

CURRICULUM VITAE

ARSHAD KUDROLLI

Professor of Physics

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Education

Ph.D. (Physics), Northeastern University, Boston (1996)

Dissertation: Experiments on Quantum and Electromagnetic Chaos

Advisor: Professor Sri Sridhar

B. Tech. (Engineering Physics), Indian Institute of Technology, Bombay (1990)

Appointments

9/08 - present, Professor of Physics, Clark University

9/19 - 8/20, Visiting Scholar in Applied Mathematics, School of Engineering & Applied Sci,
Harvard University

9/16 - 7/19, Chair, Department of Physics, Clark University

9/11 - 5/16, Jan and Larry Landry University Professor, Clark University

5/14 - 6/14, Invited Professor, Université Paris Diderot

12/13 - 1/14, Member, Kavli Institute for Theoretical Physics, University of California, Santa
Barbara

9/10 - 5/13, Chair, Department of Physics, Clark University

9/09 - 6/13, Visiting Scholar, Department of Earth, Atmospheric and Planetary Science,
Massachusetts Institute of Technology

7/06 - 8/06, Visiting Professor, Physics Department, University of Liège, Belgium

4/05 - 5/05, Member, Kavli Institute for Theoretical Physics, University of California, Santa
Barbara

9/03 - 9/08, Associate Professor of Physics, Clark University

9/00 - 8/09, Visiting Scholar and Research Affiliate, Department of Mathematics, Mas-
sachusetts Institute of Technology

9/97 - 8/03, Assistant Professor of Physics, Clark University

10/95 - 7/97, Research Associate, Haverford College, with Professor Jerry P. Gollub

Consultant

Schlumberger-Doll Research, Cambridge, MA (2012); Benevolent Technologies for Health, Boston, MA (2014)

Awards and Honors

Jan and Larry Landry University Professor, Clark University (2011-2016)

American Physical Society Fellow (2010)

National Science Foundation CAREER Award (2000)

Alfred P. Sloan Fellow (1998)

Research Interests

Soft matter; Fluid dynamics; Elasticity and mechanics; Planetary surface and subsurface processes; Environmental science; Self-assembly; Packing; Biomechanics and bio-inspired systems; Active matter

Research Grants

1. "Folding, crumpling and entangling of sheets and filaments," National Science Foundation - DMR, \$487,800, Period: 06/15/20- 05/31/23; Role: PI.
2. "RAPID: Predicting Coronavirus Disease (COVID-19) Impact with Multiscale Contact and Transmission Mitigation," National Science Foundation - DMR, \$200,000, 06/01/20- 05/30/21; Role: PI.
3. "Intruder dynamics in fluid saturated granular medium," National Science Foundation - CBET, \$334,841, 07/2018 - 06/2021; Role: PI.
4. "Internal erosion, particle transport, and channelization driven by fluid flow," Department of Energy - BES, \$150,000, 01/2018 - 12/2020; Role: PI.
5. "Instabilities, asymptotic isometry, and energy condensation in elastic sheets under twist," National Science Foundation - DMR, \$385,623, 05/2015 - 04/2020; Role: PI.
6. "Particle Sedimentation in Clay Suspensions," Petroleum Research Fund, \$100,000, 01/2014 - 08/2018; Role: PI.
7. "Granular erosion, transport, and dynamic-filtration driven by fluid flow," National Science Foundation - CBET, \$306,684, 08/2013 - 07/2016; Role: PI.
8. "Internal erosion, particle transport, and channelization driven by fluid flow," Department of Energy - BES, \$210,920, 07/2013 - 07/2016; Role: PI.
9. "MRI-R2: Acquisition of X-Ray Computed Tomography System for Imaging of Heterogeneous Materials," National Science Foundation - MRI, \$210,960, 03/2010 - 02/2012 (PI: A. Kudrolli; co-PI: C. Agosta)
10. "Collaborative Research: Fundamental Principles of Swimming in Viscoelastic Media," National Science Foundation - CBET, \$83,593, 09/2009 - 08/2013; Role: PI.

11. "Structural rearrangements and transport properties of cyclically sheared granular packings," National Science Foundation - CBET, \$300,112, 07/2009 - 06/2012; Role: PI.
12. "Physics of Channelization: Experiments, Theory and Observations," Department of Energy - BES, \$197,172, 01/2009 - 01/2013; Role: PI.
13. "Statistical and Dynamical Properties of Spherical and Non-Spherical Granular Materials," National Science Foundation - DMR, \$326,321, 06/2006 - 06/2009; Role: PI.
14. "Flow and strength of cohesive granular materials," ACS Petroleum Research Fund, \$80,000, 02/2006-08/2008; Role: PI.
15. "Physics of Channelization: Experiments, Theory and Observations," Department of Energy - BES, \$167,453, 01/2006 - 02/2009; Role: PI.
16. "Dense Granular Flows," Iowa State Univ., Department of Energy, \$30,000, 07/2004 - 08/2005; Role: PI.
17. "Particle diffusion and mixing during silo drainage," National Science Foundation - CBET, \$304,556, 04/2004 - 03/2008; Role: PI.
18. "Physics of Channelization: Experiments, Theory and Observations," Department of Energy - BES, \$137,054, 09/2002 - 11/2005; Role: PI.
19. "CAREER: Instabilities in wet and dry granular flows," National Science Foundation - DMR, \$378,004, 01/2000 -12/2004; Role: PI.
20. Research Innovation Award, Research Corporation, \$35,000 (1998); Role: PI.
21. Petroleum Research Fund Starter Grant, \$20,000, 09/1998-08/2000; Role: PI.
22. Alfred P. Sloan Research Fellowship, \$35,000 (1998); Role: PI.

Education Grants

"Clark Science-Math Teaching and Education Partnership (C-STEP)," National Science Foundation - DUE, \$1,130,704, 09/2013 - 09/2021 (PI: T. Del Prete, co-PIs: A. Kudrolli, D. Robertson, L. Smith, and N. Sternberg)

Publications

1. "Unstable invasion of sedimenting granular suspensions," Arshad Kudrolli, Rausan Jewel, Ram Sudhir Sharma, Alex Petroff, *Phys. Rev. Lett.* **125**, 054501 (2020).
2. "Burrowing dynamics of aquatic worms in soft sediments," Arshad Kudrolli and Bernny Ramirez, *PNAS* **116**, 25569 (2019).
3. "Birth and decay of tensional wrinkles in hyperelastic sheets," Andreea Panaitescu, Meng Xin, Benny Davidovitch, Julien Chopin, Arshad Kudrolli, *Phys. Rev. E* **100**, 053003(2019).
4. "Effective drag of a rod in fluid-saturated granular beds," Benjamin Allen and Arshad Kudrolli, *Phys. Rev. E* **100**, 022901 (2019).
5. "Corner singularities and shape of stretched elastic sheets," Julien Chopin, Andreea Panaitescu, and Arshad Kudrolli, *Phys. Rev. E* **98**, 043003 (2018).

6. “Micromechanics of intruder motion in wet granular medium,” Rausan Jewel, Andreea Panaitescu, and Arshad Kudrolli, *Phys. Rev. Fluids* **3**, 084303 (2018).
7. “Granular bed consolidation, creep and armoring under subcritical fluid flow,” Benjamin Allen and Arshad Kudrolli, *Phys. Rev. Fluids* **3**, 074305 (2018).
8. “Persistence of perfect packing in twisted bundles of elastic filaments,” Andreea Panaitescu, Gregory M. Grason, Arshad Kudrolli, *Phys. Rev. Lett.* **120**, 248002 (2018). *Cover*.
9. “Tension-dependent transverse buckles and wrinkles in twisted elastic sheets, Arshad Kudrolli and Julien Chopin, *Proc. Roy. Soc. A* **474**, 20180062 (2018).
10. “Headward growth and branching in subterranean channels,” Arshad Kudrolli, Nikolay Ionkin, and Andreea Panaitescu, *Phys. Rev. E* **96**, 052904 (2017). *Kaleidoscope*.
11. “Dynamic wrinkling and strengthening of a filament in a viscous fluid,” Julien Chopin, Moumita Dasgupta, Arshad Kudrolli. *Phys. Rev. Lett.* **119**, 088001 (2017).
12. “Measuring geometric frustration in twisted inextensible filament bundles,” Andreea Panaitescu, Gregory M. Grason, Arshad Kudrolli, *Phys. Rev. E* **95**, 052503 (2017).
13. “Drag law for an intruder in granular sediments, Andreea Panaitescu, Xavier Clotet, and Arshad Kudrolli, *Phys. Rev. E* **95**, 032901 (2017).
14. “Depth resolved granular transport driven by shearing fluid flow,” Benjamin Allen and Arshad Kudrolli, *Phys. Rev. Fluids* **2**, 024304 (2017).
15. “Evolution of porosity and channelization of an erosive medium driven by fluid flow,” Arshad Kudrolli and Xavier Clotet, *Phys. Rev. Lett.* **117**, 028001 (2016).
16. “Critical shear rate and torque stability condition for a particle resting on a surface in a fluid flow,” Arshad Kudrolli, David Scheff, Benjamin Allen, *J. Fluid Mech.* **808**, 397 (2016).
17. “Disclinations, e-cones, and their interactions in extensible sheets,” J. Chopin and A. Kudrolli, *Soft Matter* **12** 4457-4462 (2016).
18. “Sheared Dense Granular Flows,” Andreea Panaitescu, Ashish V. Orpe, and Arshad Kudrolli, *Handbook of Granular Materials*, Pages 285–306, Edited by Scott V. Franklin and Mark D. Shattuck, CRC Press (2015).
19. “Onset of erosion of a granular bed in a channel driven by fluid flow,” Anyu Hong, Mingjiang Tao, and A. Kudrolli, *Phys. Fluids* **27**, 013301 (2015).
20. “Pearling and arching instabilities of a granular suspension on a super-absorbing surface,” Julien Chopin and Arshad Kudrolli, *Soft Matter* **11**, 659 (2015). *Cover*.
21. “Epitaxial growth of ordered and disordered granular sphere packings,” Andreea Panaitescu and Arshad Kudrolli, *Phys. Rev. E* **90**, 032203 (2014).
22. “Effect of aspect ratio on the development of order in vibrated granular rods,” Vikrant Yadav, Jean-Yonnel Chastaing, and Arshad Kudrolli, *Phys. Rev. E* **88**, 052203 (2013).
23. “Helicoids, Wrinkles, and Loops in Twisted Ribbons,” Julien Chopin and Arshad Kudrolli, *Phys. Rev. Lett.* **111**, 174302 (2013).

24. "Book Review: An Introduction to Statistical Mechanics and Thermodynamics by Robert H. Swendsen," Arshad Kudrolli, *Physics Today* **66**, 8:50 (2013).
25. "Speed of a swimming sheet in Newtonian and viscoelastic fluids," Moumita Dasgupta, Bin Liu, Henry C. Fu, Michael Berhanu, Kenneth S. Breuer, Thomas R. Powers, and Arshad Kudrolli, *Phys. Rev. E* **87**, 013015 (2013).
26. "Diffusion of granular rods on a rough vibrated substrate," V. Yadav and A. Kudrolli, *European Physical Journal E* **35**, 104 (2012).
27. "Shape and dynamics of seepage erosion in a horizontal granular bed," Michael Berhanu, Alexander Petroff, Olivier Devauchelle, Arshad Kudrolli, and Daniel H. Rothman, *Phys. Rev. E* **86**, 041304 (2012).
28. "Flow-induced channelization in a porous medium," A. Mahadevan, A. V. Orpe, A. Kudrolli, and L. Mahadevan, *Europhys. Lett.* **98**, 58003 (2012).
29. "Nucleation and Crystal Growth in Sheared Granular Sphere Packings," Andreea Panaitescu, K. Anki Reddy, and Arshad Kudrolli, *Phys. Rev. Lett.* **108**, 108001 (2012).
30. "Four remarks on the growth of channel networks," Alexander P. Petroff, Olivier Devauchelle, Arshad Kudrolli, and Daniel H. Rothman, *Comptes Rendus Geoscience* **344**, 33–40 (2012).
31. "Building Designed Granular Towers One Drop at a Time," J. Chopin and A. Kudrolli, *Phys. Rev. Lett.* **107**, 208304 (2011).
32. "Aggregation of frictional particles due to capillary attraction," M.J. Dalbe, D. Cosic, M. Berhanu, *Phys. Rev. E* **83**, 051403 (2011).
33. "Geometry of valley growth," A.P. Petroff, O. Devauchelle, D.M. Abrams, A.E. Lobkovsky, A. Kudrolli, and D.H. Rothman, *J. Fluid Mech.* **673**, 245 (2011).
34. "Maximum and minimum stable random packings of Platonic solids," J. Baker and A. Kudrolli, *Phys. Rev. E* **82**, 061304 (2010).
35. "Heterogeneous structure of granular aggregates with capillary interactions," M. Berhanu and A. Kudrolli, *Phys. Rev. Lett.* **105**, 098002 (2010).
36. "Spatial distribution functions of random packed granular spheres obtained by direct particle imaging," A. Panaitescu and A. Kudrolli, *Phys. Rev. E Rapid Communication*, **81**, 060301 (2010).
37. "Tumbling Dynamics of Passive Flexible Wings," Daniel Tam, John W. M. Bush, Michael Robitaille, and Arshad Kudrolli, *Phys. Rev. Lett.* **104**, 184504 (2010).
38. "Concentration dependent diffusion of self-propelled rods," A. Kudrolli, *Phys. Rev. Lett.* **104**, 088001 (2010).
39. "Experimental investigation of cyclically sheared granular particles with direct particle tracking," A. Panaitescu and A. Kudrolli, *Progress of Theoretical Physics, Supplement No.* **184**, 100 (2010).
40. "Physical test of a particle simulation model in a sheared granular system," C. H. Rycroft, A. V. Orpe, and A. Kudrolli, *Phys. Rev. E* **80**, 031305 (2009).

41. "Structure and dynamics of vibrated granular chains: Comparison to equilibrium polymers," K. Safford, Y. Kantor, M. Kardar, and A. Kudrolli, *Phys. Rev. E* **79**, 061304 (2009).
42. "Growth laws for channel networks incised by groundwater flow," D. M. Abrams, A. E. Lobkovsky, A. P. Petroff, K. M. Straub, B. McElroy, D. C. Mohrig, A. Kudrolli, and D. H. Rothman, *Nature Geoscience* **2** (2009).
43. "Granular Matter - Sticky Sand," News and Views, *Nature Materials* **7**, 174 (2008).
44. "Fast decay of the velocity autocorrelation function in dense shear flow of inelastic hard spheres," A. V. Orpe, V. Kumaran, K. A. Reddy, and A. Kudrolli, *Europhys. Lett.* **84**, 64003 (2008).
45. "Erosion of a granular bed driven by laminar fluid flow," A. Lobkovsky, A. Orpe, R. Molloy, A. Kudrolli and D. H. Rothman, *J. Fluid Mech.* **605**, 47 (2008).
46. "Swarming and swirling in self-propelled granular rods," A. Kudrolli, G. Lumay, D. Volfson, and L. Tsimring, *Phys. Rev. Lett.* **100**, 058001 (2008). *Cover*.
47. "Lubrication effects on the flow of wet granular materials," Q. Xu, A.V. Orpe, and A. Kudrolli, *Phys. Rev. E* **76**, 031302 (2007).
48. "Velocity correlations in dense granular flows observed with internal imaging," A.V. Orpe and A. Kudrolli, *Phys. Rev. Lett.* **98**, 238001 (2007).
49. "Curvature condensation and twinning in an indented elastic shell," M. Das, A. Vaziri, A. Kudrolli, and L. Mahadevan, *Phys. Rev. Lett.* **98**, 014301 (2007).
50. "Dynamics of channel incision in a granular bed driven by subsurface water flow," A.E. Lobkovsky, B. Smith, A. Kudrolli, D.C. Mohrig, and D.H. Rothman, *J. Geophys. Res. - Earth Surface* **112**, F03S12 (2007).
51. "Friction of a slider on a granular layer: Nonmonotonic thickness dependence and effect of boundary conditions," S. Siavoshi, A.V. Orpe, and A. Kudrolli, *Phys. Rev. E* **73**, 010301 (2006).
52. "Maximum angle of stability of a wet granular pile," S. Nowak, A. Samadani, and A. Kudrolli, *Nature Physics*, **1**, 50 (2005).
53. "Dynamics of a bouncing dimer," S. Dorbolo, D. Volfson, L. Tsimring, and A. Kudrolli, *Phys. Rev. Lett.* **95**, 044101 (2005).
54. "Dynamics of a vibrated dimer," S. Dorbolo, N. Vandewalle, D. Volfson, L. Tsimring, and A. Kudrolli, in *Powders and Grains 2005* (Taylor and Francis, 2005).
55. "Velocity profile of granular flows inside silos and hoppers," J. Choi, A. Kudrolli and M.Z. Bazant, *J. Phys. Cond Matt.* **17**, S2533 (2005).
56. "Failure of a granular step," S. Siavoshi and A. Kudrolli, *Phys. Rev. E* **71**, 051302 (2005).
57. "Geometry of Crumpled Paper," D.L. Blair and A. Kudrolli, *Phys. Rev. Lett.* **94**, 166107 (2005). *Cover*.

58. "Anisotropy driven dynamics in vibrated granular rods," D. Volfson, A. Kudrolli, and L.S. Tsimring, *Phys. Rev. E* **70**, 051312 (2004).
59. "Threshold phenomena in erosion driven by subsurface flow," A.E. Lobkovsky, B. Jensen, A. Kudrolli, and D.H. Rothman, *J. Geophys. Res. - Earth Surface* **109**, F04010 (2004).
60. "Diffusion and mixing in gravity-driven dense granular flows," J. Choi, A. Kudrolli, R.R. Rosales, M.Z. Bazant, *Phys. Rev. Lett.* **92**, 174301 (2004).
61. "Spontaneous channelization in permeable ground: Theory, experiment, and observation," N. Schorghofer, B. Jensen, A. Kudrolli, and D.H. Rothman, *J. Fluid Mech.* **503**, 357 (2004).
62. "Size separation in vibrated granular materials," A. Kudrolli, *Rep. Prog. Phys.* **67**, 209 (2004).
63. "Collision statistics of driven granular materials," D.L. Blair and A. Kudrolli, *Phys. Rev. E* **67**, 041301 (2003).
64. "Vortices in vibrated granular rods," D.L. Blair, T. Neicu, and A. Kudrolli, *Phys. Rev. E* **67**, 031303 (2003).
65. "Clustering transitions in vibro-fluidized magnetized granular materials," D. L. Blair and A. Kudrolli, *Phys. Rev. E* **67**, 021302 (2003).
66. "Magnetized granular materials," D.L. Blair and A. Kudrolli, in *The Physics of granular media*, H. Hinrichsen and D.E. Wolf (Editors), (Wiley-VCH publishers, 2004) 281-296. *Cover*.
67. "Shocks in sand flowing in a silo," A. Samadani, L. Mahadevan, and A. Kudrolli, *J. Fluid Mech.* **452**, 293 (2002).
68. "Clustering, jamming and segregation in cohesive granular materials," A. Samadani, D.L. Blair and A. Kudrolli, ASME International Mechanical Engineering Congress & Exposition, IMECE2002-32478 (2002).
69. "Periodic orbit analysis of an elastodynamic resonator using shape deformation," T. Neicu and A. Kudrolli, *Europhys. Lett.* **57** (3), 341 (2002).
70. "Velocity correlations in dense granular gases," D. L. Blair and A. Kudrolli, *Phys. Rev. E* **64**, 050301(R) (2001).
71. "Angle of repose and segregation of cohesive granular matter," A. Samadani and A. Kudrolli, *Phys. Rev. E* **64**, 051301 (2001).
72. "Swarming ring patterns in bacterial colonies exposed to ultraviolet radiation," A. Delprato, A. Samadani, A. Kudrolli, and L. S. Tsimring, *Phys. Rev. Lett.* **87**, 158102 (2001).
73. "Eigenmodes of a clover shaped plate with mixed phase dynamics," O. Brodier, T. Neicu, and A. Kudrolli, *Euro. Phys. J. B* **23**, 365 (2001).
74. "Spectral properties of a mixed system using an acoustical resonator," T. Neicu, K. Schaadt, and A. Kudrolli, *Phys. Rev. E* **63**, 026206 (2001).
75. "Scarred patterns in surface waves," A. Kudrolli, M. Abraham, and J.P. Gollub, *Phys. Rev. E* **63**, 026208 (2001).

76. "Segregation and layering in wet granular matter," A. Samadani and A. Kudrolli, in *Powders and Grains 01* (Balkema Publishers, 2001) 429.
77. "Segregation transitions in wet granular matter," A. Samadani and A. Kudrolli, *Phys. Rev. Lett.* **85**, 5102 (2000).
78. "Non-Gaussian velocity distributions in excited granular matter in the absence of clustering," A. Kudrolli and J. Henry, *Phys. Rev. E* **62**, R1489 (2000).
79. "Extinction transition in bacterial colonies under forced convection," T. Neicu, A. Pradhan, D. Larochelle and A. Kudrolli, *Phys. Rev. E* **62**, 1059 (2000).
80. "Visualization of segregation in granular flows inside silos," A. Samadani, A. Pradhan and A. Kudrolli, in *The Proceedings of The ITUAM Symposium on Segregation in Granular Flows*, (Kluwer Academic Publishers, 2000) 53.
81. "Size segregation of granular matter in silo discharges," A. Samadani, A. Pradhan and A. Kudrolli, *Phys. Rev. E* **60**, 7203 (1999).
82. "Experimental investigation of universal parametric correlators using a vibrating plate," K. Schaadt and A. Kudrolli, *Phys. Rev. E* **60**, R3479 (1999).
83. "Velocity statistics in vibrated granular media," W. Losert, D.G.W. Cooper, J. Delour, A. Kudrolli and J.P. Gollub, *Chaos* **9**, 682 (1999).
84. "Superlattice structures in surface waves," A. Kudrolli, B. Pier and J.P. Gollub, *Physica D* **123**, 99 (1998).
85. "Time resolved studies of stick-slip motion in sheared granular layers," S. Nasuno, A. Bak, A. Kudrolli and J.P. Gollub, *Phys. Rev. E* **58**, 2161 (1998).
86. "Friction in granular layers: Hysteresis and precursors," S. Nasuno, A. Kudrolli and J.P. Gollub, *Phys. Rev. Lett.* **79**, 949 (1997).
87. "Cluster formation due to collisions in granular material," A. Kudrolli, M. Wolpert and J.P. Gollub, *Phys. Rev. Lett.* **78**, 1383 (1997).
88. "Experiments on quantum chaos using microwave cavities: Results for the pseudo-integrable L-billiard," A. Kudrolli and S. Sridhar, *Pramana, J. of Phys.* **48**, 459 (1997).
89. "Sensitive force measurements in sheared granular flow with simultaneous imaging," S. Nasuno, A. Kudrolli and J. P. Gollub, in *Powders and Grains 97* (Balkema, 1997) 535.
90. "Studies of cluster formation due to collisions in granular material," A. Kudrolli and J. P. Gollub, in *Powders and Grains 97* (Balkema, 1997) 329.
91. "Microwave 2-disk scattering," A. Kudrolli and S. Sridhar, in *Proceedings of the 4th Drexel Conference on Nonintegrability*, (World Scientific, 1996).
92. "Patterns and spatiotemporal chaos in parametrically forced surface waves: Systematic survey at large aspect ratio," A. Kudrolli and J.P. Gollub, *Physica D* **97**, 133 (1996).
93. "Localized spatiotemporal chaos," A. Kudrolli and J.P. Gollub, *Phys. Rev. E* **54**, R1052 (1996).

94. "Comment on Gaussian Orthogonal Ensemble Statistics in a Microwave Stadium Billiard with Chaotic Dynamics: Porter-Thomas Distribution and Algebraic Decay of Time Correlations," A. Kudrolli and S. Sridhar, *Phys. Rev. Lett.* **76**, 3036 (1996).
95. "Experiments on quantum chaos using microwave cavities," A. Kudrolli and S. Sridhar, in *Proceedings of the 2nd Conference on Experimental Chaos*, editors W. Ditto, L. Pecora, S. Vohra, M. Shlesinger and M. Spano, (World Scientific, 1995) 184.
96. "Spatial correlation in quantum chaotic systems with time-reversal symmetry: Theory and experiment," V.N. Prigodin, N. Taniguchi, A. Kudrolli, V. Kidambi and S. Sridhar, *Phys. Rev. Lett.* **75**, 2392 (1995).
97. "Experiments on chaos and localization in quantum wavefunctions," A. Kudrolli, V. Kidambi and S. Sridhar, *Phys. Rev. Lett.* **75**, 822 (1995).
98. "Experiments on not hearing the shape of drums," S. Sridhar and A. Kudrolli, *Phys. Rev. Lett.* **72** 2175 (1994).
99. "Signatures of chaos in quantum billiards: Microwave experiments," A. Kudrolli, S. Sridhar, A. Pandey and R. Ramaswamy, *Phys. Rev. E* **49**, R11 (1994).
100. "Experimental eigenvalue spectra of rough and multiply-connected billiards," S. Sridhar, D. Hogenboom and A. Kudrolli, in *Quantum Dynamics of Chaotic Systems*, edited by J. M. Yuan, D. H. Feng and G. M. Zaslavsky, (Gordon and Breach, 1993) 297.

Invited Presentations

1. "Dynamics of Aquatic Worms and Soft Robots in Soft Sediments," Fluids Seminar, Brown University, Nov. (2019).
2. "Structuring Elastic Sheets and Filaments With a Twist," Applied Mechanics Colloquium, Harvard University, Sept. (2019).
3. "Physics of Crawling, Swimming, and Burrowing," UMass-Lowell Annual Physics Banquet Speaker, May 2019.
4. "Patterning thin elastic structures with a twist, Mechanics: Modeling, Experimentation, Computation Seminar Series, MIT, April 2019.
5. "Evolution of porosity and channelization driven by fluid flow," 2018 Gordon Research Conference on Flow and Transport in Permeable Media: From Pore-scale Physics to Geologic-scale Processes, Sunday River, July 2018.
6. "Fluid flow driven branching patterns" 27th International Conference on Discrete Simulation of Fluid Dynamics, Worcester, June 2018.
7. "Experiments on rods, filaments, and sheet assembly with external drive," Aspen Center of Physics, June 2017.
8. "Geometry of twisted filaments," Mechanics Seminar, Condensed Matter and Biological Physics Seminars, Syracuse University, Apr. 2017.
9. "Curvature Driven Erosion and Channelization of Sedimentary Beds by Fluid Flow," SIAM Conference on Computational Science and Engineering, Atlanta, Mar. 2017.

10. "Extreme mechanics of twisted filaments," Mechanics Seminar, Northeastern University, Feb. 2017.
11. "Patterns in Sand," Amherst College Physics Colloquium, Oct. 2016.
12. "Sediment transport and channelization in rivers and fractures," Granular Materials Workshop, Amherst, June 2016.
13. International workshop: Two-Phase Continuum Models for Geophysical Particle-Fluid Flows, Max Planck Institute for the Physics of Complex Systems (MPIPKS) Dresden, Mar. 2016. *Declined.*
14. "Onset of erosion and sediment transport by a fluid flow over a granular bed," Annual American Physical Society Meeting, Baltimore, Mar. 2016.
15. "Experiments on ribbons with a twist," Workshop on Geometry, elasticity, fluctuations, and order in 2D soft matter, KITP, Santa Barbara, Feb. 2016.
16. "Granular erosion and transport by a fluid flow," Levich Institute Seminar, City University of New York, Oct. 2015.
17. "Granular erosion and transport by a fluid flow," Mechanical Engineering Department Seminar, Tufts University, Oct. 2015.
18. "Self-assembly with soft matter," Physics colloquium, College of Holy Cross, Dec. 2014.
19. "Order and disorder assembly of granular matter," Department of Mechanical Engineering and Materials Science Seminar, Yale University, Nov. 2014.
20. "Aggregation, packing, and response of soft matter," Condensed Matter Seminar, Boston University, Nov. 2014.
21. "Active Granular Matter," Université Joseph Fourier Grenoble, France, June 2014.
22. "Active Granular Matter," Physics colloquium, Universität des Saarlandes, Germany, June 2014.
23. "Active Granular Matter," ENS-Lyon Physics Seminar, Lyon, June 2014.
24. "Active Granular Matter," Matière et Systèmes Complexes Séminaire, Paris, May 2014.
25. "Wet granular flows and structures," 2014 Frontiers in Particle Science and Technology Conference, Chicago, April 2014.
26. "Experiments on swimming and collective behavior in self-propelled particles," Physical Mathematics Seminar, MIT, Cambridge, April 2014.
27. "Moving in viscoelastic medium," Winter conference on Active Fluids: Bridging Complex Fluids and Biofluids, Aspen, Jan. 2014.
28. "Active Granular Matter," Conference on Active Matter: Cytoskeleton, Cells, Tissues and Flocks, KITP, Santa Barbara, Jan. 2014.
29. "Erosion of a granular bed by fluid flow," Conference on geophysical flows, KITP, Santa Barbara, Dec. 2013.

30. "Self-organization in granular rods and self-propelled particles," On pattern creation in nature and materials, Bayreuth, Oct. 2013.
31. "Pearling and arching instabilities in granular suspensions," 56th New England Complex Fluids Workshop, Worcester, Sept. 2013.
32. "Experiments on swimming and collective behavior in self-propelled particles, Conference on Self-organization and Emergent Dynamics in Active Soft Matter, Kyoto, Feb. 2013.
33. "Self-assembled towers, arches, and ordered particle structures," Applied Mechanics Seminar, Harvard University, Nov. 2012.
34. "Designing jammed granular towers, arches and crystal structures one drop at a time," Frontiers in Pure & Applied Jamming, Chicago, Oct. 2012.
35. "Designing Jammed Granular Towers, Arches, and Crystal Structures One Drop at a Time," New Mech. Conference Brown University, Providence, Oct. 2012.
36. "Experiments on swimming and collective behavior in self-propelled particles," Self-organization and Emergent Dynamics in Active Soft Matter, Kyoto 2013.
37. "Packing of spherical and cylindrical solids far from equilibrium," Condensed Matter Seminar, UMass Amherst, November 2011.
38. "Packing of Spherical and Platonic solids," MIT, Cambridge, October 2011.
39. "Speed of a Taylor Swimmer in Newtonian and Viscoelastic Fluids," Applied Math Seminar, NYU Feb. 2012.
40. "Speed of a Taylor Swimmer in Newtonian and Non-Newtonian Fluids," Mechanics: Modeling, Experimentation, Computation Seminar, MIT, Cambridge April 2012.
41. "Collective diffusion of self-propelled rods," Seminar, Harvard University, Nov. 2010.
42. "Swimming velocity of a Taylor sheet in a viscoelastic fluid," Dynamics of elastic biostructures workshop at Tulane University, Nov. 2010 (cancelled).
43. "Introduction: Locomotion and self-propulsion," Gordon Research Conference at Colby College, Waterville, June 2010.
44. "Experimental approach to granular, granular-fluid flow, packing, and locomotion problems in two and three dimensions," DARPA Granular Materials Workshop, Arlington, Feb. 2010.
45. "Experiments on sheared granular flow with direct particle tracking," Workshop on Frontiers in Nonequilibrium Physics, Kyoto, Japan, July 2009.
46. "Experiments on sheared granular flow with direct particle tracking," 39th New England Complex Fluids Workshop, Schlumberger-Doll Research Center, Cambridge, June 2009.
47. "Swarming and Swirling: From Granular Rods to Bacterial Colonies," Workshop on Soft Active Materials, Syracuse, May 2009.
48. "Flight of a tumbling elastic wing," Applied Math Seminar, NYU, New York, May 2009

49. "Collective dynamics of rigid and deformable self-propelled particles," American Physical Society Meeting, Pittsburg, Mar. 2009.
50. "Investigation of transport properties in sheared granular matter with internal imaging," Granular Gases 2008, Schloss Thurnau, Germany, Sept. 2008.
51. "Experimental investigations of packing, folding, and crumpling in two and three dimensions," IMA workshop on Geometrical singularities and singular geometry, Minneapolis, July 2008.
52. "Challenges in Complex Matter," Physics department colloquium, Northeastern University, Mar. 2008.
53. "Velocity correlations in dense granular flows," Workshop on granular fluids, Seville, Sept. 2007.
54. "Notions in Locomotion seminar," Seminar, Aspen Institute of Physics, June 2007.
55. "Particle Shape and Dynamics of Granular Matter: Swarming to Swirling," Physics seminar, Trinity College, Apr. 2007.
56. "Particle Shape and Dynamics of Granular Matter: Swarming to Swirling," American Physical Society Meeting, Denver, Mar. 2007.
57. "Physics of Channelization: Theory, experiment, and observation," Workshop on Complex Geophysical Gravity Currents, Vancouver, Mar. 2007.
58. "Dense granular flows observed with internal imaging," Chemical Engineering seminar, IISc Bangalore, Jan 2007.
59. "Particle Shape and Dynamics of Granular Matter: Swarming to Swirling," Physics seminar, IISc Bangalore, Jan. 2007.
60. "Giant number fluctuations and cooperative phenomena in self propelled particles," Physics seminar, Brandeis University, Oct. 2006.
61. "Clustering and Dynamics of Granular Rods, Polymers and Magnets," Physics seminar, Boston University, Sept. 2006.
62. "Particle shape and dynamics of granular matter," Southern Workshop on Granular Matter, Vina del Mar, Chile, Sept. 2006.
63. "Particle shape and dynamics of granular matter," ESPCI, Paris, July 2006.
64. "Granular matter," Ecole Normale Sup'erieure, Paris, July 2006.
65. "Dynamics of anisotropic granular matter," Mechanical Engineering seminar, Yale University, Feb. 2006.
66. "Particle shape and dynamics of granular matter," Courant Institute seminar, New York University, Nov. 2005.
67. "Investigation of Dense Dry and Wet Granular Flows with Internal Imaging," Granular Matter Conference, KITP, Santa Barbara, June 2005.

68. "Self-organization in granular matter and noise driven motors," Granular Matter Seminar, KITP, Santa Barbara, April 2005.
69. "Self-organization in vibrated granular materials," NY-APS section meeting, Rochester, April 2005.
70. "Dynamics of granular materials," Physics colloquium, Georgia Tech, Dec. 2004.
71. "Anisotropic granular matter," 2nd Granular Materials Workshop, Yale University, New Haven, June 2004.
72. "Dynamics in granular materials," Physics Colloquium, Lehigh Institute, New York, May 2004.
73. "Dynamics in granular materials," Physics Colloquium, Emory University, Atlanta, April 2004.
74. "Granular Materials: Rock, Roll and Shake," Niels Bohr Seminar, Copenhagen, Mar. 2004.
75. "Self-organization in granular matter," Mechanical Engineering Seminar, WPI, Worcester, Dec. 2003.
76. "Self-Assembly in Magnetized Granular Materials," Workshop on Cooperative Grains: From Granular Matter to Nano Materials, Leiden, Netherlands, Sept. 2003.
77. "Self-Assembly in Magnetized Granular Materials," Workshop on Traffic and Granular Flow, Delft, Netherlands, Sept. 2003.
78. "Experiments on dry and wet granular materials," APCTP Winter School on Granular Material and Complex System, Phoenix Park, Korea, Feb. 2003.
79. "Granular materials: Shake, rattle and roll," Physics seminar, Korea University, Seoul, Feb. 2003.
80. "Granular materials: Shake, rattle and roll," Northeastern, Physics Colloquium, Boston, Jan. 2003.
81. "Clustering and jamming in cohesive granular materials," GLUE workshop, Argonne National Lab, Jan. 2003.
82. "Clustering, jamming and segregation in cohesive granular materials," ASME Meeting, New Orleans, Nov. 2002.
83. "Clustering, jamming and segregation in cohesive granular materials," Division of Engineering Seminar, Brown University, Providence, Oct. 2002.
84. "Clustering and segregation in dry and wet granular materials," Physics Colloquium, UMass, Lowell, Sept. 2002.
85. "Vortices, clustering and coarsening in granular materials," Workshop on the Formation of Structures in Granular Materials, Leiden, The Netherlands, Aug. 2002.
86. "Vortices in Vibrated Granular Materials," 50th Annual SIAM meeting, Philadelphia, July 2002.
87. "Cohesive Granular Matter," Gordon Research Conference, Plymouth, NH, June 2002.

88. "Vortices and clustering in anisotropic granular materials," Physics Colloquium, WPI, April 2002.
89. "Angle of Repose and segregation wet granular matter," American Physical Society Meeting, Indianapolis, Mar. 02.
90. "Vortices in vibrated granular matter, Physics Seminar," University of Maryland, College Park, Feb. 2002.
91. "Clustering and vortices in anisotropic granular materials," Nonlinear Science Seminar, Northwestern, Jan. 02.
92. "Experiments with cohesive granular matter," GBASM Workshop, Brandeis, Oct. 01.
93. "Granular matter with attraction," Physical Math Seminar, MIT, Oct. 01.
94. "Wet granular matter," Continuum Mechanics Workshop, Chicago, Aug. 01.
95. "Physics of granular and dipolar materials," Mechanical Engineering Dept Seminar, MIT, May 01.
96. "Clustering and segregation in granular matter," Mechanical Engineering Dept Seminar, NJIT, April 01.
97. "Instabilities in the flow of dry and wet granular matter," Workshop on Soft Matter as a Nonlinear System, Laguna Beach, Feb. 01.
98. "Physics of the sandbox," SPS seminar, Bridgewater State College, Dec. 00.
99. "Physics of granular flow," DEAPS seminar, MIT, Nov. 00.
100. "Clustering and segregation in the flow of granular matter," LASSP seminar, Cornell Univ., Sept. 00.
101. "Physics of the flow of granular matter," Workshop on Statistical Dynamics of Continuous Media, Aspen Center of Physics, June 00.
102. "Instabilities in the flow of granular matter," Applied Math Seminar, WPI, April 00.
103. "Flow and segregation in dry and wet granular matter," Meeting of the American Physical Society, Minneapolis, March 00.
104. "Segregation and clustering in granular matter," Physics Colloquium, Brandeis University, Feb. 00.
105. "Instabilities in the flow of granular matter," Physical Math Seminar, MIT, Nov. 99.
106. "The physics of granular matter and the convection of life," Physics colloquium, Wesleyan University, April 99.
107. "The physics of granular flow," Condensed Matter Seminar, Brown University, Feb. 99.
108. "Physics of granular flow," Physics colloquium, University of Rhode Island, Sept. 98.
109. "Scarred patterns in surface waves," Seminar, Harvard University, June 98.

110. "Flow in granular matter: Clusters and precursors," Continuum Seminar Series, MIT, April 98.
111. "Physics of granular materials," Seminar, Northeastern University, Boston, Oct. 97.
112. "Physics of granular flow," University of Massachusetts, Amherst, Sept. 97.
113. "Scarred patterns in surface waves," Institute seminar, NEC Research Institute, Princeton, Aug. 97.
114. "Cluster formation in driven granular material," American Physical Society Meeting, Kansas City, Mar. 97.
115. "Physics of granular materials and surface waves," Clark University, Worcester, Feb. 97.
116. "Eigenvalues and Eigenfunctions of Microwave Cavities," Seminar, Bell Labs, Nov. 96.
117. "Chaos and disorder in quantum billiards: Microwave experiments," Condensed matter seminar, Rutgers University, Piscataway, Apr. 95.
118. "Chaos and disorder in quantum billiards: Microwave experiments," Institute seminar, Niels Bohr Institute, Copenhagen, Apr. 95.
119. "Experiments on quantum chaos using microwave techniques," Quantum Chaos seminar, Harvard University, Cambridge, Dec. 94.

Research Advisees

Graduate: Toni Neicu, Ph.D. (Radiation Oncologist, Henry Ford Hospital, Detroit), Azadeh Samadani, Ph.D. (Faculty, Pingry School), Daniel Blair, Ph.D. (Associate Professor of Physics, Georgetown University), Saloome Siavoshi, M.S. (Graduate Student, Northeastern), Qing Xu, M.S. (Graduate Student, Georgia State University), Kevin Safford (VP, Umbel), Andrea Panaitescu, Ph.D. (Clark U.), Vikrant Yadav, Ph.D. (Postdoctoral researcher, Yale), Moumita Das, Ph.D. (Teaching Fellow, Amherst College), Casey Trimble (Mt. Holyoke), Benjamin Allen (current), Rausan Jewel (current)

Undergraduate: Apurba Pradhan, Taimur Ellahi, Ryan O'Donnell, Eric Frederick, Ian Nagle, Sarah Shugars, Micah Veilleux, Ryan Molloy, Mike Robitaille, Jessica Baker, Joshua Meyer, Darija Cosic, Fouad Abdulammer, Pascal Jundt, Cristina Ferretti, Xinyi Shen, David Scheff, Nuzhat Tani, M. Kasule, Nathan Fitzpatrick, Nikolai Ionkin, Greg Jones (current), Samuel Hong (current), Ram Sharma (current), Nadia Fakhrol Azmi (current), Trinh Huynh (current)

Post-doc/Visiting Scholar: Kristian Schaatt (NBI, Denmark), Olivier Brodier (ENS, France), Bill Jensen (UMass, Boston), Stephane Dorbolo (Liège), Geoffroy Lumay (Liège), Thomas Garnier (ENS-Lyons), Ashish Orpe (National Chemical Laboratory, Pune, India), Michael Berhanu (Univ of Paris), Anki Reddy (IIT-Guwahati), Marie-Julie Dalbe (Ecole Normale Superier-Lyon), Jean-Yonnel Chaistai (Ecole Normale Superier-Lyon), Julien Chopin (UABA, Brazil), Anyu Hong (NAF, China), Xavier Clotet (AIA, Spain), Aude Belguise (ESPCI, France), Andreea Panaitescu (current)

Teaching

Courses: Introductory Physics Calculus and Non-Calculus versions, Activity Based Introductory Physics (new course), Oscillations, Waves and Optics, Quantum Physics and Laboratory, Electrodynamics, Continuum Mechanics and Applications to Swimming and Flying, Fluid dynamics and applications (new course), Statistical and Thermal Physics

Professional Service

Organizer, Focus Session and Symposium on Flow driven pattern formation in wet granular medium sponsored by GSNP, GSOF, DFD, American Physical Society Meeting, March (2019).

American Physical Society, GSNP Membership Committee, 1/18-present

American Physical Society, GSNP Member-at-Large, 1/17-present

Editorial Board, Physical Review E, American Physical Society (2014-present)

Editorial Board, Scientific Reports, Nature Publishing Group (2012-present)

American Physical Society, GSNP Dissertation Award Selection Committee, (2018)

American Physical Society, Fellowship Committee of the GSNP, (2016).

Chair, SSI Committee, Clark University Committee on Personnel, 8/2016-7/2017

Academic Affairs Committee, Clark University Committee on Personnel, 8/2016-7/2017

Clark University Committee on Personnel, 9/2014-7/2017

co-Organizer, 13th Northeast Granular Materials Workshop, Clark University, June (2015).

APS Soft Matter Working Group (2013)

Clark Active Matter Group (01/10-08/13)

Worcester Nanotechnology Symposium Advisory Board (2011-2013)

Clark University Committee on Personnel, 9/2007-6/2010

Clark University Research Board, 10/2002-8/2011

Clark University Provost Search Committee, 2010

Science Working Group 11/2001 - 6/2007

Undergraduate physics advisor, 9/2001-6/2010

Information Technology Committee, 9/1998-8/2000, 9/2001-8/2002, 9/2003-0/2004.

Secretary-Treasurer, Topical Group on Statistical and Nonlinear Physics of the American Physical Society, 3/2007-3/2010.

co-Organizer, Gallery of nonlinear images, Chaos, 2007-2010.

co-Organizer: 27th New England Complex Fluids Workshop, Annual Northeast Granular Materials Workshop

co-Organizer: Symposia on Locomotion in Complex Fluids, 2008 March American Physical Meeting, New Orleans

Referee

Journals: Physical Review Letters, Physical Review, Science, Nature, Nature Physics, Nature Materials, Proceedings of the National Academy of Science, Journal of Fluid Mechanics, Physics of Fluids, American Journal of Physics, Physica A, Chemical Engineering Sciences, Granular Matter, Powders and Grains 2005, Powder Technology, Geophysical Research Letters

Funding Agencies: National Science Foundation, ACS/Petroleum Research Fund, Department of Energy, National Aeronautics and Space Administration, Research Corporation, Netherlands Foundation for Fundamental Research on Matter, Chile Science Foundation, Israel Science Foundation, INDO-US Science and Technology Forum

Panelist: National Science Foundation, National Aeronautics and Space Administration