

Karen E. Daniels

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EDUCATION

- 1997 – 2002 **Cornell University, Ithaca, NY**
MS in Physics
PhD in Experimental Condensed Matter Physics
Thesis title: *Pattern Formation and Dynamics in Inclined Layer Convection*
Advisor: Dr. Eberhard Bodenschatz
- 1990 – 1994 **Dartmouth College, Hanover, NH**
AB in Physics with high honors; minor in Mathematics
Thesis title: *Atmospheric Electrogrow in the Equatorial Region of Jupiter*
Advisor: Dr. Mary Hudson

PROFESSIONAL APPOINTMENTS

- 2015 – **Department of Physics, North Carolina State University, Raleigh, NC**
Professor
- 2011 – 2015 Associate Professor
- 2005 – 2011 Assistant Professor
- 2002 – 2005 **Department of Physics, Duke University, Durham, NC**
Postdoctoral Research Associate
Advisor: Dr. Robert Behringer

VISITING APPOINTMENTS

- 2011–12, 2013 **Department of Complex Fluids**
MPI for Dynamics and Self-Organization, Göttingen, Germany
Visiting Scientist (Sept 2011–May 2012, Summer 2013)
- Aug-Sept 2005 **Newton Institute, Cambridge, UK**
Visitor, Program on *Pattern Formation in Large Domains*

AWARDS

- 2007 NSF Faculty Early Career Development Program (CAREER) Award
- 2011 Alexander von Humboldt Fellowship for Experienced Researchers
- 2013 LeRoy and Elva Martin Award for Teaching Excellence
- 2013–2018 North Carolina State University Faculty Scholar
- 2015 Equity for Women Award, North Carolina State University
- 2017 Outstanding Referee, Physical Review Letters

TEACHING

- 2006 – **North Carolina State University, Raleigh, NC**
 PY 203, *Modern Physics*
 20th century survey course for sophomore physics majors
 taught in the SCALE-UP format
 PY 205/208, *Physics for Engineers and Scientists I/II* (calculus-based)
 multiple curricula and formats (traditional, Matter & Interactions, SCALE-UP)
 PY 413, *Thermal Physics*
 thermodynamics and statistical mechanics (undergraduate majors), including two labs
 PY 722, *Statistical Physics II: Fluctuations and Phase Transitions*
 topics in graduate statistical physics, including computational skills
 HON 29x, *Honors Seminar*
 interdisciplinary courses with emphasis on reading, writing, and critical thinking
Entropy and Chaos: Order and Disorder in the Universe (twice)
Patterns vs. Pandemonium (once)
- Fall 2004 **Duke University, Durham, NC**
 Recitation instructor, Physics 53, *General Physics I*
- 1997 – 1999 **Department of Physics, Cornell University, Ithaca, NY**
 Teaching Assistant, Physics 201, *Why the Sky is Blue*
 Instructor (1998) and chair (1999), teaching assistant training program
- 1994 – 1997 **Saint Ann's School, Brooklyn, NY**
 Science teacher

CURRENT RESEARCH INTERESTS

Experimental studies of nonequilibrium and nonlinear systems, including:

- granular materials (dynamics near jamming, shear, sound propagation, segregation)
- microfluidic assembly and characterization of flow-stabilized solids
- dynamics of surfactant monolayers (spreading, interactions with waves)
- mechanics of soft materials (solid surface tension, elastocapillary fracture, thermal activation)
- network mechanics of granular and multi-scale materials
- applications of the above to natural systems (earthquakes, arid ecosystems, rubble pile asteroids)
- optical techniques in soft matter physics (photoelasticity, fluorescence, shadowgraphy)

PUBLICATIONS

Links to all papers/preprints available at <http://nile.physics.ncsu.edu>

1. Axelle Amon, Philip Born, Karen E. Daniels, Joshua A. Dijksman, Kai Huang, David Parker, Matthias Schröter, Ralf Stannarius, Andreas Wierschem. "Focus on Imaging Methods in Granular Physics." *Review of Scientific Instruments*. (2017)
2. Karen E. Daniels, Jonathan E. Kollmer and James G. Puckett. "Photoelastic force measurements in granular materials." *Review of Scientific Instruments*. (2017)
3. Dina Sinclair, Rachel Levy, Karen E. Daniels. "Simulating Surfactant Spreading: Impact of a Physically Motivated Equation of State." *European Journal of Applied Mathematics*. (2017)
4. Marion Grzelka, Joshua B. Bostwick, and Karen E. Daniels. "Capillary fracture of ultrasoft gels: heterogeneity and delayed nucleation." *Soft Matter*. 13: 2962 (2017)
5. Yuming Huang and Karen E. Daniels. "Friction and Pressure-Dependence of Force Chain Communities in Granular Materials" *Granular Matter*. 18: 85 (2016)
6. Chad Giusti, Lia Papadopoulos, Eli T. Owens, Karen E. Daniels, Danielle S. Bassett. "Topological and geometric measurements of force chain structure." *Physical Review E*. 94: 032909 (2016)

7. Lia Papadopoulos, James Puckett, Karen E. Daniels, Danielle S. Bassett. "Evolution of network architecture in a granular material under compression." *Physical Review E*. 94: 032908 (2016)
8. Carlos P. Ortiz, Robert Riehn, Karen E. Daniels. "Nonaffine deformation under compression and decompression of a flow-stabilized solid." *Journal of Statistical Mechanics*. 084003 (2016)
9. Junaid M. Laskar, P. Shraavan Kumar, Stephan Herminghaus, Karen E. Daniels, Matthias Schroeter. "High refractive index immersion liquid for super-resolution 3D imaging using sapphire-based aNAIL optics." *Applied Optics*. 55: 3165-3169 (2016)
10. Priya Subramanian, Werner Pesch, Oliver Brausch, Karen E. Daniels, Eberhard Bodenschatz, and Tobias Schneider. "Spatio-temporal Patterns in Inclined Layer Convection." *Journal of Fluid Mechanics*. 794: 719-745 (2016)
11. Bruno Andreotti, Oliver Baeumchen, Francois Boulogne, Karen E. Daniels, Eric R. Dufresne, Hugo Perrin, Thomas Salez, Jacco H. Snoeijer, Robert W. Style. "Solid Capillarity: When and How does Surface Tension Deform Soft Solids?" *Soft Matter*. 12: 2993-2996 (2016)
12. Stephen L. Strickland, Michael Shearer, Karen E. Daniels. "Spatiotemporal measurement of surfactant distribution on gravity-capillary waves." *Journal of Fluid Mechanics*. 777: 523-543 (2015)
13. Dapeng Bi, Silke Henkes, Karen E. Daniels, Bulbul Chakraborty. "The Statistical Physics of Athermal Materials." *Annual Reviews of Condensed Matter Physics*, **6**: 6383, 2015.
14. Danielle S. Bassett, Eli T. Owens, Mason A. Porter, M. Lisa Manning, Karen E. Daniels. "Extraction of Force-Chain Network Architecture in Granular Materials Using Community Detection." *Soft Matter*, DOI: 10.1039/c4sm01821d (2015).
15. Ellen R. Swanson, Stephen L. Strickland, Michael Shearer, Karen E. Daniels. "Surfactant Spreading on a Thin Liquid Film: Reconciling Models and Experiments." *Journal of Engineering Mathematics*, DOI: 10.1007/s10665-014-9735-0 (2015).
16. Carlos P. Ortiz, Karen E. Daniels, and Robert Riehn "Nonlinear Elasticity of Flow-Stabilized Solids." *Physical Review E*. **90**: 022304, 2014.
17. Joshua B. Bostwick, Michael Shearer, Karen E. Daniels. "Elastocapillary deformations on partially-wetting substrates: rival contact-line models." *Soft Matter*. **10**: 7361-7369, 2014.
18. Stephen L. Strickland, Matthew Hin, M. Richard Sayanagi, Cameron Gaebler, Karen E. Daniels, Rachel Levy. Self-healing Dynamics of Surfactant Coatings on Thin Viscous Films. *Physics of Fluids*. **26**: 042109, 2014.
19. Karen E. Daniels, Caroline Bauer, Troy Shinbrot. "Correlations between electrical and mechanical signals during granular stick-slip events." *Granular Matter*. **16**: 217-222, 2014.
20. Gopal G. Penny, Karen E. Daniels, and Sally E. Thompson. "Local properties of patterned vegetation: quantifying endogenous and exogenous effects." *Philosophical Transactions of the Royal Society A*. **371**: 20120359, 2013.
21. Joshua B. Bostwick and Karen E. Daniels "Capillary fracture of soft gels." *Physical Review E*. **88**: 042410, 2013.
22. Karen E. Daniels. "Rubble-Pile Near Earth Objects: Insights from Granular Physics." in *Asteroids: Prospective Energy and Material Resources*. Viorel Badescu, editor. Springer, 2013.
23. James G. Puckett and Karen E. Daniels. "Equilibrating temperaturelike variables in jammed granular subsystems." *Physical Review Letters*. **110**: 058001, 2013.
24. Eli T. Owens and Karen E. Daniels. "Acoustic measurement of a granular density of modes." *Soft Matter*. **9**: 1214-1219, 2013.
25. Carlos P. Ortiz, Robert Riehn, and Karen E. Daniels. "Flow-Driven Formation of Solid-like Microsphere Heaps." *Soft Matter*. **9**: 543-549, 2013.

26. Danielle S. Bassett, Eli T. Owens, Karen E. Daniels, Mason A. Porter. "The Influence of Topology on Signal Propagation in Granular Force Networks." *Physical Review E*, **86**: 041306, 2012.
27. James G. Puckett, Frédéric Lechenault, Karen E. Daniels, Jean-Luc Thiffeault. "Trajectory entanglement in dense granular materials." *Journal of Statistical Mechanics*. P06008, 2012.
28. Kiri Nichol and Karen E. Daniels. "Equipartition of rotational and translational energy in a dense granular gas." *Physical Review Letters*, **108**: 018001, 2012.
29. Nicholas W. Hayman, Lucie Ducloué, Kate L. Foco, Karen E. Daniels. "Granular controls on periodicity of stick-slip events: kinematics and force-chains in an experimental fault." *Pure and Applied Geophysics*, **168**: 2239-2257, 2011.
30. Eli T. Owens and Karen E. Daniels. "Sound propagation and force chains in granular materials." *Europhysics Letters*, **94**: 54005, 2011.
31. James G. Puckett, Frédéric Lechenault, and Karen E. Daniels. "Local origins of volume fraction fluctuations in dense granular materials." *Physical Review E*, **83**: 041301, 2011.
32. Melissa L. Fender, Frédéric Lechenault, and Karen E. Daniels. "Universal shapes formed by two interacting cracks." *Physical Review Letters*, **15**: 125505, 2010.
33. David W. Fallest, Adele M. Lichtenberger, Christopher J. Fox, and Karen E. Daniels. "Fluorescent visualization of a spreading surfactant." *New Journal of Physics*, **12**: 73029, 2010.
34. Lindsay B. H. May, Michael Shearer, and Karen E. Daniels. "Scalar conservation laws with nonconstant coefficients with application to particle size segregation in granular flow." *Journal of Nonlinear Science*, **20**: 689, 2010.
35. Frédéric Lechenault and Karen E. Daniels. "Equilibration of granular subsystems" *Soft Matter*, **6**: 3074, 2010.
36. Lindsay B. H. May, Laura A. Golick, Katherine C. Phillips, Michael Shearer, and Karen E. Daniels. "Shear-driven size segregation of granular materials: modeling and experiment." *Physical Review E*, **81**: 051301, 2010.
37. Sally E. Thompson and Karen E. Daniels. "A porous convection model for small-scale grass patterns." *The American Naturalist*, **175**: E10-E20, 2010.
38. Laura A. Golick and Karen E. Daniels. "Mixing and segregation rates in sheared granular materials." *Physical Review E*, **80**: 042301, 2009.
39. Karen E. Daniels and Nicholas W. Hayman. "Force chains in seismogenic faults visualized with photoelastic granular shear experiments." *Journal of Geophysical Research*, **113**: B11411, 2008.
40. Karen E. Daniels, Oliver Brausch, Werner Pesch, and Eberhard Bodenschatz. "Competition and bistability of ordered undulations and undulation chaos in inclined layer convection." *Journal of Fluid Mechanics*, **597**: 261-282, 2008.
41. Robert P. Behringer, Karen E. Daniels, Trushant S. Majmudar, and Matthias Sperl. "Fluctuations, correlations and transitions in granular materials: statistical mechanics for a non-conventional system." *Philosophical Transactions of the Royal Society A*, **366**: 493-504, 2008.
42. Karen E. Daniels, Shomeek Mukhopadhyay, Paul J. Houseworth, and Robert P. Behringer. "Instabilities in droplets spreading on gels." *Physical Review Letters*, **99**: 124501, 2007.
43. Karen E. Daniels and Robert P. Behringer. "Characterization of a freezing/melting transition in a vibrated and sheared granular medium." *Journal of Statistical Mechanics*, P07018, July 2006.
44. Karen E. Daniels and Robert P. Behringer. "Hysteresis and competition between disorder and crystallization in sheared and vibrated granular flow." *Physical Review Letters*, **94**: 168001, 2005.
45. Christian Huepe, Hermann Riecke, Karen E. Daniels, and Eberhard Bodenschatz. "Statistics of defect trajectories in spatio-temporal chaos in inclined layer convection and the complex Ginzburg-Landau equation." *Chaos*, **14**: 864, 2004.

46. Karen E. Daniels, Christian Beck, and Eberhard Bodenschatz. "Defect turbulence and generalized statistical mechanics." *Physica D*, **193**: 208, 2004.
47. Karen E. Daniels, Richard J. Wiener, and Eberhard Bodenschatz. "Localized transverse bursts in inclined layer convection." *Physical Review Letters*, **91**: 114501, 2003.
48. Karen E. Daniels and Eberhard Bodenschatz. "Statistics of defect motion in spatiotemporal chaos in inclined layer convection." *Chaos*, **13**: 55, 2003.
49. Karen E. Daniels and Eberhard Bodenschatz. "Defect turbulence in inclined layer convection." *Physical Review Letters*, **88**: 034501, 2002.
50. Karen E. Daniels, Brendan B. Plapp, and Eberhard Bodenschatz. "Pattern formation in inclined layer convection." *Physical Review Letters*, **84**: 5320, 2000.

PROCEEDINGS

1. Jonathan E. Kollmer and Karen E. Daniels. "An experimental investigation of the force network ensemble." *Powders and Grains 2017*.
2. Zhu Tang, Theodore A. Brzinski, and Karen E. Daniels. "Granular rheology: measuring boundary forces with laser-cut leaf springs." *Powders and Grains 2017*.
3. Karen E. Daniels. "The role of force networks in granular materials." *Powders and Grains 2017*.
4. Michael Shearer, Lindsay B. H. May, Nicholas Giffen, and Karen E. Daniels. "The Gray-Thornton Model of Granular Segregation." Proceedings of Joint IUTAM-ISIMM Symposium on Mathematical Modeling and Physical Instances of Granular Flows, AIP Conference Proceedings (2010) J. D. Goddard (ed.)
5. James G. Puckett, Frédéric Lechenault, Karen E. Daniels. "Generating Ensembles of 2D Granular Configurations." Gallery of Nonlinear Images, *Chaos*, **19**: 041108, 2009.
6. Eli T. Owens, Stéphanie Couvreur, Karen E. Daniels. "Spatiotemporally Resolved Acoustics in a Photoelastic Granular Material." *Powders and Grains 2009*. **1145**: 447–450, AIP Conference Proceedings, 2009.
7. James G. Puckett, Frédéric Lechenault, Karen E. Daniels. "Generating ensembles and measuring mixing in a model granular system." *Powders and Grains 2009*. **1145**: 675–678, AIP Conference Proceedings, 2009.
8. Karen E. Daniels and N. W. Hayman. "Boundary conditions and event scaling of granular stick-slip events." *Powders and Grains 2009*. **1145**: 567–570, AIP Conference Proceedings, 2009.
9. Karen E. Daniels, Shomeek Mukhopadhyay, and Robert P. Behringer. "Starbursts and Wispy Drops: Surfactants Spreading on Gels." Gallery of Nonlinear Images, *Chaos*, **15**: 041107, 2005.
10. Karen E. Daniels, Melissa Eblen-Zayas, Ariel Michelman-Ribeiro, and Jami M. Valentine. "Research Funding and Women in Physics." Women in Physics: Second IUPAP International Conference on Women in Physics. (B. K. Hartline and A. Michelman-Ribeiro, eds.) AIP Conference Proceedings **795**: 41, 2005.
11. Karen E. Daniels and Robert P. Behringer. "Characterization of a Freezing/Melting Transition in a Vibrated and Sheared Granular Medium." *Powders and Grains 2005*. **1**: 357–360, Balkema, 2005.
12. Karen E. Daniels, Joyce E. Coppock, and Robert P. Behringer. "Dynamics of Meteor Impacts." Gallery of Nonlinear Images, *Chaos*, **14**: S4, 2004.
13. Karen E. Daniels, Brendan B. Plapp, and Eberhard Bodenschatz. "Inclined layer convection." *Proceedings of the International Congress of Theoretical and Applied Mechanics, Chicago, IL, 27 August – 1 September 2000*. Kluwer Academic Publishers, 2000.

COMMENTARY

1. Karen E. Daniels. "Viewpoint: Pushing on a Nonlinear Material." *Physics*, **7**: 113, 2014.

INVITED TALKS

1. "Temperature-like variables in granular materials." Condensed Matter Seminar. University of Michigan. Dec 2016.
2. "Oxide-Mediated Fingering of Liquid Metals". Surface Activity Driven by Material Geometry and Elasticity workshop. UMass Amherst, Sept 2016.
3. "Configurational Temperatures in Granular Materials" StatPhys 26. Lyon, France. July 2016.
4. "Acoustics in disordered granular materials: from the particle scale to force networks." Euromech Colloquium 580 Strongly Nonlinear Dynamics and Acoustics of Granular Metamaterials. Grenoble, France. July 2016.
5. "Nonlocal rheology" IFPRI (International Fine Powders Research Institute) Annual Meeting. Guildford, UK. June 2016.
6. "Temperature-like variables in granular materials." Department Colloquium. University of Oregon. May 2016.
7. "Photoelasticity for Contact Force Measurements" & "3D Contact Force Measurements using Rubies" tutorials at spring school Imaging Particles. Erlangen, Germany. April 2016.
8. Monitoring monolayers: the spatiotemporal dynamics of surfactants on fluid surfaces " RPI Mechanical Engineering colloquium. Troy, NY. December 2015
9. "Playing with Sand: Complex Behaviors from a Simple Material" NCA&T Physics Colloquium, Greensboro, NC. October 2015.
10. "Temperature-like variables in granular materials ." Colloquium. Syracuse University Physics Department. Syracuse, NY. October, 2015
11. "Capillary Fracture " Condensed Matter Seminar. Syracuse University Physics Department. Syracuse, NY. October, 2015
12. "The Geometry of Force Transmission in Granular Materials" Geometry and Physics of Spatial Random Systems. Bad Herrenalb, Germany. September 2015.
13. "Quantifying Force Transmission in Granular Materials Near the Rigidity Transition" European Solid Mechanics Conference, Madrid, Spain, July 2015.
14. "Labquakes: Faults & Earthquakes as Granular Phenomena " Analog Modeling of Tectonic Processes Workshop, Amherst, Massachusetts, May 2015.
15. "The Physics of Granular Materials." Mechanics and Materials Seminar, Department of Civil and Environmental Engineering, NCSU, February, 2015.
16. "Temperature-like Variables in Granular Materials." *Unifying Concepts in Glass Physics VI*, Aspen, CO, February 2015.
17. "Capillary Fracture." *Dynamics Days 2015*, Rice University, Houston, TX, January 2015.
18. "Shapes Formed by Interacting Cracks." American Geophysical Union Fall Meeting, San Francisco, CA, December 2014.
19. "Playing with Sand: Complex Behaviors from a Simple Material." Dept. of Physics, Harvey Mudd College, Claremont, CA, November 2014.
20. "Vibrational modes: effects of particle shape and loading history" Conference *Complexity in Mechanics: Intermittency and collective phenomena in disordered solids Conference*. Kavli Institute of Theoretical Physics, Santa Barbara, CA. October 2014
21. "Playing with Sand: Complex Behaviors from a Simple Material." Dept. of Physics, Eastern Carolina University, Davidson Greenville, NC, September 2014

22. "Acoustic Probes of Granular Packings: Pressure, Disorder & Particle Shape." *Grand Challenges in Particulate Media: From Granular Media to Colloids and Active Matter*. Centro Científico Tecnológico, La Plata, Argentina, August 2014
"Key Techniques for Granular Experiments." & "The Statistical Physics of Athermal Particles: The Edwards Ensemble at 25" (Summer School Lectures) Pan-American Advanced Studies Institute on *Frontiers in Particulate Media: From Fundamentals to Applications*, Centro Científico Tecnológico, La Plata, Argentina, August 2014
23. "Capillary fracture." Annual Meeting, Society for Industrial and Applied Mathematics. Chicago, IL. July 2014.
24. "Temperature-like variables in granular materials." Seminar, Process & Energy Department, Faculty of Mechanical, Maritime, and Material Engineering, TU Delft, Delft, Netherlands. May 2014.
25. "Ultrasoft Solids: Deformation & Fracture." Triangle Soft Matter Day, Chapel Hill, NC. May 2014.
26. "Acoustics in granular materials: from the particle scale to force networks." Condensed matter seminar, Department of Physics, U. Pennsylvania, Philadelphia, PA. October 2013.
27. "Tiny Sandpiles: Flow Stabilized Solids in Microfluidics." Levich Institute Seminar, CCNY, New York, NY. September 2013.
28. "Solid-like microsphere heaps." 7th International Discussion Meeting on Relaxations in Complex Systems, Barcelona, Spain. July 2013.
29. "Acoustics in granular materials: from the particle scale to force networks." Soft Matter Colloquium, Van der Waals-Zeeman Institute, University of Amsterdam, Netherlands. July 2013
30. "Tiny Sandpiles: Granular meets van der Waals." Seminar, Otto-von-Guericke-University, Magdeburg, Germany. June 2013.
31. "Soft fracture: initiation and growth." Seminar, Okinawa Institute of Science and Technology, Okinawa, Japan. March 2013.
32. "Soft fracture: initiation and growth." Materials Deformation: Fluctuations, Scaling, Predictability, Workshop, École de Physique des Houches, France, February 2013
33. "Interrogating a granular material: force networks, state variables, and acoustics." Nonlinear Dynamics Seminar, Georgia Tech, Atlanta, GA, November 2012.
34. "Soft Fracture." Applied Mechanics Colloquium, Harvard, Cambridge, MA, October 2012.
35. "Stick-slip failure in sheared granular materials." International Workshop on Computational Mechanics of Materials, Baltimore, MD, September 2012.
36. "Ruby: A Valuable Granular Material." Physics Colloquium, NC State University. Raleigh, NC. August 2012.
37. "Interrogating a granular material: force networks, acoustics, and state variables." Dept. of Physics, U. Nice, Nice, France. April 2012.
38. "Fluctuations and State Variables in Driven Granular Materials." German March Meeting, Berlin, Germany, March 2012.
39. "Shapes formed by Interacting Cracks." Invited Symposium, APS March Meeting, March 2012.
40. "Shapes formed by Interacting Cracks." Industrial and Applied Mathematics Seminar, Oxford University. February 2012.
41. "Shapes formed by Interacting Cracks." Physics of Fluids Seminar, U. Twente, Enschede, Netherlands. February 2012.
42. "Interrogating a granular material: force networks, acoustics, and state variables." German Aerospace Center (DLR) Institute of Materials Physics in Space. Cologne, Germany. January 2012.
43. "Pattern formation in grasses." Environmental Fluid Dynamics Seminar, Dept. of Physics, Göttingen, Germany, January 2012.

44. "Fluctuations and State Variables in Driven Granular Materials." École Normale Supérieure, Paris, France. January 2012.
45. "Mixing and segregation in granular materials." Seminar, Institute for Multiscale Simulation, Friedrich-Alexander Universität Erlangen-Nürnberg, Erlangen, Germany, December 2011
46. "Granular Materials: Complex Behaviors from Simple Components." Seminar, Center for Glass and Time, University of Roskilde, Roskilde, Denmark, December 2011
47. "Fluctuations and State Variables in Driven Granular Materials." Colloquium, Department of Physics, Universität Göttingen, Göttingen, Germany, November 2011
48. "Shapes formed by Interacting Cracks." Seminar, Institut für Experimentelle Physik, Otto-von-Guericke-Universität Magdeburg, Magdeburg, Germany, November 2011
49. "Crack-crack Interactions." Seminar, Leiden Institute of Physics, U. of Leiden, Leiden, Netherlands, October 2011.
50. "State Variables and Fluctuations in Dense Granular Systems" Workshop *Fluctuations and Response in Active Materials: From Driven Granular Systems to Swarming Bacteria*, Lorentz Center, Leiden, Netherlands, June 2011
51. "Stick-slip failure in sheared granular materials." Workshop *Large Fluctuations and Collective Phenomena in Disordered Materials*, University of Illinois, Urbana-Champaign, IL, May 2011
52. "Faults & earthquakes as granular phenomena: controls on stick-slip dynamics." 2011 Dynamics Days, Chapel Hill, NC, January 2011
53. "Spreading droplets: fingers, fractures, and flows." Physics Department Colloquium, James Madison University, Harrisonburg, VA, October 2010
54. "Local and global controls on granular dynamics." Physics Department Colloquium, North Carolina State University, Raleigh, NC, August 2010
55. "Local and global controls on granular dynamics." Center for Soft Matter Research, New York University, New York, NY, August 2010
56. "The effect of force chains on granular acoustics." Laboratory of the Physics and Mechanics of Heterogeneous Materials, ESPCI, Paris, France, June 2010
57. "How do surfactants spread on fluids and gels?" Dynamics of Complex Fluids Department Seminar, MPI for Dynamics and Self-Organization, Göttingen, Germany, June 2010
58. "State variables in dense granular materials." Dept. of Physics. Wake Forest University. Winston-Salem, NC, February 2010
59. "Playing with Sand: Complex Behaviors from a Simple Material." Dept. of Physics, Davidson College, Davidson, NC, January 2010
60. "State variables in granular systems." SESAPS Invited Session *Nonequilibrium materials science: theory, simulation, and experiment*. Atlanta, GA, November 2009
61. "State variables in equilibrating granular systems." 7th EuroMech Solid Mechanics conference. Minisymposium *Force chain fluctuations and jamming in dense granular flows*. Lisbon, Portugal, September 2009
62. "State variables in equilibrating granular systems" Workshop *Statistical mechanics of static granular media*. Lorentz Center, Leiden, Netherlands, July 2009
63. "Force Chains and State Variables in Granular Materials." Department of Physics. University of Western Ontario, April 2009
64. "Dynamics of Cracking Gels" Soft Matter Seminar, Physics Department, Rochester Institute of Technology, Rochester, NY, April, 2009

65. "Force chains and state variables in granular materials." Condensed Matter Seminar, Physics Department, University of Illinois at Champaign-Urbana. March, 2009
66. "Playing with Sand: Complex Behaviors from a Simple Material." Physics Colloquium, Appalachian State University, Boone, NC, February 2009
67. "Force Chains in Granular Materials." Acoustics Seminar, Naval Research Lab, January 2009
68. "Dynamics of Cracking Gels." Applied Math Seminar, MIT, Cambridge, MA, October 2008
69. "Granular acoustics, force chains, and time-reverse mirrors." Gordon Conference on Granular and Granular-Fluid Flows. Waterville, ME, June 2008
70. "Not-so-Continuum Behaviors in Granular Materials" NCSU Differential Equations Seminar, April 2008
71. "Faults & Earthquakes as Granular Phenomena: Controls on Stick-Slip Dynamics." Invited Symposium, APS March Meeting, March 2008
72. "What state variables control a crystallization/disorder transition in a driven granular material?" Crystallization and Jamming in Soft Matter under Driving Workshop, Lorenz Center, Leiden, Netherlands, February 2008
73. "Faults & Earthquakes as Granular Phenomena: Controls on Stick-Slip Dynamics." Physics Colloquium, Duke University, Durham, NC, February 2008
74. "Sound Propagation and Force Chains in Granular Materials." Opening Workshop for Program on Random Media, SAMSI, Research Triangle Park, NC, September 2007
75. "Faults & Earthquakes as Granular Phenomena: Controls on Stick-Slip Dynamics." Leiden Institute of Physics, Leiden, Netherlands, June 2007
76. "Force chains in granular materials: failure and acoustics." Dept. of Mechanical Engineering, Yale University, New Haven, CT, April 2007
77. "The Physics of Granular Materials: Complex Behavior from a Simple Material" Los Alamos National Lab, Los Alamos, NM, March 2007
78. "What can we learn about granular materials from the geometry and topology of force chain networks?" Computational Homology and Fluid Dynamics Workshop, Georgia Tech, Atlanta, GA, March 2007
79. "Freezing, Melting, and Fluctuations in Granular Materials." Molecular Theory and Simulation Seminar, NCSU Department of Chemical Engineering. September 2006
80. "Mixing and Segregation in Sheared Granular Materials." Opening Workshop for Program on Development, Assessment and Utilization of Complex Computer Models, SAMSI, Research Triangle Park, NC, September 2006
81. "Earthquakes and Faults as Granular Processes." (Joint with Peter Malin and Nicholas Hayman) Complex and Nonlinear Systems Seminar, Duke University, Durham, NC, April 1006.
82. "Freezing and Melting in Granular Materials." Focus Session: Granular Materials Near Jamming, APS March Meeting, Baltimore, MD, March 2006
83. "Starbursts and Wispy Drops: Surfactants Spreading on Gels." UCLA-IPAM-NSF workshop on Thin Films and Fluid Interfaces, IPAM, UCLA, Los Angeles, CA, January 2006
84. "Freezing and melting in granular materials." Department of Physics and Physical Oceanography, University of North Carolina – Wilmington, Wilmington, NC, November 2005
85. "Freezing and melting in granular materials." Department of Mechanical Engineering and Materials Science, Duke University, Durham, NC, March 2005
86. "Freezing and melting in granular materials." Solid State Seminar, Physics Department, Cornell University, Ithaca, NY, March 2005
87. "Fluids, Strange and Beautiful." Physics Department, Occidental College, Los Angeles, CA, February 2005

88. "Freezing and melting in granular materials." Colloquium, Physics Department, North Carolina State University, Raleigh, NC, February 2005
89. "Fluids, Strange and Beautiful." Physics Department, Vassar College, Poughkeepsie, NY, February 2005
90. "Fluids, Strange and Beautiful." Physics Department, Mount Holyoke College, South Hadley, MA, February 2005
91. "Freezing and melting in granular materials." Colloquium, Physics Department, University of Utah, Salt Lake City, UT, January 2005
92. "Fluids, Strange and Beautiful." Physics Department, Guilford College, Greensboro, NC, January 2005
93. "Freezing and melting in granular materials." Special Colloquium, Physics Department, The Ohio State University, Columbus, OH, January 2005
94. "Freezing and melting in granular materials." Condensed Matter Physics Seminar, Physics Department, University of California, San Diego, CA, January 2005
95. "Hysteresis and competition between disorder and crystallization in granular flow." Southeastern Section of the American Physical Society Annual Meeting, Oak Ridge, TN, November 2004
96. "Freezing, melting, and novel dynamics in granular materials." Condensed Matter Seminar. Physics Department. Duke University, Durham, NC, October 2004
97. "Freezing, melting, and novel dynamics in granular materials." Joint Applied Math/Condensed Matter Seminar. University of North Carolina, Chapel Hill, NC, September 2004
98. "Pattern Formation in Inclined Layer Convection." Physics Department Colloquium, Dartmouth College, Hanover, NH, February 2004
99. "Shearing and Disorder in a Vibrationally Fluidized 3D Granular Flow." Workshop on Multi-scale Challenges in Soft Matter Materials, Statistical and Applied Mathematical Sciences Institute, Research Triangle Park, NC, February 2004
100. "Pattern Formation in Inclined Layer Convection." Physics Department Colloquium, Dickinson College, Carlisle, PA, October 2003
101. "Shearing and Order in Vibrationally Fluidized 3D Granular Media." Flow Regimes, Transitions, and Segregation in Granular and Particle-Laden Flows Conference. Isaac Newton Institute for Mathematical Sciences, Cambridge, UK, September 2003
102. "Order, Chaos, and Defect Statistics in Inclined Layer Convection." Trends in Pattern Formation: From Amplitude Equations to Applications Conference, Max-Planck-Institut für Physik komplexer Systeme, Dresden, Germany, August 2003
103. "Order, Chaos, and Defects in Inclined Layer Convection." Pattern Formation in Physics and Biology Conference. Kavli Institute for Theoretical Physics, Santa Barbara, CA, August 2003
104. "Pattern formation in Inclined Layer Convection." Center for Nonlinear Dynamics, University of Texas at Austin, February 2002
105. "Pattern Formation and Defect Turbulence in Inclined Layer Convection." Condensed matter and statistical physics seminar, Department of Physics, Syracuse University, October 2001
106. "Pattern Formation in Inclined Layer Convection." Center for Nonlinear and Complex Systems, Duke University, March 2001

PROFESSIONAL SERVICE

Divisional Associate Editor, Physical Review Letters (2017–)

Member-at-Large, Program Committee, Program Chair (2017), Topical Group on Soft Matter (GSOFT), American Physical Society, 2014–2017. <http://www.aps.org/units/gsoft/>

Workshop Co-Organizer, *Capillarity of Soft Interfaces*. Lorentz Center, Leiden, Netherlands, November 2015. <http://www.lorentzcenter.nl/lc/web/2015/714/info.php3?wsid=714&venue=Oort>

Workshop Co-Organizer, *Dynamics at Interfaces*. Okinawa Institute of Science and Technology, Okinawa, Japan, June 2014. <https://groups.oist.jp/di>

Workshop Co-Organizer, *Thin Liquid Films and Fluid Interfaces: Models, Experiments and Applications*. Banff International Research Station, Banff, Canada, December 2012. <http://www.birs.ca/events/2012/5-day-workshops/12w5035>

Elected Chair, Gordon Research Conference on *Granular and Granular-Fluid Flow*, July 2012 <http://www.grc.org/programs.aspx?year=2012&program=granular>

Co-editor, Focus issue on “Granular Segregation,” *New Journal of Physics*. May, 2011.

Workshop Co-Organizer, *Particulate Matter: Does Dimensionality Matter?* at Max Planck Institute for Complex Systems in Dresden, Germany, June 2010. <http://www.mpipks-dresden.mpg.de/~pardim10/>

Member-at-Large, Topical Group on Statistical and Nonlinear Physics (GSNP), American Physical Society, 2008 – 2011.

Organization of Focus/Invited Sessions: American Physical Society March Meeting 2007 “Tests of the universality of jamming”; American Physical Society SESAPS 2008 “Granular Materials”; American Geophysical Union 2014 “Spatiotemporal Complexity of Seismicity from Microscopic to Global Scales”

Reviewer for *Agronomy Journal*, *Europhysics Letters*, *Granular Matter*, *Interface Focus*, *International Journal of Biometrology*, *Journal of Fluid Mechanics*, *Journal of Geophysical Research*, *Journal of Physics*, *Journal of Rheology*, *New Journal of Physics*, *Philosophical Transactions of the Royal Society A*, *Physical Review Letters*, *Physical Review E*, *Physical Review Fluids*, *Physical Review X*, *Physics of Fluids*, *Proceedings of the Royal Society A*, *Proceedings of the National Academy of Sciences*, *Pure and Applied Geophysics*, *Reviews of Modern Physics*, *Review of Scientific Instruments*, *Scientific Reports*, *Soft Matter*, *Scientific Reports*.

Proposal panelist for NSF (CBET, DMR, MRSEC). Proposal reviewer for NSF, NASA, DOE, ARO, Petroleum Research Fund, Research Corporation, Civilian Research and Development Fund, Vienna Science and Technology Fund (Austria), Foundation for Fundamental Research on Matter (Netherlands), Netherlands Organisation for Scientific Research

SELECT UNIVERSITY SERVICE

Member, University Task Force on Women Faculty (2007–2008)

Member, Advisory Committee on Development of Women and Faculty of Color as Emerging Leaders for the ADVANCE Developing Diverse Departments NSF Grant. NCSU. (2009–2012)

Member, PAMS Leadership Survey Committee (2010)

Member, 5-year review committee, Physics Department Head (2010)

Co-founder and co-organizer, *Complex Matter and Biophysics Seminar*, Dept. of Physics (2007–)
http://wikis.lib.ncsu.edu/index.php/Complex_Matter_and_Biophysics_Seminar

Undergraduate Advisor (2007–)

NCSU Sigma Xi Membership Committee (2010 – 2011), Executive Committee Member-at-Large (2012–2013)

Departmental Coordinator of Women in Physics events (2013–)

Departmental Coordinator for Undergraduate Research (2013–)

Search Committee, Dean of College of Sciences (2015)

CURRENT FUNDING

“A Network Approach to Multi-Scale Materials.” James S. McDonnell Foundation. \$450,000. 8/01/2014 through 07/31/2018.

“Wetting and Spreading with Soft Materials.” National Science Foundation. \$425,000. 9/1/2016 through 8/31/2019.

“Rheology of Intermediate Granular Flows: Particle Shape and Size Distributions.” International Fine Particle Research Institute, Inc. \$76,000. 8/10/2015 through 8/9/2017.

TRAINING

POSTDOCS: Jonathan Kollmer (2016–); Frédéric Lechenault (2007–2008, now CNRS at École Normale Supérieure, Paris); Joshua Bostwick (2011–2013, now Assistant Professor of Mechanical Engineering, Clemson University); Ted Brzinski (2013–2016, now Assistant Professor of Physics, Haverford College)

GRADUATE STUDENTS: Lindsay May (2007–2010, PhD, joint with Michael Shearer, NCSU Mathematics, now at Northrop Grumman); James Puckett (2008–2012, PhD, PostDoc at Yale University, now Assistant Professor of Physics at Gettysburg College, PA); Eli Owens (2008–2012, PhD, now Assistant Professor, Presbyterian College); Carlos Ortiz (2008–2013, joint with Robert Riehn, NSF Graduate Student Fellowship, now Postdoc at University of Pennsylvania); Stephen Strickland (2011–2016, now visiting Assistant Professor, Dickinson College); Yuming Huang (2014–2015, master’s student), Scott Lindauer (2014–); Zhu Tang (2015–); Shih-Yuan Chen (2017–)

VISITING GRADUATE STUDENTS: Stéphanie Couvreur (2008, École Normale Supérieure, Paris), Lucie Ducloué (2009, École Normale Supérieure, Paris), Kirsten Harth (2012, U. Magdeburg, Germany), Antoine Le Bouil (2010, U. Rennes, France), Kiri Nichol (2011, U. Leiden, Netherlands), Marion Grzelka (2014, École Normale Supérieure, Cachan), Giorgio Olivieri (2015, U. Twente, NL) Ward Holleman (2016, U. Twente, NL) Workamp, Marcel (2016, U. Wageningen, NL) Arne te Nuijjenhaus (2016, U. Twente, NL) Amalia Thomas (2016, U. Cambridge, UK)

GRADUATE COMMITTEE: Wor Thongthai (MS, NCSU Physics, 2008), Derrick Stevens (PhD, NCSU Physics, 2009), Diana Streng (MS, NCSU Physics, 2009), Mahmoud Moradi (PhD, NCSU Physics, 2010), Ellen Peterson (PhD, NCSU Math, 2010), Nick Lowman (PhD, NCSU Math 2014), Zubair Azad (PhD, NCSU Physics, 2016), Collin Eaker (PhD, Chemical Engineering, 2016), Junan Zu (PhD, NCSU Electrical and Computer Engineering, 2016) Ben Hoffman (PhD, NCSU Physics, current), Matthew Melillo (PhD, NCSU Chemical Engineering, current), Austin Reid (PhD, NCSU Physics, current), Will Sams (PhD, NCSU Physics, current),

EXTERNAL GRADUATE COMMITTEE/EXAM: Simon de Vet (PhD, Physics, University of Western Ontario, Canada, 2009), Sally Thompson (PhD, Nicholas School for the Environment, Duke, 2010), Kiri Nichol (PhD, Physics, U. Leiden, Netherlands, 2011), Constantinos Spandagos (PhD, Chemical Engineering, Imperial College, London, 2011), Ceyda Sanli (PhD, Physics, U. Twente, Netherlands, 2012).

UNDERGRADUATE STUDENTS: Kenneth Ball (2006–2007, PhD NCSU Mathematics), Oindree Banerjee (2011, now PhD student, Ohio State Physics), Sara Berry (2012–2015, now PhD student, U. Washington Atmospheric Sciences), Ephraim Bililign (2015–2017, will be PhD student, U. Chicago Physics), Philip Boyne (2007–2009, now high school physics teacher, Raleigh, NC), John Chavez (2012–2013), Mia de los Reyes (2013–2014, Goldwater Scholar, NSF Graduate Student Fellowship, Churchill Scholar, MS Astronomy Cambridge, will be PhD student CalTech Astrophysics), Garrett Early (2014–2015), Melissa Fender (2008–2011, MS, U. Chicago Physics, now PhD student, Wake Forest Physics), Kate Foco (2009–2011, now PhD student, Scripps Institute of Oceanography), Laura Golick Gray (2007–2009, PhD Emory Physics, now postdoc Princeton Engineering), Greg Gibson (2006), Paul Houseworth (2006–2007, now Progress Energy), Adam Keith (2010–2011, now PhD student, U. Colorado Physics, NSF Graduate Student Fellowship), Michael Kerley (2013–2014), Rebekah Lee (2014–2015, now MS student Boise State Geophysics), Adele Lichtenberger Igel (2008–2010, now PhD student, Colorado State Atmospheric Science), Erik Lutz (2015), Michael Mann (2014–2016, now PhD student, Cornell Geophysics), Alex Mauney (2013–2014, NSF Graduate Student Fellowship, now PhD student, Cornell Physics), Robert McMillion (2007–2008), José Medrano (2015, now high school physics teacher, New York, NY), Hannah-mirian Mekbib (2015–2016), Dhruvil Patel (2006), Kyle Payton (2014), Katherine Phillips (2006–2007, Harvard Applied Physics PhD, NSF Graduate Student Fellowship), Luis Royo Romero (2015), Luke Sargent (2006), Mark Schillaci (2011–2013, now PhD student, Ohio State Physics), Bjorn Sumner (2017), Megan Szakasits (2012–2013, now PhD student, Michigan Chemical Engineering) Keith Vandergriff (2015–2016)

VISITING UNDERGRADUATE STUDENTS: Chris Fox (2008, Harvey Mudd College, now PhD student U. Chicago Statistics), Georgi Dinolov (2009, Harvey Mudd College, now PhD student Santa Cruz Applied Mathematics), Kali Allison (2010, Harvey Mudd College, now PhD student Stanford Geophysics), Wynn Vonnegut (2010, Harvey Mudd College, now software engineer), Matt Hin (2012, Harvey Mudd College, now PhD student Cornell Applied Mathematics), Richard Sayanagi (2012, Harvey Mudd College, now PhD student U. Wisconsin Physics), Caroline Bauer (2013, U. Magdeburg, Germany) Gustavo Rimirez (2016, Hunter College)

POPULAR PRESS COVERAGE

Cho, A. "In a Jumble of Grains, A Good Hard Shake Restores Order." *Science*, 31 March 2006, p. 1860.

Minkel, J. R. "Grain Freeze." *Scientific American* (News Scan item), July 2005, p. 26.

Svitil, K. A. "New Physics: Beads Clump When Shaken." *Discover*, October 2005, Vol 26, No. 10.

Press release on geophysics activities:

http://www.jsg.utexas.edu/news/resspotlights/2009/tabletop_earthquakes.html

Calla Colfield. "Finding New Physics Among Earthquake Lights." *APS News*. June 2014.

Charles Q. Choi. "Mysterious Flashing Earthquake Lights Maybe Explained." *Live Science*. February 26, 2014

Stephen Luntz. "Clue To Mysterious Lights That Appear Before Earthquakes." *IFSL*. March 7, 2014

Meeri Kim. "Experiments at Rutgers lend credence to existence of earthquake lights" *Washington Post*. March 6, 2014

John Wallace. "High-index immersion fluid enables 1.17 NA objective with 12 mm working distance." *Laser Focus World* Feb 1, 2016.

MEMBERSHIPS

American Physical Society: Division of Fluid Dynamics, Division of Condensed Matter Physics, Group on Statistical and Nonlinear Physics, Group on Soft Matter, Forum on Physics Education, Forum on Physics and Society, and Southeastern Section

American Geophysical Union

American Association of Physics Teachers

Sigma Xi

American Association for the Advancement of Science