M. Gregory Forest
Comprehensive Curriculum Vitae
December 8, 2021

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

Mailing Address: CB 3250, UNC Chapel Hill, Chapel Hill, NC 27599-3250
Email: forest@unc.edu
Webpage: http://forest.web.unc.edu

Major Current Research Areas: Mathematics of Complex Fluids and Soft Matter; Diffusive & Hydrodynamic Transport in Passive and Active Soft Matter; Lung Biology and Mechanics; Virology & Immunology; Molecular Cell Biology; Chromosome Structure and Dynamics; Nano-Composite Materials; Biological and Engineered Membranes

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-present

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 U.S. Patent No. 10,679,755, issued 06/19/2020; Canada patent application 2,899,197, pending; Europe patent 294885, issued 07/02/2021; all applications and awards with founders MG Forest, D Hill, S McKinley, J Mellnik, P Vasquez.
Patents Filed: Methods, systems, and computer readable media for using synthetically trained deep neural networks for automated tracking of particles in diverse video microscopy data sets JM Newby, MG Forest, and SKB Lai - US Patent App. 16/379,466, 2019; Optimized Crosslinkers for Trapping a Target on a Substrate S Lai, MG Forest, C Henry, T Wessler, A Chen, J Schiller, and JM Newby - US Patent App. 15/977,432, 2018

Publications

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2. Spectral theory for the periodic sine-Gordon equation: a concrete viewpoint, M.G. Forest, D.W. McLaughlin, J. Math. Phys. **23**(7), 1248-1277 (1982)
3. Modulations of sinh-Gordon and sine-Gordon wavetrains, M.G. Forest, D.W. McLaughlin, Studies in Appl. Mathematics **68**, 11-59 (1983)
4. Modulations of perturbed sine-Gordon wavetrains, M.G. Forest, D.W. McLaughlin, SIAM J. Applied Math. **44**(2), 287-300 (1984)
5. On the modulational stability of two-phase sine-Gordon wavetrains, N. Ercolani, M.G. Forest, D.W. McLaughlin, Studies in Applied Math. **71**(2), 91-101 (1985)
6. The geometry of real sine-Gordon wavetrains, N. Ercolani, M.G. Forest, Comm. Math. Physics **99**, 1-49 (1985)
7. Modulational instabilities of periodic sine-Gordon waves: a geometric analysis, N. Ercolani, M.G. Forest, D.W. McLaughlin, Lectures in Appl. Math. **23**, 149-166 (1985)
8. Oscillations and instabilities in near integrable pde's, N. Ercolani, M.G. Forest, D.W. McLaughlin, Lectures in Applied Mathematics **23**, 3-46 (1985)
9. The origin and saturation of modulational instabilities, N. Ercolani, M.G. Forest, D. W. McLaughlin, Physica D **18**, 472-474 (1986)
10. Geometry and modulation theory for the periodic nonlinear Schrödinger equation, J. E. Lee, M.G. Forest, IMA Volumes in Mathematics and Its Applications **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, S. Bechtel, D. Bogy, M.G. Forest, Journal of Non-Newtonian Fluid Mechanics **21**, 273-308 (1986)
12. A quasi-periodic route to chaos in a near-integrable PDE, A. Bishop, M.G. Forest, D.W. McLaughlin, E. Overman, Physica D **23**, 293-328 (1986)
13. Hamiltonian structure for the modulation equations of a sine-Gordon wavetrain, N. Ercolani, M.G. Forest, D.W. McLaughlin, R. Montgomery, Duke Mathematical Journal **55**(4), 949-983 (1987)
14. Effective stress rates of viscoelastic free jets, S. Bechtel, K. Lin, M.G. Forest, J. Non-Newtonian Fluid Mechanics **26**, 1-41 (1987)

15. 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, J. Leon, Editor, World Scientific (1987)
16. On the behavior of viscoelastic free jets with elliptical cross-section, S. Bechtel, K. Lin, M.G. Forest, J. Non-Newtonian Fluid Mechanics **27**, 87-126 (1988)
17. 1-D closure models for 3-D incompressible viscoelastic free jets: von Kármán flow geometry and elliptical cross-section, S. Bechtel, M.G. Forest, D. Holm, K. Lin, J. Fluid Mechanics **196**, 241-262 (1988)
18. A quasiperiodic route to chaos in a near-integrable p.d.e.: homoclinic crossings, A.R. Bishop, M.G. Forest, D.W. McLaughlin, E.A. Overman, Physics Letters A **127**, 335-340 (1988)
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20. Geometry of the modulational instability, Part II: Global analysis, N. Ercolani, M.G. Forest, D.W. McLaughlin, Memoirs of the A.M.S., unpublished.
21. Geometry of the modulational instability III. Homoclinic orbits, N. Ercolani, M.G. Forest, D.W. McLaughlin, Physica D **43**, 349-384 (1990)
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64. A model study of the spinning of thermotropic liquid crystalline polymers: Fiber performance predictions and bounds on throughput, Q. Wang, H. Zhou, M.G. Forest, Advances in Polymer Technology **18**(4), 314-335 (1999)
65. Non-soliton pulse evolution in normally dispersive optical fibers, N. Kutz, K. T-R McLaughlin, M.G. Forest, J. Optical Soc. of America B **16**(11), 1856-1862 (1999)
66. Nonhomogeneous patterns with core defects in elongational flows of liquid crystal polymers, Q. Wang, H. Zhou, M.G. Forest, J. Rheology **43**(6), 1573-1582 (1999)
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72. On the Backlund-Gauge transformation and homoclinic orbits of a coupled nonlinear Schrodinger system, O. Wright, M.G. Forest, Physica D: Nonlinear Phenomena **141,** 104-116 (2000)
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74. Methods for the exact construction of mesoscale patterns in rod-like nematic liquid crystal polymers, Q. Wang, H. Zhou, M.G. Forest, Physica D-Nonlinear Phenomena **152**, 288-309 (2001)
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76. On the flow-phase diagram for discotic liquid crystals in uniaxial extension and compression, Q. Wang, H. Zhou, M.G. Forest, Liquid Crystals **28**(5), 717-720 (2001)
77. Non-Newtonian viscous oscillating free surface jets, and a new strain-rate dependent viscosity form for flows experiencing low strain rates, S. Bechtel, K. Koelling, N. Youseff, H. Zhou, M.G. Forest, Rheol. Acta **40**, 373-383 (2001)
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92. Kinetic theories and mesoscopic models for solutions of nonhomogeneous liquid crystal polymers, C. Calderer, Q. Wang, M.G. Forest, JNNFM **120**(1), 69-78 (2004)
93. Likelihood & expected-time statistics of monodomain attractors in sheared discotic and rod-like nematic polymers, X. Zheng, R. Zhou, Q. Wang, M.G. Forest, Rheol. Acta **43**(1), 17-37 (2004)
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98. Extension-enhanced conductivity of liquid crystalline polymer nano-composites, H. Zhou, X. Zheng, Q. Wang, R. Lipton, M.G. Forest, Macromolecular Symposia **28**, 81-85 (2005)
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100. Connections between stability, convexity of internal energy, and the second law for compressible Newtonian fluids, S.E. Bechtel, F. Rooney, Q. Wang, M.G. Forest, ASME J. Applied Mechanics **72**, 299 (2005)
101. Anisotropy and dynamic ranges in effective properties of sheared nematic polymer nanocomposites, X. Zheng, R. Zhou, Q. Wang, R. Lipton, M.G. Forest, Advanced Functional Materials **15**, 2029-2035 (2005)
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103. Anisotropy and heterogeneity of nematic polymer nano-composite film properties, R. Zhou, Q. Wang, X. Zheng, R. Lipton, M.G. Forest, Institute for Mathematics and Its Applications **141**, Modeling of Soft Matter, 85-98 (2005)
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105. Kinetic structure simulations of nematic polymers in plane Couette cells, II: In-plane structure transitions, R. Zhou, Q. Wang, M.G. Forest, SIAM Multiscale Modeling and Simulation **4**(4), 1280-1304 (2005)
106. Alignment and rheo-oscillator criteria for sheared nematic polymer films in the monolayer limit, J. Lee, R. Zhou, M.G. Forest, Discrete and Continuous Dynamical Systems (DCDS) **6**, 339-356 (2006)
107. Anchoring distortions coupled with plane Couette & Poiseuille flows of nematic polymers in viscous solvents: morphology in molecular orientation, stress & flow, H. Zhou, M.G. Forest, DCDS **6**, 407-425 (2006)
108. On weak plane Couette and Poiseuille flows of rigid rod and platelet ensembles, Z. Cui, Q. Wang, H. Zhou, M.G. Forest, SIAM J. Applied Math **66**(4), 1227-1260 (2006)
109. A classical problem revisited: Rheology of nematic polymer monodomains in small amplitude oscillatory shear, E. Choate, M.G. Forest, Rheologica Acta **46**(1), 83-94 (2006)
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111. Nematic polymer mechanics: flow-induced anisotropy, X. Zheng, R. Lipton, R. Zhou, M.G. Forest, Continuum Mechanics & Thermodynamics **18**, 377-394 (2007)
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115. Nematic liquids in weak capillary Poiseuille flow: structure scaling laws and effective conductivity implications, H. Zhou, M.G. Forest, Int. J. Numerical Analysis & Modeling **4**(3), 460-477 (2007)
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118. A strategy for dimensional percolation in sheared nano-rod dispersions, X. Zheng, R. Vaia, M. Arlen, M.G. Forest, Advanced Materials **19**(22), 4038-4043 (2007)
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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)

13. Markovetz, M., W. Kissner, I. Garbarine, C. Morrison, T. Kato, M. Papanikolas, R. Freeman, M.G. Forest, C. Esther Jr, M. Muhlebach, S. Stick, C. Ehre, R. Boucher, D. Hill (2019). Establishing the Mucus Flake Burden as a Biomarker of CF Disease Severity, PEDIATRIC PULMONOLOGY, WILEY 111 RIVER ST, HOBOKEN 07030-5774, NJ USA.

Submitted papers

- A comprehensive PBPK model recapitulates early kinetics of anti-PEG antibody-mediated accelerated blood clearance of PEGylated liposomes in vivo, A. Talkington, M. McSweeney, T. Wessler, M. Rath, Z. Li, T. Zhang, H. Yuan, J. Frank, M.G. Forest, Y. Cao, S.K. Lai, Journal of Controlled Release
- Mucus and Mucus Flake Composition as Candidate Biomarkers of CF Airway Disease Progression, M. Markovetz, I. Garbarine, C. Morrison, W. Kissner, I. Seim, M.G. Forest, M. Papanikolas, R. Freeman, A. Ceppe, A. Ghio, N. Alexis, S. Stick, C. Ehre, R. Boucher, C. Esther, M. Muhlebach, D. Hill, Journal of Cystic Fibrosis
- Self-Propelling End-Oriented Chain Reptation in Entangled Polymer Melts, X. Cao, H. Merlitz, C. Wu, M.G. Forest, Physical Review Letters
- Modeling insights into SARS-CoV-2 respiratory tract infections, A. Chen, T. Wessler, K. Daftari, K. Hinton, R. Boucher, R. Freeman, S. Lai, R. Pickles, M.G. Forest, Biophysical Journal
- Aerosol transport modeling: the key link between lung infections of individuals and populations, C. Darquenne, A. Borojeni, M. Colebank, M.G. Forest, B. Madas, M. Tawhai, Y. Jiang, Science Translational Medicine

Preprints to be submitted

- Disentangling the signal from the noise in microbead rheology of pathological mucus, N. Caughman, M. Markovetz, M. Papanikolas, R. Freeman, D.B. Hill, M.G. Forest, M. Lysy

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, 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, State, Foundation and UNC Grant Support (current):

- 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, 07/01/17-07/31/22
- PI, NSF DMS-1816630, “Collaborative Research: Computational modeling of how living cells utilize liquid-liquid phase separation to organize chemical compartments”, Co-PIs Wang, U. So. Carolina, Zhao, Utah State, 06/01/18 – 05/31/22
- PI and Associate Director, NSF DMS-1929298, Statistical and Applied Mathematical Sciences Institute, RTP, NC, Co-PIs: D. Banks, Duke, M. Haider, NCSU, 09/01/20 - 08/31/2021

- Co-PI, Cystic Fibrosis Foundation FREEMA19G0, "Supramolecular Assembly of Mucus Flakes in Health and Disease", PI: R. Freeman, co-PI: D.B. Hill, 07/01/2019 - 06/30/2022
- Co-PI, NSF CISE-1931516, "Collaborative Research: Frameworks: Multiphase Fluid-Structure Interaction Software Infrastructure to Enable Applications in Medicine, Biology, and Engineering", 1/1/2020 - 12/31/2024, PI: B. Griffith
- Co-PI, Sloan Foundation, "RESEMBLE: Regulating Signaling of matErial EnseMBLEs", 5/15/21 – 5/14/24, PI R. Freeman, Co-PIs: R. Baker, A. Gladfelter, K. Hahn, D. Klotsa, E. Nazockdast

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, University of Akron, Akron, 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-adviser Peter Mucha, Amazon, Inc., Seattle, WA
- Simi Wang, Modeling Networks in Nanorod Composites and Power Grids, 2014, co-adviser Peter Mucha, Amazon, Inc., Seattle, WA
- Yuan Jin, Computational modeling of complex fluids and human bronchial epithelial cell cultures, May 2015, Google, Inc.
- Caitlin Hult, Modeling of chromosomes in living yeast nuclei, co-adviser D. Adalsteinsson, May 2017, Gettysburg College, Gettysburg, PA
- Tim Wessler, Modeling of mammalian cell mechanics, antibody-based strategies for viral immunity and protection, May 2017, postdoc U. Michigan 2017-2020, currently UNC postdoc

- Samuel Heroy, Network analyses of nano-rod composites and genome organization in yeast, co-adviser P. Mucha, May 2018, postdoc, U. Oxford and University College, London
- Aaron Barrett, The immersed boundary method for complex fluids with applications to flagellar locomotion, co-adviser B. Griffith, May 2019, postdoc, U. Utah
- Yunyan He, Chromosomal dynamics and structure in mitosis, co-advisers D. Adalsteinsson, K. Bloom, May 2020, The MathWorks Inc., Torrance, CA
- Ryan Fox, Enhanced mechanical reinforcement from shear-directed assembly of a liquid crystal polymer with liquid crystal graphene oxide, adviser T. Dingemans, 2020, Exponent Inc., Bowie, MD
- Fuhui Fang, Numerical advances for fluid-structure interactions in entangled polymer solutions with applications to active microbead rheology, co-adviser B. Griffith, August 2020, Microsoft, Inc.
- Ben Walker, Methods for detecting dynamic and multiscale structure and self-organization of the yeast genome, from experimental and simulated data, co-adviser K. Newhall (UNC), May 2021, postdoc at UC-Irvine NSF-Simons Center for Multiscale Cell Fate Research, June 2021 -
- Anne Talkington, Physiologically based, pharmacokinetic (PBPK) modeling and experiments of drug delivery to tumors based on an anti-PEG, bi-specific antibody strategy, co-adviser Sam Lai (UNC), May 2021, postdoc at UVA, July 2021 -

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

- Andrew Ford, Molecular dynamics modeling of heterogeneous structure and rheology of human lung mucus, co-advisers R. Freeman (UNC), X. Cao (Xiamen University), May 2022
- Neall Caughman, Data analysis and material property inferences from passive microscopic probe experiments in heterogeneous biological systems, co-adviser M. Lysy (U. Waterloo), May 2022
- Kate Daftari, Data analysis of particle tracking experiments, Mechanistic spread of SARS-CoV-2 in the human lung, Modeling of granular systems, co-adviser K. Newhall (UNC), May 2022

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
- Kate Daftari, 2020

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, University of Akron
- 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, Cal State, Dominguez Hills
- 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, 2017-2019, w/ A. Gladfelter, U. Ottawa
- X. Cao, NSF and NIGMS, 2018-2019, Xiamen University, China
- S. Qadeer, NSF-FRG, 2018-2021, w/ B. Griffith, Pacific Northwest National Laboratory

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
- K. Patel, Optimization of Crosslinker Efficiencies Through Asymptotic Approximation and Simulation of Fick's Law Systems, 2019

Selected Presentations (2017 - present)

- 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

- 2019, “The power of weak binding in biological systems”, NSF-Simons Southeast Center for Mathematics and Biology, Workshop on Particle Tracking Techniques and Live Cell Imaging, Tulane University, New Orleans, LA, Organizers: Christine Payne (Duke) and Scott McKinley (Tulane), February 9
- 2019, “An emerging paradigm in biology: the power of weak binding”, Richard DiPrima lecture, Rensselaer Polytechnic Institute, Troy, NY, April 15
- 2019, “An emerging paradigm in biology: the power of weak binding”, plenary lecture, the Alberta Mathematics Dialogue, University of Alberta, Augustana Campus, May 2
- 2019, “An emerging paradigm in biology: the power of weak binding”, Minisymposium at the International Congress of Industrial and Applied Mathematics, Valencia, Spain, Minisymposium on Stochastic Dynamics of Biological Cells and Fluids, Organizers: Pete Kramer (RPI) and Scott McKinley (Tulane), July 17
- 2019, “An emerging paradigm in biology: the power of weak binding”, 2019 International Graduate Summer School on Soft Matter and Non-Equilibrium Physics, Xiamen University, Xiamen, China, August 12
- 2019, “Beyond mapping the genome: how do genes function?”, Department of Mathematical Sciences, Zhejiang University, Hangzhou, China, August 14
- And then came COVID-19.
- 2021, “Physiologically faithful, mechanistic modeling to explain clinical observations from inhaled SARS-CoV-2 exposures”, Interagency Modeling and Analysis Group (HHS, NIH, NIBIB), Multiscale Modeling Consortium, Zoom meeting, February 4
- 2021, “Modeling insights into SARS-CoV-2 respiratory tract infections”, Mathematical Biology and Applied Mathematics Seminar, Duke University, March 26
- 2021, “Modeling insights into SARS-CoV-2 respiratory tract infections”, Applied Mathematics and Scientific Computing Seminar, Temple University, April 21
- 2021, “Modeling insights into SARS-CoV-2 respiratory tract infections”, Systems Biology Group, University of Florida, April 22
- 2021, “Modeling insights into SARS-CoV-2 respiratory tract infections”, Mathematics Colloquium, University of Utah, April 22
- 2021, “Modeling insights into SARS-CoV-2 respiratory tract infections”, UC-Irvine NSF-Simons Center for Cell Fate Research, October 28
- 2021, “Modeling insights into SARS-CoV-2 respiratory tract infections”, NC State Mathematics Colloquium, November 8
- 2021, “Modeling insights into SARS-CoV-2 respiratory tract infections”, UNC Chapel Hill Mathematics-Applied Mathematics Colloquium, November 11
- 2021, “Physiological, Virological, and Clinical Data-Informed Modeling Insights into SARS-CoV-2 Respiratory Tract Infections”, Clemson Materials Science and Engineering, Advanced Materials Colloquium, November 18

Professional Activities and Service (Current and Recent)

- Associate Director, Statistical and Applied Mathematical Sciences Institute (SAMSI), an NSF-DMS Research Institute awarded jointly to Duke, NC State, and UNC, 2018-2021
- Chair, External Advisory Board, UC-Irvine NSF-Simons Center for Multiscale Cell Fate Research, August 2019 – present
- Co-PI and Co-Director (with Michael Kosorok, UNC Biostatistics) of NIH Big Data to Knowledge in Biomedicine Graduate Training Program, 2015 - 2020
- Co-Chair with Layna Mosley (Political Science), Data Science Working Group, UNC Chapel Hill, College of Arts & Sciences, 2018 - 2019
- Chair, External Advisory and Review Board, Materials Assembly and Design Excellence in South Carolina (MADE in SC), NSF-funded, 09/01/17 – present
- Member, SIAM John von Neumann Prize committee for 2021, 2022