Matthew A. Caporizzo

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OVERVIEW

My research expertise span the fields of single-molecule biophysics and polymer physics. With an interest in nanomaterial toxicology, I have pioneered both *in-vitro* and *in-vivo* techniques to probe nanoparticle toxicity at both the single protein and single cellular level. Combining single-molecule total internal reflection microscopy and atomic force microscopy, I have developed the VIVA technique to probe organelle level cell viscoelasticity, and directly relate to metabolic processes such as myosin motility, degree of f-actin polymerization. VIVA has found a change in cardiomyocyte stiffness and viscosity correlated with the level of microtubule (MT) tyrosination which indicates a tyrosination dependent link between MTs and sarcomeres governs cardiomyocyte mechanical properties. My work has led to an interdisciplinary group at Penn dedicated exclusively to developing these techniques in the context of understanding the development of diseases such as cancer and atherosclerosis on the sub-cellular level. We are also interested in understanding the short and long-term non-specific effects of cellular exposure to nanomaterials (such as nanoparticles and organic dyes) commonly used in commercial products.

EDUCATION

Ph.D, University of Pennsylvania, Department of Materials Science Engineering, Philadelphia, Pa. (September 2014)

Non-specific interactions between cationic nanoparticle-polymer composites and biomolecules.
Contact: Russell J. Composto (215.898.4451)

B.S., The University of Pittsburgh, Department of Engineering Physics, Pittsburgh, Pa.

BS in Engineering Physics, *Summa Cum Laude*, (2008).
Awards: Outstanding Senior, Class of 2008
Research Assistant, 2007-2008. Contact: John Barnard (412)624.9720

ACADEMIC AWARDS

Best Poster: Nano/Bio Interface Center NanoDay at Penn, Best Poster Award, 22.Oct.2013.
Best Poster: Nano/Bio Interface Center Symposium, University of Pennsylvania, 27.Oct.2011.
Best Artistic Image: NBIC Image Contest, Nano Day 2011, University of Pennsylvania, 26.Oct.2011.
Cover Image: NBIC External Advisory Board Meeting Program, University of Pennsylvania, 28.Mar.2011.
Ashton Fellowship: University of Pennsylvania, 2008-2014.
Outstanding Senior: Engineering Physics: University of Pittsburgh 2008.

2015 Presentations,

Talk, RIPPS @ DRIPPS, Hospital of the University of Pennsylvania, June 11 2015, "Determining the Viscoelasticity of Single Cells using VIVA."

APS March Meeting 2015: Caporizzo MA, Roco CM, Coll Ferrer MC, Eckmann DM, Correlating Viscoelasticity with Metabolism in Single Cells using Atomic Force Microscopy, S47.00004, March 5, 2015.

Invited talk, Asylum Research: AFM in Biology Workshop, "Determining the viscoelasticity of single cells using Variable Indentation Rate Rheology by Laplace Transform, VIRRAL", Feb 12-13, 2015.

PUBLICATIONS

Caporizzo MA, Ezzibdeh RM, Composto RJ**,** Hierarchical Nanoparticle Topography in Amphiphilic Copolymer Films Controlled by Thermodynamics and Dynamics**,** *Langmuir,* 2015.

Caporizzo MA, Roco CM, Coll Ferrer MC, Eckmann DM, Composto RJ, Strain-rate Dependence of Elastic Modulus Reveals Silver Nanoparticle Induced Cytotoxicity**,** *Nanobiomedicine*,2:9, 2015.

Nalam PC, Gosvami NN, **Caporizzo MA**, Composto RJ, Carpick RW, Nano-rheology of hydrogels using direct drive force modulation atomic force microscopy, *Soft Matter*, 2015, 10.1039.

Patrick Robison, **Matthew A. Caporizzo**, Hossein Ahmadzadeh,Alexey I. Bogush, Kenneth B. Margulies, Vivek Shenoy, Benjamin L. Prosser, Detyrosinated microtubules sense force and bear load in contracting cardiomyocytes, *Submitted.*

Caporizzo MA, Sun Y, Goldman YE, Nanoscale Topography Controls the Attachment of F-Actin, *Langmuir*, 2012.

Ferrier R, Lee HS, Hore MJA, **Caporizzo MA,** Eckmann DM, Composto RJ, Janus Gold Nanorod Linking to Control Plasmonic Properties in Solution and Polymer Nanocomposites, *Langmuir*, 13, 7, 2014, 1906-1914.

TEACHING EXPERIENCE/PAST STUDENTS:

Mentor: Rachleff Scholar, Brandon Kao: 2015-Present.
Mentor: Claire E Fishman: Summer 2015 – Present.
Mentor: Charles Roco: Summer 2012 and Summer 2013 (see publications)
Mentor: Rami Ezzibdeh: Undergrad University of Pennsylvania (2011-present) (see publications)
Mentor: Aryeh Coburn-Soloway: Germantown Highschool, (2011).
Mentor: Laetitia Grabot: Masters Student from University of Grenoble, Grenoble, France, (2011).
MSE 550: Graduate Laboratory: Assisted with AFM section and wrote unpublished text (2010-2011).
TA: MSE/BE 330: Soft Materials, (2010).
Mentor: Leigh Andrews (Germantown Highschool): (2010).
Rock Climbing Outdoor Guide, Instructor, and Head Route Setter: *University of Penn* (2008-2013).

EXPERIENCE OVERVIEW:

NBIC Facilities Maintenance:

Asylum Bio-Scope Super-User (Maintain instrument and train people to use combined TIRF-AFM)

Modified instrument to be capable of TIRF Microscopy via 4 wavelengths and high sensitivity CCD for single molecule experiments

EMPLOYMENT HISTORY

Intern, May 2007 – 2009: Communication Automation Corporation
1180 McDermott Drive, West Chester, Pa
Contact: President, Jim Bridges: (610)692.9526
Built and Tested Fiber Optical Data Processing Devices

Research Assistant, 2007-2008: University of Pittsburgh Department of Materials Science and Engienering
848 Benedum Hall, University of Pittsburgh, Pittsburgh, Pa
Contact: Professor John Barnard (412)624.9720
Built Microdrop analysis system and integrated with Kruss droplet analysis software.
Trained students on Microfab JetLab Materials Printer

Rock Climbing Instructor, University of Pennsylvania Dept. of Recreation, (2008-2013)