamos National Laboratory; Hoechst-Celanese Corp., Charlotte, NC; Corning, Inc., Corning, NY; Liquidia Technologies, Durham, NC; Kimberly Clark Corp., Appleton, WI

Startup Companies: Path BioAnalytics (Scientific Founder, no longer associated); Carolina Modeling & Simulation LLC (Founder); Artificial Intelligence Tracking Solutions (AITS) (Co-Founders, Jay Newby, Sam Lai)

Patents: Australia patent number 2014209378, issued 09/08/2016; U.S. patent application 14/762,657, pending; Canada patent application 2,899,197, pending; Europe patent application 14743797.4, pending; all applications and awards with founders Forest, Hill, McKinley, Mellnik, Vasquez

Publications

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2. Spectral theory for the periodic sine-Gordon equation: a concrete viewpoint (with D.W. McLaughlin), J. Math. Phys., Vol. 23(7), 1248-1277 (1982)
3. Modulations of sinh-Gordon and sine-Gordon wavetrains (with D.W. McLaughlin), Studies in Appl. Mathematics, Vol. 68, 11-59 (1983)
4. On the modulational stability of two-phase sine-Gordon wavetrains (with N. Ercolani and D.W. McLaughlin), Studies in Applied Math., Vol. 71(2), 91-101 (1985)
5. Modulations of perturbed sine-Gordon wavetrains (with D.W. McLaughlin), SIAM J. Applied Math., Vol. 44(2), 287-300 (1984)
6. The geometry of real sine-Gordon wavetrains (with N. Ercolani), Comm. Math. Physics, Vol. 99, 1-49 (1985)
7. Modulational instabilities of periodic sine-Gordon waves: a geometric analysis (with N. Ercolani and D.W. McLaughlin), Lectures in Appl. Math., Vol. 23, 149-166 (1985)
8. Oscillations and instabilities in near integrable pde's (with N. Ercolani and D.W. McLaughlin), Lectures in Applied Mathematics, Vol. 23, 3-46 (1985)
9. The origin and saturation of modulational instabilities (with N. Ercolani and D. W. McLaughlin), Physica D, Vol. 18, 472-474 (1986)
10. Geometry and modulation theory for the periodic nonlinear Schrödinger equation (with J. E. Lee), IMA Volumes in Mathematics and Its Applications, Vol. 2, 35-70, Springer-Verlag (1986)
11. A one-dimensional theory for viscoelastic fluid jets, with application to extrudate swell and draw-down under gravity (with S. Bechtel and D. Bogy), Journal of Non-Newtonian Fluid Mechanics, Vol. 21, 273-308 (1986)
12. A quasi-periodic route to chaos in a near-integrable PDE (with A. Bishop, D. W. McLaughlin and E. Overman), Physica D, Vol. 23, 293-328 (1986)
13. Hamiltonian structure for the modulation equations of a sine-Gordon wavetrain (with N. Ercolani, D.W. McLaughlin, and R. Montgomery), Duke Mathematical Journal Vol. 55(4), 949-983 (1987)
14. Effective stress rates of viscoelastic free jets (with S. Bechtel and K. Lin), J. Non-Newtonian Fluid Mechanics, Vol. 26, 1-41 (1987)
15. On the behavior of viscoelastic free jets with elliptical cross-section (with S. Bechtel and K. Lin), J. Non-Newtonian Fluid Mechanics, Vol. 27, 87-126 (1988)
16. Correlations between chaos in the perturbed sine-Gordon equation and finite modal equations, Proceedings of 4th Int'l Conference on Nonlinear Evolution Equations and Dynamical Systems, Montpellier, France, June 1987, J. Leon, Editor, World Scientific
17. Geometry of the modulational instability III. Homoclinic orbits (with N. Ercolani and

D.W. McLaughlin), Physica D, Vol. 43, 349-384 (1990)

18. 1-D closure models for 3-D incompressible viscoelastic free jets: von Kármán flow geometry and elliptical cross-section (with S. Bechtel, D. Holm, and K. Lin), J. Fluid Mechanics, Vol. 196, 241-262 (1988)
19. A quasiperiodic route to chaos in a near-integrable p.d.e.: homoclinic crossings (with A.R. Bishop, D.W. McLaughlin, and E.A. Overman), Physics Letters A, Vol. 127, 335-340 (1988)
20. Geometry of the modulational instability, Part I: Local analysis (with N. Ercolani and D.W. McLaughlin), Memoirs of the A.M.S., unpublished.
21. Geometry of the modulational instability, Part II: Global analysis (with N. Ercolani and D.W. McLaughlin), Memoirs of the A.M.S., unpublished.
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23. Numerical evidence for global bifurcations leading to switching phenomena in long Josephson junctions (with S. Pagano, R. Parmentier, et.al.), Journal of Wave Motion, Vol. 22, 213-226 (1990)
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28. Frequency and phase locking of spatially periodic perturbed sine-Gordon breather trains, (with S. P. Sheu and A. Sinha), SIAM J. Applied Mathematics, Vol. 52(3), 746-761 (1992)
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crystal polymers, (with Q. Wang and H. Zhou), Physica D-Nonlinear Phenomena, Vol. 152, 288-309 (2001)

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79. Symmetries of the Doi kinetic theory for nematic polymers of arbitrary aspect ratio: at rest and in linear flows, (with Q. Wang and R. Zhou), Physical Review E, Vol. 66, 031712 (2002)
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81. Full-tensor alignment criteria for sheared nematic polymers (with R. Zhou, Q. Wang), J. Rheology, Vol. 47(1), 105-128 (2003)
82. Monodomain response of finite-aspect-ratio macromolecules in shear and related linear flows, (with Q. Wang), Rheologica Acta, Vol. 42, 20-46 (2003)
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86. The weak shear kinetic phase diagram for nematic polymers, (with Q. Wang, R. Zhou), Rheologica Acta, Vol. 43(1), 17-37 (2004)
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100. Connections between stability, convexity of internal energy, and the second law for compressible Newtonian fluids, (with S.E. Bechtel, F. Rooney, and Q. Wang), ASME J. Applied Mechanics, Vol. 72, 299 (2005)
101. Anisotropy and dynamic ranges in effective properties of sheared nematic polymer nano-composites, (with X. Zheng, R. Zhou, Q. Wang, R. Lipton), Advanced Functional Materials, Vol. 15, 2029-2035 (2005)
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127. Effects of tilted director angle anchoring conditions on the dynamic moduli of heterogeneous nematic polymers, (with E. Choate, Z. Cui, L. Ju), 15th International Congress on Rheology and 80th Annual Meeting of the Society of Rheology, August 3-8, 2008, XV International Congress on Rheology, Soc. Rheology 80th Annual Meeting, Vol. 1027: 481-483 (2008)
128. Modeling aspects of two-bead microrheology, (with C. Hohenegger), 15th International Congress on Rheology and 80th Annual Meeting of the Society of Rheology, August 3-8, 2008, XV International Congress on Rheology, Soc. Rheology 80th Annual Meeting, Vol. 1027: 1093-1095 (2008)
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Submitted papers

- Computational modeling of cytokinesis of animal cells driven by actomyosin dynamics, Q. Wang, J. Zhao, M.G. Forest, Physical Review E, in revision
- A Permanent Gel Muco-Inflammatory Milieu in Early CF Lung Disease: Targets for Therapy, C. Esther, M. Muhlebach, C. Ehre, D.B. Hill, M. Wolfgang, M. Kesimer, K. Ramsey, M. Markovetz, I. Garbarine, M.G. Forest, I. Seim, B. Zorn, C. Morrison, M. Delion, L. Turkovic, S. Ranganathan, S Stick, S. Conlan, R. Boucher, Science Translational Medicine, revision submitted
- Network analyses of 4D genome datasets automate detection of community-scale gene structure and plasticity induced by transient gene-gene binding, B. Walker, D. Taylor, C. Hult, D. Adalsteinsson, M.G. Forest, PLOS Computational Biology
- Nanoparticle Loading of Unentangled Polymers Induces Entanglement-Like Relaxation Modes and A Broad Sol-Gel Transition, X. Cao, M. Holger, M.G. Forest, Physical Review Letters
- Antibody-mediated immobilization of virions in mucus, M. Jensen, Y-Y Wang, S. Lai, M.G. Forest, and S. McKinley, Bulletin of Mathematical Biology

Conference Abstracts

1. Hill, D., B. Lindley, M. Forest, R. Superfine, M. Kesimer, R. Boucher and J. Sheehan (2009). MEASURING AND MIMICKING MUCOCILIARY CLEARANCE.

PEDIATRIC PULMONOLOGY, WILEY-LISS DIV JOHN WILEY & SONS INC, 111 RIVER ST, HOBOKEN, NJ 07030 USA.

2. Hill, D., S. McKinley, P. Vasquez, J. Mellnik, M. Forest and R. Boucher (2012). MUCUS: MEMORY AND MESH. PEDIATRIC PULMONOLOGY, WILEY-BLACKWELL 111 RIVER ST, HOBOKEN 07030-5774, NJ USA.
3. C. I. Sandefur, M. Forest, R. Boucher, T. Elston, COMPUTATIONAL MODEL OF AIRWAY SURFACE LIQUID HOMEOSTASIS VIA PURINERGIC REGULATION OF ION TRANSPORT
   Pediatric Pulmonology 10/2013; 48:257-257
4. Hill, D., C. Ehre, B. Button, G. Dixon and M.G. Forest (2014). DEFINING SUCCESSFUL MUCUS: A MULTI-DISCIPLINARY APPROACH. PEDIATRIC PULMONOLOGY, WILEY-BLACKWELL 111 RIVER ST, HOBOKEN 07030-5774, NJ USA.
5. Hill, D., M.G. Forest, J. Mellnik, C. Ehre, M. Muhlebach, C. Esther, S. Stick and R. Boucher (2015). CHARACTERIZING EARLY CF AIRWAY DISEASE: COMPLEX BIOPHYSICAL ANALYSIS AND DATA ANALYTICS OF PEDIATRIC CF BAL SAMPLES. PEDIATRIC PULMONOLOGY, WILEY-BLACKWELL 111 RIVER ST, HOBOKEN 07030-5774, NJ USA.
6. Chaudhry, I., Rushton, Z., Quinney, N. L., Boyles, S. E., Cholon, D. M., Sears, P., Randell, S. H., Mellnik, J., Forest, M. G., Ehre, C., Gentzsch, M. "CFTR Rescue Affects Secreted Mucins and Mucus." North American Cystic Fibrosis Conference (2015).
7. Gentzsch, M., Cholon, D. M., Guimbellot, J. S., Chua, M., Sears, P. R., Mellnik, J. W., Forest, M. G., Randell, S. H. "Novel Resources and Model Systems for Mutation-Specific and Personalized Rescue of CFTR" Cystic Fibrosis Foundation Research Conference: Pushing the Frontiers (2015)
8. Vasquez, P. A., J. Mellnik, S. A. McKinley, M.G. Forest, R. C. Boucher and D. Hill (2015). Defining Successful Mucus: Marrying Biochemistry And Biophysics. B110. COPD GALORE: NEW INSIGHTS INTO BRONCHITIS AND EMPHYSEMA DEVELOPMENT AND TREATMENT, American Thoracic Society.
9. Martina Gentzsch, Deborah M. Cholon, Nancy L. Quinney, Susan E. Boyles, Imron G. Chaudhry, Jennifer S. Guimbellot, Scott H. Randell, John Mellnik, M. Gregory Forest, "Targeting channel transport to promote fluid balance in cystic fibrosis", Federation of American Societies for Experimental Biology, Conference on The Lung Epithelium in Health and Disease, July 31, 2016
10. David B Hill, M Gregory Forest, Ian Seim, Kathryn Ramsey, Marianne Muhlebach, Charles R Esther Jr, Stephen Stick, and Richard C Boucher, BIOPHYSICAL ANALYSIS OF PEDIATRIC CF BAL: DEFINING BIOMARKERS OF THE ONSET OF CF AIRWAY DISEASE, Pediatric Pulmonology, Vol. 51, 239 (2016)
11. Mellnik J, Quinney NL, Boyles SE, Kucera KS, Forest MG, Gentzsch M. Viscoelastic properties of mucus within airway organoid models predict outcomes of CF therapeutics. Pediatric Pulmonology, Vol. 51, 248 (2016)
12. Hill, DB, Combs, ME, Malachowski, JL, Forest, MG, EFFECTS OF PH AND MUCUS CONCENTRATION ON MUCUS RHEOLOGY}, PEDIATRIC PULMONOLOGY, Vol. 51, 239 (2016)

UNC preprints, to be submitted

- Modeling barrier properties of intestinal mucus reinforced with IgG and secretory IgA against motile bacteria, F. Xu, J. Newby, T. Wessler, A. Chen, M.G. Forest, S. Lai
- PolyQ-dependent phase separations drive spatial heterogeneity in cytoplasmic crowding, E. Langdon, T. Gerbich, G. McLaughlin, J. Crutchley, L. Holt, M.G. Forest, J.M. Newby, A.S. Gladfelter

- Limited processivity of single motors improves overall transport flux of self-assembled motor-cargo complexes, K. Patel, S. Mao, M.G. Forest, S. Lai, J. Newby
- Evidence that self-similar microrheology of highly entangled polymeric hydrogels scales robustly with, and is tunable by, polymer concentration, I. Seim, J. Cribb, J. Newby, P. Vasquez, M. Lysy, D.B. Hill, M.G. Forest

Non-research scholarly articles

- "Mathematical challenges in nanoscience and nanotechnology", an essay for the September 2000 Workshop on "Societal Implications of Nanoscience and Nanotechnology", U.S. Interagency Working Group on Nanoscience and Nanotechnology, Washington, DC, Kluwer Academic Publishers (2001)
- "Nano-Materials: Can we do the Math?" solicited essay by the American Association for the Advancement of Science, for posting on the EurekAlert! Web site for international journalists (2002)
- "Mechanistic Models of Lung Disease", an essay for the Applied Mathematics feature issue of International Innovation, Research Media Ltd., U.K. (2015)

Federal and State Grant Support (current):

- Co-PI, NIH 1T32 CA201159-01, Big Data to Knowledge in Biomedicine Graduate Training Program, 5/1/15-4/30/20, Co-PI: Michael Kosorok, UNC
- PI, NSF DMS-1462992, "A Mathematical-Experimental Strategy to Discern the Molecular Basis of (Un)Successful Mucus", 09/15/15 – 08/31/19, co-PI: David Hill, UNC Physics & Cystic Fibrosis and Pulmonary Biology Center
- PI, NSF DMS-1517274, "Collaborative Research: Kinetic to Continuum Modeling of Active Anisotropic Fluids", 09/15/15 – 08/31/19, co-PIs: Q. Wang, U. So. Carolina, R. Zhou, Old Dominion
- PI, Army Research Office W911NF-16-1-0356, "A Network-Science-Integrated Feedback Loop for Design of Multifunctional Polymeric Rod-Like Nanocomposites", co-PIs: T. Dingemans, D. Klotsa, P. Mucha, 06/10/16 – 05/09/19
- Co-PI, NSF DMS-1664645, "FRG: Collaborative Research: Computational Methods for Complex Fluids: Adaptivity, Fluid-Structure Interaction, and Applications in Biology", PI: Guy, UC-Davis; Co-PIs Forest & Griffith, UNC, Miller & Thomases, UC-Davis, 07/01/17-06/30/20
- PI, NSF DMS-1816630, "Collaborative Research: Computational modeling of how living cells utilize liquid-liquid phase separation to organize chemical compartments", Co-PIs Gasior, UNC, Newby, University of Alberta, Wang, U. So. Carolina, Zhao, Utah State, 06/01/18 – 05/31/21

- Co-PI, UNC Office of the Vice Chancellor for Research, inaugural Creativity Hubs pilot award, "Sustainable access to safe water: Graphene-polymer nanocomposite membranes for water purification", PI: Dingemans, UNC, co-PIs Coronell, Miller, Stewart, UNC, Freeman, UT-Austin, 07/01/18 – 06/30/20
- Co-PI and Associate Director, NSF Statistical and Applied Mathematical Sciences Institute, RTP, NC, 07/01/2018-06/30/2020, PI: D. Banks, Duke, co-PI M. Haider, NCSU

Teaching Recognition:
Meritorious Teaching Award, Liberal Arts College, University of Arizona, 1979

Ph.D. Students Advised, Year of Degree, Current Affiliation

- Jong-Eao Lee, "Geometry and modulation theory for the periodic nonlinear Schrödinger equation", 1986, National Chiao Tung University, Taiwan

- Karen Bolinger, "Pointwise closure models for slender, non-Newtonian free jets", 1990, Clarion University, Clarion, PA
- Qi Wang, "Dynamics of slender viscoelastic free jets", 1991, University of South Carolina, Columbia, SC
- Jian-Zhong Cao, "Higher Order Perturbation Theory for Slender Viscoelastic Jets and Fibers with Torsion", 1992, deceased
- S. P. Sheu, "Homoclinic Orbits for a System of Coupled Nonlinear Schrodinger Equations", 1992, National Chung-Hsing University, Taiwan
- C. D. Carlson, "An analysis of the Rayleigh capillary instability in slender jets", 1996, Mitsubishi Polyester Film, Columbus, NC
- Xiaoyu Zheng, "On the effective properties of nematic polymer nano-composites", 2006, Kent State University, Kent, OH
- Eric Choate, "Dynamic moduli and linear viscoelasticity of nematic polymers", 2007, Radford University, Radford, VA
- Joohee Lee, "Mathematical descriptions of nematic polymers in the monolayer limit", 2007, Ewha Women's College, S. Korea
- Lingxing Yao, "Viscoelasticity at Microscopic and Macroscopic Scales: Characterization and Prediction", 2007, Case Western Reserve Univ., Cleveland, OH
- Brandon Lindley, "Linear and Nonlinear Shear Wave Propagation in Viscoelastic Fluids", 2008, data analyst at Daniel H. Wagner Associates, Vienna, Virginia
- Ke Xu, "Mathematics of microrheology with applications to pulmonary liquids", 2009, Simulations Plus, Lancaster, CA
- Feng (Bill) Shi, "Modeling networks and dynamics in complex systems", 2013, co-advised with Peter Mucha, Odum Institute, University of North Carolina
- Simi Wang, "Modeling Networks in Nanorod Composites and Power Grids", 2014, co-advised with Peter Mucha, Amazon, Seattle, WA
- Yuan Jin, "Computational modeling of complex fluids and human bronchial epithelial cell cultures", May 2015, Google, Inc.
- John Mellnik, "Stochastic modeling of biological fluids", May 2015, CEO of Path BioAnalytics, Inc., Chapel Hill, NC
- Caitlin Hult, "Modeling of chromosomes in living yeast nuclei", co-adviser D. Adalsteinsson, May 2017, postdoc, U. Michigan
- Tim Wessler, "Modeling of mammalian cell mechanics, antibody-based strategies for viral immunity and protection", May 2017, postdoc, U. Michigan
- Samuel Heroy, Network analyses of nano-rod composites and genome organization in yeast, co-adviser P. Mucha, May 2018, postdoc, U. Oxford

Current Ph.D. Students, Topic, Tentative Degree Date

- Yunyan He, Chromosomal dynamics and structure in mitosis, co-adviser D. Adalsteinsson, 2019
- Aaron Barrett, The immersed boundary method for complex fluids with applications to flagellar locomotion, co-adviser B. Griffith, 2019
- Fuhui Fang, Stochastic immersed boundaries and cellular motility, co-adviser B. Griffith, 2020
- Sam Bubnovich, Crystallization kinetics in carbon nanotube – polymer composites, co-adviser P. Mucha, 2021

M.S. Students at UNC-CH, advised or co-advised

- Greg Robbins, 2002
- Alison Hall, 2003
- John Bakken, 2005
- Jessica Wehner, 2010
- Caitlin Hult, 2015

- Susan Kolim, 2017

Postdoctoral Scholars Supervised & Co-Supervised, Current Position

- B. Maulik, Battelle Postdoctoral Fellowship, 1988-1990, unknown
- D. Muraki, AFOSR funding, 1990, Simon Fraser U.
- O. Wright, AFOSR funding 1991-1993, Cedarville U.
- B. Umarov, funded by Uzbek Academy of Science, 1990, Uzbekistan
- C. Goedde, Battelle Fellowship, NSF, 1990-1994, Depaul University
- J. Cao, AFOSR funding, 1992-1995, deceased
- H. Zhou, UNC and AFOSR funding, 1996-1999, Naval Postgraduate School
- T. Ueda, UNC and AFOSR funding, 1996-1997, private sector
- D. Anderson, UNC and AFOSR funding, 1997-1999, George Mason U.
- R. Zhou, UNC and AFOSR funding, 2001-2004, Old Dominion U.
- L. Lee, UNC Virtual Lung Project funding, 2003-2005, U. Wyoming
- Z. Cui, UNC and AFOSR funding, 2005-2007, Fayetteville State U.
- X. Zheng, NASA funding, 2006, Kent State U.
- C. Hohenneger, ARO funding, w/ P. Mucha, 2006-2007, U. Utah
- L. Yao, NIH and NSF funding, 2007-2008, Case Western Reserve U.
- J. Lee, ARO and UNC funding, 2007-2009, S. Korea
- X. Yang, AFOSR funding, 2007-2009, U. So. Carolina
- B. Lindley, NSF funding, summer of 2008, Daniel H. Wagner Associates
- E. Choate, NSF funding, 2009-2010, Radford U.
- P. Vasquez, NSF and DOE funding, 2010-2013, U. So. Carolina
- A. Chen, SAMSI and NIH funding, 2011-2015, General Electric, Inc.
- J. Zhao, NSF-NIH funding, w/ Q. Wang, U. So. Carolina, 2015-2017, Utah St.
- J. Newby, NSF, NC General Assembly, NIH funding, 2015-2018, U. Alberta
- F. Xu, NSF-NIGMS & NC General Assembly funding, 2016-2017, Google, Inc.
- K. Gasior, NSF and NIH, 2017-present, primary adviser A. Gladfelter
- X. Cao, NSF and NIGMS, 2018-present
- S. Qadeer, NSF-FRG, 2018-present, co-advised by B. Griffith

Undergraduate Honors Theses Advised

- R. Waters, with E. T. Samulski, Electrospinning of Liquid Crystals, 2005
- B. Smith, Stress Filtering in Sheared Viscoelastic Layers and Hypotheses for Biological Relevance, 2007

Selected Presentations (2013 - present)

- 2013, Defects in nematic polymer hydrodynamics, Isaac Newton Institute, Cambridge University, Mathematics of Liquid Crystals Program, Workshop on Symmetry, Bifurcation and Order Parameters, January 9
- 2013, The Virtual Lung Project at UNC, Department of Applied Mathematics, University of Colorado - Boulder, Distinguished Lecture Series, April 5
- 2013, Mathematical and Numerical Challenges in Living Biological Materials, International Conference on Numerical Analysis and Applied Mathematics, Rhodes, Greece, plenary, September 24
- 2013, The Virtual Lung Project at UNC, School of Mathematics Colloquium, University of Minnesota, Minneapolis, October 29
- 2014, The Virtual Lung Project at UNC, Department of Mathematics and Statistics, Helen Barton Lecture Series, UNC Greensboro, April 21
- 2014, Nematic polymer hydrodynamics, Arizona Program in Applied Mathematics

35th Anniversary Workshop, Tucson, AZ, April 26

- 2014, Transient, often anomalous and heterogeneous, diffusive transport through Nature's favorite barrier fluid: Mucus, Frontier Probability Days Conference, Plenary Lecture, University of Arizona, Tucson, AZ, May 19
- 2014, Diffusive barriers in the human body: data and analysis, Beijing Computational Science Research Center, Beijing, China, May 30
- 2014, Active nano-rod dispersions, SIAM Annual Meeting, mini-symposium on Nonlinear Fluids, S. Walker and A. Salgado, organizers, Chicago, IL, July 8
- 2014, Nano-rod dispersion flows and induced material properties, AFOSR Computational Mathematics annual meeting, Arlington, VA, July 29
- 2014, Data-Driven Modeling of Living Cells and Mucus, invited address, Materials Research Society Fall Meeting, Boston, MA, Dec 2
- 2014, Rounded cell oscillations as a model system for understanding cellular mechanical-chemical processes, Materials Research Society Fall Meeting, Boston, MA, Dec 3
- 2015, Modeling mucus flow, Gordon Research Conference on Mucus and Cilia, Galveston, TX, Feb 10, plus 5 posters supporting the lecture
- 2015, Computational challenges in complex biological fluids, Tulane University, Scientific Computing around Louisiana workshop, plenary, March 21
- 2015, Mathematics of Living Fluids, American Mathematical Society Regional Meeting, plenary, Huntsville, AL, March 28
- 2015, Data-Driven Modeling of Living Fluids, Department of Mathematics, Applied Mathematics & Statistics, Case Western Reserve, Cleveland, OH, April 13
- 2015, The Virtual Lung Project at UNC, Origins Institute, Case Western Reserve University, Cleveland, OH, evening public lecture, April 14
- 2015, Mathematics of Complex Fluids either Living or Critical to Life, NYU Shanghai, International Conference on Mathematics of Nonlinearity in Neural and Physical Science, NYU Shanghai University, Shanghai, China, June 10
- 2015, Dynamic Organization of the Yeast Genome, Institute for Nonlinear Science, Shanghai Xiao Tong University, Shanghai, China, June 12
- 2015, Diffusion in Mucus is not Normal, even in Normals, Society for Mathematical Biology Annual Meeting, Atlanta, GA, July 2
- 2015, Quantification of anomalous diffusion in mucus: the miner's canary of human health, Workshop on Advances in Scientific Computing and Applied Mathematics, 70th Birthday Celebration of Max Gunzburger, Las Vegas, NV, Oct 10
- 2015, Diffusive transport of particles in mucus, in sickness and in health, Daniel Inouye School of Pharmacy, Hilo, Hawaii, Dec 9

- 2015, Modeling the physical structure and function of living biological soft matter, PacifiChem 2015, Session on The Physical Structure & Function of Biological and Bioinspired Soft Matter, Honolulu, Hawaii, Dec 16
- 2016, Anomalous diffusion in mucus: signatures of health and disease, UC-Boulder, Computational Math Group, February 23, 2016
- 2016, Anomalous diffusion in mucus: signatures of health and disease, Colorado School of Mines, Applied Mathematics and Statistics, February 26, 2016
- 2016, Dynamic Organization of DNA in Living Yeast, Lecture 1 (Colloquium) of the Magnus Lectures, Department of Mathematics, Colorado State University, April 4
- 2016, The Virtual Lung Project at UNC, Lecture 2 (Public) of the Magnus Lectures, Department of Mathematics, Colorado State University, April 5
- 2016, Transient Anomalous Diffusion in Mucus Gels and Other Biological Fluids, Lecture 3 (Technical) of the Magnus Lectures, Department of Mathematics, Colorado State University, April 6
- 2016, Mucus Microrheology as an Assay for Disease Progression & Drug Treatment,

Minisymposium on Modeling, Analysis, and Simulations of Biological Complex Fluids, Philadelphia, PA, May 8

- 2016, Human Lung Mucus Rheology at Microscopic and Macroscopic Scales: Implications for Flow Modeling & Simulations, SIAM Mathematical Aspects of Material Sciences, Minisymposium on Soft Matter & Complex Biological Systems, Philadelphia, PA, May 9
- 2016, Microscale Heterogeneity and Equilibrium Viscoelasticity of Biological Hydrogels, Kimberly Clark Corporation, Appleton, WI, December 8
- 2017, Molecular-to-micron scale experiments and the role of mathematics in "big data to knowledge" in biology and biomedicine, SIAM Southeastern Regional Conference, Florida State University, Tallahassee, FL, plenary lecture, March 18
- 2017, Mathematics exploits in experimental biology & personalized medicine, BAMM (Biology and Medicine Through Mathematics) Conference, Virginia Commonwealth University, Richmond, VA, plenary lecture, May 18
- 2017, "If I give you a bucket of mucus, what experiments would you perform to characterize and model it?", Recent Advances in Nonlinear Waves, A conference in honor of Harvey Segur's 75th birthday, U. Washington, Seattle, WA, August 2
- 2018, Lecture Series at the International School on Computational Principles to Organize Complexity: Success Stories in Quantitative Biology, Lecture 1: "Mucus is hot": micro and macro rheology of mucus are bellwethers of pulmonary health; Lecture 2: "Weak beats strong": a paradigm of molecular kinetics in biology; Lecture 3: "A happy collaboration": when experimental data analytics & model selection yield model recovery of experimental data, Organizers: A. Seminara, C. Rycroft, T. Fai, M. Neri, Nice, France, June 25-29
- 2018, "A mechanistic paradigm for biological self-organization and functional properties: the power of weak binding", SIAM Conference on Mathematical Aspects of Materials Science, Portland, OR, plenary lecture, July 12
- 2018, "An emerging mechanistic paradigm for self-organization and functional properties of biological materials: the power of weak binding", the Householder lecture, Oak Ridge National Laboratory, Computational & Applied Mathematics Group, and University of Tennessee, Knoxville, Department of Mathematics, November 16

Professional Activities and Service (Recent)

- Associate Director, Statistical and Applied Mathematical Sciences Institute (SAMSI), an NSF-DMS Institute awarded jointly by Duke, NC State, and UNC, 2018-present
- Co-Chair with Layna Mosley (Political Science), Data Science Working Group, UNC Chapel Hill, College of Arts & Sciences, Sep 2018 - present
- Chair, External Advisory and Review Board, Materials Assembly and Design Excellence in South Carolina (MADE in SC), NSF-funded, 09/01/17 – present
- External Advisory and Review Board, South Carolina Project on Organ Biofabrication, NSF-NIH funded, 2009-2016; Chair, 2010-2016
- Co-Director, UNC Institute for Advanced Materials, Nanoscience & Technology, 2002-2012; Interim Director, Fall 2012-January 2013.
- Chair, SIAM Activity Group on the Life Sciences, Jan 2013 - Dec 2014
- Steering Committee, UNC Center Cancer Nanotechnology Excellence, 2010-2014
- Scientific Advisory Committee, NSF-Mathematical Biosciences Institute (MBI), The Ohio State University, Columbus, OH, 2011-2013
- External Advisory Committee, Institute for Applied Mathematics and Computational Science, Texas A&M University, 2009-2012
- Scientific Advisory Board, Interdisciplinary Mathematics Institute, the University of South Carolina, College of Arts and Sciences, 2010-2014
- Associate Editor for SIAM Journal on Applied Mathematics, 2000-2015

- Associate Editor for Continuum Mechanics & Thermodynamics, 2003-2018
- Editorial Board of Communications in Applied Mathematics and Computational Science, 2007-2018
- Editorial Board of Journal of Non-Newtonian Fluid Mechanics, 2010-2018
- Editorial Board of Advances in Computational Mathematics, 2014-2016
- Organizing Committee, SIAM Conference on the Life Sciences, San Diego, CA, August 7-11, 2012
- Co-Chair, Organizing Committee, Workshop on Cilia- and Flagella-Induced Fluid Mechanics, Mathematical Biosciences Institute, Ohio State, Oct 15-18, 2012
- Scientific Advisory Board for the Mathematics of Liquid Crystals research programme (http://www.newton.ac.uk/programmes/MLC/index.html) at the Isaac Newton Institute, University of Cambridge, Jan 7 – July 5, 2013
- Co-Chair (with Felix Otto), SIAM Conference on Mathematical Aspects of Materials Science, June 9-12, 2013
- Chair, Organizing Committee, Mathematics of Nonlinearity in Neural and Physical Science, NYU Shanghai University, Shanghai, China, June 8-10, 2015
- Co-PI (with Michael Kosorok, Biostatistics) of NIH Big Data to Knowledge in Biomedicine Training Program, May 2015-
- SIAM Nominating Committee for elected officers, 2017-2018