

David J. Odde

Education

1995 Ph.D. Chemical and Biochemical Engineering, Rutgers University
1992 M.S. Chemical and Biochemical Engineering, Rutgers University
1988 B.Ch.E. Chemical Engineering, University of Minnesota

Academic Appointments

2007- Professor, Dept. of Biomedical Engineering, University of Minnesota
1999-2007 Associate Professor, Dept. of Biomedical Engineering,
University of Minnesota
1995-1999 Assistant Professor, Department of Chemical Engineering,
Michigan Technological University

Professional Appointments

2013-2014 Acting Department Head, Department of Biomedical Engineering,
University of Minnesota (Spring Semester)
2013- Founding Editorial Board Member, *Technology*, published by World
Scientific Publishing Company
2011- Editorial Board Member, *Biophysical Journal*, the official journal of the
Biophysical Society, published by Cell Press.
2011- Associate Editor, *Physical Biology*, published by the Institute of Physics
2009-2013 Instructor, Physiology Course, Marine Biological Laboratory (MBL),
Woods Hole, MA
2007-2012 Founding Co-Editor-In-Chief of *Cellular and Molecular Bioengineering*, an
official journal of the Biomedical Engineering Society (BMES), published
by Springer Publishing
2007- Editorial Board Member, *Current Biology*, published by Cell Press
2007-2008 Long-Term Visitor, Institute for Mathematics and Its Applications,
University of Minnesota
2006-2007 Acting Department Head, Department of Biomedical Engineering,
University of Minnesota (Spring Semester)
2004 Visiting Scientist, Department of Anatomy, University of Cambridge
2004 Visiting Fellow, Clare Hall, University of Cambridge
2003 Research Associate, Marine Biological Laboratory, Woods Hole, MA
2003 Visiting Scientist, Department of Biology, University of North Carolina
2000-2013 Director of Undergraduate Studies, Department of Biomedical Eng.,
University of Minnesota
1999 James and Lorna Mack Endowed Chair in Cellular and Molecular
Bioengineering, Department of Chemical Engineering, Michigan
Technological University

Awards and Recognition

2013 Inaugural Alan J. Hunt Memorial Lecture, Dept. of Biomedical
Engineering, U. of Michigan
2011 Stanley Lecture, Dept. of Chemical and Biological Engineering, Iowa
State Univ.
2010 Elected Fellow of the Biomedical Engineering Society
2009 George W. Taylor Award for Distinguished Research (awarded to one
faculty member per year within the College of Science & Engineering)
2008 Medal of Excellence Award for Distinguished Young Alumni,
Rutgers University School of Engineering

2007	Elected to College of Fellows, American Institute for Medical and Biological Engineering, AIMBE
2006	Paper of the Year Award for <i>Molecular Biology of the Cell</i> (Award made to graduate advisee Melissa Gardner, first author, by the American Society for Cell Biology; DJO was senior and corresponding author)
2003	Annual Reviews Best Poster Award, Biomedical Engineering Society Annual Meeting
2003	Whitaker Foundation Academic Leadership Program
2002-2004	McKnight Land-Grant Professorship
2000-2004	National Science Foundation CAREER Award
2000-2001	Institute of Technology Student Board Award as Professor of the Year in Biomedical Engineering

Membership in Professional Societies

Society for Neuro-Oncology (2013-)
 American Association for the Advancement of Science (2008-)
 American Institute for Medical and Biological Engineering (2007-)
 Biophysical Society (2005-)
 Biomedical Engineering Society (1995-)
 American Society for Cell Biology (1994-)

Articles

1. Hepperla, A.J., P.T. Willey, C.E. Coombes, B.M. Schuster, M. Gerami-Nejad, M. McClellan, S. Mukherjee, J. Fox, M. Winey, **D.J. Odde**, E. O'Toole, M.K. Gardner, "Minus-end-directed kinesin-14 motors align antiparallel microtubules to control metaphase spindle length," *Developmental Cell*, 31, 61-72 (2014).
2. Prael, L.S., Castle, B.T., Gardner, M.K., and **D.J. Odde**, "Quantitative Analysis of Microtubule Self-Assembly Kinetics and Tip Structure," *Methods in Enzymology*, 540, 35-52 (2014).
3. Castle, B.T. and **D.J. Odde**, "Brownian dynamics of subunit addition-loss kinetics and thermodynamics in linear polymer self-assembly," *Biophysical Journal*, 105:2528-2540 (2013).
4. Bangasser, B.L. and **D.J. Odde**, "Master Equation-Based Analysis of a Motor-Clutch Model for Cell Traction Force," *Cellular and Molecular Bioengineering*, 6:449-459 (2013).
5. Bangasser, B.L., S.S. Rosenfeld, and **D.J. Odde**, "Determinants of maximal force transmission in a motor-clutch model of cell traction in a compliant microenvironment," *Biophysical Journal*, 105(3): p. 581-92 (2013).
6. Coombes, C.E., A. Yamamoto, M.R. Kenzie, **D.J. Odde**, and M.K. Gardner, "Evolving tip structures can explain age-dependent microtubule catastrophe," *Current Biology*, 23(14): p. 1342-8 (2013).
7. Flink C, and **D.J. Odde**, "Science+dance=bodystorming," *Trends in Cell Biology*, 22:613-616 (2012).
8. Seetapun D, Castle BT, McIntyre AJ, Tran PT, and **D.J. Odde**, "Estimating the microtubule GTP cap size *in vivo*," *Current Biology*, 22:1681-1687 (2012).
9. Hendricks AG, Lazarus JE, Perlson E, Gardner MK, **Odde D.J.**, Goldman YE, Holzbaur EL, "Dynein tethers and stabilizes dynamic microtubule plus ends," *Current Biology*, 22:632-637 (2012).
10. Mogilner, A and **D.J. Odde**, "Modeling Cellular Processes in 3D," *Trends in Cell Biology*, 18, 692-700 (2011).
11. Gardner, MK, Charlebois, BD, Janosi, IM, Howard, J, Hunt, AJ, and **D.J. Odde**, "Rapid microtubule self-assembly kinetics," *Cell*, 146, 582-92 (2011).
12. **Odde, D.J.**, "Getting cells and tissues into shape," *Cell*, 144, 325-326 (2011).
13. Griffin, E.E., **D.J. Odde**, G. Seydoux, "Regulation of the MEX-5 gradient by a spatially segregated kinase/phosphatase cycle," *Cell*, 146, 955-68 (2011).

14. Demchouk, A., Gardner, M.K., and **D.J. Odde**, "Microtubule Tip Tracking and Tip Structures at the Nanometer Scale Using Digital Fluorescence Microscopy," *Cellular and Molecular Bioengineering*, 4, 192-204 (2011).
15. Castle, B.T., Howard, S.A., and **D.J. Odde**, "Assessment of Transport Mechanisms Underlying the Bicoid Morphogen Gradient," *Cellular and Molecular Bioengineering*, 4, 116-121 (2011).
16. Gardner, M.K. and **D.J. Odde**, "Stochastic simulation and graphic visualization of mitotic processes," *Methods*, 51:251-6 (2010).
17. Seetapun, D. and **D.J. Odde**, "Cell-length-dependent microtubule accumulation during cell polarization", *Current Biology*, 20:979-88 (2010).
18. Gardner, M.K., Sprague, B.L., Pearson, C.G., Cosgrove, B.D., Bicek, A.D., Bloom, K., Salmon, E.D., **D.J. Odde**, "Model Convolution: A Computational Approach to Digital Image Interpretation," *Cellular and Molecular Bioengineering*, 3: 163-170 (2010).
19. Bicek, A.D., E. Tuzel, A. Demtchouk, M. Uppalapati, W.O. Hancock, D.M. Kroll, and **D.J. Odde**, "Anterograde microtubule transport drives microtubule bending in LLC-PK1 epithelial cells," *Molecular Biology of the Cell*, 20: 2943-53 (2009).
20. Chan, C.E. and **D.J. Odde**, "Traction dynamics of filopodia on compliant substrates," *Science*, 2008. 322(5908): p. 1687-91.
21. Gardner, M.K. and **D.J. Odde**, "Dam1 goes it alone on disassembling microtubules," *Nature Cell Biology*, 10, 379-381 (2008).
22. Gardner, M.K., D.C. Bouck, L.V. Paliulis, J.B. Meehl, E.T. O'Toole, J. Haase, A. Soubry, A.P. Joglekar, M. Winey, E.D. Salmon, K. Bloom, and **D.J. Odde**, "Chromosome congression by Kinesin-5 motor-mediated disassembly of longer kinetochore microtubules," *Cell*, 2008. 135(5): p. 894-906.
23. Gardner, M.K., **D.J. Odde**, K. Bloom, "Kinesin-8 molecular motors: putting the brakes on chromosome oscillations," *Trends in Cell Biology*, 18, 307-310 (2008).
24. Lipkow, K. and **D.J. Odde**, "Model for protein concentration gradients in the cytoplasm," *Cellular and Molecular Bioengineering*, 1, 84-92 (2008).
25. Gardner, M.K., A.J. Hunt, H.V. Goodson, and **D.J. Odde**, "Microtubule Assembly Dynamics: New Insights at the Nanoscale," *Current Opinion in Cell Biology*, 20, 64-70 (2008).
26. Gardner, M.K., J. Haase, M.B. Anderson, J.N. Molk, K. Mythreye, E.T. O'Toole, M. Winey, E.D. Salmon, **D.J. Odde**, and K. Bloom, "The microtubule-based motor Kar3 and plus-end binding protein Bim1 provide structural support for the anaphase spindle," *The Journal of Cell Biology*, 180, 91-100 (2008).
27. Guo, X.E., and **D.J. Odde**, "Cellular and Molecular Bioengineering: An Editorial Perspective," *Cellular and Molecular Bioengineering*, 1, 4 (2008).
28. Schek HT, 3rd,* Gardner MK,* Cheng J, and **D.J. Odde**,** Hunt AJ,** "Microtubule assembly dynamics at the nanoscale," *Current Biology*, 17(17), 1445-55 (2007). *denotes authors contributed equally. ** denotes authors co-directed the project equally.
29. Bicek AD, Tuzel E, Kroll DM, and **D.J. Odde**, "Analysis of microtubule curvature," *Methods in Cell Biology*, 83, 237-68 (2007).
30. Gardner M, **D.J. Odde**, and K. Bloom, "Hypothesis testing via integrated computer modeling and digital fluorescence microscopy," *METHODS*, 41, 232-237 (2007).
31. Nahmias Y. and **D.J. Odde**, "Micropatterning of hepatic-endothelial sinusoid-like structures by laser-guided direct writing," *Nature Protocols*, 1, 2288-2296 (2006).
32. Gardner, M.K., and **D.J. Odde**, "Asymmetric Division: Motor Persistence Pays Off," *Current Biology*, 16, R1021-1023 (2006).
33. Meyers J*, Craig J*, and **D.J. Odde**, "Potential for control of signaling pathways via cell size and shape," *Current Biology*, 16, 1685-1693 (2006). *denotes authors contributed equally.
34. Gardner, M.K. and **D. J. Odde**, "Modeling kinetochore motility in mitosis," *Current Opinion in Cell Biology*, 18, 639-647 (2006).

35. Pearson C*, Gardner M*, Paliulis L, Salmon ED, **D.J. Odde**, K. Bloom, "Measuring nanometer scale gradients in spindle microtubule dynamics using model convolution microscopy," *Molecular Biology of the Cell*, 17, 4069-4079 (2006). *denotes authors contributed equally.
36. Shimogawa, M.M., Graczyk, B., Gardner, M.K., Francis, S.E., White, E.A., Ess, M., Molk, J.N., Ruse, C., Niessen, S., Yates, J.R., 3rd, Muller, E.G., Bloom, K., **Odde, D.J.**, and T.N. Davis, "Mps1 phosphorylation of dam1 couples kinetochores to microtubule plus ends at metaphase," *Current Biology*, 16, 1489-1501 (2006).
37. Nahmias, Y. K., R. Schwartz, W.-S. Hu, C. M. Verfaillie and **D. J. Odde** , "Establishment of liver-like tissue in vitro via endothelium-mediated hepatocyte recruitment." *Tissue Engineering*, 12, 1627-1638 (2006).
38. DeSilva MN, Paulsen J, Renn MJ, and **D. J. Odde**, "Two-step cell patterning on planar and complex curved surfaces by precision spraying of polymers," *Biotechnology and Bioengineering*, 93, 919-927 (2006).
39. Fischer TM, Steinmetz PN, and **D. J. Odde**, "Robust micromechanical neurite elicitation in synapse-competent neurons via magnetic bead force application," *Annals of Biomedical Engineering*, 9, 1229-1237 (2005).
40. **Odde, D. J.**, "Mitotic spindle: Disturbing a subtle balance," *Current Biology*, 15, R956-R959 (2005).
41. VanBuren, V., L.U. Cassimeris, and **D. J. Odde**, "A mechanochemical model of microtubule structure and kinetics," *Biophysical Journal*, 89, 2911-2926 (2005).
42. Gardner, M., C. Pearson, B. Sprague, T. Zarzar, K. Bloom, E.D. Salmon, and **D. J. Odde**, "Tension-dependent regulation of microtubule dynamics at kinetochores can explain metaphase congression in yeast," *Molecular Biology of the Cell*, 16, 3764-3775 (2005).
43. Nahmias, Y.K., A. Arneja, T. Tower, M.J. Renn, and **D. J. Odde**, "Cell patterning on biological gels via cell spraying through a mask," *Tissue Engineering*, 11, 701-708 (2005).
44. Nahmias, Y.K., R. Schwartz, C.M. Verfaillie, and **D. J. Odde**, "Laser-guided direct writing for three-dimensional tissue engineering," *Biotechnology and Bioengineering*, 92, 129-136 (2005).
45. **Odde, D. J.**, "Chromosome capture: take me to your kinetochore," *Current Biology*, 15, R328-30 (2005).
46. DeSilva, M. N., R. Desai and **D. J. Odde**, "Micro-patterning of animal cells on PDMS substrates in the presence of serum without use of adhesion inhibitors," *Biomedical Microdevices*, 6, 219-222 (2004).
47. Nahmias, Y. K., B. Z. Gao and **D. J. Odde**, "Dimensionless Parameters for the Design of Optical Traps and Laser Guidance Systems," *Applied Optics*, 43, 3999-4006 (2004).
48. Pearson, C.G., E. Yeh, M. Gardner, **D. J. Odde**, E.D. Salmon, and K. Bloom, "Stable kinetochore-microtubule attachment constrains centromere positioning in metaphase," *Current Biology*, 14, 1962-1967 (2004).
49. Baldi, A., J. N. Fass, M. N. DeSilva, **D. J. Odde** and B. Ziaie, "A micro-tool for mechanical manipulation of *in vitro* cell arrays," *Biomedical Microdevices* 5, 291-295 (2003).
50. Fass, J. N. and **D. J. Odde**, " Tensile force-dependent neurite elicitation via anti-b1 integrin antibody coated magnetic beads," *Biophysical Journal*, 85, 623-636 (2003).
51. Sprague, B. L., C. G. Pearson, P. S. Maddox, K.S. Bloom, E. D. Salmon and **D. J. Odde**, "Mechanisms of microtubule-based kinetochore positioning in the yeast metaphase spindle," *Biophysical Journal*, 84, 3529-3546 (2003).
52. VanBuren, V., **D. J. Odde** and L. U. Cassimeris, "Estimates of lateral and longitudinal energies within the microtubule lattice," *Proceedings of the National Academy of Sciences USA*, 99, 6035-6040 (2002). (erratum in 101, p. 14989 (2004))
53. Davis, L. J., **D. J. Odde**, S. M. Block and S. P. Gross, "The importance of lattice defects in katanin-mediated microtubule severing *in vitro*," *Biophysical Journal*, 82, 2916-2927 (2002).

54. Nahmias, Y. and **D. J. Odde**, "Analysis of radiation forces in laser trapping and laser-guided direct writing applications," *IEEE Journal of Quantum Electronics*, **38**, 131-141 (2002).
55. Bulinski, J. C., **D. J. Odde**, B. J. Howell, E. D. Salmon and C. M. Waterman-Storer, "Rapid dynamics of the microtubule binding of ensconsin in vivo." *Journal of Cell Science*, **114**, 3885-3897 (2001).
56. **Odde, D. J.** and M. J. Renn, "Laser-guided direct writing of living cells," *Biotechnology and Bioengineering*, **67**, 312-318 (2000).
57. **Odde, D. J.** and M. J. Renn, "Laser-guided direct writing for applications in biotechnology," *Trends in Biotechnology*, **17**, 385-389 (1999).
58. **Odde, D. J.**, L. Ma, A. H. Briggs, A. DeMarco, and M. W. Kirschner, "Microtubule bending and breaking in living cells," *Journal of Cell Science*, **112**, 3283-3288 (1999).
59. **Odde, D. J.**, "Diffusion inside microtubules," *European Biophysics Journal*, **27**, 514-520 (1998).
60. **Odde, D. J.** and H. M. Buettner, "Autocorrelation function and power spectrum of two-state random processes used in neurite guidance," *Biophysical Journal*, **75**, 1189-1196 (1998).
61. **Odde, D. J.** and S. S. Hawkins, "Computer-assisted motion analysis of fluorescent tubulin dynamics in the nerve growth cone," *Journal of Computer-Assisted Microscopy*, **9**, 143-151 (1997).
62. Howell, B., **D. J. Odde** and L. Cassimeris, "Kinase and phosphatase inhibitors cause rapid alterations in microtubule dynamic instability in living cells," *Cell Motility and the Cytoskeleton*, **38**, 201-214 (1997).
63. **Odde, D. J.**, "Estimation of the diffusion-limited rate of microtubule assembly," *Biophysical Journal*, **73**, 88-96 (1997).
64. **Odde, D. J.**, E. M. Tanaka, S. S. Hawkins and H. M. Buettner, "Stochastic dynamics of the nerve growth cone and its microtubules during neurite outgrowth," *Biotechnology and Bioengineering*, **50**, 452-461 (1996).
65. **Odde, D. J.**, L. Cassimeris and H. M. Buettner, "Spectral analysis of microtubule assembly dynamics," *American Institute of Chemical Engineers Journal*, **42**, 1434-1442 (1996).
66. **Odde, D. J.**, L. Cassimeris and H. M. Buettner, "Kinetics of microtubule catastrophe assessed by probabilistic analysis," *Biophysical Journal*, **69**, 796-802 (1995).
67. **Odde, D. J.** and H. M. Buettner, "Time series characterization of simulated microtubule dynamics in the nerve growth cone," *Annals of Biomedical Engineering*, **23**, 268-286 (1995).
68. Yarmush, M. L., A. M. Weiss, K. P. Antonsen, **D. J. Odde**, and D. M. Yarmush, "Immunoaffinity purification: Basic principles and operational considerations," *Biotechnology Advances*, **10**, 413-446 (1992).

Chapters in Books

1. Castle, B. and **D.J. Odde**, "Dynamics of Microtubule Assembly," in *Encyclopedia of Cell Biology*, Section Editors: Douglas Lauffenburger and Jason Haugh, Overall Editors: Ralph Bradshaw and Philip A. Stahl, Elsevier Press, (in press).
2. Bicek, A., Seetapun, D., and **D.J. Odde**, "Microtubules in cellular mechanotransduction", in *Mechanotransduction*, Cambridge Univ. Press, Mohammad Mofrad and Roger Kamm, editors, p. 234-249 (2009).
3. Bicek A, Tuzel E, Kroll D, and **D. J. Odde**, "Analysis of microtubule curvature," In: Wang YL, Discher D, editors. *Methods in Cell Biology: Cell Mechanics*, Elsevier, pp. 237-268 (2007).
4. Buettner, H. M., **D. J. Odde** and A. M. Burt, "Cell Structure and Motion: Cytoskeleton and Cell Movement," in *Encyclopedia of Cell Technology*, R. Spier, ed., New York, Wiley, pp. 472-481 (2000).
5. **Odde, D. J.**, "Affinity Adsorption," in *Handbook of Fermentation and Downstream Processing*, E. Goldberg, ed., New York, Chapman & Hall, pp. 70-89 (1997).

Refereed Papers in Conference Proceedings

1. Gao, B. Z., J. N. Fass, M. J. Renn and **D. J. Odde**, "Nano- and microscale manipulation of biological particles by laser-guided direct writing," *SPIE Proceedings*, 4608, 245-250 (2002).
2. Baldi, A., J. N. Fass, M. N. DeSilva, **D.J. Odde**, B. Ziaie, "A microtool for in vitro cell array manipulation," *Proceedings of the Second Annual International IEEE-EMBS Special Topic Conference on Microtechnologies in Medicine and Biology*, pp. 180-183 (2002), an IEEE Proceedings edited by A. Dittmar and D. Beebe.

Patents

1. Bonne, U., Deetz, D., Lai, J., **Odde, D.** and Zook, D., "Membrane dehumidification," U.S. Pat. No. 4900448 (1990). Assigned to Honeywell, Inc.
2. Renn, M. J., **D. J. Odde**, and R. Pastel, "Laser guidance of nonatomic particles," U.S. Patent No. 6823124 (2004).

Selected Technical Reports

1. **Odde, D. J.**, "Nanoscience and Nanotechnology in Tissue Engineering," in *Nanotechnology Research Directions: IWGN Workshop Report*, Eds. M.C. Roco, R.S. Williams, P. Alivisatos, Kluwer Academic Publishers, Dordrecht, The Netherlands, pp. 163-164 (2000). *The report formed the basis for establishing the National Nanotechnology Initiative during the President William Clinton Administration.*
2. L. McIntire and **D. J. Odde**, "Cellular and Molecular Engineering Curriculum," in *Whitaker Foundation Biomedical Engineering Educational Summit Report*, Whitaker Foundation, Rosslyn, VA (2000). *The Summit Report provided the first comprehensive statement on the state of the art in biomedical engineering education.*

Current Sponsored Projects

National Cancer Institute, R01-CA-172986

"Modeling and microsystems approach to glioma invasion" (8/13-5/18)

Goals: To address the overarching question of how the microenvironmental properties, including adhesion ligand density, mechanical stiffness, geometrical confinement, and local microarchitecture, enable/disable glioma cell migration. The project will use the motor-clutch model to make specific, testable predictions with both engineered in vitro and in vivo experimental systems. Specific goals include: 1) determine the mechanochemical basis of glioma migration *in vitro*, 2) quantitatively analyze glioma migration *in vivo*, and 3) quantitatively characterize glioma migration in 2D/3D engineered Microsystems.

Role: MPI (with Steve Rosenfeld, Cleveland Clinic; DJO is PI at UMN; UMN is administrative lead institution)

Total costs: \$2,293,409

Current year direct costs: \$327,283 (\$209,924 to UMN)

National Institute of General Medical Sciences, R01-GM-76177

"Microtubule Mechanics at the Nanoscale" (11/07-09/17)

Goals: To investigate the dynamics of microtubule assembly dynamics in vitro at nanometer-scale resolution using laser tweezers and high resolution tracking. Determine how microtubule drugs and microtubule-associated proteins control microtubule assembly. Develop computational models for microtubule assembly by iterative analysis in conjunction with laser tweezers experiments.

Role: MPI (with David Sept, Univ. of Michigan; DJO is PI at UMN; U Michigan is administrative lead institution)

Current year direct costs: \$218,203 (\$145,243 to UMN)

University of Minnesota Children's Cancer Research Fund

"Mechanisms of ARHGAP36 truncation in driving medulloblastoma progression" (7/14-6/15)

Goals: In this project we will seek to quantitatively characterize the biophysical mechanisms by which ARHGAP36 truncation drives oncogenesis. In particular, we will: 1) Measure rates of cell migration and proliferation in engineered microenvironments of controlled mechanical stiffness for wild-type and ARHGAP36 mutant MB and neural precursor cells, 2) Measure rates of tumor progression, cell proliferation, and cell migration in mouse brain slices, 3) Develop a "flight simulator" to computationally model medulloblastoma migration with wild-type and mutant ARHGAP36 to identify in silico possible therapeutic targets.

Role: MPI (with David Largaespada, Univ. of Minnesota Masonic Cancer Center)

Current year direct costs: \$50,000

Institute for Engineering in Medicine, University of Minnesota, Group Project Grant

"Cell Engineering Approach to Dynamic Cellular Biomarkers for Cancers with Poor Prognosis" (2/13-1/16)

Goals: To develop live cell metrics that are prognostic of outcome in glioblastoma multiforme and in pancreatic adenocarcinoma. We will use cells obtained directly from surgical resections at the University of Minnesota, and correlate the live cell activities with patient-specific outcomes.

Role: MPI (with Amy Skubitz, Univ. of Minnesota)

Total costs: \$75,000

Note: Continuously funded from NIH, NSF, DARPA, Whitaker Fdn., and/or NASA since 1997

Recently Completed Projects

National Institute of General Medical Sciences, R01-GM-71522

"Modeling Microtubule Dynamics in Mitosis" (9/05-12/14)

Goals: To investigate the mechanochemical basis of microtubule-mediated chromosome movement, we are: developing a force-balance model for budding yeast mitosis, developing models for infectious yeast and animal cell mitoses using the budding yeast model as a starting point, and developing models for the nanoscale-kHz dynamics of kinetochores and KMT plus ends. In each case we are establishing a mathematical foundation based on physical principles, implementing a computer code, and comparing the simulation predictions to experimental microscopy data using model-convolution.

Role: PI

Total costs: \$2,640,509 (over all years of the grant)

Final year direct costs: \$211,349

National Cancer Institute, RC1-CA145044

"Microsystems and Modeling Approach to Glioma Migration and Metastasis" (10/09-9/12)

Role: MPI (with Steve Rosenfeld, Cleveland Clinic)

Goal: Develop and test models for glioma cell migration using advanced engineered environments

Total costs: \$1,000,000

University of Minnesota Informatics Institute

"Expression Analysis of Glioblastoma Cells in Mechanically Defined Environments" (5/2014-4/2015)

Role: PI

Goal: Perform transcriptomic and proteomic analysis on U251 glioma cells grown on environments of varying mechanical stiffness in order to simulate human tissue conditions

\$5,000 direct/yr

Institute for Advanced Study, University of Minnesota

“Choreography of the Moving Cell: Self-Organization and Catastrophe through the Lens of Embodied Artmaking” (7/09-6/14)

Goals: To develop human-scale simulations of cellular and molecular processes, to aid in the deconstruction of mathematical and computational models, and to develop new forms of dance.

Role: MPI (with Prof. Carl Flink, Univ. of Minnesota)

Final year total costs: \$4,500

Manuscript Reviews

Frequent Reviews (≥5 reviews):

Biophysical Journal

Cell

Cellular and Molecular Bioengineering

Current Biology

The Journal of Cell Biology

Molecular Biology of the Cell

Nature

Nature Cell Biology

Proceedings of the National Academy of Sciences USA

Science

Physical Review E

Human Frontiers Science Program Journal

IEEE Transactions on Advanced Packaging

IEEE Transactions on Biomedical Engineering

Integrative Biology

Journal of Applied Physiology

*Journal of Biological Chemistry**

Journal of Biomechanics

*Journal of Biomechanical Engineering**

*Journal of Biotechnology**

*Journal of Cell Science**

Journal of Microscopy

Journal of Theoretical Biology

Methods in Cell Biology

Molecular Cancer Therapeutics

Langmuir

Nanoletters

*Nature Cell Biology**

*Nature Communications**

Nature Materials

*Nature Methods**

Nature Protocols

Physical Biology

Physical Review Letters

PLoS

PLoS Biology

*PLoS Computational Biology**

PLoS One

Systems and Synthetic Biology

Technology

Tissue Engineering

Traffic

Trends in Cell Biology

Other Reviews:

Advanced Materials

American Institute of Chemical Engineers Journal

Annals of Biomedical Engineering

ASME Biomechanical Engineering

Biochemical Journal

Biomaterials

Biomedical Engineering Online

*Biotechnology and Bioengineering**

BMC Bioinformatics

Bulletin of Mathematical Biology

Cancer Therapeutics

Cell Motility and the Cytoskeleton

Chromosoma

*Developmental Cell**

*Developmental Neurobiology**

EMBO Reports

*European Biophysics Journal**

*At least 2 reviews

Proposal Reviews

U.S. Government

2014-2018

Standing Member, NIH “Modeling and Analysis of Biological Systems” Study Section

National Institutes of Health Center for Scientific Review (11 review panels + ad hoc reviews, most recent panels: MABS)
NIH National Heart, Lung, and Blood Institute (NHLBI PI review)
National Science Foundation (5 review panels + ad hoc reviews)
United States Air Force Office of Scientific Research
United States Army
U.S. Israeli Bi-national Science Foundation

Foreign Governments

Alberta Heritage Foundation
German Research Foundation (DFG)
Natural Sciences and Engineering Research Council of Canada
NWO-Science funding agency of the government of the Netherlands
Provincial Government of Quebec
Swiss National Science Foundation

Private Foundations and Other Institutions

Alzheimer's Association, Human Frontiers Science Program, University of Nebraska, Whitaker Foundation Fellowship Program

University of Minnesota

Institute for Advanced Study (IAS Collaboratives)
Institute for Engineering in Medicine (IEM Seed Grants)
Institute for Mathematics & Its Applications (IMA Postdoctoral Fellowships)

Recent Invited Presentations (Since 2009):

Conferences and Workshops:

1. "Cell Mechanics and Motility," Biophysics Symposium, University of Maryland, College Park, MD, May 2009 (Organizers: Dave Thirumalai, Arpita Upadhyaya, Wolfgang Losert)
2. Gordon Research Conference on "Motile & Contractile Systems," New London, NH, July 2009 (Chairs: Kerry Bloom and Dyche Mullins)
3. "Building the Cell," Premeeting Workshop of the American Society for Cell Biology, December 2009. (Organizer: Wallace Marshall).
4. Society for Physical Regulation in Biology and Medicine, "Cell Engineering Paradigms in Aging, Cancer, and Regenerative Medicine," Annual Meeting Keynote Speaker, Tucson, AZ, January 2010 (Conference Chair: Anshu Mathur)
5. ASME 2010 First Global Congress on NanoEngineering for Medicine and Biology (NEMB2010)," Houston, TX, February 2010 (Session Organizers: James Lee and Larry Nagahara)
6. Workshop on "Transport in a Cell," Mathematical Biosciences Institute, The Ohio State University, Columbus, OH, April 2010 (Organizers: Anatoly Kolomeisky and Michael Diehl)
7. European Molecular Biology Organisation (EMBO) Conference "Microtubules", Heidelberg, Germany, June 2010 (Organizers: Carsten Janke, Michel Steinmetz, Thomas Surrey)
8. Gordon Research Conference on "Signal Transduction By Engineered Extracellular Matrices," Biddeford, ME, June 2010 (Chairs: Chris Chen and Karen Hirschi)
9. 2010 Yeast Genetics and Molecular Biology Meeting, Session on "Quantitative Imaging Methods," Vancouver, Canada, July 2010 (Chair: Jackie Vogel)
10. NSF Pan-American Advanced Studies Institutes (PASI) Training Course, "Function and Regulation of the Cytoskeleton," Rio de Janeiro, Brazil, August 2010, (Organizers: L.C. Cameron, John Mercer, Meg Titus, and Jose Sotelo, Jr.).

11. 11th International Conference for Systems Biology 2010, "The Spatial Dimension of Dynamics," Edinburgh, Scotland, October, 2010 (Organizers: Martin Howard and Andrew Goryachev)
12. BMES-SPRBM Conference on Cellular and Molecular Bioengineering, "Molecular Imaging and Mechanotransduction," Annual Meeting Keynote Speaker, Miami Beach, FL, January 2011 (Conference Chairs: X. Edward Guo and Cheng Dong)
13. "Mathematical Biology of the Cell: Cytoskeleton and Motility," Banff International Research Station, Banff, Canada, August 2011 (Conference Chairs: David Sept, Anders Carlsson, Adriana Dawes, Leah Edelstein-Keshet)
14. Chicago Humanities Festival, Chicago, IL, November 2011 (Organizer: Julia Mayer)
15. "The Role of the Arts in Humanizing Bioengineering," AIMBE Annual Meeting, Washington, DC, February 2012 (Conference Chair: Alan Russell)
16. "Outlook for Next-Generation Neuroscience," Symposium at NAIST, Nara Institute of Science & Technology, Nara, Japan, March 2012 (Organizers: Yuichi Sakumura, Shoji Komai, Naoyuki Inagaki)
17. Gordon Research Conference on "Biopolymers," Newport, RI, June 2012 (Organizers: Angel Garcia and Enrique De La Cruz)
18. "Generating New Biological insight from Complex Data: Methodology, Data Gathering, Inference, Modelling, Validation, Integration and Solutions," Society for Experimental Biology, Salzburg, Austria, June 2012 (Organizer: Patrick Hussey)
19. "Actin Dynamics", German Society for Cell Biology, Regensburg, Germany, September 2012 (Organizer: Klemens Rottner)
20. National Association of Engineering Student Councils, Midwest Section, Minneapolis, MN, October 2012 (Organizer: Karan Sumra)
21. "Biomimetic Nanoscale Platforms, Particles, and Scaffolds for Biomedical Applications," Materials Research Society Meeting, Boston, MA, November 2012 (Organizer: Nicole Moore)
22. BMES Conference on Cellular and Molecular Bioengineering, Waimea, HI, January 2013 (Conference Chairs: Chris Chen, Michael Detamore, and Nic Leipzig)
23. "Acto-Myosin Mechanics at Cell Membranes," National Centre for Biological Sciences, Tata Institute of Fundamental Research, Bangalore, India, April 2013 (Organizers: Darius Koester, John Mercer, G. Shivashankar, Satyajit Mayor)
24. Annual Meeting of the German Physical Society (DPG), Biological Physics Division, Regensburg, Germany, March 2013 (Organizer: Ulrich Schwarz)
25. TEDMED, Washington, DC, April 2013 (Organizers: Alyssa Picchini Schaffer and Lisa Shufro)
26. "Stochastic Modeling of Biological Processes," Workshop at the Institute for Mathematics and its Applications (IMA), University of Minnesota, May 2013 (Organizers: Peter Bates, Brent Doiron, Timothy Elston, G. Bard Ermentrout, and Wenxian Shen).
27. Annual "Science@theInterface" Symposium at the University of Chicago, "Biological Self-Organization and the Cytoskeleton," Institute for Biophysical Dynamics, June, 2013 (Organizers: Ron Rock and Edwin Munro)
28. "Mechanochemical Cell Biology," British Society for Cell Biology (BSCB) Autumn 2013 Meeting, September 2013 (Organizers: Anne Straube and Justin Molloy)
29. Annual "Physics of Living Matter Symposium," Cambridge, UK, September 2013 (Organizers: Kristian Franze, Alexandre Kabla, Alfonso Martinez Arias)
30. Joint Weizmann Institute of Science-Mechanobiology Institute Mechanobiology Conference "Dynamic Architecture of Cells and Tissues", Singapore, Singapore, October 2013 (Organizers: Alexander Bershadsky, Benjamin Geiger, and Michael Sheetz)
31. "Design of Medical Devices," Session on "Neuroimaging," Minneapolis, MN, April 2014 (Session Chair: Taner Akkin)

32. "Cardiac Growth & Regeneration - Visualizing the future," Viterbo, Italy, June 2014 (Organizers: Paolo Di Nardo, William Claycomb, Germano Di Sciascio, Pawan Singal)
33. Gordon Research Conference, "Signal Transduction from Engineered Extracellular Matrices," Waltham, MA, July 2014 (Chair: Jason Burdick, Co-Chair: Linda Griffith)
34. Association of Medical Illustrators Annual Conference, Rochester, MN, August 2014 (Organizer: Robert Morreale)
35. Banff International Research Station (BIRS), "Mathematics of the Cell: Integrating Genes, Biochemistry and Mechanics," Banff, AB, Canada, September 2014 (Organizers: Eric Cytrynbaum, Adriana Dawes, Alex Mogilner, and David Sept)
36. European Molecular Biology Organization (EMBO) Workshop, "A Systems-Level View of the Cytoskeleton," Stockholm, Sweden, October 2014 (Organizers: Alexander Bershadsky and Benjamin Geiger)

Academic and Research Institutions:

1. Carnegie-Mellon University-University of Pittsburgh, Joint Ph.D. Program in Computational Biology, April 2009 (Host: Aabid Shariff)
2. University of Minnesota, Biophysics Seminar, Dept. of Physics & Astronomy, Minneapolis, MN, October 2009 (Host: Vincent Noireaux)
3. Columbia University, Dept. of Biomedical Eng., New York, NY, October 2009 (Host: Ed Guo)
4. Rice University, Dept. of Bioengineering, Houston, TX, January 2010 (Host: Michael Diehl)
5. University of Minnesota, Masonic Cancer Center, Minneapolis, MN, February 2010 (Host: Jonathan Sachs)
6. University of British Columbia, Dept. of Mathematics, Vancouver, BC, March 2010 (Host: Eric Cytrynbaum)
7. University of Massachusetts, Dept. of Biology, Amherst, MA, March 2010 (Host: Wei-Lih Lee)
8. University of Edinburgh, Wellcome Trust Centre for Cell Biology, Edinburgh, Scotland, October 2010 (Host: Ken Sawin)
9. University of Dundee, Wellcome Trust Centre for Gene Regulation and Expression, Dundee, Scotland, October 2010 (Host: Tomoyuki Tanaka)
10. McGill University, Dept. of Biology, Montreal, Canada, November 2010 (Host: Jackie Vogel)
11. University of Minnesota, Hormel Institute, Austin, MN, November 2010 (Host: Edward Hinchcliffe)
12. Indiana University, Biocomplexity Institute, Bloomington, IN, February 2011 (Host: Claire Walczak)
13. University of Michigan, Dept. of Chemical Eng., Ann Arbor, MI, March 2011 (Host: Jennifer Linderman)
14. University of Wisconsin, Dept. of Biomedical Eng., Madison, WI, April 2011 (Host: Paul Campagnola)
15. University of Connecticut Health Center, Center for Cell Analysis and Modeling, Farmington, CT, October 2011 (Hosts: Vladimir Rodionov and Les Loew)
16. Massachusetts Institute of Technology, Dept. of Biological Eng., Cambridge, MA, November 2011 (Host: Mark Bathe)
17. Rensselaer Polytechnic Institute, Dept. of Biology, Troy, NY, January 2012 (Host: Lee Ligon)
18. Johns Hopkins University, Dept. of Molecular Biology & Genetics, Baltimore, MD, April 2012 (Host: Geraldine Seydoux)
19. University of California at Irvine, Dept. of Developmental & Cell Biology, Irvine, CA, April 2012 (Host: Steve Gross)

20. University of Pennsylvania, Dept. of Chemical and Biomolecular Engineering, Philadelphia, PA, October 2012 (Host: Matthew Lazzara)
21. National Heart, Lung, and Blood Institute (NIH), Laboratory of Computational Biology, Bethesda, MD, November 2012 (Host: Jian Liu)
22. Harvard University, Bauer Forum, Cambridge, MA, November 2012 (Host: Dan Needleman)
23. Cleveland Clinic, Lerner Research Institute, Dept. of Cancer Biology, Cleveland, OH, January 2013 (Host: Steve Rosenfeld)
24. University of California at San Francisco, Biophysics Program, San Francisco, CA, January 2013 (Hosts: Dyche Mullins and Wallace Marshall)
25. University of Vermont, School of Medicine, Dept. of Molecular Physiology & Biophysics, Burlington, VT, January 2013 (Host: Jason Stumpff)
26. Dartmouth College, Dept. of Biological Sciences, Hanover, NH, February 2013 (Host: Amy Gladfelter)
27. Max Planck Institute for Molecular Cell Biology & Genetics, Dresden, Germany, March 2013 (Host: Ewa Paluch)
28. University of California-San Francisco/University of California-Berkeley, Berkeley, CA, May 2013 (Host: Valerie Weaver)
29. Cornell University, Department of Biomedical Engineering, Ithaca, NY, December 2013 (Hosts: Cindy Reinhart-King and Michael Schuler)
30. University of Minnesota, Department of Pharmaceutics, Minneapolis, MN, January 2014 (Host: Bill Elmquist)
31. Princeton University, Department of Chemical and Biological Engineering, Princeton, NJ, March 2014 (Host: Clifford Brangwynne)
32. Washington University, Department of Biochemistry and Molecular Biophysics, St. Louis, MO, July 2014 (Host: John Cooper)
33. University of Minnesota/Mayo Clinic Brain Tumor Program Retreat, Minneapolis, MN, August 2014 (Organizers: David Largaespada and Brian O'Neill)
34. University of Minnesota Masonic Cancer Center, Minneapolis, MN, September 2014 (Hosts: Jim McCarthy and Kalpa Gupta)
35. University of Minnesota Stem Cell Institute/Engineering Symposium, Minneapolis, MN, October 2014 (Organizers: Tim O'Brien and Jakub Tolar)
36. Yale University, Department of Molecular Biophysics and Biochemistry, New Haven, CT, November 2014 (Host: Julien Berro)
37. University of Pennsylvania, Pennsylvania Muscle Institute, Philadelphia, PA, November 2014 (Host: Ekaterina Grishchuk)
38. University of California-San Diego, Department of Mechanical and Aerospace Engineering, La Jolla, CA, December 2014 (Host: David Saintillan)
39. University of Colorado Denver Anschutz Medical Campus, Molecular Biology Seminar Series, Denver, CO, to be presented January 2015 (Host: Chad Pearson)
40. The Ohio State University, Department of Biomedical Engineering, Columbus, OH, to be presented March 2015 (Host: Yi Zhao)

General Audience/Popular Talks:

1. "The Dynamic Cell: From Microtubules to Motion," Desert Hills Lutheran Church, Green Valley, AZ, January 2010 (Host: Emilie Odde)
2. TEDMED talk at the Kennedy Center for the Performing Arts, Washington, DC, April, 2013. <http://www.tedmed.com/speakers/show?id=46953> (see below also for more details on this art/science project)
3. Northern Spark, Minneapolis, MN, June 2014. All-night, city-wide arts festival, presented to general audience at Northrop Auditorium as part of the "Faculty Filibuster," (Organizer: Prof. Ann Waltner).

4. "Faith and Science," Nativity Lutheran Church, Saint Anthony, MN, October 2014 (Host: Dr. Ed Spenny)
5. University of Minnesota College of Science & Engineering Leadership Gala (CSE Fundraising and Recognition Event), with Carl Flink and Black Label Movement, Minneapolis, MN, November 2014 (Organizer: Kim Dokter)

Institutional Service Activities

Department:

Director of Undergraduate Studies in Biomedical Engineering (2000-2013, except for research leaves/sabbaticals 2003-2004 and 2008)

most significant accomplishments:

- Implemented new Bachelor of Biomedical Engineering Degree program
- >600 alumni, most employed in Minnesota biomedical technology industry
- current class size ~80 seniors
- led 3 successful rounds of accreditation by ABET, the leading accrediting body for engineering programs in the US and Canada

ABET Accreditation Coordinator (2000-2013)

Latin Honors Representative (2000-2013)

Undergraduate and Graduate student recruiting (2000-)

Emphasis Area Advisor, Cell and Tissue Engineering (2000-)

Pre-med advisor to BME undergraduate students (2013-)

Chair, Faculty Search Committee (2000-2002, 2004-2008)

Faculty Search Committee (2009-2010, 2012-2013)

Co-Chair, Biomedical Imaging Workshop (May 2010)

College:

College of Science & Engineering Promotion & Tenure Committee (2014-2016)

College of Science & Engineering Faculty Liaison Committee for Development (2014-)

College of Science & Engineering Honors & Awards Committee (September 2009-2012, Chair 2011-2012 academic year)

College of Science & Engineering Curriculum Committee (2000-2013)

College of Science & Engineering Academic Standards and Student Affairs Committee (2000-2013)

Faculty Search Committee, Department of Mechanical Engineering, University of Minnesota (2001-2002)

University:

Brain Tumor Program Executive Committee (an administrative unit of the Masonic Cancer Center; 2013-)

Theme Co-Chair in Cellular and Molecular Bioengineering, Institute for Engineering in Medicine (2012-)

Faculty Search Committee, College of Biological Sciences, Cluster Hire in Biophysics (2012-2014)

Co-Chair, Search Committee, Institute for Engineering in Medicine Director (2011-2012)

Board Member, Institute for Advanced Studies (January 2009-2012)

Task Force on Advanced Optical Imaging (Tim Ebner, Chair; 2009-2012)

Academic Health Center, Biosciences Discovery District, Program Development Committee in Cancer (Doug Yee, Chair; 2010)

Chair, Institute for Engineering in Medicine Seed Grant Review Committee (2009)

Faculty Search Committee, Department of Pharmaceutics, University of Minnesota (2006-2007)

Faculty Advisor to Biomedical Engineering Society BMES Student Chapter at the University of Minnesota (1999-2001, 2004-2006)

Recent Professional Service Activities (since 2011)

BMES Fellows Selection Committee (2012-)

Guest Editor (along with Will Hancock and David Sept), *Cellular and Molecular Bioengineering*, BMES journal, Special issue dedicated to Alan Hunt

Member, 2014 ASCB Program Committee Subcommittee on Physical Science in Cell Biology (2013-2014)

BMES 2016 Annual Meeting Co-Chair (with Prof. Song Li, U. California-Berkeley; ~4,000 attendees annually)

Recent Public Outreach and Arts-Related Activities (since 2011)

Developed “Bodystorming” as an approach to learning, teaching, and research in biology (in collaboration with Prof. Carl Flink, Theatre Arts & Dance Dept, and Artistic Director, Black Label Movement Dance Company).

Highlighted in:

- “Cellular Chaos on the Dance Floor,” *Science*, **338**, 870 (2012)
<http://scim.ag/bodystorm>
- Twin Cities Public Television, <http://www.mnoriginal.org/episode/hit-the-moving-cell-project/> – interview with D.O. and C.F. and project clips (10 minutes)
<http://www.mnoriginal.org/episode/black-label-movement-hit/>
- Institute for Advanced Study, <http://ias.umn.edu/2011/09/22/moving-cell-2/> – video podcast of a joint class between BMEN 5351 Cell Engineering (D.O, instructor) and DNCE 3010 Modern Dance Technique (C.F., instructor) held in the Barker Dance Studio at the University of Minnesota (85 minutes)
- Chicago Tribune review of ‘HIT’, http://articles.chicagotribune.com/2011-03-11/features/ct-live-0312-same-planet-dance-review20110311_1_dancer-dance-centercollisions
- Twin Cities StarTribune review of ‘HIT’, <http://www.startribune.com/entertainment/stageandarts/139153774.html?refer=y>
- TEDMED talk at the Kennedy Center for the Performing Arts, Washington, DC (April, 2013) <http://www.tedmed.com/speakers/show?id=46953>
- Reviewed in *Dance Magazine*, <http://www.dancemagazine.com/reviews/July-2013/Black-Label-Movement>

Graduate Students and Post-Doctoral Researchers Advised

Completed Postdoctoral Fellowships

Bruce Gao, Ph.D. (University of Miami, Dept. of Biomedical Engineering)
2000-2003.
Currently Associate Professor (Tenured), Dept. of Bioengineering,
Clemson University, Clemson, SC. (Will be promoted to Full
Professor with Tenure, effective summer 2015)

Theodore Tower, Ph.D. (University of Minnesota, Dept. of Chemical Engineering and
Materials Science)
2001-2002.
Currently Technical Leader at Kimberly-Clark, Neenah, WI.

Erkan Tüzel, Ph.D. (University of Minnesota, Dept. of Physics and Astronomy)
2007-2009.
Currently Assistant Professor (Tenure-Track), Dept. of Physics,
Worcester Polytechnic Institute, Worcester, MA.

Current Postdoctoral Fellows

Brannon McCullough, Ph.D. (Yale University, Dept. of Molecular Biophysics & Biochemistry)
2012-

Completed Ph.D. Degrees

Joseph Fass
“Investigation of neurite initiation and elongation for neural network engineering applications,”
2003.
Program: Chemical Engineering
Currently Staff Scientist/Bioinformatician, Genome Center, U. of California-Davis, Davis, CA

Yaakov Nahmias
“Laser-guided direct writing for three-dimensional tissue engineering analysis and application of
radiation forces,” 2004.
Program: Biomedical Engineering
Currently Assistant Professor (Tenure-Track), Dept. of Biomedical Engineering, Hebrew Univ.,
Jerusalem, Israel

Mauris DeSilva
“Investigation of micropatterning and micromechanical forces towards engineering neural
networks with defined connectivity,” 2005.
Program: Materials Science and Engineering
Currently Professor, Uniformed Services University of Health Sciences, and Principal
Investigator, Naval Medical Research Unit, San Antonio, TX

Andrew Bicek
“Origin and Consequences of Microtubule Bending in Living Cells,” 2007
Program: Biomedical Engineering
Currently Senior R&D Engineer, Boston Scientific, Inc., Maple Grove, MN

Melissa Gardner
“Modeling and analysis of microtubule-mediated chromosome transport during mitosis,” 2008
Program: Biomedical Engineering

Currently Assistant Professor (Tenure-Track), Genetics, Cell Biology, & Development Dept., University of Minnesota.

Note: Dr. Gardner's dissertation received the "Best Dissertation Award" from the University of Minnesota Graduate School in Physical Sciences and Engineering, 2009. In addition, her dissertation was selected as the University of Minnesota nominee in the same category for the national award, covering two years.

Clarence Chan

"Cellular adhesion dynamics: investigation of molecular clutch attachment and force transmission," 2008.

Program: Biomedical Engineering

Currently Principal Systems Engineer, Roche Molecular Systems, San Francisco, CA

Dominique Seetapun

"Microtubule Dynamics and Neuronal Polarity Establishment During Neurite Initiation," 2011.

Program: Biomedical Engineering

Currently Senior R&D Scientist at Miromatrix Medical, Inc., Minneapolis, MN

Brian Castle

"Multiscale Modeling and Analysis of Microtubule Self-Assembly Dynamics," 2014.

Program: Biomedical Engineering

Currently Postdoctoral Fellow in my laboratory

Benjamin Bangasser

"Optimality in the nanomechanics of cell migration and adhesion," 2014.

Program: Chemical Engineering

Currently Engineer III at Valspar, Inc., Minneapolis, MN

Completed Ph.D. Degrees-Significant Co-Advising Effort

Vincent VanBuren

"Modeling Microtubule Dynamics Instability," 2005

Lehigh University

Program: Biological Sciences (Advisor: Lynne Cassimeris)

Assistant Professor (tenure-track), Texas A&M University

Current Ph.D. Students

Rebecca Klank	Biomedical Engineering, expected graduation 2015
Emily Tubman	Biomedical Engineering, expected graduation 2015
Louis Prael	Biomedical Engineering, expected graduation 2017
Ghaidan Shamsan	Biomedical Engineering, expected graduation 2018
Mahya Hemmat	Mechanical Engineering (co-advised with V. Barocas, expected graduation 2019)

Completed M.S. Plan A Degrees

Taunisha McShan (nee Harris)

"Investigation of Collagen Fibril Alignment Under Flow Conditions," 1998.

Michigan Technological University

Program: Chemical Engineering.

Currently a scientist at 3M (St. Paul, MN)

Yeqing Cao

"Quantitative Analysis of Microtubule Dynamics: History-Dependence of Catastrophe," 1999.
Michigan Technological University
Program: Chemical Engineering.
Currently a scientist at Lucent Technologies (Holmdel, NJ).

Keck-Choong Ho

"Embryonic Chick Forebrain Cell Adhesion and Microcontact Printing of Extracellular Matrix," 1999.
Michigan Technological University
Program: Chemical Engineering
Currently a biochemical engineer at Bayer Corp. (Oakland, CA).

Liza Davis

"The Importance of Lattice Defects in Katanin-mediated Microtubule Severing," 2002.
University of Minnesota
Program: Chemical Engineering
Currently an engineer at Boston Scientific, Inc. (Minneapolis, MN).

Brian Sprague

"Mechanisms of Microtubule-Based Kinetochore Positioning in the Yeast Metaphase Spindle Assessed by Model-Convolution Analysis," 2002.
University of Minnesota
Program: Biomedical Engineering
Currently Assistant Professor, Univ. of Vermont Medical School (Burlington, VT)

Trent Fischer

"Investigation of Synapse Formation in Micromechanically Engineered Neural Networks", 2005.
University of Minnesota
Program: Biomedical Engineering
Co-advised with P. Steinmetz.
Currently senior scientist with Medtronic, Inc. (Fridley, MN)

Alexey Demchouk

"Microtubule tip tracking and tip structures at the nanometer scale using digital fluorescence microscopy," 2010.
University of Minnesota
Program: Biomedical Engineering
Currently a scientist at 3M, Inc. (St. Paul, MN)

Joseph Powers

"The Predicted Role of Stereospecificity in Crowding-mediated Effects on Reversible Association: A Brownian Dynamics Investigation," 2013.
University of Minnesota
Program: Biomedical Engineering
Currently a Bioengineering doctoral candidate at Univ. of Washington (Seattle, WA)

Current M.S. Plan B-Project Students

David Sorenson Biomedical Engineering, expected graduation 2015

Undergraduate Student Researchers: 60+ students advised over 15 years at U of Minnesota

- Graduate schools attended: MIT (4), Johns Hopkins U., U. Pennsylvania, U. Washington, U. California-San Diego, Columbia U., among others
- 2 former undergraduate researchers are now tenured/tenure-track faculty (Cornell U. and Michigan Technological U.)
- Typically ~3 UROP projects advised/year
- 4 Undergraduate students have co-authored journal articles

Teaching and Curriculum Development

University of Minnesota

BMEN 5350/5351 Cell Engineering

Taught 2000, 2002, 2004, 2005, 2007 (Fa+Sp), 2009 (Fa+Sp), 2010, 2011, 2012, 2013, 2014 (13 times total)

- Teaches students the fundamental physics and chemistry of the cell (diffusion, kinetics & thermodynamics, and forces) and how to apply them to develop mathematical/computational models for cellular processes of medical importance
- Typical enrollment: ~30 graduate students/seniors in biomedical engineering (min 17 in 2000, max 59 in 2014)
- Course had only been taught once before 2000, essentially developed the course over the last 14 years
- Provided basis of textbook (2/3 drafted), "Physics and Chemistry of the Cell," under contract with Cambridge University Press (expected in 2015)
- Two student projects have been published as journal articles (#15 and #33)
- Involves project collaborations with UMN life sciences faculty (e.g. in 2014: Mike O'Connor, Gant Luxton, Dick Linck, Ted Hinchcliffe, and Melissa Gardner) and life science faculty from around the US and world (e.g. in 2014: U. of Cambridge, Notre Dame U., Ben Gurion U., U. of Pennsylvania)

BMEN 2501/5501 Cellular and Molecular Biology for Biomedical Engineers

Taught 2000, 2001, 2003, 2005, 2006 (5 times total)

- Teaches students the basic organization, processes, and functions of the cell using a physically-based molecular perspective to bring an engineering approach to the subject
- Revamped course to include physical fundamentals and a mathematical perspective
- Designed and implemented laboratory component for the undergraduate course (2501)
- Typical enrollment: ~80 undergraduates (2501) and ~20 graduates (5501)
- Oversaw establishment of the BMEN 2501 course as fulfilling the university's liberal education requirement of life science with laboratory

BMEN 5311/ChEn 5753 Advanced Biomedical Transport Process

Taught 2010, 2011, 2012, 2013, 2014 (5 times total; co-taught equally with Prof. Victor Barocas)

- Teaches students the fundamentals of mass and momentum transport (i.e. diffusion and fluid mechanics) in the context of biology and medicine, including analytical and numerical solutions to partial differential equations
- Typical enrollment: ~25 graduate students and seniors in biomedical engineering