



## Richard Superfine

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Department of Physics and Astronomy  
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### Research Interests:

Integrated research on lung defense. Study of nanotubes, molecules, macromolecular assemblies, and polymers at surfaces. Properties of viruses, fibrin fibers and viscoelasticity of biofluids. Interfacial dynamics, friction and nanometer scale devices. Development of biophysical techniques: user interfaces, force measurement, scanning probe and optical microscopies.

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### Education:

B.S. Physics, Lehigh University, Bethlehem PA, 1982  
Ph.D. Physics, University of California, Berkeley CA, 1991

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### Professional Experience:

Bowman and Gordon Gray Professor, 2004-present  
Started first biological physics course at senior and freshman levels. Workshop at BMES national meetings, first Forces in Biology Workshop in U.S. started at UNC-CH.

Director, NIH Center for Computer Int. Systems for Microscopy and Manipulation, 2002-present  
Lead the invention, development, application of force technologies, advanced user interfaces and visualization. Secure and manage \$2.5 million yearly research budget amongst 18 principal investigators. Started and lead the Virtual Lung Project, a group of 20 senior investigators from across Arts & Sciences, Health Sciences and UNC Cystic Fibrosis Center developing the first integrated computational model of lung defense. Secured Bioengineering Research Partnership grant.

Director, W. M. Keck Foundation Atomic Imaging Laboratory 2001-2005  
Secured funding from W. M. Keck Foundation: first atomic resolution TEM at UNC-CH.

Associate Professor of Physics, UNC-Chapel Hill, 1999-2004  
Assistant Professor of Physics, UNC-Chapel Hill, 1992-99  
Lawrence Berkeley Laboratory Postdoctoral Fellow, 1991-1992  
Senior Technical Associate, AT&T Bell Laboratories, 1982-1985

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### Professional Honors, Affiliations and Activities:

Bowman and Gordon Gray Award – University of North Carolina 2004  
R&D 100 Award for nanoManipulator System 2001  
White House/Smithsonian Millenium Celebration Panelist 2000  
Johnson Teaching Award For Excellence in Undergraduate Education (UNC) 2000

Hettleman Prize For Research Excellence (UNC) 1998  
Macres Award from the Microbeam Analysis Society-1995  
Junior Faculty Development Award -University of North Carolina, 1992  
Plenary Speaker - STM'97 International Conference (Hamburg)  
Member: Biophysical Society; American Physical Society; Biomedical Engineering Society  
Referee: Nature, Science, Nanoletters, Phys.Rev., Phys. Rev. Lett., Rev. Sci. Instr.  
Review Panelist: NIH continuing, NSF continuing, NIH Study Section Biomedical Engineering 2004-2006, Naval Research Labs Review Panel 2000, NSF STC Site Review Panel 1999; DOD Review Panel on Molecular Electronics 1998; NSF Nanotechnology Review Panel 1998; NIST National Advanced Manufacturing Testbed Review Panel 1996; National Science Foundation: DNA Computation Workshop Panelist 1996; DOE Review Panel: Materials Research-1992  
Conference Session Organizer: National Conference of the Cystic Fibrosis Foundation Symposium 2007, Gordon Research Conference symposium 2007, Carolina Biophysical Symposium 2008, 2006, 2004, 2002. American Vacuum Society 2001, Southeastern Section of the American Physical Society 2006, 2001, 1999.

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## Publication list:

Note: Impact Factors (2007) – Nature (28.7), Science (26.3), Nature Nanotech (14.9), Proc. Nat Acad. Sci. (9.6), Nanolett. (9.6), Phys. Rev. Lett. (6.9), J. Thromb. Haemost. (5.6), Biophys. J. (4.6), Appl. Phys. Lett (3.6)

88. Evans, B., B.L. Carstens, A.R. Shields, R. Superfine, *Preparation and Characterization of a Novel Complexed Ferroelastomer*, Advanced Materials 2009 (in review).
87. Meehan, T., J. Cribb, K. Skinner, R. Superfine, Cylinder vs Spheres: *Biofluid Shear Thinning in Nanoparticle Transport*, Annals Biomed. Engineering 2009 (in review).
86. Darling, E.M., E.P. Poston, B.A. Evans, R. Superfine, and F. Guilak, *Mechanical properties and gene expression of chondrocytes on micropatterned substrates following monolayer expansion*, Journal Cellular and Molecular Bioengineering, 2009 (in press).
85. Hill, D., V.S. Swaminathan, I. O'Brien, E. T., A. Estes, J. Cribb, C.W. Davis, and R. Superfine, *Force Generation and Dynamics of Individual Cilia under External Loading*, Biophysical Journal, 2009 (in press).
84. Fisher, J.K., M. Ballenger, E.T. O'Brien, J. Haase, R. Superfine, and K. Bloom, DNA relaxation dynamics as a probe for the intracellular environment. Proceedings of the National Academy of Sciences of the United States of America, 106(23): p. 9250-9255. 2009.
83. Mair, L., K. Ford, and R. Superfine, *Size Uniform 200nm Particles: Fabrication and Application to Magnetofection*. Journal of Biomedical Nanotechnology, 5(2): 182-191, 2009.
82. Lindley, B.; Howell, E. L.; Smith, B. D.; Rubinstein, G. J.; Forest, M. G.; Mitran, S. M.; Hill, D. B.; Superfine, R. *Stress communication and filtering of viscoelastic layers in oscillatory shear*. Journal of Non-Newtonian Fluid Mechanics 156(1-2):112-120; 2009.

81. O'Brien, E.T., J. Cribb, D. Marshburn, I. Taylor, R.M., and R. Superfine, *Magnetic Manipulation for Force Measurements in Cell Biology*. Biophysical Tools for Biologists, Vol 2: In Vivo Techniques; 433- .2008:
80. Spero, R.C., L. Vicci, J. Cribb, D. Bober, V.S. Swaminathan, E.T. O'Brien, S.L. Rogers, and R. Superfine, *High Throughput System for Magnetic Manipulation of Cells, Polymers and Biomaterials*. Rev. Sci. Instruments, 79(8); 083707, 2008.
79. Hall, A. R.; Falvo, M. R.; Superfine, R.; Washburn, S. *A Self-Sensing Nanomechanical Resonator Built on a Single-Walled Carbon Nanotube*. Nano Lett. 8(11):3746-3749; 2008.
78. O'Brien, I., E. T., M. Falvo, D. Millard, B. Eastwood, I. Taylor, R.M., and R. Superfine, *Ultra-Thin Self-Assembled Fibrin Sheets*. Proceedings of the National Academy of Sciences of the United States of America, 105(49):19438-19443; 2008.
77. Falvo, M. R.; Millard, D.; O'Brien, E. T.; Superfine, R.; Lord, S. T. *Length of tandem repeats in fibrin's alpha C region correlates with fiber extensibility*. Journal of Thrombosis and Haemostasis 6(11):1991-1993; 2008.
76. Desai, K., Bishop, G., Vicci, L., O'Brien, E. T., Taylor II, R. M. & Superfine, R. "Agnostic Particle Tracking for Three-Dimensional Motion of Cellular Granules and Membrane-Tethered Bead Dynamics." (2008) *Biophysical Journal* **94(6)**, 2374-2384.
75. M. Guthold, Liu, E. A. Sparks, L. M. Jawerth, L. Peng, M. Falvo, R. Superfine, R. R. Hantgan, S. T. Lord, "A comparison of the mechanical and structural properties of fibrin fibers with other protein fibers", *Cell Biochemistry and Biophysics*, 49(3): p. 165-181 (2007)
74. Elizabeth Bouzarth, Adam Brooks, Roberto Camassa, et al., "Epicyclic orbits in a viscous fluid about a precessing rod: Theory and experiments at the micro- and macro-scales" *Phys. Rev. E* , 76(1): p. 016313 (2007).
73. A. R. Hall, M. R. Falvo, R. Superfine, and S. Washburn, "Electromechanical Response of Single-Wall Carbon Nanotubes to Torsional Strain in a Self-Contained Device", *Nature Nanotechnology*, 2(7): p. 413-416 (2007)
72. Evans, B.A., Shields, A.R., Carroll, R.L., Washburn, S., Falvo, M.R., and Superfine, R. "Magnetically Actuated Nanorod Arrays as Biomimetic Cilia" *Nano Letters*, 2007, 10.1021/nl070190c
71. Sul OJ, Falvo MR, Taylor RM, Washburn S, Superfine R. *Thermally actuated untethered impact-driven locomotive microdevices*. *Applied Physics Letters* 89(20). (2006).
70. Fisher, J., J. Cribb, K. V. Desai, L. Vicci, B. Wilde, K. Keller, R. M. Taylor II, J. Haase, K. Bloom, E. T. O'Brien and R. Superfine "Thin-Foil Magnetic Force System for High-Numerical-Aperture Microscopy." *Review of Scientific Instruments* 77(2): 23702. (2006).
69. Hall AR, An L, Liu J, Vicci L, Falvo MR, Superfine R, Washburn S. 2006. *Experimental measurement of single-wall carbon nanotube torsional properties*. *Physical Review Letters* 96(25).
68. Fisher, J. K., L. Vicci, K. Bloom, E. T. O'Brien, C. W. Davis, R. M. Taylor II and R. Superfine *Magnetic Manipulation for the Biomedical Sciences*. In: *Handbook of Nanoscale Science, Engineering, and Technology*, Second Edition. T. a. Francis. (2006).
67. Fisher, J. K., L. Vicci, J. Cribb, E. T. O'Brien, R. M. Taylor II and R. Superfine "Magnetic Force Micromanipulation Systems for the Biological Sciences." *NANO*, invited review. (2006).

66. Schoner, J., M. Lin, R. Superfine, M. R. Falvo, R. M. Taylor II and S. T. Lord (March 25-29, 2006) "*Interactive Simulation of Fibrin Fibers in Virtual Environments.*" IEEE VR 2006, Alexandria, VA. published in Proceedings of IEEE VR 2006: 8 pages (2006)
65. Liu, W., L. M. Jawerth, E. A. Sparks, M. R. Falvo, R. R. Hantgan, R. Superfine, S. T. Lord and M. Guthold "*Fibrin Fibers Have Extraordinary Extensibility and Elasticity.*" *Science* 313(5787): 634. (2006).
64. Matsui H, Wagner VE, Hill DB, Schwab UE, Rogers TD, Button B, Taylor RM, Superfine R, Rubinstein M, Iglewski BH and others. *A physical linkage between cystic fibrosis airway surface dehydration and Pseudomonas aeruginosa biofilms.* Proceedings of the National Academy of Sciences of the United States of America 103(48):18131-18136. (2006).
63. Prakash R, Superfine R, Washburn S, Falvo MR.. *Functionalization of Carbon Nanotubes with Proteins and Quantum Dots in Aqueous Buffer Solutions.* Applied Physics Letters 88(063102). (2006)
62. Fisher, J.K., J.R. Cummings, K.V. Desai, L. Vicci, B. Wilde, K. Keller, C. Weigle, G. Bishop, R.M. Taylor, C.W. Davis, R.C. Boucher, E.T. O'Brien, and R. Superfine, *Three-dimensional force microscope: A nanometric optical tracking and magnetic manipulation system for the biomedical sciences.* Review of Scientific Instruments, 2005. **76**(5).
61. *Exponential decay of local conductance in single-wall carbon nanotubes*, Stadermann, M., S.J. Papadakis, M.R. Falvo, Q. Fu, J. Liu, Y. Fridman, J.J. Boland, R. Superfine, and S. Washburn,. *Physical Review B*, 2005. **72**(24).
60. D. Marshburn, C. Weigle, B.G. Wilde, R.M. Taylor II, K.V. Desai, J.K. Fisher, J. Cribb, E.T. O'Brien, R. Superfine. *The Software Interface to the 3D-Force Microscope.* IEEE Visualization 2005, Minneapolis, MN. IEEE Computer Society. 2005.
59. Taylor II, R. M., D. Borland, F. P. Brooks Jr., M. Falvo, M. Guthold, T. Hudson, K. Jeffay, G. Jones, D. Marshburn, S. J. Papadakis, L.-C. Qin, A. Seeger, F. D. Smith, D. H. Sonnenwald, R. Superfine , S. Washburn, C. Weigle, M. C. Whitton, P. Williams, L. Vicci and W. Robinett, *Visualization and Natural Control Systems for Microscopy.* In: Visualization Handbook. C. J. a. C. Hansen, Harcourt Academic Press: 875-900 (2004).
58. *Nanoscale study of conduction through carbon nanotube networks*, M. Stadermann, S. J. Papadakis, M. R. Falvo, J. Novak, E. Snow, Q. Fu, J. Liu, Y. Fridman, J. J. Boland, R. Superfine and S. Washburn, *Physical Review B* **69**(20): 201402 (2004).
57. *Resonant Oscillators with Carbon-Nanotube Torsion Springs*, S. J. Papadakis, A. R. Hall, P. A. Williams, L. Vicci, M. R. Falvo, R. Superfine and S. Washburn, *Physical Review Letters* **93**: 146101 (2004).
56. *Analysis of the Interaction of Adeno-Associated Virus and Heparan Sulfate Using Atomic Force Microscopy*, A. Negishi, J. Chen, D. McCarty, R. J. Samulski, J. Liu and R. Superfine, *Glycobiology* **14**(11): 969-977 (2004).
55. (in press) *Hands-on Investigations with Microscopic Organisms*, M. G. Jones, T. Andre, D. Kubasko, A. Bokinski, T. Tretter, A. Negishi, R. M. Taylor II and R. Superfine, *Science Education* (2004).
54. *Remote Atomic Force Microscopy of Microscopic Organisms: Technological Innovations for Hands-On Science with Middle and High School Students*, M. G. Jones, T. Andre, D. Kubasko, A. Bokinski, T. Tretter, A. Negishi, R. M. Taylor II and R. Superfine, *Science Education* **88**(1), 55-71(2004).

53. *Visualization and Mechanical Manipulations of Individual Fibrin Fibers*, M. Guthold, W. Liu, B. Stephens, S. T. Lord, R. R. Hantgan, D. A. Erie, R. M. Taylor II and R. Superfine, *Biophys. J.* **87**(6): 4226-4236 (2004).
52. *The Design of DNA Self-Assembled Computing Circuitry*, C. Dwyer, L. Vicci, J. Poulton, D. Erie, R. Superfine, S. Washburn and R. M. Taylor II, *IEEE Trans. on VLSI* **12**: 1214-20 (2004).
51. *Simultaneous Atomic Force Microscopy Measurement of Topography and Contact Resistance of Metal Films and Carbon Nanotubes*, M. Stadermann, M., H. Grube, J. Boland, S. J. Papadakis, M. R. Falvo, R. Superfine and S. Washburn *Review of Scientific Instruments* **74**(8): 3653-3655, (2003).
50. *Visualization of individual carbon nanotubes with fluorescence microscopy using conventional fluorophores*, Prakash, R., S. Washburn, R. Superfine, R. E. Cheney and M. Falvo, *Appl. Phys. Lett.*, **83**: 1219-1221 (2003).
49. *Two-dimensional manipulation and orientation of actin-myosin systems with dielectrophoresis*, Asokan, S. B., L. Jawerth, R. L. Carroll, R. E. Cheney, S. Washburn and R. Superfine, *Nano Letters* **3**(4): 431-437 (2003).
48. *A simple and efficient method for carbon nanotube attachment to scanning probes and other substrates*, Hall, A., W. G. Matthews, Superfine, R., Washburn, S., Falvo, M. R., *Appl. Phys. Lett.*, **82**(15): 2506-2508 (2003).
47. *Fabrication of Nanometer-scale Paddle Oscillators Incorporating Individual Multiwalled Carbon Nanotubes*, Williams, P. A., A. M. Patel, S. J. Papadakis, S. Washburn, M. R. Falvo, R. Superfine, *Appl. Phys. Lett.*, **82**(5): 805-807. (2003).
46. *Torsional response and stiffening of individual multi-walled carbon nanotubes*, Williams, P. A., Papadakis, S. J., Patel, A. M., Falvo, M. R., Washburn, S., and Superfine, R., *Phys. Rev. Lett.*, **89**(25): art. no.-255502 (2002).
45. *DNA-functionalized single-walled carbon nanotubes* Dwyer, C., Guthold, M., Falvo, M., Washburn, S., Superfine, R., and Erie, D. *Nanotechnology* **13**, 601-604 (2002).
44. *Nanomanipulation: Buckling, Transport and Rolling at the Nanoscale*, Falvo, et al.. *CRC Handbook of Nanoscience, Engineering, and Technology*. S. Lyshevski, D. Brenner, J. Iafrate and W. Goddard. Eds., Boca Raton, CRC Press LLC. (2002) *in press*.
43. *Controlled placement of an individual carbon nanotube onto a microelectromechanical structure*, Williams, P. A., A. M. Patel, S. J. Papadakis, A. Seeger, R. M. Taylor II, A. Helser, M. Sinclair, M. R. Falvo, S. Washburn and R. Superfine, *Appl. Phys. Lett.* **80**(14): 2574-2576.(2002).
42. *Hands-on tools for nanotechnology*, Seeger, A., S. Paulson, M. Falvo, A. Helser, R. M. Taylor II, R. Superfine and S. Washburn, *J. Vac. Sci. Tech. B* **19**: 2717-2722(2001).
41. *The rules are changing: Force measurements on single molecules and how they relate to bulk reaction kinetics and energies*, Guthold, M., Superfine, R., Taylor, R. *Biomedical Microdevices*, **3** (1), 9-18 2001
40. *A model for a spreading and melting droplet on a heated substrate*, D.M. Anderson, M.G. Forest and R. Superfine, *SIAM J. Appl. Math.* **61**, 1502-1525 (2001)
39. *Tunable resistance of a carbon nanotube-graphite interface*, S. Paulson, M. Falvo, M. Buongiorno Nardelli, R.M. Taylor II, A. Helser, R. Superfine, S. Washburn' *Science* **290**: 1742-1744 (2000).

38. *Lattice Interactions in carbon nanotubes*, Falvo, M., R. Superfine, Tribology Lett 9, 73-76 (2000)
37. *Nanomanipulation for Physical Properties*, Falvo, M. and R. Superfine, J. Nanoparticle Research (invited review) 2, 237-248 (2000).
36. *Gearlike rolling motion mediated by commensurate contact: Carbon nanotubes on HOPG*, Falvo, M. R., J. Steele, R. M. Taylor II and R. Superfine, Phys. Rev. B **62**(16): R10,665-10667. (2000)
35. *Rolling nanotubes: Atomic lattices as gears*, Superfine, R., International Winterschool on Electronic Properties of Novel Materials, Kirchberg, Austria, March 8, American Institute of Physics (in press) (2000)
34. *Touching Viruses In A Networked Microscopy Outreach Project*, Superfine, R., M. G. Jones and R. M. Taylor II, Conference on K-12 Outreach from University Science Departments, Raleigh, NC, February 10-12, The Science House (Raleigh): 151-154 (2000)
33. *Touching on the nanometer scale: slip, roll and tear*, Superfine, R., M. Falvo, J. Steele, G. Matthews, M. Guthold, D. Erie, A. Helsner, M. G. Jones, R. M. Taylor II and S. Washburn, International Union of Microbeam Analysis Societies, Kailua-Kona, Hawaii, June 8-13, 2000, Institute of Physics. **165**: 369-370 (2000)
32. *Controlled Manipulation of Molecular Samples with the nanoManipulator*, Guthold, M., Falvo, M. R., Matthews, W. G., Paulson, S., Washburn, S., Erie, D., Superfine, R., Brooks, F. P. & Taylor, R. M.. IEEE/ASME Transactions on Mechatronics. 5, 189-198 (2000)
31. *A Multidimensional Evaluation of the nanoManipulator, a Scientific Collaboration System*, Sonnenwald, D. H., E. Kupstas-Soo and R. Superfine, SIGGROUP Bulletin **20**(2): 46-50. (1999)
30. *Quantitative manipulation of DNA and viruses with the nanoManipulator Scanning Force Microscope*. Matthews, G., Guthold, M., Negishi, A., Taylor, R. M., Erie, D., Jr., F. P. B. & Superfine, R., Surf. Interface Anal. 27: 437-43. (1999).
29. *Investigation and Modification of Molecular Structures Using the NanoManipulator*, Guthold, M., M. Falvo, W. G. Matthews, S. Paulson, J. Mullin, S. Lord, D. Erie, S. Washburn, R. Superfine, F. P. Brooks and R. M. Taylor, J Mol. Graph. Model. 17: 187-197. (1999)
28. *In situ resistance measurements of strained carbon nanotubes*, S. Paulson, M.R. Falvo, N. Snider, A. Helsner, T. Hudson, A. Seeger, R.M. Taylor II, R. Superfine and S. Washburn, Appl. Phys. Lett. 75(19) 2936-2938 (1999).
27. *Nanometre-scale rolling and sliding of carbon nanotubes*, M.R. Falvo, G. J. Clary, A. Helsner, R. M. Taylor, V. Chi, F. P. Brooks Jr., S. Washburn and R. Superfine, Nature, v397, n6716, pp236-238 (1999).
26. *Advanced Interfaces to Scanning Probe Microscopes*, R. M. Taylor II and R. Superfine, Handbook of Nanostructured Materials and Nanotechnology, H. S. Nalwa, Ed., Volume 2 (Spectroscopy and Techniques), Ch.5 pp.271-308 (Academic Press, New York, 1999)
25. *Virtual Viruses*, Jones, M.G., Superfine, R., Taylor, R. , Science Teacher.66 (7), 48-50 (1999).
24. *Nanomanipulation experiments exploring frictional and mechanical properties of carbon nanotubes*, M. R. Falvo, G. Clary, A. Helsner, S. Paulson, R. M. Taylor II, V. Chi, F. P. Brooks Jr, S. Washburn, R. Superfine (invited) *Microscopy and Microanalysis*, **4**, 504-512. (1998)

23. *Photothermal modulation for oscillating mode atomic force microscopy in solution* , G. Ratcliff, D. Erie, R. Superfine, Appl. Phys. Lett., 72, 1911-1913 (1998).
22. *Bending and buckling of carbon nanotubes under large strain*, Falvo, M.R., G.J. Clary, R.M. Taylor II, V. Chi, F.P. Brooks Jr., S. Washburn and R. Superfine, Nature, Vol 389, No 6651, 9 October, pp. 582-584 (cover story). (1997)
21. *Pearls Found on the way to the Ideal Interface for Scanned-probe Microscopes*, Taylor, Russell M., Jun Chen, Shoji Okimoto, Noel Llopis-Artime, Vernon L. Chi, Frederick P. Brooks, Jr., Mike Falvo, Scott Paulson, Pichet Thiansathaporn, David Glick, Sean Washburn and Richard Superfine, Proceedings of IEEE Visualization '97, Phoenix, AZ, October 19-24, 467-470.1997
20. *Manipulation of Nanometer Objects: Friction, Mechanical Properties and Devices*, Richard Superfine, Michael R. Falvo, Scott Paulson, Sean Washburn, Russell M. Taylor II, G. J. Clary, Vernon Chi, Frederick P. Brooks, Jr., Proceedings of the International Conference on Novel Materials, Puri, India (March 3-7, 1997).
19. *Sticking to the Point: A Friction and Adhesion Model for Simulated Surfaces*, Chen, Jun, Chris DiMattia, Mike Falvo, Pichet Thiansathaporn, Richard Superfine and Russell M. Taylor II, Proceedings of the Sixth Annual Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems, Dallas, Texas. November 17-18, 1997. pp. 167-171.
18. *In-Situ Imaging of Polymer Melt Spreading with a High Temperature Atomic Force Microscope*, D. Glick, P. Thiansathaporn, R. Superfine Appl. Phys. Lett., (71) 3513-3515, 1997.
17. *Manipulation of Individual Viruses:Friction and Mechanical Properties*, M. Falvo, S. Washburn, R. Superfine, M. Finch, F. P. Brooks, Jr., V. Chi, and R. M. Taylor, II, *Biophysical Journal*, (72) 1396-1403, 1997.
16. *The Nanomanipulator: A Teleoperator for Manipulating Materials at the Nanometer Scale*, M. Falvo, R. Superfine, S. Washburn, M. Finch, R. M. Taylor, V. L. Chi, F. P. Brooks Jr., Proceedings of the 5th International Symposium on the Science and Technology of Atomically Engineered Materials, (Richmond VA, Oct. 30- Nov. 5, 1995) World Scientific, New York, . pp. 579-586. (1996)
15. *Monolayers in Three Dimensions: NMR, SAXS, Thermal, and Electron Hopping Studies of Alkanethiol Stabilized Gold Clusters*, R.H. Terrill, T.A. Postlethwaite, C.-H. Chen, C.-D. Poon, A. Tarzis, A. Chen, J.E. Hutchison, M.R. Clark, G. Wignall, J.D. Londono, R. Superfine, M. Falvo, C.S. Johnson,Jr., E.T. Samulski, and R.W. Murray, *J. Am. Chem. Soc.* 117, 12537-12548 (1995)
14. *Homodyne Surface Second Harmonic Generation*, P. Thiansathaporn and R. Superfine, Optics Lett. **20**, 545-547(1995).
13. *Surface Modification Tools in a Virtual Environment Interface to a Scanning Probe Microscope*," Finch, Mark, Vernon Chi, Russell M. Taylor II, Mike Falvo, Sean Washburn, and Richard Superfine. Proceedings of the ACM Symposium on Interactive 3D Graphics (Monterey, CA, April 9-12, 1995), 13-18. special issue of Computer Graphics, ACM SIGGRAPH, New York, 1995.
12. *Hydrogen Bonding at the Pure Water Liquid/Vapor Interface* Q. Du, R. Superfine, E. Freysz, and Y. R. Shen, , Phys. Rev. Lett. **70**, 2313 (1993).

11. *Surface Vibrational Spectroscopy of Pure Liquids*, R. Superfine, J. Y. Huang, and Y. R. Shen, "", *Laser Spectroscopy X*, M. Ducloy, E. Giacobino, G. Camy, eds. (World Scientific, New Jersey, 1992)
  10. *Probing the Mechanisms for Surface Induced Alignment of Liquid Crystals*, Y. R. Shen, W. Chen, M. B. Feller, J. Y. Huang and R. Superfine, *Mol. Cryst. Liq. Cryst.*, **207**, 77 (1991)
  9. *Nonlinear Optical Studies of the Pure Liquid/Vapor Interface: Vibrational Spectra and Polar Ordering*, R. Superfine, J. Y. Huang and Y. R. Shen, *Phys. Rev. Lett.* **66**, 1066 (1991)
  8. *Experimental Determination of the Sign of the Molecular Dipole Moment Derivative: An Infrared Visible Sum Frequency Generation Absolute Phase Measurement Study*, R. Superfine, J. Y. Huang and Y. R. Shen, *Chem. Phys. Lett.* **172**, 303 (1990)
  7. *Phase Measurement for Surface Infrared Visible Sum Frequency Generation*, R. Superfine, J. Y. Huang and Y. R. Shen, *Opt. Lett.* **15**, 1276 (1990)
  6. *A nonlinear spectroscopic study of coadsorbed liquid crystal and surfactant monolayers: Conformation and interaction*, J. Y. Huang, R. Superfine and Y. R. Shen, *Phys. Rev. B*, **42**, 3660 (1990)
  5. *Molecular Conformation and Ordering in a Monolayer Determined by Simultaneous Surface Infrared-Visible Sum Frequency and Second Harmonic Generation*, R. Superfine, J. Y. Huang and Y. R. Shen, *Laser Spectroscopy IX*, edited by M. Feld, J. Thomas and A. Mooradian, p.212-215 (Academic Press, San Diego, 1989)
  4. *Surface Vibrational Spectroscopy of Molecular Adsorbates on Metals and Semiconductors by Infrared-Visible Sum-Frequency Generation*, R. Superfine, P. Guyot-Sionnest, J. H. Hunt, C. T. Kao, and Y. R. Shen, *Surf. Sci.* **200**, L445 (1988).
  3. *Vibrational Spectroscopy of a Silane Monolayer at Air/Solid and Liquid/Solid Interfaces Using Sum-Frequency Generation*, P. Guyot-Sionnest, R. Superfine, J. H. Hunt and Y. R. Shen, *Chem. Phys. Lett.* **144**, 1 (1988)
  2. *A Study of Diacetylene Monomer and Polymer Monolayers Using Second and Third Harmonic Generation*, G. Berkovic, R. Superfine, P. Guyot-Sionnest, and Y. R. Shen, *J. Opt. Soc. Am. B*, **5**, 662 (1988)
  1. *Observation of the Triplet Excited State of a Conjugated-Polymer Crystal*, L. Robins, Joseph Orenstein, and R. Superfine, *Phys. Rev. Lett.* **56**, 1850 (1986)
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## Patents

1. *Techniques for Modulation of AFM cantilevers*, Erie, D., G. Ratcliff and R. Superfine. United States. (2001) *U.S. Patent No. 6,330,824 B1*.
2. *Methods and systems for controlling motion of and tracking a mechanically unattached probe*, Vicci, L., R. Superfine, United States Patent 7,119,645, October 10, 2006.
3. *Methods and systems for controlling motion of and tracking a mechanically unattached probe*, Vicci, L., R. Superfine, United States Patent 7,189,969, March 13, 2007.
4. *Methods and systems for controlling motion of and tracking a mechanically unattached probe*, Vicci, L., R. Superfine, United States Patent 7,191,092, March 13, 2007.
5. *Methods and systems for controlling motion of and tracking a mechanically unattached probe*, Vicci, L., R. Superfine, United States Patent 7,305,319, December 4, 2007.
6. *Agnostic Tracking*, Desai, K, Vicci, L. R., Superfine, R., Bishop, G., Taylor II, R. M. U. S. Provisional Patent 60/901,943 (February 16, 2007)
7. *Methods and Systems for Multi-Force High Throughput Screening*, R. Superfine, L. Vicci, PCT International Application PCT/US2008/002331 (February 22, 2008)

## Grants History: Richard Superfine

(**Bold number** = active, *Italics* = Principal Investigator)

Principal Investigator of \$15.5 million dollars of research grants cumulative.

	Sponsor (Role)	Title	Year	Award Total
<b>30.</b>	<i>NSF DMR-0817489 (P.I.)</i>	<i>The Multiscope</i>	09/08-09/10	\$440,000
<b>29.</b>	NSF DMR-0705977 (Co. P.I.)	<i>Strong, Elastic and Novel Biomaterials</i>	06/07-05/10	\$360,000
<b>28.</b>	<i>NIH NHLBI R01-HL077546-01A2 (P. I.)</i>	<i>The Virtual Lung Project: Integrated Modeling of Epithelial Fluid Flows</i>	08/01/06 07/31/11	\$3,500,000
27.	NHI National Cancer Institute U54-CA119343 (Sen. Inv.)	<i>Carolina Center of Cancer Nanotechnology Excellence</i>	10/01/05 12/31/08	\$300,000 (RS part)
<b>26.</b>	NSF DMS-0502266 (Co-P. I.)	<i>EMSW21-RTG: Laboratory and Mathematical Fluid Dynamics: Experiments, Computation, and Modeling</i>	2005-2010	\$1,726,947 (RS part ~ \$250k)
<b>25.</b>	NSF MCB-0451240 (Co-P. I.)	<i>Biomechanics of Chromosome Structure and Dynamics in Living Cells</i>	2005-2008	\$411,227
<b>24.</b>	<i>NSF CMS-0507151 (P. I.)</i>	<i>NIRT: Bio-inspired actuating Structures</i>	2005-2009	\$1,099,330
<b>23.</b>	<i>NIH/NIBIB 5 P41-EB002025 (P. I.)</i>	<i>Computer Integrated Systems for Microscopy&amp;Manipulation</i>	2005-2009	\$4,575,005
22.	NASA/Princeton Univ. (co-P. I.)	<i>Bioinspire Design and Process of Multifunction Nanocomposites</i>	2003-2007	\$3,385,499
21.	NIH/NIBIB (P. I.) 1R01EB000761-01	<i>3D Force Microscope for Microrheology and Active Transport</i>	2002-2007	\$2,602,000
20.	W. M. Keck Foundation (Director)	<i>Atomic Imaging Manipulation Laboratory</i>	2001-2005	\$1,000,000
19.	NIH/NIBIB (Senior Inv.)	<i>Interactive Graphics for Molecular Studies and Microscopy</i>	6/2001-12/2004	\$3,200,000
18.	NSF ECS-0100629 (P. I.)	<i>The Development of Nanoelectromechanical Structures for GHz Oscillators and Other High Frequency Devices</i>	9/2001 – 9/2005	\$270,000
17.	NSF ECS Division (P. I.)	<i>Biomolecular motor/Nanotube integration for actuator nanotechnology</i>	9/2000 – 9/2004	\$1,100,000
16.	NSF ROLE 0017 (Co-P. I.)	<i>Investigating Viruses With Touch: Nanotechnology and Science Inquiry</i>	1/2001 – 12/2003	\$767,275
15.	Burroughs Wellcome Fund (P. I.)	<i>Targeted Opportunities in Nanotechnology: nanoManipulator Outreach</i>	9/2001 – 9/2005	\$25,000
14.	NSF ECS SGER 0004109 (P. I.)	<i>Carbon Nanotube Nanoelectromechanical Devices</i>	9/2000 – 9/2002	\$50,000
13.	NIH/NCRR (Senior Inv.)	<i>Interactive Graphics for Molecular Studies and Microscopy</i>	9/98-9/2004	\$1,284,304
12.	ONR – MURI (Co-Director)	<i>Science and Technology of Nanotube-Based Materials and Devices</i>	4/98-12/2003	\$5,579,930
11.	Army Research Office (P. I.)	<i>Acquisition and Development of a Unique SEM/AFM Analytical System: II</i>	3/99 – 3/2001	\$250,000
10.	Army Research Office	<i>Acquisition and Development of a Unique</i>	3/98 –	\$250,000

	(P. I.)	<i>SEM/AFM Analytical System: I</i>	3/2000	
9.	NSF ECS Division (P. I.)	<i>Mechanical Properties of Nanotubes: Elastic Moduli, Buckling and a Nanometer-Scale Switch</i>	1997-2001	\$419,854
8.	NSF (ACS-9527192) (Co. P. I.)	<i>Application of High Performance Graphics Supercomputers and Communication to Provide Improved Interfaces to Scanning Probe Microscopes</i>	9/95-9/2001	\$2,300,000
7.	NSF (DMR-9512431) (P. I.)	<i>Development of the Nanomanipulator: Real-Time Scanning Probe Microscope Interface for Nanometer Science</i>	9/95 - 8/97	\$230,000 (+\$100,000 Thermomicroscopes, Inc.)
6.	Hoechst Celanese, Inc. (P. I.)	<i>Adhesion of Dissimilar Materials</i>	1/97 - 12/97	\$50,100
5.	Hoechst Celanese, Inc. (P. I.)	<i>LCP Interfaces and Adhesion: AFM and Quantitative Pull-off Characterization</i>	1/97 - 12/97	\$50,690
4.	UNC-Hoechst Celanese Partnership Seed Grant (P. I.)	<i>Optical Processing for Optimized Adhesion</i>	8/96 - 7/97	\$25,000
3.	Hoechst Celanese, Inc. (P. I.)	<i>Characterization of Photoresist Films</i>	9/96 - 3/97	\$9,000
2.	UNC-CH Res. Fnd. (P. I.)	<i>Near Field Optical Microscope Head Design</i>	4/96 - 4/97	\$1,900
1.	NSF (DUE-9350914) (P. I.)	<i>Scanning Tunneling Microscope Instrumentation for Introductory Electronics and Materials Characterization Courses</i>	4/93 - 4/95	\$19,000

## Training

Graduate Students and Postdoctoral Fellows	Training Period	Current Position or Source of Support
<b>PRIOR STUDENTS</b>		
Michael R. Falvo	Physics, Ph. D. 1998	Res. Associate Prof. UNC
Pichet Thiansathaporn	Physics, Ph. D. 1998	Teleion Wireless, Inc.
David Glick	Physics, Ph. D. 1999	Amazon.com
Charles Bartlett	Physics, M.S. 1997	Engineer
W. Garrett Matthews	Physics, Ph. D. 2001	Assistant Professor, University South Florida
Jeremy Cummings	Biomedical Engineering, Ph. D. 2002	President, Cummings Engineering, Inc.
Phillip Williams	Physics, Ph. D. 2002	Postdoctoral Fellow NASA Langley
Martin Guthold	Postdoctoral Fellow 1998-2001	Assistant Professor Wake Forest Univ.
Stergios Papadakis	Postdoctoral Fellow 2000-2004	Research Associate, Applied Physics Lab, Johns Hopkins Univ.

Atsuko Negishi	Materials Science Ph. D. 2002	Research Assistant, Guelph Univ.
Michael Stadermann	Chemistry Ph. D. 2004	Lawrence Livermore left in October 2004
Lloyd Carroll	Postdoctoral Fellow 2001-2005	Assistant Professor, West Virginia University
David Hill	Postdoctoral Fellow 2003-2006	Accepted research position at UNC CF Center
Onejae Sul	Physics Ph. D. 2006	
Sreeja Asokan	Physics Ph. D. 2006	Postdoctoral Fellow, UNC
Jing Hao	Materials Science Ph. D. 2006	Assistant Professor, Japan.
Kalpit Desai	Biomedical Engineering Ph. D. 2007	Postdoctoral Fellow, UNC
Ashely Estes	Physics M. S. 2007	Engineering
Jay Fisher	Biomedical Engineering Ph. D. 2007	Postdoctoral Fellow, Harvard
Timothy Meehan	Chemistry Ph. D. 2007	Assoc. Lect./Res. Fellow University of Queensland
Ben Evans	Physics Ph. D. 2008	Assistant Professor, Elon University
<b>CURRENT STUDENTS</b>		
Jeremy Cribb	Biomedical Engineering Ph. D. candidate, 2002-	Microbead Rheology for Complex Biofluids
Adam Shields	Physics Ph. D. candidate, 2005-	Magnetic Actuating Surfaces
Richard Spero	Physics Ph. D. candidate, 2005-	High Throughput Magnetics for Complex Biofluids Rheology
Lamar Mair	Materials Science Ph. D. candidate 2006-	Magnetic Nanoparticle Transport for Drug Delivery
Kris Ford	Biomedical Engineering Ph. D. candidate 2006-	Magnetic Nanoparticle Transfection
Jerome Carpenter	Materials Science Ph, D, candidate 2006	Electrospun membranes for Cell Cultures under Cyclic Strain
Vinay Swaminithan	Materials Science Ph, D, candidate 2007-	Mechanobiology of Lung Epithelial Cells
Briana Carstens	Physics Ph. D. 2006-	Biomimetic Cilia Arrays
Nathan Hudson	Physics Ph. D. 2006-	Physics of Blood Clots

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## Undergraduate Research Training

1. Zachary Hackney (9/2008 – present) Diffusion in Tissue Mimics
2. Becky Flint (2/2009 – present) Cell Mechanics using Magnetic Probes
3. Mike Millard (6/2008 – present) Microfluidics for Mucus Clearance assay
4. Vishal Parikh (1/2009 – present) Microfluidics for Cell Cultures

5. Alan Liu (1/2009 – present) Magnetic Biomimetic Silia
6. Andy Branscomb (2/2009 – present) Microfluidic devices for Clot Biophysics
7. Stephen Norris (6/2008 – present) Microbead Rheology of Biofluids
8. Kaylah Roberson (6/2008 – present) Biomimetic Cilia for fluid flow
9. Patrick Moore (2/2009 – present) Mucus Rheological Properties
10. Rachel Sircar (6/2007 – present) “Fibrin fiber clot transport properties”, UNC
11. Matthew Cozon (9/2007-present) “Elastic Membranes for Polarized Cell Cultures”
12. Saritha Prakash (6/2007 – present) “Hydrogels for Artificial Cilia” UNC
13. Max Ballenger (8/2006 – present) “DNA force measurements”, UNC
14. David Zilber (8/2006 – 5/2007) “Templated actuating structures”, UNC
15. Anderson Cox (8/2006 – present) “Spot Labeled beads”
16. Ben Laorque (8/2006 – 2007) “Functionalized Particles”
17. Sam Davis (8/2006 – 2007) “Nanotemplated nanoMaterials”
18. Ben Smith (5/2006 – 2007) “Fibrin Gel Rheology”
19. Russell Schmitz (5/2006-8/2006) “Ferrofluids for new composites”
20. Richard Samulski (5/2006 – present) “Hydrogels as tissue mimics”
21. Frances Low, (5/2006 – 2008) “Templated Hydrogels for Artificial Cilia”
22. Philip Howard (9/2005 – 2006) “Fibrin fiber mechanics”, UNC math undergraduate
23. Michael Adams (8/2004-2006) “Artificial Microtubule Actuating Surfaces”
24. Sorell Massenbourg (9/2004-2007) “Microbead Rheology of Mucus”, UNC sophomore
25. Andres Gonzales, SMART (5/2006-8/2006) “Electrospun Tissue Scaffolds”
26. David Bober, (5/2006 – present), “Magnetic force systems for biology”
27. Angela Garner. (5/2006-7/2006)
28. Lakia Skoggins\*, SPGRE (5/2005 – 8/2005), “Nanocrystals from templates”
29. Korsica Lassiter, SMART (5/2005 – 8/2005), “Cilia and Cystic Fibrosis Disease”
30. Chernelle Hill\*, SPGRE (5/2005 – 8/2005), “Calcite Crystals”
31. Emilola Abayomi, SPGRE (5/2005 – 8/2005) “Microbead rheology”
32. Brittany Cuthbertson, SPGRE (5/2005 – 8/2005) “Biofluid Rheology”
33. Jerome Carpenter (UNC-Physics) (1/2003-present as graduate student) “Metallic Nanorods”
34. Adam Hall\* (UNC) (1/2001 – present-as grad student) “Carbon nanotube processing and patterning”
35. Jay Fisher (UNC) (5/2001 – present-as grad student) “3D force microscope”
36. Rachel Weiner (9/2005 – 2006) “Engineered Cilia Materials”, UNC Physics freshman
37. Joseph Dratz (9/2003-2004) “Nanotube materials”, UNC Physics undergraduate
38. Dan Blum (5/2004-2005) “Magnetic Characterization of Synthetic Cilia”
39. Rohit Prakash (UNC-Biomedical Eng.) (6/2002-present) “Fluorescent Labeling of Nanotubes”
40. Tneshia Sweat (UNC-Biology) (5/2002-2005) “Cell Biology applications of 3DFM”
41. Ben Wilde\* (UNC) (1/2001 – 2002) “Magnetic systems for a 3D force microscope”
42. Carl (CJ) Bailey (5/2004-8/2004) “Two-Particle Correlation Functions” SPGRE program
43. Gregory Richard (5/2004-8/2004) “An Algorithm for Tracking Single Fluorescent Particles” SPGRE program
44. Sara Obeid (5/2004-8/2004) “From PDMS to Velcro”, SMART program
45. Adrienne Yancey (5/2004-8/2004) “Cystic Fibrosis and Microrheology”; SMART program
46. Louise Jawerth (UNC-Physics) (5/2001 – 8/2004) “Biomotor analytical systems”

47. Aarish Patel\* (UNC-Mat. Sci.) (1/2000 – 2004) “Nanotube electromechanical devices”
48. Jasmine C. Davenport\* (NC A&T) (5/2003-8/2003) “Magnetophoretic Separation of Nanometer Objects”; SPGRE program
49. Susan Lee\* (UNC-CH) (5/2003-8/2003) “Cilia/Cystic Fibrosis Research”; SPGRE program
50. Shelli Pace\* (Southern University and A&M College) (5/2003-8/2003) “Virus Binding in Flow Channels-How is Binding Influenced by Flow Velocity”; SPGRE program
51. Deborah Sill (UNC-Physics) (1/2001 – 5/2003) “Optical design of a 3D force microscope”
52. Donald Brandl (UNC-Physics) (9/2002 – 11/2002) “ Calculations of Magnetic fields in Microfabricated Structures”
53. Laura Tolliver (UNC) (5/2001-6/2002) “Thermal CVD growth of nanotubes”
54. Roger Holliday\* (UNC) (5/2000) “Arc growth of nanotubes”
55. Darius Sanders\* (Delaware State University) (5/2000-9/2000): “The making of electronic devices using e-beam lithography”
56. Janessly Lopez-Alequin (5/2000-9/2000): “Study of the Thermal Stability of Adenovirus Using an Atomic Force Microscope”. This student was part of the SPIRE program, administered by Skip Bollenbacher in Biology.
57. Ronald Copeland (Norfolk State University) (5/2000-9/2000) “Functional Bio-Nanomaterials:DNA/Nanotubes for Computing”. Ronald was part of the SPGRE program.
58. Claudia Low\* (UNC) (5/2000 – 9/2000): “DNA/Carbon nanotube circuitry”
59. Ari Yeskel (Brandeis University) (5/2000-9/2000): Nanotube Functionalization Strategies”
60. Lily Yu (UNC) (5/2000 – 9/2001) “Stamp printing of molecules”
61. Katy Liu (Princeton) (5/2001 – 9/2001) “Functionalization of surfaces for biomotor applications”
62. Kenneth Garman (UNC) (1/2001 – 5/2001) “Computer Interfacing of a Nanometer Stage”
63. Dante Silman\* (Norfolk State Univ.) (5/2000-9/2000): “The making of nanotube devices using e-beam lithography”
64. Michael Ricci\* (UNC) (9/1999-5/2000) “Nanotube dynamics on surfaces”
65. Keith Thomas (UNC) (9/1999 – 5/2000), “AFM tips”
66. Ryan Fuerier “Surface Plasmon Apparatus”
67. Desiree Bath\* “Particle/Polymer Adhesion”
68. Chekesha Clingman\* “Particle Functionalization for adhesion control”
69. Bernard Griggs
70. Jayvius Wynn
71. Roderick Lim
72. Ainhoa Phillip
73. Cameron Lily
74. John Ritzo
75. Rob Outerson
76. Stefan Nikles
77. Danielle Morgan
78. Peter Groves
79. Claudine Chen

\* denotes joint mentorship with a second faculty member

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## Invited Presentations:

83. Cilia, Silia and Silly Putty: Real and Engineered Biofluidics. Biomedical Engineering Department Colloquium, University of Virginia, Charlottesville, VA, October 30, 2009.
82. "A Systems Biology Approach to Mucociliary Clearance", invited speaker GlaxoSmithKline, King of Prussia, PA, June 22, 2009.
81. "The Virtual Lung Project", V-Tissues 2009, Environmental Protection Agency, Research Triangle Park, April 20, 2009.
80. "Hydrodynamics of the Lung", Chemical Engineering Department Symposium, Johns Hopkins University, Baltimore, MD, October 15, 2008.
79. "The Virtual Lung Project", North Carolina Society of Anesthesiology Annual Meeting, Charlotte, NC, September 20, 2008.
78. "Nanotechnology and Biomedical Applications", UNC Wilmington, Wilmington, NC April 14, 2008
77. "Mucociliary Interactions", North America Cystic Fibrosis Conference, Anaheim Ca, October 3-6, 2007.
76. "Nanotechnology and Biology", Vasculata 2007, University of North Carolina, Chapel Hill, NC. August 5-8, 2007.
75. "New Magnetic Technologies for Mucus Clearance Studies", Williamsburg Meeting of the Cystic Fibrosis Foundation, Williamsburg, MD, June 3-5, 2007.
74. "The Virtual Lung Project", Gordon Research Conference on Mucus, Cilia and Mucociliary Interactions. Ventura Beach, CA, February 4-9, 2007.
73. "Nanotechnology in Biomedical Sciences", Physics Department Colloquium, Fayetteville State University, Fayetteville, NC, March 20, 2007.
72. "NANOMACHINES: From Atomic Lattice Gears to Cystic Fibrosis", Indo-US Shared Vision Workshop on Soft, Quantum and Nano Computing (SQUAN-2007), Dayalbagh Educational Institute Dayalbagh, Agra India, February 20, 2007
71. "Fluid Flows and Lung Defense", Single Molecule Symposium at University of Michigan, Ann Arbor, MI, May 20, 2006
70. "Spinning Rods and Human Lung Cell Cultures", SIAM Conference on the Life Sciences, Raleigh, North Carolina, July 31-August 4, 2006
69. "Biomimetic Structures and Materials", URETI program BiMAT annual review, Univeristy of California, Santa Barbara, May 24, 2006.
68. "Nanotechnology and Lung Defense", Physics Department Colloquium, University of South Florida, Tampa, FL, September 22, 2006
67. "NEMS: Tools, Nanostructures, Biology", Department of Physics Colloquium, Univeristy of Virginia, Charlottesville, VA. (February, 2005)
66. "The Virtual Lung Project: Multiscale Challenges in Pulmonary Mucus Flows." DOE Workshop. (July 20-22, 2005)
65. "Biological Hydrodynamics: From live cilia to engineered systems" North Carolina State Univeristy, Raleigh, NC. (September 7, 2005)

64. "Nanotechnology: What is it all about?" SPIRE program speaker, North Carolina Central University, Durham, NC. (September 15, 2005)
63. "Materials Studies and Nanofabrication challenges in lung defense", Dow Chemical, Inc. , Midland, Michigan. (October 14, 2005)
62. "Biological Hydrodynamics: From real to engineered cilia" Keynote speaker, Midland Section American Chemical Society Annual Meeting, Midland, Michigan. (October 15, 2005)
61. "Nanomachines: Oscillators to Cilia." Lehigh University, Department of Physics, Bethlehem, PA. (Jan. 22, 2005)
60. "Nanoscale Actuating Devices and Structures." 12th International Conference on Experimental Mechanics, Bari, Italy. (Aug. 29-Sept. 4, 2004)
59. "NanoMedicine: New Technologies from Imaging to Cilia." Arkansas Biosciences Fall Research Symposium (keynote speaker), Little Rock, AR(October 28, 2004)
58. "Biomimetic Actuating Structures." Joint Symposium between the North Carolina Section of the Materials Research Society and Carolinas Central Chapter of ASM International, MCNC, Research Triangle Park, NC. (November 5, 2004)
57. "Nanotechnology: Tools, Devices, and Biology." 2004 Annual Biomedical Research Conference for Minority Students, Dallas, TX. (November 10-13, 2004)
56. Multiscale challenges in Fluid Flows(?), DOE Fluids Workshop, Denver CO, July 20-22, 2004
55. Magnetic Manipulation: Biology and Biomimetic Materials, Microscopy and Microanalysis, Savannah, Georgia, August 1-5, 2004.
54. *NanoMedicine: New Technologies from Imaging to Cilia.* Arkansas Biosciences Fall Research Symposium (keynote speaker), Little Rock, AR, October 28, 2004.
53. *Force Measurements in Biology* (workshop). 2004 Annual Biomedical Engineering Society Fall Meeting Pre-Conference Workshop, Philadelphia, PA, October 13, 2004.
52. *Nanoscale Actuating Devices and Structures.* 12th International Conference on Experimental Mechanics, Bari, Italy, Aug. 29-Sept. 4, 2004.
51. *Nanomechanics: From materials to Biology.* Nanotechnology and MEMS: Experiments and Modeling Symposium, 12th International Conference on Experimental Mechanics, Bari, Italy, Aug. 29-Sept.4, 2004.
49. *NEMS: Tools, Nanostructures and Biology.* 3rd Swiss/US-Nanoforum, University of Basel, Oct. 13-14, 2003.
48. *Touching at the Nanoscale: Particle Properties in Devices and as Microprobes.* 77th American Chemical Society Colloid and Surface Science Symposium, Georgia Tech University, Atlanta, GA, June 15-18, 2003.
47. *Nanomanipulation: From nanotube to biological nanomachines.* Modern Microscopy/Scanning 2003, San Diego, CA, March 2-5, 2003
46. *Microfabricated Magnetic Pole Structures for Biological Force Measurements.* 47th Biophysical Society Annual Meeting, San Antonio, Texas, March 3, 2003.
45. *Nanomachines: From Nanotubes to Biology.* NanoElectroMechanical Systems. Chicago, Il, Army Research Office, Chicago, Il, November 14, 2002.
44. *Nanoscale Manipulation and Microscopy: goals and needs.* Mathematics in

- Nanoscale Science and Engineering, UCLA Institute for Pure and Applied Mathematics, November 4, 2002.
43. *Biological Nanomachines: Tools and Science*. Southeastern Section of the American Physical Society Annual Meeting. Auburn, Al. November 1, 2002.
  42. *Touching In Biological Systems: A 3D Force Microscope*. Microscopy and Microanalysis 2002, Quebec City, Canada. August 6, 2002.
  41. *Nanomachines: Tools, Technology and Biology*. Materials Research Society of Brazil Annual Meeting. Rio DeJaniero, Brazil, July 9, 2002
  40. *Nanotechnology at UNC*. Venture 2002, Council for Economic Development, Chapel Hill, NC, May 1, 2002.
  39. *BioNanotechnology and Molecular Motors*, Nanotech and Biotech Convergence-2002, Stamford CT, May 5-6, 2002
  38. *The Atoms Matter, Lattice registry effects in dynamics and electron transport of nanotubes*, The 2nd International Conference On Scanning Probe Microscopy Of Polymers, Weingarten Germany, July, 21-25, 2001.
  37. *NanoBiotechnology*, Biotech 2001, Chapel Hill, NC, May 21, 2001.
  36. *The Atoms Matter: Lattice registry effects in NEMS devices*, International Center of Excellence Symposium of Institute for Molecular Science, Institute for Molecular Science, Okazaki, Japan, March 15-17, 2001.
  35. *Remote Manipulation: from Viruses to Nanotubes*, Nineteenth Annual Symposium on Advances in Microscopy, North Carolina Society for Microscopy and Microbeam Analysis, Wilmington, NC, October 13-15, 2000
  34. *The Atoms Matter: Lattice registry effects in NEMS devices*, Eighth Foresight Conference on Molecular Nanotechnology, Bethesda, MD, November 3-5, 2000
  33. *Rolling nanotubes: Atomic lattices as gears*, International Winterschool on Electronic Properties of Novel Materials, Kirchberg, Austria, March 8, 2000
  32. *Buckling and Rippling of Carbon Nanotubes*, Complex Fluids Gordon Conference, Salve Regina University, Newport, RI, August 13-18, 2000
  31. *Touching on the nanometer scale: slip, roll and tear*, International Union of Microbeam Analysis Societies, Kailua-Kona, Hawaii, June 8-13, 2000
  30. *Touching Viruses Through the Web: a Remote Atomic Force Microscopy Outreach Project*, American Association of Physics Teachers Summer Meeting, Guelph, Ontario, August 1-3, 2000
  29. *Nanorobotics: Atomic lattices as gears*, Department of Chemistry, University of Vienna, Vienna, Austria, March 14, 2000
  28. *Touching Viruses In A Networked Microscopy Outreach Project*, Superfine, R., M. G. Jones and R. M. Taylor II, Invitational Conference on K-12 Outreach from University Science Departments, Raleigh, NC, February 10-12.(2000)
  27. *Atomic View of Nanotube Dynamics on Surfaces*, Second International Conference on Nanotechnology in Carbon and Related Materials, University of Sussex, Brighton, UK, September 8-10, 1999
  26. *Slip, Slide and Roll: Nanometer objects in motion*, Seventh Foresight Conference on Molecular Nanotechnology, Santa Clara, CA, October 15-17, 1999
  25. *Nanomanipulation for nanoscale science*, Sigma XI, Research Triangle Park, NC,

February 2, 1999

24. *Recent DoD MURI Results in Carbon Nanotube S&T*, Defense Science & Technology Seminar on Emerging Technologies: Carbon Nanotubes Revolutionary Opportunities, Deputy Under Secretary of Defense for Science & Technology and the Office of Naval Research, Arlington, VA, March 19, 1999
23. *Slip, Slide and Roll: Nanotube Dynamics on Surfaces*, Symposium on the Science and Technology of Carbon Nanotubes, University of Pennsylvania, Philadelphia, PA, March 20, 1999
22. *Nanomanipulation for material properties and devices*, U.S. Army Science and Technology Meeting, Army Research Office, Research Triangle Park, NC, May 6-7, 1999
21. *Nanomanipulation for Nanoscale Science*, ThermoMicroscopes, Inc., Tokyo, Japan, December 6, 1999
20. *Nanomanipulation for Material Properties, Interactions and Devices*, American Vacuum Society Annual Meeting, Baltimore, MD, November 15, 1998
19. *Nanomanipulation for material properties, substrate interactions and devices*, Microscopy Society of America Annual Meeting, Atlanta, GA, July 12, 1998
18. *Nanometer-Scale Material Properties and Interactions Through Nanomanipulation.*, Southeast Regional Meeting of the ACS (SERMACS '98), Research Triangle Park, NC, November, 1998
17. *The Nanomanipulator*, 9th International Conference on Scanning Tunneling Microscopy (Plenary Talk), Hamburg, Germany, July 20-25, 1997
16. *Scanning Probe Microscopy Short Course*, Invited Seminar Series, Royal Institute of Technology, Stockholm, Sweden, May 12-16, 1997
15. *Handcrafting nanometer scale systems - pushing, bending, and building with macromolecular assemblies using AFM*, Nanotechnology: Materials, Manufacturing and Applications, San Francisco, CA, June 26, 1997
14. *Manipulation of Nanometer Objects: Friction, Mechanical Properties and Devices*, International Conference on Novel Materials, Puri, India, April 10, 1997, 1997
13. *Polymer Adhesion and Wetting at the Nanometer Scale: The View From Atomic Force Microscopy*, Hoechst Celanese, Inc., Summit NJ, December 11, 1996
12. *Polymer Surfaces from Atomic Force Microscopy*, UNC-Hoechst Celanese Polymer Workshop, UNC-Chapel Hill, May 7, 1996
11. *Scanning Probe Microscopy for the Characterization and Modification of Polymeric and Macromolecular Materials*, American Chemical Society NC Polymer Section, North Carolina State University, Raleigh, NC, April 11, 1996
10. *Virtual Reality Technology and Scanning Probe Microscopy*, Industrial Applications of Scanning Probe Microscopy (IASPM), NIST, Washington, DC, 2-3 May, 1996
9. *Linear and Nonlinear Optical Studies of Polymer Interfacial Kinetics*, International Conference on Lasers '95, Charleston, SC, December 5, 1995
8. *The Nanomanipulator: A Pantograph for Nanometer Scale Modification and Manipulation*, Materials Research Society Southeast Section Annual Meeting, Research Triangle Park, NC, November 10, 1995
7. *The Nanomanipulator: A Teleoperator for Manipulating Materials at the*

- Nanometer Scale*, 5th International Symposium on the Science and Engineering of Atomically Engineered Materials, Richmond VA, November 5, 1995
6. *The Nanomanipulator: A Virtual Reality Interface for Scanning Probe Microscopy*, Microbeam Analysis Society Annual Meeting, Breckenridge, CO, August 7, 1995
  5. *Touching on the Nanometer Scale: A Virtual Reality Interface for Scanning Probe Microscopy*, Center for Biomolecular Technology, University of Washington, Seattle, August 4, 1995
  4. *Linear and Nonlinear Optical Studies of Polymer Interfacial Kinetics*, International Conference on Laser Science and Applications, Charleston, NC, December 4, 1995
  3. *Touching on the Nanometer Scale: A Virtual Reality Interface for Scanning Probe Microscopy*, Proc. 29th Ann. Conf. of the Microbeam Analysis Soc., Breckenridge, CO, 1995, 1995
  2. *Phase Measurements of Surface Infrared-Visible Sum Frequency Generation: Determination of Polar Ordering of Molecules at Surfaces*, International Quantum Electronics Conference, Anaheim, CA, May 21-25, 1990
  1. *Molecular Conformation and Ordering in a Monolayer Determined by Simultaneous Surface Infrared-Visible Sum Frequency and Second Harmonic Generation*, Ninth International Conference on Laser Spectroscopy, Bretton Woods, NH, June 18-23, 1989

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## University Service:

Interdisciplinary Work and Values Subcommittee (Provost's Task Force on Tenure and Promotion) 2009  
Curriculum in Applied Sciences Planning Committee 2007-2009  
Morehead Planetarium and Science Center Faculty Advisory Board – Chair 2009-present  
Morehead Planetarium and Science Center Zoom Exhibit Advisory Board 2006 – present  
Scientific Advisory Committee, Michael Hooker Microscopy Center 2006 - present  
Personnel Review Committee (Proposal Development Initiative), Chair 2006  
Board of Governors UNC meeting speaker 2005  
UNC Institute for Advanced Materials Executive Board 2005-present  
Graduate Student Mentorship Award Selection Committee 2005  
Burroughs Wellcome Fund Fellowship Selection committee 2005  
Friday Center “What’s the Big Idea” Series Advisory Board 2005  
Undergraduate Recruiting Committee 2004 - present  
Imaging Task Force 2003  
Undergraduate Science Recruiting Committee 2003-2007  
Institute for Advanced Materials Nanoscience and Technology Steering Committee 2003  
Development Presentation: Washington DC Meeting, May 2003.  
Provost Academic Planning Task Force 2002  
Postdoc Affairs Advisory Committee 2002-2004

Curriculum Review Committee Co-Chair, Interdisciplinary Studies 2001-2002  
University Research Committee of the Faculty Council 2000-2002  
Development Presentation: From Stars to Molecules: Great Science at UNC, Executive Steering  
Committee Meeting, Reynold's Plantation, GA, May 10, 2001.  
Morehead Discovery Center Advisory Board 2001  
Johnston Award Graduate Assistant Award Committee 2001  
Facilities Planning Science Complex Subcommittee 2001  
Ad Hoc committee on Nanotechnology 2001  
Proposal Evaluation Committees: NSF Major Research Instrumentation Program 2001, Howard  
Hughes Medical Institute Professorships 2001  
Provost Search Committee, 2000  
Administrative committee, Program in Molecular and Cellular Biophysics 1998-2001  
Science Advisory Board, Senior Assoc. Dean of Sciences 1998-1999  
Administrative Board of the Library 1996-1999  
Advisory Committee for the Curriculum in Applied Sciences 1996-1999  
Advisory Committee for the Materials Science Graduate Program 1996-1999

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### **Departmental Service:**

Committee on Hiring 2008 - continuing  
Faculty Search Chair Biological Physics 2007  
Faculty Search Committee Condensed Matter Physics 2007  
Graduate Program Committee 2004 – present  
Faculty Search Committee member 2002, 2004, 2006  
Society of Physics Students Advisor 2000-2002  
Undergraduate Committee 1995-2000  
Undergraduate Major Advisor 1997-1998

### **Education/Recruiting Service:**

Panelist on "What Makes Successful Teaching", SPIRE Symposium October 4, 2001  
Project Uplift 1998-2002  
CTOPS 1998-2002  
Carolina Contact 1997-2002  
Summer Pre-Graduate Research Experience Mentor 1995-2002 (8 students, 2 entered  
department graduate program)