

Curriculum Vitae

Bradley Edward Layton, Ph.D.

Assistant Professor

Department of Applied Computing and Electronics

The University of Montana College of Technology

Griz House 4

909 South Ave W

Missoula, MT 59801

406.243.7865 (o); 610.306.8408 (m)

bradley.layton@umontana.edu; blay@alum.mit.edu

<http://ace.cte.umt.edu/nrg/>

<http://ace.cte.umt.edu/brad.layton/>

EDUCATION

Biomedical Engineering, Ph.D. University of Michigan, Ann Arbor, 2003

Concentrations: soft-tissue mechanics, molecular structure of collagen

Dissertation: Remodeling of Heterogeneous Extracellular Matrices of the Diabetic Nerve: Models and Experiments

Advisor: Professor Ann Marie Sastry

Mechanical Engineering, M.S. University of Michigan, Ann Arbor, 1999

Concentrations: finite element modeling, neuroanatomy

Mechanical Engineering, B.S. Massachusetts Institute of Technology, Cambridge, MA, 1992

Concentrations: fluid mechanics, design. Minor: writing

PROFESSIONAL EXPERIENCE

Director, September 2010 – present

Energy Technology Program, University of Montana College of Technology, Missoula, MT

Assistant Professor, September 2010 – present

Applied Computing and Electronics Department, University of Montana COT, Missoula, MT

Associate Professor, September 2009 – August 2010

Mechanical Engineering and Mechanics, Drexel University, Philadelphia, PA

Assistant Professor, September 2003 – August 2009

Mechanical Engineering and Mechanics, Drexel University, Philadelphia, PA

Postdoctoral Fellow, June 2003-August 2003

Radiology, University of Michigan, Ann Arbor

- Developed model for brain tumor response to radiation and chemotherapy

Postdoctoral Fellow, May 2003

Neurology, University of Michigan, Ann Arbor

- Atomic force microscopy of glucose- and dinitrobenzene-challenged mitochondria

Postdoctoral Fellow, January 2003-April 2003

Biomedical Engineering, University of Michigan, Ann Arbor

- Developed nonlinear model of molecular behavior of peripheral nerve collagen

Graduate Student Research Assistant, 1997-2002

Mechanical Engineering | Biomedical Engineering, University of Michigan, Ann Arbor

- Designed and conducted animal diabetic neuropathy studies: nerve conduction velocity measurement, in vivo endoneurial fluid pressure measurement, atomic force microscopy of ECM proteins, in situ immunohistochemistry of ECM proteins, finite-element and failure modeling of soft-tissue composites, closed-form analysis of non-linear viscoelastic materials, statistical analysis of clinical data, image analysis of stochastic fibrous materials

Technical Assistant, 1997

Georgia Business Net, Augusta, GA

- Maintained and installed network hardware and software

Construction and Design Assistant, 1997

Stillwater Design, Cambridge, MA

- Designed and built rowing shells with carbon fiber, fiberglass and Kevlar

Junior Engineer, 1996

Associated Design and Manufacturing Company, Alexandria, VA

- Subcontractor to Northrop Grumman and USEPA
- Consulted in mechanical design, thermodynamics, fluid mechanics, system dynamics

Fire Protection Engineer, 1994-1996

Gasser Associates, Aiken, SC

- Subcontractor to Westinghouse
- Did walk-downs on US DOE Savannah River Site buildings
- Wrote recommendations based on National Fire Protection Association codes
- Clearance: DOE L

Assistant System Administrator, 1993-1994

Photon Research Associates, Arlington, VA

- Subcontractor to NASA and Ballistic Missile Defense Office (BMDO)
- Programmed and performed system administration on SGI-PC network
- Modeled space-based infrared sensors
- Clearance: DOD L

Junior Scientist, 1992

US DOE Office of Space, Washington, DC

- Collected and evaluated documents on properties of lunar soil and its effects on long-term lunar energy systems
- Discussed findings with NASA and Johnson Space Center scientists
- Clearance: DOE L

Machinist, 1990

Merlin Metalworks, Somerville, MA

- Designed, machined, and welded titanium bicycles

PUBLICATIONS

Books

Layton, B.E. et al. "Cell and Protein Mechanics" B.E. Layton, Editor. Pan Stanford Publishing (invited, in preparation)

Layton, B.E. "Mechanoevolution" Bentham Science Publishers (invited, in preparation)

Book chapters

1. Layton, B.E. and M. Brent Boyd. 2010. "Atomic Force Microscopy of Isolated Mitochondria" In: Atomic Force Microscopy: Methods and Protocols in Biomedical Applications, P.C. Braga and D. Ricci, Eds. (invited, to appear)

Layton, B.E. "The Role of MechanoEvolution in Predicting Future Technologies" in Systems Engineering for Micro and Nano Scale Technologies. Jonathan W. Plant, Janet L. Barth, M. Ann Garrison Darrin, Eds. Taylor & Francis / CRC Press Johns Hopkins Applied Physics Laboratory, Editor (invited, in review)

Archival/refereed papers

2. Layton, B.E. 2010. "Selective Pressure for Axial Stiffness Drives Tubulin Towards Anisotropy," International Journal of Molecular Sciences. (invited, to appear)
3. Layton, B.E., M. Tripepi, B. Bitonti, N. Dollahon, RA Balsamo. 2010. "De novo synthesis of a 31 kD dehydrin coincides with AFM-resolved cellulose microfibril rearrangements in the dry state for the resurrection fern *Polypodium polypodioides*" American Journal of Botany 97 (4) 535-544.
4. Allen K., and Layton B.E. 2009. "Determination of the Forces Imposed by Micro and Nanopipettes during DOPC:DOPS Liposome Manipulation" Chemistry and Physics of Lipids 162 34-52. PMID: 19665459.
5. Allen K., F.M. Sasoglu, and Layton, B.E., 2009. "Cytoskeleton-Membrane Interactions in Neuronal Growth Cones: A Finite Analysis Study" Journal of Biomechanical Engineering-Transactions of the ASME, 131(2) 1-10. PMID: 19102565.
6. F. Mert Sasoglu, Andrew Bohl, Layton, B.E. 2009. "Parallel force measurement with a polymeric microbeam array using an optical microscope and micromanipulator" Computer Methods & Programs in Biomedicine, 93 1-8. PMID: 18774621.
7. J. Andrew Goshorn, Edward M. Deegan, and Layton, B.E. 2009. "Spare Part Storage Optimization Onboard Deployable Military Support Assets" Naval Engineers Journal 121, (4) (in press)
8. Layton, B.E. 2008. "Practical and Theoretical Energy Density Calculations of Prevalent Energy Sources," International Journal of Green Energy 5 (6) 438-455.
9. Zeiger, A. Layton, B.E. 2008. "Molecular Modeling of the Axial and Circumferential Elastic Moduli of Tubulin," Biophysical Journal, 95 3606-3618. PMID: 18621829.
10. Layton, B.E. Adam D'Souza, Adam Zeiger, Alia Sabur, William Dampier 2008. "Collagen's triglycine repeat length may help to explain an interdomain transfer event from a eukaryote into *Trichodesmium erythraeum*" Journal of Molecular Evolution, 66 (6) 539-554. Cover Image. PMID: 18521530.
11. Layton, B.E. 2008. "Recent Patents in Bionanotechnologies: Nanolithography, Bionanocomposites, Cell-Based Computing and Entropy Production." Recent Patents in Nanotechnology, 2 (2) 72-83.

12. Mulero, R. Layton, B.E. 2007. "Optimization of a Stamping Blank Layout for Use on Pre-Cut Sheet Metal" *Journal of Manufacturing Systems* 26 (1) 1-12.
13. Sasoglu, F.M. Bohl, A.J., Layton, B.E. 2007. "Design and microfabrication a high-aspect-ratio tapered PDMS microbeam array for parallel nanoscale force measurement and protein printing." *Journal of Micromechanics and Microengineering* 17 623-632.
14. Layton, B.E., Sastry, A.M., 2006. "An Equal and Local-Load-Sharing Failure-Mechanics Model for Peripheral Nerve Extracellular Matrix in Diabetic and Non-Diabetic Rats." *Acta Biomaterialia* 2 (6) 595-607. PMID: 16905373.
15. Gadia, V., Roy, S., Venkatesh, N., Lunagaria, S., Patel, R., Layton, B.E. 2005. "Towards Nanotechnology for All." *News from the Bottom, Volume 1, Issue 2*
16. Gadia, V., Roy, S., Venkatesh, N., Lunagaria, S., Patel, R., Layton, B.E. 2005. "Construction of an Educational Model of an Atomic Force Microscope." *The Nanotechnology Group Volume 4, Number 7*.
17. Layton, B.E., Sullivan, S.M., Palermo, J.J., Buzby, G.J., Gupta, R., Stallcup III, R.E., 2005. "Nanomanipulation and Aggregation Limits of Self-Assembling Structural Proteins," *MicroElectronics Journal* 36 (7) 644-649.
18. Layton, B.E., Sastry, A.M., 2004. "A Mechanical Model for Collagen Fibril Load Sharing in the Peripheral Nerve of Diabetic and Non-Diabetic Rats." *ASME Journal of Biomechanical Engineering* 126, 803-814. PMID: 15796339.
19. Layton, B. E., Sastry, A. M., Lastoskie, C. M., Philbert, M. A., Miller, T. J., Sullivan, K.A., Feldman, E.L., Wang C.-W., 2004. "In Situ Imaging of Mitochondrial Outer Membrane Pores Using Atomic Force Microscopy." *Biotechniques* 37, 564-573. PMID: 15517968.
20. Layton, B.E., Sastry, A.M., Sullivan, K.A., Feldman, E.L., Wang, H., Philbert, M.A., Komorowski, T.E., 2004. "Differences between Collagen Morphologies, Properties and Distribution in Diabetic and Normal BioBreeding and Sprague-Dawley Rat Sciatic Nerves." *Journal of Biomechanics* 37 (6) 879-888. PMID: 15111075.
21. Wang, H., Layton, B.E., Sastry, A.M., 2003. "Nerve Collagens from Diabetic and Non-diabetic Sprague-Dawley and BioBreeding Rats: An Atomic Force Microscopy Study." *Diabetes Metabolism Research and Reviews* 19 (4) 288-298. PMID: 12879406
22. Cheng, X., Sastry, A.M., Layton, B.E., 2001. "Transport in Stochastic Fibrous Networks." *Journal of Engineering Materials and Technology* 123 (1) 12-19.
23. Allen, K.B. and Layton, B.E. "Determination of the Mechanical Properties of DOPC:DOPS Liposomes using an Image Procession Algorithm and Micropipette-Aspiration Techniques" in press *Chemistry and Physics of Lipids*

Journal papers in review

- Bela Peethambaran, Merewyn Boak, Xiang Wenxi, M. Brent Boyd, Bradley E. Layton, Balsamo Ronald "Role of 14-3-3 λ in Arabidopsis thaliana during drought stress" *submitted*
- Helms, S. and Layton, B.E., "Computational Fluid Dynamics simulation of a Hybrid Savonius-Darrieus Wind Turbine for Urban Use" *Submitted*
- Peters, Tom, Lynch, B., Layton, B.E., Jamieson, B.G., A Space-Based Electrical Impedance Hematology Analyzer, *submitted*

Journal papers submitted

Legum, B.M. Layton, B.E., Cooper, R. Mattia, D., Gogotsi, Y. “The Effect of Deformation on Room Temperature Coulomb Blockade in Multiwalled Carbon Nanotubes,” submitted to IEEE Transactions on Electron Devices

Journal papers in preparation

Abay, A. and Layton, B.E. “Design of a Solar Tower for the Rift Valley” in preparation for American Society of Civil Engineering

Bohl, A.J. Layton, B.E., and Moxon, K. “Insertion Mechanics of Silicon Brain Electrodes” in preparation

Boyd, M.B., Balsamo, R.A. and Layton, B.E. “Leaf Mechanics of Arabidopsis thaliana” in preparation

Layton, B.E. “A Unification of the Second Law with Information Theory through a Society-Dependent Coefficient,” in preparation for Entropy

Technical reports

24. Layton, B.E. 2008. Final report for Pennsylvania Department of Community and Economic Development award, “A Green Alternative to Municipal Maintenance”

25. Layton, B.E. 2007. Internal report for “A Bioresorbable Staple with Growth Factor,” submitted to Coulter Foundation.

26. Layton, B.E. 2006. Final report for Pennsylvania Health Department award, “Nanoscience meets Nanotechnology”

27. Layton, B.E. 2005. Final report for NSF-DMII MRI award, “Acquisition of a Nanomanipulation Device for Biological, Electronic and Optoelectronic Samples and Devices”

Application notes

28. Rishi Gupta, Aaron Geisberger, Gareth Hughes (Zyvex Corporation), Dr. Bradley Layton (Drexel University), Zyvex Application Note 9710: “Manipulation of Collagen for Mechanical Characterization” http://www.zyvex.com/Products/CFMC_001a.html
<http://www.zyvex.com/Documents/9710.PDF>

Conference papers and abstracts published

29. Bradley Layton, 2010, “Mechanoevolution” ASME International Mechanical Engineering Congress and Exposition, November 12 – 18, Vancouver, British Columbia, Canada.

30. Bradley Layton and Brandon Tolle, 2010, “Predicting Material Anisotropy at the Molecular Scale across all Sequenced Tubulins,” ASME International Mechanical Engineering Congress and Exposition, November 12 – 18, Vancouver, British Columbia, Canada.

31. Dana Denick, Jay Bhatt and Bradley Layton, 2010. “Citation Analysis of Engineering Design Reports for Information Literacy Assessment” American Society for Engineering Education Annual Conference and Exposition, June 20 – 23, Louisville, KY

32. Simara Price, Bradley Layton, Maliha Ahmed, Shivanthi Anandan, 2010. “Towards Development of a Genetic System in Trichodesmium erythraeum,” 110th General Meeting for the American Society of Microbiology. May 23-27 San Diego, CA

33. Michael Marks, Bradley Layton, and Tony Lowman, 2010. "Atomic Force Microscopy as a Tool for Determining Mucosin Adhesion In Vitro," Society for Biomaterials, April 21 – 24, Seattle, WA.
34. Justin Warren, Yury Gogotsi and Bradley Layton 2010. "Mechanical Properties of Assembled Nanopipettes" ASME Global Congress on NanoEngineering for Medicine and Biology (NEMB 2010), Feb 7-10, Houston, TX
35. M. Brent Boyd and Bradley Layton, 2009 "Nanomechanics of Arabidopsis thaliana" ASME International Mechanical Engineering Congress and Exposition November 13-19, 2009, Orlando, Florida (abstract and podium only)
36. Bradley Layton, 2009 "Fighting Fire with Fire: Information Theory Battles Global Warming," ASME International Mechanical Engineering Congress and Exposition November 13-19, 2008, Orlando, Florida (abstract and podium only)
37. Bradley Layton and Ronald Balsamo "Nanomechanics of Drought Tolerance" CREES/USDA Grantees Conference, September Sept 27-28, Santa Fe New Mexico.
38. Andrew Bohl and Bradley Layton "Energy Analysis of Sustainable Transportation" ASME International Mechanical Engineering Congress and Exposition November 2-6, 2008, Boston, Massachusetts (abstract and podium only)
39. Andrew Bohl and Bradley Layton "Mechanical Property Measurement of PLGA for Surgical Device Manufacturing" ASME International Mechanical Engineering Congress and Exposition November 2-6, 2008, Boston, Massachusetts (abstract and podium only)
40. Benjamin Legum and Bradley Layton "Nanofabrication Strategy for Carbon-Nanotube Pipettes" ASME International Mechanical Engineering Congress and Exposition November 2-6, 2008, Boston, Massachusetts (abstract and podium only)
41. Kate Allen and Bradley Layton, "A Mechanical Model for Cytoskeleton and Membrane Interactions in Neuronal Growth Cones," ASME International Mechanical Engineering Congress and Exposition November 11-15, 2007, Seattle, Washington
42. Bradley Layton, Lauren Jablonowski, Ryan Kirby, Nick Lampe "Bicycle Infrastructure Development Strategy for Suburban Commuting," ASME International Mechanical Engineering Congress and Exposition November 11-15, 2007, Seattle, Washington
43. Stephanie Sullivan, Brian Jamieson, Bernard Lynch, and Bradley Layton "Cell Sorting Evaluation of a Multi-Bed Microfabricated Hematology Analyzer," ASME International Mechanical Engineering Congress and Exposition November 11-15, 2007, Seattle, Washington
44. Adam Zeiger and Bradley Layton, "Tubulin Mechanics: A Molecular Mechanics Study of all Known Tubulin Structures," ASME International Mechanical Engineering Congress and Exposition November 11-15, 2007, Seattle, Washington. (abstract only)
45. Bradley Layton and Ronald Balsamo, "An Orthotropic Material Mechanics Model of Cellulose Wall Structure Derived From in situ AFM of the Drought-Resistant Fern Polypodium polypodioides," ASME International Mechanical Engineering Congress and Exposition November 11-15, 2007, Seattle, Washington. (abstract only)
46. F Mert Sasoglu, Devrim Kilinc, Kathleen Allen and Bradley Layton, "Towards a Method for Printing a Network of Chick Forebrain Neurons for Biosensor Applications," IEEE-EMBC Annual Meeting, Lyon, France, August 23-26, 2007.

47. Legum, B., Cooper, R., Gogotsi, Y., Layton, B.E. "The Effect of Deformation on Room Temperature Coulomb Blockade using Conductive Carbon Nanotubes," IEEE-EMBC Annual Meeting, Lyon, France, August 23-26, 2007. PMID: 18002930.
48. Adam Zeiger and Bradley Layton, "A Molecular Mechanics Model for Axial Elastic Modulus Prediction of Tubulin" ASME Applied Mechanics and Materials Conference, Austin, Texas, June 3-7, 2007. (invited, abstract only)
49. Bradley Layton and Adam D'Souza, "The Bonds That Make Us Big: The Collagen Goldilocks Hypothesis," ASME Applied Mechanics and Materials Conference, Austin, Texas, June 3-7, 2007. (invited, abstract only)
50. Ronald A. Balsamo, Manuela Tripepi, Natalie Algar, Jill M. Farrant, and Bradley E. Layton, "Whole leaves to cellulose microfibrils: Mechanical, molecular, and architectural approaches to study wall in-folding in vegetative tissues of desiccation tolerant plants." 5th International Workshop on Desiccation Sensitivity and – Tolerance in Seed and Vegetative Plant Tissues, 14 - 21 January, 2007, Drakensberg, South Africa
51. Layton, B.E., Tamayne, D. Dolin, M. Gallagher, M. "An Integrated Atomic Force Microscopy Nanomanipulation Stage for Biological Samples," Seeing at the Nanoscale IV, July 17-20, 2006, Philadelphia, PA.
52. Sasoglu FM, Bohl AJ, Layton BE 2006. .Microfabrication Procedure of PDMS Microbeam Array using Photolithography for Laminin Printing and Piconewton Force Transduction on Axons. Conf Proc IEEE Eng Med Biol Soc. 1:2844-7. PMID: 17946983
53. Patel, R., Legum, B., Gogotsi, Y., Layton, B.E., "Parameterization of a Piezoelectric Nanomanipulation Device," Proceedings of ESDA2006 8th Biennial ASME Conference on Engineering Systems Design and Analysis, July 4-7, 2006, Torino, Italy.
54. Sullivan, S.M., Jamieson, B.J., Layton, B.E., "A Micro-Fabricated Electrical Impedance Based Hematology Analyzer," ASME International Mechanical Engineering Congress and Exposition. November 5-11, 2005, Orlando, FL
55. Allen, K.B., Sasoglu, F.M., Layton, B.E., "Mechanical Neural Growth Models," ASME International Mechanical Engineering Congress and Exposition. November 5-11, 2005, Orlando, FL
56. Layton, B.E., Jamieson, B.J., Sullivan, S.M. 2005. "A Micro-Fabricated Electrical-Impedance-Based In-Flight Hematology Analyzer," 3rd Annual Conference on Microchannels and Minichannels. June 13-15, Toronto, Canada.
57. Layton, B.E., Allen, K.B., Stokes, M.D., Myers, K.A., Baas, P.W., 2005. "Towards a Method for Peripheral Nervous System Axonal Stiffness Measurements with MEMS-based Microgrippers," 2nd Annual IEEE-EMBS Conference on Neural Engineering, March 16-19, Arlington, VA.
58. Layton, B.E., Fontecchio, A., Ko, F., Nabet, B., Spanier, J. 2005. "Acquisition of a Zyvex L100 nanomanipulation device for biological, electronic, and optoelectronic samples and devices." Design, Service and Manufacturing Research and Grantees Conference, Jan 3-6. Tempe, AZ
59. Layton, B.E. 2004. "Nanomanipulation and Aggregation Limits of Self-Assembling Structural Proteins" European Micro and Nano Systems, October 20-21, Paris France
60. Layton, B.E. 2004. "Self-Assembly Limits in Structural Proteins" Proceedings of ASME Integrated Nanosystems, September 22-24, Pasadena, CA

61. Layton, B.E., Gupta, R., Jackson, N.L., Shah, A.J., Stallcup, R.E., III, Sullivan, S.M., 2004. "Nanomanipulation and Characterization Of Structural Proteins" 26th Annual International Conference IEEE-EMBS Sep 1-5, Francisco, CA. PMID: 17270802.
62. Layton, B.E. 2004 "A Mechanics-Based Model for the Collagen Fibril Aggregation Limit" October 13-16, 2004, Biomedical Engineering Society Annual Fall Meeting, Philadelphia, PA
63. Layton, B.E. Sastry, A.M., 2003. Mitochondrial Pore Imaging via AFM. BMES Annual Fall Meeting. Oct 1-4, Nashville, TN.
64. Layton, B.E. 2003. Implications of hexagonal close-packing in a finite domain on self-assembly of nanofibrous materials. NATO-Advance Study Institute (ASI) Nanoengineered Nanofibrous Materials. Sep 1-12, Antalya Turkey.
65. Chenevert, T.L., Layton, B.E., Johnson, T.D., Schepkin, V.D., Ross, B.D. 2003. A Model of Temporal Dependence in Therapy-Induced ADC Change, ISMRM 11th Scientific Meeting and Exhibition, Toronto July 10-16.
66. Layton, B.E., Sastry, A.M., 2002. Damage in the heterogeneous ECM of peripheral nerves due to diabetes. ASME International Mechanical Engineering Congress, November 17-22, New Orleans, LA.
67. Layton, B.E., Sastry, A.M., Wang, H., Sullivan, K.A., 2002. A model for pressure enhancement in the diabetic nerve: simulations of diabetic rat peripheral nerve and nerve collagens. 24th Annual Conference and the Annual Fall Meeting of the Biomedical Engineering Society] EMBS/BMES Conference, 2002. Proceedings of the Second Joint, Volume: 1, 450 -451.
68. Sastry, A.M.; Layton, B.E.; Wang, H.; Sullivan, K.A.; Philbert, M.A.; Komorowski, Mechanical and structural changes in diabetic rat peripheral nerve collagens Annual International Conference of the IEEE Engineering in Medicine and Biology - Proceedings, v 1, 2002, p 432-433
69. Layton, B.E., Sastry, A.M., Sullivan, K.A., Feldman, E.L., 2000. Remodeling of Peripheral Nerve Tissue in Diabetic Rats. International ASME Congress, November 5-10, Orlando, FL

Patents and Provisional Patents

1. Bradley Layton and Gregory Buzby "An Integrated Atomic Force Microscopy Nanomanipulation Platform" Issued January 19, 2010. Patent number 7,647,848.
2. Bradley Layton and Nicholas Haas, "Vertical Axis Wind Turbine," (pending)
3. Ari Brooks, Margaret Wheatley, Bradley Layton "A Surgical Stapler," (pending)
4. Ari Brooks, Margaret Wheatley, Bradley Layton "A Surgical Staple, with Elution Drug," (pending)
5. Bradley Layton "A Pontoon Rowing Boat" (provisional patent, submitted November 29, 2005)

FUNDED PROPOSALS

1. "Multiscale Structure-Function Relationships of Collagen in the Marine Cyanobacterium *Trichodesmium erythraeum*" NSF CMII 07030000 PI, with Shivanthi Anandan (Drexel Bioscience) and Fred Silver (UMDNJ). 6/1/2009 – 5/31/2012. Total project funding: \$403,000.
2. LiT: RUI: Mitigation of Dehydration-Induced Nanomechanical Failure in *Arabidopsis thaliana*," Co-PI in collaboration with Ronald Balsamo of Villanova University. NSF IOS 0950374 3/1/2010 – 2/28/2013. Total Project Funding: \$422,000.

3. "Design, Testing and Deployment of a Hybrid Savonius-Darrieus Wind Turbine for Urban Use" PI. Energy Commercialization Institute \$5,000
4. "Does nanoscale cellulose fibril rearrangement in mesophyll and vascular tissues affect survival rates during dehydration in *Eragrostis*?" USDA Co-PI, 7/15/2008 – 7/14/2010 with Ronald Balsamo (Co-PI) of Villanova University. Total project funding: \$100,000.
5. "The Keck Institute for Attofluidic Nanotube-Based Probes", Co-I (Yury Gogotsi, Gary Freidman, Jane Clifford, Elisabeth Papazoglou), Submitted to the Keck Foundation 7/1/07 – 6/30/10. Total Budget: \$3,000,000.
6. "A Savonius-Darrieus Hybrid Turbine for Urban or Residential Use" PI, NetScientific Inc. 6/30/2009. – 12/31/2010. Total project funding: \$45,000.
7. "MRI: Acquisition of a Nanomanipulation Device for Biological, Electronic and Optoelectronic Samples and Devices," NSF DMII MRI 0421033 PI, with Co-PIs: Frank Ko, Jonathan Spanier, Adam Fontecchio, and Bahram Nabet, sponsored by the National Science Foundation, 7/15/2004 – 7/14/2005; Total project funding: \$143,000
8. "Nanotechnology Meets Neuroscience: Microgrippers to Study the Molecular Motor Mechanics of Axons," Co-PI, with Peter Baas, sponsored by Pennsylvania Department of Health, 1/1/2005 – 6/30/2006; Total project funding: \$364,544
9. "A Micro-fabricated Hematology Analyzer," Co-PI with Brian Jamieson, sponsored by DDF05-553 NASA, 1/1/2005 – 6/30/2006; Total project funding: \$60,000
10. "Drexel University GAANN Fellowships in Biomedical Applications in Engineering." Co-I with Mun Choi, PI. Sponsored by Department of Education. P200A060138 8/1/2006 – 7/31/2009. Total project funding: \$400,000
11. "Research Experiences for Teachers in Areas of Innovative and Novel Technologies in Philadelphia" Co-I (PI: Mun Choi, Co-PIs: Yury Gogotsi, Bradley E. Layton, Athina P. Petropulu, Fredricka K. Reisman) Sponsored by National Science Foundation 0601845 10/1/06 – 02/28/09; Total project funding: \$459,904.
12. "A Surgical Stapler with Biodegradable Staples" Co-PI (PIs: Ari Brooks and Margaret Wheatley) Sponsored by the Coulter Translational Research 11/30/2006 – 11/30/2007; Total project funding: \$95,000.
13. "A Green Alternative to Municipal Maintenance" PI Sponsored by the DCED and James Roebuck, C000021433 7/1/2005 to 6/30/2008. Total project funding: \$15,000
14. "MechanoEvolution: How early molecular winners affect our lives on a daily basis," Drexel Special topics course, sponsored by Drexel University, Total project funding: \$5,000
15. "Cell and Protein Mechanics Workshop" Sponsored in part by IEEE-EMBS and Greater Philadelphia Bioinformatics Alliance, September 2006, Total project funding: \$6,000

Program initiation and development

1. Development of the Energy Technology Program at The University of Montana College of Technology. Helped facilitate the coordination of face-to-face and online learning.
2. Helped to establish the program in Physical Cell Biology with Peter Baas, Gianluca Gallo and Michele Marcolongo at Drexel University, 2006. This program is a inter-college program to give life scientists access to faculty and facilities on the Main Campus, while providing engineering students access to the faculty and facilities on the Queen Lane Campus. The primary focus of the program is to model and measure physical changes to cells and cytoskeletal elements in models relevant to disease and development.

SEMINARS, LECTURES, WORKSHOPS, INVITED TALKS AND PRESENTATIONS

1. "Sustainable Energy Technology" Given to Vicky Watson's students, November, 2010.
2. "Nanoscale Education" 50th Annual PNWIS conference in Missoula, University of Montana, November 3-5, 2010. Invited.
3. "Nanomechanics of Collagen Evolution in *Trichodesmium erythraeum*" University of Montana Department of Chemistry and Biochemistry hosted by Chris Palmer, September 27, 2010
4. "A Quantitative Look at Global Energetics" Drexel University Blood and Oil series hosted by Scott Knowles, August 11, 2010
5. "Diabetes and Collagen Mechanics" Drexel University Body Synthetic course hosted by Todd Doehring, August 11, 2010
6. "Practical Implications of the Energy Density of Prevalent Energy Sources," University of Montana, College of Technology, June 15, 2010.
7. "The Role of Cell and Protein Mechanics in Biomedical Engineering: A Perspective on Research and Teaching in the Post-Genomic Era" Ohio State University, Department of Biomedical Engineering. March 2010.
8. "Protein Evolution: Collagen and Tubulin Are Optimized Self-Assembling Nanobiomaterials" Eastern Analytical Symposium and Exposition. November 2009.
9. "Genetic Drift toward Mechanical Anisotropy: Collagen and Tubulin" MIT Materials Science Department, October 2009
10. "Nanoscale Protein Mechanics" University of British Columbia. March 2009.
11. "Collagen and Tubulin Mechanics," IUPUI. Invited by Alan Jones, March, 2008.
12. "Protein Evolution," Johns Hopkins University Applied Physics Laboratory. Invited by Ann Darrin, November, 2007.
13. "MechanoEvolution," Johns Hopkins University, Applied Physics Laboratory Colloquium. Invited by Ann Darrin, November, 2007.
14. "An Energetic Argument Justifies the War for Oil: What Engineers can do to Prevent the Loss of Life in the Quest for Energy-Dense Resources," Delaware Valley Chapter of the American Society of Mechanical Engineering. Invited by Mark A. Nicosia, President of Delaware Valley ASME, Widener University.
15. "Mechanics of Protein Evolution," October, 2007. Carnegie Mellon University. Invited by Phil LeDuc.

16. "The Mechanics of Protein Evolution," September, 2007. University of Colorado, Boulder. Invited by Jerry Qi.
17. "Tubulin Mechanics" May, 2007. Talk given with Adam Zeiger to Neurobiology and Anatomy Department, Drexel University.
18. "MechanoEvolution" April, 2007. Invited to speak to the Drexel University Mechanical Engineering and Mechanics department by the Engineering Graduate Student Association.
19. "The Relationship of Biomechanics to Drought and Desiccation Tolerance in Plants," Talk given as Keynote by collaborator, Ronald Balsamo of Villanova University to Omaha Nebraska group.
20. "Collagen Mechanics," February, 2007. Invited by Todd Doehring to speak at the Biomedical Engineering Departmental Seminar Series.
21. "Integration of an Atomic Force Microscope with a Nanomanipulator," February, 2007. Invited by Yury Gogotsi and the Drexel Nanotechnology Institute.
22. "Writing for Mechanical Engineers," February, 2007. Invited speaker to the faculty forum on behalf of Harriet Millan.
23. "Mechanical Genes," November, 2006. Invited speaker at Villanova University's biology departmental seminar series. Delivered via webcast.
24. "Cell and Protein Mechanics," November, 2006. Invited speaker at the Drexel College of Engineering Discovery Workshop on Bioscience Research hosted by Mun Choi and Kenneth Blank.
25. "An Educational Atomic Force Microscope," August, 2006. invited speaker at the MSP (Math and Science Program) outreach symposium hosted by Mun Choi
26. "Mechanical Axonal Growth Models: Towards Directed Neural Growth and Highly Parallel Piconewton Force Transduction," July, 2006. invited speaker at Bioengineering Department Politecnico di Milano, Milan, Italy.
27. "Mechanical Axonal Growth Models: Towards Directed Neural Growth and Highly Parallel Piconewton Force Transduction," July, 2006. invited speaker at National Nanotechnology Laboratories, Lecce, Italy.
28. "An Athletic Engineer's Perspective on the Value of an MIT Education," March, 2006. invited speaker at the MIT Young Alumni Club of Philadelphia
29. "Bionanotechnology in Mechanical Engineering," November 2005. invited speaker at the Drexel University Chapter of the Society of Women Engineers.
30. "Nanometrology and Micrometrology of Cells, Organelles and Proteins under Mechanical and Environmental Challenge," December, 2005. invited speaker at the Army Research Laboratory
31. "Nanometrology and Micrometrology in Biological Systems" November, 2005. invited speaker at the National Institute of Standards and Technology, Mathematical and Computational Sciences Division
32. "An update of the micromanipulation and nanomanipulation capabilities at Drexel University." July, 2005. invited speaker at the Drexel University GPBA Bio-Nanotechnology Symposium
33. "Micromanipulation, Nanomanipulation and Self-Assembly Limits of Structural Proteins" February, 2005. invited speaker at the Drexel University Department of Material Science and Engineering

34. "Nanotechnology meets Neuroscience" February, 2005. invited Neurology Grand Rounds speaker at the Drexel University School of Medicine
35. "Micromanipulation, Nanomanipulation and Self-Assembly Limits of Structural Proteins" November, 2004. invited speaker at the Drexel University Department of Biomedical Engineering, Science and Health Systems
36. "Nanomanipulation and Characterization of Structural Proteins" November, 2004. invited speaker at the Computational Systems Biology Group sponsored by Aydin Tozeren
37. "Nanosopic Imaging and Nanomanipulation of Neurons, Organelles, and Proteins" July, 2004. invited speaker at Drexel Queen Lane Campus laboratories of Dr. Peter Baas on neuronal manipulation
38. "Cellular Nanomanipulation: Cell Sensing Series" June, 2004. invited seminar speaker at Drexel Biochemistry Department IBAPS Institute of Basic and Applied Protein Science,
39. "Mechanical Models of Soft Tissue: Molecular to Tissue Scales" October, 2003. invited seminar speaker at Drexel Department of Material Science Department.

Conference Poster Presentations

1. Sasoglu, F.M., Allen, K.B., Layton, B.E. 2007. "Fibronectin printing and Neuronal Arrays," Mid-Atlantic MEMS Alliance, Johns Hopkins University, MD, October 2, 2007.
2. Sasoglu, F.M., Bohl, A.J. Layton, B.E. 2006. "Design and Characterization of a Parallel Nanoscale Force Transduction Array," 28th IEEE EMBS Annual International Conference, New York, NY, August 30- September 3, 2006.
3. Sullivan, S.M., Layton, B.E., Jamieson, B.G. 2006. "A Micro-Fabricated Electrical-Impedance-Based In-Flight Hematology Analyzer," Mid-Atlantic MEMS and Nanotech Special Topics Symposium, Laurel, MD, April 4, 2006.
4. Sasoglu, F.M., Layton, B.E. "Design and Microfabrication of an Actuated PDMS High-Aspect-Ratio Microbeam Array for Piconewton Force Transduction," TASSA Conference, Drexel University, March 25-26, 2006.
5. Sasoglu, F.M., Layton, B.E. "Design and Microfabrication of an Actuated PDMS High-Aspect-Ratio Microbeam Array for Piconewton Force Transduction," Mid-Atlantic MEMS and Nanotech Special Topics Symposium, Laurel, MD, April 4, 2006.
6. Sullivan, S.M., Layton, B.E., Jamieson, B.G. Velasquez, J. 2005. "A Micro-Fabricated Electrical-Impedance-Based In-Flight Hematology Analyzer," BMES Fall Meeting, Baltimore, MD, September 29, 2005.
7. Sasoglu, F.M. Layton, B.E., 2005. "Parameterization and Microfabrication Procedure of A Microcone Array to Measure Cell Stiffness," BMES Fall Meeting, Baltimore, MD, September 29, 2005.
8. Allen, K.B., Layton, B.E., 2005 "Mechanical Neural Growth Models" BMES Fall Meeting, Baltimore MD September 29 2005.
9. Allen, K.B., Layton, B.E., 2005. "Microtubule Polymerization, and Single Cell Micromanipulation," A.J. Drexel Institute of Basic and Applied Protein Science 3rd Annual Protein Institute Retreat, June 16th 2005

10. Sasoglu, F.M., Layton, B.E., 2005. "A Silicone Elastomer Microbeam Array for Measuring Neurite Stiffness," Drexel University Research Day, April 26, 2005, Philadelphia, PA.
11. Sullivan, S.M., Layton, B.E., Jamieson, B.J., 2005 "A Micro-Fabricated, Electrical-Impedance-Based Space-Based Hematology Analyzer," Drexel University Research Day, April 26, 2005, Philadelphia, PA.
12. Layton, B.E., Fontecchio, A., Ko, F.K., Nabet, B., Spanier, J.E., Luzzi, D., MacDiarmid, A., Allen, K.B., Ermold, M., Gallo, E., Laim, L., Sullivan, S.M. Titchenal, N., 2005. "Acquisition of a nanomanipulation device for biological, electronic, and optoelectronic samples and devices" National Science Foundation Design, Service, and Manufacturing Research and Grantees Conference, January 3-6, 2005, Scottsdale, AZ,
13. Sullivan, S.M. Layton, B.E. 2004 "Genomic Sequence Analysis of Structural Proteins as a Predictor for Tissue Properties" Biomedical Engineering Society Annual Fall Meeting, Oct 13-16, 2004, Philadelphia, PA.
14. Jackson, N.L., Sullivan, S.M., Layton, B.E. 2004. "'Knanoknot' Nanomechanical Manipulation of Collagen fibrils" Biomedical Engineering Society Annual Fall Meeting, Oct 13-16, 2004, Philadelphia, PA.
15. Rose, S., Tan, S., Azad, F., Layton, B.E. 2004. "A self-assembly model for genetically engineered collagen" Biomedical Engineering Society Annual Fall Meeting, Oct 13-16, 2004, Philadelphia, PA
16. Stokes, M., Layton, B.E., 2004 "Nanotechnology - Thermally Activated microgrippers" Biomedical Engineering Society Annual Fall Meeting, Oct 13-16, 2004, Philadelphia, PA
17. Palermo, J.P., Buzby, G., Allen, K., Hudson, J., Hubert-Theriot, J., Layton, B.E. 2004. "Bench Top Atomic Force Microscope" Biomedical Engineering Society Annual Fall Meeting, Oct 13-16, 2004, Philadelphia,
18. PA Shah, A.J., Layton, B.E., 2004. "Assessment and Design of MEMS Microgripper Technologies," Drexel University Research Day, May 4, 2004, Philadelphia, PA.
19. Sullivan, S.M., Layton, B.E., 2004. "Directed Evolution of Earth's Most Abundant Protein," Drexel University Research Day, May 4, 2004, Philadelphia, PA.
20. Jackson, N.L., Layton, B.E., 2004. "KnanoKnot" – Nanomechanical Manipulation of Collagen Fibrils," Drexel University Research Day, May 4, 2004, Philadelphia, PA.
21. Ramacrishna, P., Layton, B.E., 2004. "Towards Building a Molecular Rope Using Molecular Dynamics," Drexel University Research Day, May 4, 2004, Philadelphia, PA.
22. Layton, B.E. "A Mathematical Model of Apparent Diffusion Coefficients in Brain Tumor Magnetic Resonance Imaging" July, 2003. presentation of postdoctoral research on brain tumor response modeling to Radiology Department, University of Michigan
23. Layton, B.E. "Nanoscopic Mitochondrial Imaging" June, 2003. presentation of postdoctoral research on mitochondrial imaging results to Neurology Department, University of Michigan

TECHNICAL REVIEWERSHIP AND CONFERENCE ORGANIZATION

Proposal, Journal and Conference Paper Review

Proposal Reviews

1. Numerous NSF Review panels.
2. Online survey for National Science Foundation's review policy.
3. Internal Drexel University reviewer for State of Pennsylvania tobacco settlement.
4. National Science Foundation Reviewer for the University of South Carolina Nanocenter.

Book Reviews

5. Reviewer for Wiley Engineering Textbook
6. Reviewer for Sustainability Textbook

Journal paper and conference paper reviews

Advances in Engineering Education • ASME Conference on Engineering Systems Design and Analysis • ASME Microchannels and Minichannels • Cell Biochemistry and Biophysics • Computer-Aided Design • Electrophoresis • IEEE-EMBC Proceedings • Journal of Composite Materials • Journal of Engineering Materials Technology • Journal of Micromechanics and Microengineering • Journal of Orthopedic Research • Journal of Polymer Science: Polymer Physics • Journal of Wind Engineering & Industrial Aerodynamics • Lab on a Chip • Langmuir • MicroElectronics Journal • Nanotechnology • NATO ASI 2003 Nanotechnology Textbook • Neuroscience • Recent Patents in Nanotechnology • The Royal Society Interface • Proceedings of the Royal Society A: Mathematical • Physical and Engineering Sciences • Sensors • Trends in Biotechnology

Conference Organization/Chair

1. Invited to be session chair for ASME IMECE, Vancouver, British Columbia, Canada, November 15, 2010.
2. Theme chair for "IEEE-EMBC Molecular and Cellular Biomechanics; Tissue Engineering; Biomaterials. August, 2009 Minneapolis, MN.
3. Theme chair for "IEEE-EMBC Molecular and Cellular Biomechanics; Tissue Engineering; Biomaterials. August, 2008 Vancouver BC, Canada.
4. Session chair for "Nanoscale, Biological, Cellular and Nonlinear Materials – III," ASME International Mechanical Engineering Congress and Exposition, November 11-15, 2007 Seattle, Washington
5. Theme chair for "IEEE-EMBC Molecular and Cellular Biomechanics; Tissue Engineering; Biomaterials. August 23-26, 2007 Lyon, France.
6. Chair for Cellular and Protein Mechanics Workshop sponsored by IEEE-EMBS, ASME, GPBA (Greater Philadelphia Bioinformatics Alliance). September 14-16, 2006. Philadelphia, PA
7. Co-Chair for Microscale Flows in Biological Systems Track of the ASME 3rd Annual Conference on Microchannels and Minichannels. June 13-15, 2005. Toronto, Canada.

OTHER CONFERENCES/WORKSHOPS ATTENDED FOR PROFESSIONAL DEVELOPMENT

1. IEEE Permanent magnet motor building course, November, 2007.
2. Essential Skills of Dynamic Public Speaking. March 2007.

3. Tree-tending. Ardmore, PA. April 2007. Certificate awarded.
4. “How to Publish in Nature, or Wherever You Want: Tips for Manuscript Preparation to Avoid Being de-Natured” A special symposium by Chris Gunter, Senior Editor of Nature and only local Philadelphia editor, University of Pennsylvania, December, 2006.
5. Richard Dawkins Lecture, Philadelphia Free Library, November, 2006.
6. Drexel University Biomedical Applications Symposium, November 15, 2006
7. ASME Teaching Seminar, Drexel University September 21 – September 23, 2006.
8. ASME Nano Bootcamp, Northwestern University, July 2004

INDUSTRY-UNIVERSITY RESEARCH INITIATIVES

1. Served as the director of the Cell and Protein Mechanics Laboratory at Drexel University. This laboratory has provided support for numerous Drexel faculty and has established a collaborative relationship with Zyvex Corporation, one of the Nation’s leading nanotechnology companies. Since acquisition of the Zyvex L100, Drexel University has been made a partner with under the Zyvex Academic Partnership program: <http://www.zyvex.com/Alliances/academic.html>
2. Established a relationships with a local manufacturers and companies to sponsor student projects.

SUMMARY OF COURSES TAUGHT, AND COURSES DEVELOPED

Syllabi available upon request

Mathematics

MEM 591 Applied Engineering Mathematics I Fall 2004, Fall 2005, Fall 2006, Fall 2007, Fall 2008

- matrix, tensor, vector notation, linear algebra, Markov processes, eigenvalue problems, analytical differential calculus, vector field calculus, heat transfer equations, fluid dynamics equations, elasticity equations

MEM 592 Applied Engineering Mathematics II Winter 2005, Winter 2006, Winter 2007, Winter 2008, Winter 2009

- ordinary differential equations, partial differential equation, Laplace transforms, Navier equations, variation of parameters, waves in elastic solids, series solutions, non-linear differential equations

MEM 593 Applied Engineering Mathematics III Spring 2005, Spring 2006, Spring 2007, Spring 2008, Spring 2009

- Fourier transforms, partial differential equations, numerical methods, optimization, stochastic processes, probability theory, and statistics

Senior Engineering Design

MEM 491 Senior Design 2003-2004, team 014, “Vibrational Analysis of an Industrial Compressor”

MEM 491 Senior Design 2004-2005, team 023 “A Portable Pump Design”

MEM 491 Senior Design 2005-2006, team 005, “FSAE Braking System Design”

MEM 491 Senior Design 2005-2006, team 011, “Space-Based Hematology”

MEM 491 Senior Design 2005-2006, team 022, “NanoBase Design for a Simultaneous Atomic Force Microcopy and Nanomanipulation”

MEM 491, 492, 493 Senior Design 2006-2007, team 023, “A Miniaturized Hematology Analyzer”

MEM 491, 492, 493 Senior Design 2006-2007, team 024, “An Integrated Atomic Force Microscopy Nanomanipulation Platform for Biological Samples”

- MEM 491, 492, 493 Senior Design 2007-2008, team 011, “A Human Electric Hybrid Vehicle Chassis Team.”
- MEM 491, 492, 493 Senior Design 2007-2008, team 012, “A Human Electric Hybrid Vehicle Motor and Controls Team”
- MEM 491, 492, 493 Senior Design 2007-2008, team 013, “A Human Electric Hybrid Vehicle Suspension and Drivetrain Team.”
- MEM 491, 492, 493 Senior Design 2007-2008, team 022, “A Small Wind Turbine for Sustainable Urban Energy.”
- MEM 491, 492, 493 Senior Design 2007-2008, team 030, “A Surgical Stapler”
- MEM 491, 492, 493 Senior Design 2008-2009, team 020, “Mechanical Testing of a Surgical Staple”
- MEM 491, 492, 493 Senior Design 2008-2009, team 022, “A Small Wind Turbine for Sustainable Urban Energy: Mechanical Team.”
- MEM 491, 492, 493 Senior Design 2008-2009, team 023, “A Small Wind Turbine for Sustainable Urban Energy: Electrical Team.”
- MEM 491, 492, 493 Senior Design 2008-2009, team 006, “Automotive X-Prize Shell Design”
- MEM 491, 492, 493 Senior Design 2008-2009, team 007, “Automotive X-Prize Frame Design”
- MEM 491, 492, 493 Senior Design 2008-2009, team 008, “Automotive X-Prize Suspension Design”
- MEM 491, 492, 493 Senior Design 2008-2009, team 009, “Automotive X-Prize Transmission Design”
- MEM 491, 492, 493 Senior Design 2008-2009, team 010, “Automotive X-Prize Seat, Steering and Brakes Design”
- MEM 491, 492, 493 Senior Design 2008-2009, team 011, “Automotive X-Prize Motor, Battery and Lighting Design”
- MEM 491, 492, 493 Senior Design 2008-2009, team 012, “ASME Human-Powered Vehicle Transmission, Brakes and Steering design”
- MEM 491, 492, 493 Senior Design 2008-2009, team 013, “ASME Human-Powered Vehicle Seat, Frame and Shell Design”
- MEM 491, 492, 493 Senior Design 2009-2010, team 001, “ASME Human-Powered Vehicle Seat, Frame and Shell Design”
- MEM 491, 492, 493 Senior Design 2009-2010, team 002, “ASME Human-Powered Vehicle Transmission, Brakes and Steering design”
- MEM 491, 492, 493 Senior Design 2009-2010, team 003, “Automotive X-Prize Regenerative Brake Design”
- MEM 491, 492, 493 Senior Design 2009-2010, team 004, “Urban-Turbine Design”
- MEM 491, 492, 493 Senior Design 2009-2010, team 005, “Surgical Stapler-Staple Integration”
- MEM 491, 492, 493 Senior Design 2009-2010, team 006, “Portable Solar”

Dynamics

- MEM 238 Dynamics Spring 2004, Winter 2004, Summer 2009, Summer 2010
- wrote and delivered lectures on Newtonian mechanics to Drexel’s pre-juniors
 - worked with forty-five students on design projects to prepare them for their senior design class and to improve their technical communication skills.

Materials

- TDEC 211 Materials, Fall 2003
- led two recitations with approximately 30 students each
 - facilitated online availability of course material

Thermodynamics

MEM 230 Introduction to Thermodynamics, Spring 2011

- 70 student sophomore level course

Freshman Engineering Design

I have been the course coordinator of this course of 850+ students since the fall of 2008. The primary duties have been delivering lectures, organizing guest speakers, maintaining syllabi, developing new moduli, organizing weekly meetings with core faculty, distributing weekly notes to the nearly 30 laboratory faculty, organizing weekly meetings with the ten graduate student teaching fellows, and leading at least two laboratories per week as well as maintaining grading consistency for all students. The time commitment has been enormous, but the positive learning experiences I have observed from the students has been well worth the commitment.

TDEC 132 Freshman Design 2003-2004, team 110, “A Two-Sided Television”

TDEC 132 Freshman Design 2004-2005, team 024, Educational AFM team

- design of an educational atomic force microscope. Students used LabView, SolidWorks and performed database research into the fundamentals of atomic force microscopy. Students submitted the completed version which includes an instruction manual for integration with the NSF-RET program. Students received the highest grade of their class and have a two online publications <http://schc.sc.edu/nfb/NFBIssues.lasso> and <http://www.thenanotechnologygroup.org/index.cfm?content=79>

TDEC 132 Freshman Design 2005-2006, team 003, KnanoKnot team.

- covered basic principles of scanning electron microscopy and nanomanipulation with the ultimate goal of pushing the dexterity limits of the Zyvex L100.

TDEC 132 Freshman Design 2005-2006, team 006, PVC Boat for Children.

- covered basic principles boat design

TDEC 132 Freshman Design 2005-2006, team 008, NanoForensics team.

- evaluated the ability of nanoparticles to identify artifacts

TDEC 132 Freshman Design 2005-2006, team 017, PVC Boat for Adults

- covered basic principles boat design

TDEC 132 Freshman Design 2005-2006, team 058, Recycle Team

- explored alternatives to solid waste collection

ENGR 101, 102, 103 Section 027 2006-2007, Designed a “Bicycle Highway,” which was featured on Drexel University main web page innovations section,

<http://www.drexel.edu/news/innovations/bicycle-highway.aspx>

ENGR 101, 102, 103 Section 027 2007-2008. “A Human-Powered Composter”

ENGR 101, 102, 103 2008-2009. “Automotive X-Prize Transmission Design”

ENGR 101, 102, 103 2008-2009. “Human-Powered Vehicle Design”

ENGR 101, 102, 103 2008-2009. “Space Elevator Design”

ENGR 101, 102, 103 2009-2010. Course coordinator.

ENGR 101, 102, 103 2009-2010. Currently advising ten teams of five and organizing the course.

Special Courses

MEM 399 Integrated AFM Nanomanipulator Summer 2006. Student mentored: Matt Dolin

MEM 399 Knanoknot, Summer 2006. Student mentored: Derek Mitchell

MEM 699-002 MEMS-Based Hematology Analyzer Fall 2005

- Stephanie Sullivan's project with NASA Goddard
- MEM-399-003 MechanoMolecular Properties of Growing Axons Spring 2005
 - Mentored Ms. Aisha Granville on the mechanical and electrostatic properties of structural proteins
- MEM 380-005 MechanoEvolution, Spring 2005, Spring 2006
 - Explored the similarities and symbioses between natural evolution and machine evolution
- MEM 699-004 Marine Collagen Characterization, Fall 2006 mentored student in atomic force microscopy of novel sponge collagen
- MEM 399-006 Marine Collagen Detection, Winter 2007
 - Mentored student in immunohistochemical detection of Trichodesmium erythraeum collagen
- MEM 399-007 Collagen Evolution, Winter 2007
 - Mentored student in bioinformatics of collagen evolution
- MEM 699-004 Cell and Protein Printing, Spring 2007
 - Mentored student in cell and protein printing strategies for cell sensor arrays
- MEM 399-003 Nanobiomechanics, Spring 2007
 - Mentored student in nanoscale biomechanics of cells and proteins
- MEM 399-001 Attofluidics, Fall 2007
 - Mentored student Matt Lynch on nanofluid mechanics
- MEM 399-001 Drought resistant plants, Fall 2008 - present
 - Mentored student Andrew McDonald on soft tissue mechanics
- MEM 399-001 Surgical Stapler, 2008-present
 - Mentored student Scott Holden on finite element analysis and mechanical drawing
- MEM 695-001 Solar Tower Design, Spring 2010 CRN=35400
 - Abemelek Abay, Ethiopian master's student with interest and experience in solar power design

OTHER STUDENTS MENTORED

NSF RET Teachers

National Science Foundation Research Experience for Teachers

Summer 2004

Janet Hudson of Shaw Middle School and six of her students to prepare them for an international robotics competition.

Joyce Hubert-Theroit of Henderson Senior High School, and Mr. Joseph Podrazik to build an instructional atomic force microscope to be used at their schools

Summer 2005

Joe Podrazik, Souderton High School, Souderton, PA. Together we built an educational atomic force microscope for use in his high school engineering classroom.

Janet Hudson of Shaw Middle School. Together we explored the educational atomic force microscope

Summer 2006

Joe Podrazik, Souderton High School, Souderton, PA. Together we build a second-generation motorized educational atomic force microscope. This version was demoed during a webcast from Drexel to Souderton in the Fall of 2006.

Emily Wideman, Milton-Hershey High School, Hershey, PA

Fahmida Shah, North Carolina School of Science and Mathematics, North Carolina. Emily was involved in assisting my graduate student Kathleen Allen in computer modeling and culturing of neurons.

Summer 2009

Art Gutzler, NSF RET Fellow, Father Judge High School, Philadelphia, PA. Art performed atomic force microscopy on *Trichodesmium erythraeum* a performed image analysis, as well as prepared lesson plans based upon his findings.

**SEED (Summer Engineering Experience at Drexel)
Summer Mentorship Program**

Summer 2004

Sally Tan, Illinois Math and Science Academy, Aurora, Illinois

Fahmida Shah, North Carolina School of Science and Mathematics, North Carolina

Summer 2005

Luke Irvin, Pine Grove High School, Pine Grove, Pennsylvania

Mike Iannuzzi, Springfield High School, Springfield, Pennsylvania

Dan Mattson, Glen Ellyn High School, Glen Ellyn, Illinois

Summer 2006

George Thomas, Poquoson High School, Poquoson, Virginia

Nick Gunther, Springfield High School, Springfiled, Pennsylvania

Poonam Sharma, Plymouth Whitemarsh High School, Plymouth Meeting Pennsylvania,

Sanjay Ramdon, Saint Mary High School, Highgate PO, Saint Mary, Jamaica.

Summer 2009

Casey Maher, Penn Charter, Philadelphia, PA

Chris Jacinto, North Penn, Philadelphia, PA

Summer 2010

Shannon Sabino, Scale Model of Wind Turbine, Howell High

Roman Frederick, Scale Model of High-Fuel Efficiency Car, Southwest Accelerated Learning Acad

Timothy Hackett, Prediction of Tubulin's modulus from Teritiary Structure, Phoenixville High

Chris Logue, Prediction of Tubulin's modulus from Teritiary Structure, Monsignor Bonnnor High

B. Outreach Relations and Activities

1. Special Workshop on Human Electric Hybrid Vehicle Design. January, 2008. Hosted John Tetz, independent HEHV builder, Rich Sadler, independent HEHV builder, and Stephen Mosca, founder of Go-One
2. Tour of Bossone Research Enterprise Building. June, 2007. Led a tour of five department heads and the provost of Wilkes University through the Bossone facilities along with their architect to discuss the design of the Bossone Building.
3. Tour of the Cell and Protein Mechanics Laboratory. March, 2007. Arranged through Joanne Ferroni as part of the National Consortium for Specialized Secondary Schools of Mathematics, Science and Technology (NCSSSMST).

4. Tour of the Cell and Protein Mechanics Laboratory. February, 2007. Arranged through Mun Choi and Joanne Ferroni as part of Engineers week for local Philadelphia high school students. Tour led by Stephanie Sullivan.
5. Tour of the Cell and Protein Mechanics Laboratory. February, 2007. Arranged through Mun Choi for Dr. Hyun Chul Park's students of the Pohang University of Science and Technology.
6. "Mechanical Engineering at Drexel University: A perspective on the contributions engineers can make in the field of nanotechnology and global ecology" Special Webcast to Souderton High School , February, 2007. High School. Invited by Joseph Podrazik, Souderton High School Engineering Teacher.
7. Tour of the Cell and Protein Mechanics Laboratory. January, 2007. Arranged through Joanne Ferroni for the Lego League to understand the fundamentals of the Educational AFM.
8. North Philadelphia High School Laboratory tour of the Cell and Protein Mechanics Laboratory. December 2006. Twenty students discussed fundamentals of cell and protein mechanics in a hands-on demonstration. Organized through Joanne Ferroni.
9. A visit to the Energy Coordinating Agency of Philadelphia, Philadelphia, PA, November 2006. Organized a meeting with Harold Finigan and a group of freshman engineering students to learn how solar cells work.
10. Junior FIRST Robotics LEGO Japan Competition Philadelphia, PA, 2005. Worked closely with Janet Hudson of Shaw Middle School and six of her students to prepare them for an international robotics competition. Helped in securing funds from Governor Edward Rendell's office of special programs.
11. Drexel University Summer Engineering Experience at Drexel for Middle School Females, Philadelphia, PA, 2005. Presented work in my laboratory to a group of twenty-five eighth-grade girls to give them insight into university engineering research.
12. Illinois Math and Science Academy, Aurora, Illinois, 2005. Presented Drexel's engineering curriculum to over three hundred high school students, and continued to mentor Ms. Sally Tan on her work she did at Drexel during the summer of 2004 under the Summer Internship Program.
13. Souderton Public High School, Souderton, PA, 2005. Spoke to engineering class on aspects of engineering and engineering education. Topics included biomedical engineering and nanoscopic imaging and nanomanipulation.
14. Havertown Public High School, Havertown, PA, 2005. Served as a judge for senior projects ranging from engineering projects to ethics debates.
15. Souderton Public High School, Souderton, PA, 2004. Spoke to engineering class on aspects of engineering and engineering education. Topics included biomedical engineering and nanoscopic imaging and nanomanipulation.
16. Louis Stokes Alliance for Minority Participation, Drexel University, Philadelphia, PA, 2004. Worked closely with Ms. Nykia Jackson and Ms. Sidia Rose to develop bistable microgripper technology and genetically engineered collagen protocols.
17. Illinois Math and Science Academy, Aurora, Illinois, 2004. Presented Drexel's engineering curriculum to over three hundred high school students.
18. Young Inventors Competition Judge, Bonner HS, Drexel Hill, PA, 2004: At the invitation of local high school teachers I served as a judge at a local high school invention competition.

19. National Consortium for Specialized Secondary Schools of Mathematics, Science and Technology Stuyvesant H.S., New York, NY, 2004: Presented current advanced research topics in nanotechnology to high school students and teachers.
20. Drexel University Summer Mentor Program, 2004: This summer program has enabled me to invite top high school students to participate in the investigations of my laboratory.
21. Drexel University Premed for Engineers Initiative, 2003-: Currently I am on a committee to bring a full premed degree to the College of Engineering at Drexel University.
22. Hands on Science, US Department of Energy, 1992: As a US Department of Energy employee in Washington DC, I traveled to a local K-12 school teaching science interactively to gifted minority students in southeast Washington DC.

C. News Appearances

1. “Bringing Dehydrated Plants 'Back to Life'” March 31, 2010 EurekaAlert article by Sophia Balcomb. http://www.eurekaalert.org/pub_releases/2010-03/ajob-bdp033110.php
2. “Fans, foes: Status report due on stimulus jobs,” January 20, 2010. Interview with Philadelphia Inquirer Staff Writers Jane M. Von Bergen and Diane Mastrull.
3. “City weighs large-scale bike-sharing program,” May 19, 2008. Philadelphia Metro Appearance with Mayor Michael Nutter
4. “New Mexico Governor Bill Richardson addresses Drexel University,” May 19, 2008. Channel 10 news images of Layton’s Human-Electric Hybrid Vehicle.
5. “Drexel to Advance Nanotube Probes with \$1M from Keck,” August 24th, 2007. Philadelphia Business Journal. Press coverage for recent Drexel Keck Institute recently created at Drexel University for which I serve as CO-PI.
6. Philadelphia Fox 29. “Drexel University hosts FIRST Robotics Competition” Monday, March 27, 2006. Represented Drexel University College of Engineering on local Philadelphia TV station.
7. ABC Primetime Special Report on Nanotechnology at Drexel University, Aaron Gloster, Saturday October 15, 2005. Laboratory featured on local Philadelphia TV station.
8. Philadelphia Tribune, “From Philly to Japan” Janae Hoffler, Friday, August 19, 2005, Cover page and page B1. Mentorship of local middle school robotics team featured in local Philadelphia newspaper.
9. Philadelphia Daily News, “City Kids Gearing up for a Science Trip to Japan” Elmer Smith, Friday, August 19, 2005, Page 19. Mentorship of local middle school robotics team featured in local Philadelphia newspaper.
10. Philadelphia Daily News, “Shaw Students Come Back as Winners” Elmer Smith, Wednesday, August 31, 2005 Page 15. Mentorship of local middle school robotics team featured in local Philadelphia newspaper.
11. The Neighborhood Leader, “Shaw Middle School Robotics Team Compete in Japan”, Carole I. Smith, August 20-September 2, 2005, Page 10. Mentorship of local middle school robotics team featured in local Philadelphia newspaper.

D. Local Governmental Recognition

Cited in the Notes of Testimony at the Philadelphia City Council meeting November 3, 2005 for assisting the Shaw Middle School FIRST Robotics Team in their Japan Competition.

HONORS AND AWARDS

1. Nominated for the Allen Rothwarf Award for Teaching Excellence, spring 2007 by Department Head Mun Choi.
2. Advisor for Best Freshman Design Project, “Design of a Portable Educational Atomic Force Microscope” with Rahul Singh, Vinay Gadia, Sristi Roy, Nischitha Venkatesh, Sagar Lunagaria, Rohan Patel, Drexel University, 2005
3. Honored by the Illinois Math and Science Academy for “Commitment to Mentoring and to the Developing Talent of Young Scientists and Engineers” April, 2005
4. Honored with a certificate of appreciation by the School District of Philadelphia for service to the NASA Explorer School’s students, parents, staff and community, July 2005.
5. Honored by the National Parks Service for volunteer work at the Wright Brothers Centennial Celebration, Kitty Hawk, NC, 2003.
6. Robert M. Caddell Award for research contributions in materials manufacturing, U of M, 2001
7. Best Solid Mechanics and Materials Poster for Graduate Symposium, U of M, 2001

PROFESSIONAL MEMBERSHIPS

1. American Society of Engineering Education
2. American Society of Mechanical Engineers
3. Biomedical Engineering Society
4. IEEE-EMBS Society
5. Order of the Engineer

GRADUATE STUDENT ADVISEES

1. Kathleen Allen, Ph.D. (2009) National Science Foundation Fellow, Drexel University
2. Mert Sasoglu, Ph.D. (2009), Drexel University
3. Stephanie Sullivan, B.S. Ph.D. Candidate, Drexel University (SuperNOVA Fellow)
4. Adam Zeiger, B.S. M.S. (2007) Department of Defense Fellow, MIT
5. Andrew Bohl, M.S. (2010)
6. Benjamin Legum, Ph.D. pre-candidate (2011)
7. Michael Brent Boyd, Ph.D. pre-candidate (2012)
8. Herb Francisco, Ph.D. pre-candidate (2012)
9. Cameron Douglas, B.S. M.S. (2010)
10. Steve Helms B.S. M.S. (2010)
11. Mohammed Abba B.S. M.S. Ph.D. pre-candidate (2013)
12. Abemelek Abay, M.S. (2010)

DISSERTATION COMMITTEES

1. Kathleen Allen (chair) MEM
2. Jonathan Ayutsede 2005 (Frank Ko, MSE)
3. Teeranoot Chanthasopeephan 2007 (Jaydev Desai, MEM)
4. Andrew Darling 2005 (Wei Sun, MEM)
5. Adam Ertel (Aydin Tozeren, BME)
6. Connie Gomez (Wei Sun, MEM)
7. Michael Gormley (Aydin Tozeren, BME)
8. Tie Hu (Jaydev Desai, MEM)
9. Saif Khalil 2005 (Wei Sun, MEM)
10. Devrim Kilinc (Ken Barbee, BME)

11. Andrew Kossenkov (Aydin Tozeren, BME)
12. Lin Lu (Jack Zhou, MEM)
13. Chris Massey (Michelle Marcolongo, MSE)
14. Bao Mosinyi, 2006 (Jonathan Awerbuch, MEM)
15. Rafael Mulero, 2011 (MinJun Kim, MEM)
16. Kalyani Nair (Wei Sun, MEM)
17. Anand Pillarisetti (Jaydev Desai, MEM)
18. Gwenaelle Proust 2005 (Surya Kalidindi, MSE)
19. Kishan Rijal (Raj Mutharasan, CBE)
20. Alia Sabur (Selçuk Güçeri, MSE)
21. Mert Sasoglu (chair) MEM
22. Temitope Sodunke (Moses Noh, MEM)
23. Edward Steager (MinJun Kim, MEM)
24. Steve (Alisa Morss, MEM)
25. Stephanie Sullivan (chair) MEM
26. Jason Toy, 2010 (Sorin Siegler, MEM)
27. Alexandra Vamvakidou (Aydin Tozeren BME)
28. Chun Xu 2005 (David Wootton, MEM)
29. Eda Yildirim (Wei Sun, MEM)
30. He Zhao (Bahrad Sokhansanj, BME)

EXTRACURRICULAR INTERESTS

- bicycling, recycling, sustainable energy
- 1995 US National Rowing Team: Qualified US Quadruple Sculls for Atlanta Olympic Games
- 1997 US National Rowing Team
- Queen Mother Cup Champion in quadruple sculls, Henley Royal Regatta, 1995, 1997.
- 2000 – 2003 rowing instructor for Ann Arbor Rowing Club