

Richard Superfine

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Research Interests:

Study of nanotubes, molecules, macromolecular assemblies, and polymers at surfaces. Interfacial dynamics, friction and nanometer scale devices. Development of surface science techniques: advanced instrument interfaces, Scanning Probe Microscopy (Force, Tunneling, Optical, etc.), Linear and Nonlinear Optical Spectroscopy

Education:

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

Professional Experience:

Associate Professor of Physics, UNC-Chapel Hill, 1999-present
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

Professional Honors, Affiliations and Activities:

White House/Smithsonian Millenium Celebration Panelist 2000
Hettleman Prize (UNC) 1998, Johnson Teaching Excellence Award (UNC) 2000
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: Biophys. Society; American Physical Soc.; Amer. Assc. of Physics Teachers

Referee: Phys.Rev., Phys. Rev. Lett., Nature, JVST, Surface Science, Liquid Crystals, NSF

Naval Research Labs Review Panel 1999, 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;
Department of Energy Review Panel: Materials Research-1992

Five Most Relevant Publications

- "In situ resistance measurements of strained carbon nanotubes", S. Paulson, M.R. Falvo, N. Snider, A. Helser, T. Hudson, A. Seeger, R.M. Taylor II, R. Superfine and S. Washburn, *Appl. Phys. Lett.* 75(19) 2936-2938 (1999).
- "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).
- "Nanometre-scale rolling and sliding of carbon nanotubes," M.R. Falvo, G. J. Clary, A. Helser, R. M. Taylor, V. Chi, F. P. Brooks Jr., S. Washburn and R. Superfine, *Nature*, v397, n6716, pp236-238 (1999).
- "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 1997, pp. 582-584 (cover story).
- "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)

Five Additional Publications:

- "Photothermal modulation for oscillating mode atomic force microscopy in solution" , G. Ratcliff, D. Erie, R. Superfine, *Appl. Phys. Lett.*, 72, 1911-1913 (1998).
- " Virtual Viruses," Jones, M.G., Superfine, R., Taylor, R. , *Science Teacher*.66 (7), 48-50 (1999).

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"Nanomanipulation experiments exploring frictional and mechanical properties of carbon nanotubes", M. R. Falvo, G. Clary, A. Helser, S. Paulson, R. M. Taylor II, V. Chi, F. P. Brooks Jr, S. Washburn, R. Superfine (invited) *Microscopy and Microanalysis*, **4**, 504-512. (1998)

"Manipulation of Individual Viruses: Friction and Mechanical Properties," M. Falvo, M. Finch, R. M. I. Taylor, V. Chi, F. P. Brooks, S. Washburn, and R. Superfine, *Biophys. J.*, vol. 72, pp. 1396-1403, 1997.

"Hydrogen Bonding at the Pure Water Liquid/Vapor Interface", Q. Du, R. Superfine, E. Freysz, and Y. R. Shen, *Phys. Rev. Lett.* **70**, 2313-2316 (1993).

Synergistic Activities

1. Minority Recruitment: Our laboratory has participated for the past 5 years in a UNC program "Summer Pregraduate Research Experience" for bringing minority students to the UNC campus for the summer before their senior years as a way of recruiting these students to come to UNC for graduate school. We have had 5 students from this program work in our laboratory over the summer, two have whom have subsequently come to UNC for graduate school, the first minority students in our department in over 2 decades.

2. Outreach: We have taken our advanced interface for microscopy to a high school. The students manipulate viruses using an AFM. The student, computer graphics and pen-base control are in the high school, with the AFM and virus sample in the lab at UNC. The students interact with the AFM though the internet. This program is continuing, and a publication is in press.

Thesis advisor:

Y. R. Shen

University of California, Berkeley

Post-doctoral advisor:

Joseph Orenstein

University of California, Berkeley

List of previous collaborators:

F. P. Brooks, Jr., *UNC Chapel Hill*

J. Bernholc, *NC State University*

V. Chi, *UNC Chapel Hill*

J. Desimone, *UNC Chapel Hill*

D. Erie, *UNC Chapel Hill*

J. P. Lu, *UNC Chapel Hill*

L. McNeil, *UNC Chapel Hill*

C. Roland, *NC State University*

E. T. Samulski, *UNC Chapel Hill*

R. J. Samulski, *UNC Chapel Hill*

B. Stoner, *UNC Chapel Hill*

R. M. Taylor II, *UNC Chapel Hill*

F. Tsui, *UNC Chapel Hill*

Graduate Students and Postdoctoral Associates Total (11):

Martin Guthold

Garrett Matthews

Atsuko Negishi

Phillip Williams

Scott Paulson

Jeremy Cummings

Neal Snider

Michael Falvo

Pichet

Thiansathaporn

David Glick

Danielle Cox