

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 Dissertation: Mechanical and Interfacial Properties of Adenovirus Advisor: Richard Superfine	May 2001.
B.S. Physics	Augusta State University, Augusta, GA	May 1994.
B.S. Biology	Presbyterian College, Clinton, SC	May 1987.

Professional Experience:

Assistant Professor	Department of Physics	USF	2003 - present
Research Associate	Cystic Fibrosis Research Center	UNC – CH	2000 – 2003
Research Assistant	Department of Physics	UNC – CH	1994 – 2000
Research Assistant	Department of Oral Physiology	Medical College of GA	1989 – 1994
Teaching Assistant	Department of Physics	UNC – CH	1994 – 1995
Teaching Assistant	Department of Physics	Augusta St. University	1993 – 1994
Medical Technician		Bay Pines VA Hospital	1987 – 1989
Teaching Assistant	Microbiology Laboratory	Presbyterian College	1986 – 1987

Honors and Society Memberships:

Burroughs Wellcome Career Award at the Scientific Interface - Nomination
Session Chair, 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.
Special Alumni Scholarship (Merit based), Presbyterian College, 1983 – 1987.
Member: Biophysical Society, American Physical Society

Courses Taught (at USF)

General Physics I and II (PHY 2053 and 2054) – multiple semesters
Applications of Physics to Biology and Medicine I and II (PHZ 4702 and 4703) – multiple semesters

Peer-Reviewed Publications:

1. Quantitation of surface-reducing-end covalently bound polysaccharides via hydrozoinolysis and deamination. A Peramo and G Matthews, *Langmuir* 2008; 24:11334-11337.
2. Polymer model of cancer cell adhesion to glycosaminoglycans substrates using the radius of gyration. A Peramo, M Meads, W Dalton, WG Matthews, *Journal of Applied Polymer Science* 2008; doi:10.1002/app.28951.
3. Static adhesion of cancer cells to glass surfaces coated with Glycosaminoglycans. A Peramo, M Meads, W Dalton, WG Matthews, *Colloids and Surfaces B: Biointerfaces* 2008; doi:10.1016/j.colsurfb.2008.07.019.
4. Nanoscale mechanics of collagen fibrils. AJ Heim, TJ Koob, WG Matthews, *Biomacromolecules* 2007; 8:3298-3301.
5. 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* 2007; 23:6391-95.
6. Multifunctional ferrimagnetic-ferroelectric thin films for microwave applications. R Heindl, H Srikanth, S Witanachchi, P Mukherjee, A Heim, G Matthews, S Balachandran, S Natarajan, T Weller, *Applied Physics Letters* 2007; 90:25.
7. 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.
8. 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.
9. Glycosaminoglycan model glass substrates and cancer cell interactions. A Peramo, WG Matthews; Proceedings of the NSTI-Nanotechnology Conference, Boston, MA, May 7-11, 2006.
10. Deposition of covalently patterned glycosaminoglycans on silanized glass surfaces. A Peramo, A Albritton, G Matthews, *Langmuir* 2006; 22:3228-34.
11. 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.
12. 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.
13. 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.
14. 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.
15. 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.
16. 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.
17. 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.
18. 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.
19. 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.
20. 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.
21. 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.
22. 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:

1. Nanoscale Mechanics and Assembly of Hierarchical Forms of Collagen Fibrils, Department of Physics Colloquium, Wake Forest University, Winston-Salem, NC, December 6, 2007.
2. Nanoscale Biological Physics at the University of South Florida, Colloquium, Alabama State University, Montgomery, AL, October 9, 2007
3. Nanoscale mechanics of collagen fibrils. Biomedical Engineering Program Seminar, University of South Florida, Tampa, FL September 29, 2006.
4. Nanomanipulation and imaging of viruses. 5th International Workshop on Biomedical Applications of Nanotechnology – NanoMed 2006, Logenhaus, Berlin, February 16 - 17, 2006.
5. The Importance of Forces and Material Properties in Biology. Department of Physiology and Biophysics Colloquium, University of South Florida, Tampa, FL, November 9, 2004.
6. Manipulation on the Nanometer Length Scale. Department of Physics Colloquium, Emory University, Atlanta, GA, February 12, 2002.

Conferences:

1. Nanoscale mechanics and assembly of hierarchical forms of collagen. WG Matthews, AJ Heim, and TJ Koob. 52nd Annual Meeting of the Biophysical Society, February 2 – 6, 2008, Long Beach, CA.
2. 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.
3. 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.
4. 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.
5. Glycosaminoglycan model glass substrates and cancer cell interactions. A. Peramo, W.G. Matthews; NSTI-Nanotechnology Conference, Boston, MA, May 7-11, 2006.
6. Soft Supported Biomimetic Membranes: Assembly and Performance. Monica J. Escobar, Jeffy Jimenez, Garrett Matthews and Alcantar Norma. AIChE National Meeting, 2005, Cincinnati, OH.
7. 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.
8. 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.
9. 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.
10. Mechanical Properties of single Microtubule Molecules. W. G. Matthews and R. Superfine, Biophysical Society 46th Annual Meeting, San Francisco, CA, February 23-27, 2002.
11. 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.
12. 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.
13. 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.

Patents Awarded

International Patent

"A self-assembling, collagen based material to be used for corneal replacements"

Authors: Matthews WG, Heim AJ, Koob TJ

Filed: 03/13/07

Status: Published 09/20/07

Publication Number: WO/2007/106812

Proposals Funded

1. Title: Functionalized Nanomaterials for Biosensor Applications
Role: PI
Dates: 02/01/08 – 01/31/09
Source: FCoE-BITT
Total Direct Cost: \$75,000
2. Title: Fabrication of Biosensors Using Functionalized Nanomaterials
Role: PI
Dates: 02/01/08 – 01/31/09
Source: FMMD IERG
Total Direct Cost: \$30,000
3. Title: Adhesion of Metastatic Cells to Model Endothelial Glycocalyx
Role: PI
Dates: 01/01/05 – 12/31/05
Source: Moffitt Cancer Center ACS IRG
Total Direct Cost: \$20,000

Students Supervised

Graduate:

Current:

Yasin Al-Titi

Erin Brownell

Heather Harper

Past:

Antonio Peramo

Rebecca Boren

August Heim

Joshua Robinson

Ph.D. awarded 2006

MS awarded 2006

MS awarded 2006

MS awarded 2007

Currently employed: UM – Ann Arbor.

Currently employed: Hillsborough County, FL DoE

Currently employed: Secure Works, Inc. Atlanta, GA

Undergraduate:

Ashley Albritton

Dilip Babu

Katelynn Budny

Alex Bulger

Ujval Choksi

Alon Deutsch

Jessica Farrell

Physics

Biology

Physics

Biology (Honors Thesis)

Biology (Honors Thesis)

Physics

Biology (Honors Thesis)

Christine Hernandez

Tim Luttrell

Hernan Mercedes

Vishal Patel

Adam Rafi

Aaron Rubenstein

Chemistry (Honors Thesis)

Physics

Biology

Biology

Biology (Honors Thesis)

Biology