W. Garrett Matthews

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Research Interests:

My research interests include the investigation of biological macromolecules and macromolecular assemblies on the nanometer length scale, specifically the structural and mechanical properties of these molecules and their interactions with one another. I also am interested in self-assembly, biological motors, and biopolymers. I use a variety of microscopies to further our understanding of these materials and their properties, including various scanning probe microscopes, fluorescence and confocal fluorescence microscopy, and electron microscopy techniques. Additionally, I use various manipulation techniques such as atomic force microscopes and optical traps to probe mechanical properties and intermolecular interactions.

Education:

Ph.D., Physics; University of North Carolina, Chapel Hill, NC; May 2001.
Dissertation: Mechanical and Interfacial Properties of Adenovirus
Advisor: Richard Superfine
B.S., Physics; Augusta State University (formerly Augusta College), Augusta, GA; 1994.
B.S., Biology; Presbyterian College, Clinton, SC; 1987.

Professional Experience:

Research
Assistant Professor – Department of Physics, University of South Florida 2004 - present
Research Associate, UNC – CH Cystic Fibrosis Research and Treatment Center
Chapel Hill, NC; October 2001 – 2004
Postdoctoral Research Associate, UNC – CH Cystic Fibrosis Research and Treatment Center
Chapel Hill, NC; October 2000 - October 2001.
Graduate Research Assistant, UNC - CH Physics and Astronomy Department
Chapel Hill, NC; May 1994 – October 2000.
Research Assistant, Medical College of Georgia
Augusta, GA; August 1989 – May 1994.
Medical Technician, Bay Pines Veterans' Administration Hospital
Bay Pines, FL; August 1987 – August 1989.

Teaching
Assistant Professor – Department of Physics, University of South Florida 2004 – present
Taught Introductory Physics and Applications of Physics to Biology/Medicine
Teaching Assistant, Undergraduate Physics Lab, UNC – CH
Chapel Hill, NC; August 1994 – January 1995.
Teaching Assistant, Undergraduate Physics Lab, Augusta State University
Augusta, GA; August 1993 – May 1994.
Teaching Assistant, Undergraduate Microbiology Laboratory, Presbyterian College
Clinton, SC; August 1986 – December 1986 and August 1987 – December 1987.
Teaching Assistant, Undergraduate Biology Laboratory, Presbyterian College
Clinton, SC; January 1986 – May 1986.

Honors and Society Memberships:

Burroughs Wellcome Career Award at the Scientific Interface - Nomination
Co-Chair, Atomic Force Microscopy Session, 2002 Meeting of the Biophysical Society.
Graduate Merit Fellowship, UNC – CH, 1994.
Outstanding Science and Math Graduate, Augusta State University, 1994.
Outstanding Employee Award, Bay Pines Veterans' Administration Hospital, 1988 and 1989.
βββ Biological Honor Society, Presbyterian College, 1984 – 1987.
Tull Scholarship (Merit based), Presbyterian College, 1984.
Special Alumni Scholarship (Merit based), Presbyterian College, 1983 – 1987.
Member, Biophysical Society
Member, American Physical Society

Peer-Reviewed Publications:

Nanoscale mechanics of collagen fibrils. AJ Heim, TJ Koob, WG Matthews, *Biomacromolecles* 2007 (Accepted for publication).

Size-Exclusion "Capture and Release" Separations Using Surface-Patterned Poly(*N*-isopropylacrylamide) Hydrogels. A Castellanos, SJ DuPont, AJ Heim II, G Matthews, PG Stroot, W Moreno, and RG Toomey, *Langmuir* Published on web April 19, 2007; In press.

Determination of the elastic modulus of native collagen fibrils via radial indentation. AJ Heim, TJ Koob, WG Matthews, *Applied Physics Letters* 2006; 89:181902-05.

Construction and Characterization of Soft-Supported Lipid Bilayer Membranes for Biosensors Application. J Jimenez, AJ Heim, WG Matthews, N Alcantar; Proceedings of the 28th IEEE EMBS Annual International Conference, New York City, USA, Aug 30-Sept 3, 2006.

Glycosaminoglycan model glass substrates and cancer cell interactions. A Peramo, WG Matthews; Proceedings of the NSTI-Nanotechnology Conference, Boston, MA, May 7-11, 2006.

Deposition of covalently patterned glycosaminoglycans on silanized glass surfaces. A Peramo, A Albritton, G Matthews, *Langmuir* 2006; 22:3228-34.

A simple and efficient method for carbon nanotube attachment to scanning probes and other substrates. A Hall, WG Matthews, R Superfine, MR Falvo, S Washburn, *Applied Physics Letters*, 85 (15): 2506 – 2508, 2003.

Controlled manipulation of molecular samples with the nanoManipulator. M Guthold, MR Falvo, WG Matthews, S Paulson, S Washburn, D Erie, R Superfine, FP Brooks, RM Taylor, *Proceedings of IEEE/ASME International Conference on Advanced Intelligent Mechatronics*, Atlanta, GA. September 1999.

Investigation and modification of molecular structures using the nanoManipulator. M Guthold, M Falvo, WG Matthews, S Paulson, A Negishi, S Washburn, R Superfine, FP Brooks, RM Taylor, *J. Mol. Graph. Model*., 17 (3-4), 187-197, 1999.

Quantitative manipulation of DNA and viruses with the nanoManipulator Scanning Force Microscope. M Guthold, WG Matthews, A Negishi, RM Taylor, D Erie, FP Brooks Jr., R Superfine, *Surf. Interface Anal*., 27, 437-43, 1999.

Fluid shifts across human dentine in vitro in response to hydrodynamic stimuli. DH Pashley, WG Matthews, Y Zhang, M Johnson. *Arch. Oral Biol*., 41 (11),1065-72, 1996.

Nanoleakage: leakage within the hybrid layer. H Sano, T Takatsu, B Ciucchi, JA Horner, WG Matthews, DH Pashley. *Oper. Dent*., 20 (1), 18-25, 1995.

Tensile properties of mineralized and demineralized human and bovine dentin. H Sano, B Ciucchi, WG Matthews, DH Pashley, *J. Dent. Res*., 73 (6), 1205-11, 1994.

The effect of dentin depth on the permeability and ultrastructure of primary molars. V Koutsi, RG Noonan, JA Horner, MD Simpson, WG Matthews, DH Pashley, *Pediatr. Dent*., 16 (1), 29-35, 1994.

The effects of outward forced convective flow on inward diffusion in human dentine in vitro. DH Pashley, WG Matthews, *Arch. Oral Biol*., 38 (7), 577-82, 1993.

Air blast-induced evaporative water loss from human dentine, in vitro. W.G. Matthews, CD Shoman, DH Pashley, *Arch. Oral Biol*., 38(6), 517-23, 1993.

Bond strengths to superficial, intermediate and deep dentin in vivo with four dentin bonding systems. EL Pashley, L Tao, WG Matthews, DH Pashley, *Dent.Mater*., 9 (1), 19-22, 1993.

In vitro permeability of furcation dentin in permanent teeth. R Rapp, G Matthews, M Simpson, DH Pashley, *J. Endod*., 18(9), 444-7, 1992.

Selected Presentations:

Invited:

Nanoscale mechanics of collagen fibrils. Biomedical Engineering Program Seminar, University of South Florida, Tampa, FL September 29, 2006.

Nanomanipulation and imaging of viruses. 5th International Workshop on Biomedical Applications of Nanotechnology – NanoMed 2006, Logenhaus, Berlin, February 16 - 17, 2006.

The Importance of Forces and Material Properties in Biology. Department of Physiology and Biophysics Colloquium, University of South Florida, Tampa, FL, November 9, 2004.

Manipulation on the Nanometer Length Scale. Department of Physics Colloquium, Emory University, Atlanta, GA, February 12, 2002.

Conferences:

Measurement of the mechanical properties of intact collagen fibrils. H. Mercedes, A. Heim, T. Koob, and W.G. Matthews; March Meeting of the American Physical Society, March 13-17, 2006, Baltimore, MD.

Design and use of an artificial capillary in the study of metastatic cell adhesion. A. Rafi, A. Peramo, R. Boren, A. Heim, W.G. Matthews; March Meeting of the American Physical Society, March 13-17, 2006, Baltimore, MD.

Investigating the glycocalyx using atomic force microscopy. R. Boren, A. Rafi, A. Peramo, W.G. Matthews; March Meeting of the American Physical Society, March 13-17, 2006, Baltimore, MD.

Glycosaminoglycan model glass substrates and cancer cell interactions. A. Peramo, W.G. Matthews; NSTI-Nanotechnology Conference, Boston, MA, May 7-11, 2006.

Soft Supported Biomimetic Membranes: Assembly and Performance. Monica J. Escobar, Jeffy Jimenez, Garrett Matthews and Alcantar Norma. AICHE National Meeting, 2005, Cincinnati, OH.

Physical Properties of the Glycoprotein Mucin. Garrett Matthews, William Davis, Richard Superfine, Richard Boucher, Annual APS March Meeting 2003, Austin, TX, March 3-7, 2003.

Controlled Manipulation of Macromolecules and Microspheres over Surfaces – Demonstration of Rolling on the Nanometer Length Scale. W. G. Matthews, A. Negishi, D.M. McCarty, R.J. Samulski, R. Superfine, Biophysical Society 46th Annual Meeting, San Francisco, CA, February 23-27, 2002.

Atomic Force Microscopy Studies of the Structure of Single Mucin Molecules and Their Viscoelastic Properties. W. G. Matthews, C. W. Davis, R. C. Boucher, Biophysical Society 46th Annual Meeting, San Francisco, CA, February 23-27, 2002.

Mechanical Properties of single Microtubule Molecules. W. G. Matthews and R. Superfine, Biophysical Society 46th Annual Meeting, San Francisco, CA, February 23-27, 2002.

Surface Interactions of Adenovirus and Adeno-Associated Virus. W. G. Matthews, A. Negishi, R. Taylor, D. M. McCarty, R. J. Samulski, R. Superfine, Biophysical Society 44th Annual Meeting, New Orleans, LA, February 12-16, 2000.

Elasticity of adenovirus in air and in liquid. W.G. Matthews, A. Negishi, A. Seeger, R. Taylor, D.M. McCarty, R.J. Samulski, R. Superfine, 66th Annual Meeting of the Southeastern Section of the American Physical Society (SESAPS), Chapel Hill, NC, November 7-9, 1999.

Elasticity and binding of adenovirus in air and in liquid. W.G. Matthews, A. Negishi, A. Seeger, R. Taylor, D.M. McCarty, R.J. Samulski, R. Superfine, 43rd Annual Meeting of the Biophysical Society, Baltimore, MD, February 13-17, 1999.