

**BIOGRAPHICAL SKETCH**

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NAME David J. Odde	POSITION TITLE Professor		
eRA COMMONS USER NAME			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
University of Minnesota	B.Ch.E.	1988	Chemical Engineering
Rutgers, The State University of New Jersey	M.S.	1992	Chemical & Biochemical Engineering
Rutgers, The State University of New Jersey	Ph.D.	1995	Chemical & Biochemical Engineering

**A. Positions and Honors***Positions:*

- 1995-1999 Assistant Professor, Department of Chemical Engineering, Michigan Tech. University  
 1999-2007 Associate Professor, Department of Biomedical Engineering, University of Minnesota  
 1999- Director of Undergraduate Studies, Department of Biomedical Eng., University of Minnesota  
 1999- Graduate Faculty Member, Chemical Engineering, University of Minnesota  
 1999- Graduate Faculty Member, Materials Science and Engineering, University of Minnesota  
 2001- Member, Institute for Engineering and Medicine, University of Minnesota  
 2003 Research Associate, Marine Biological Laboratory, Woods Hole, MA  
 2003 Visiting Scientist, Department of Biology, University of North Carolina  
 2004 Visiting Scientist, Department of Anatomy, University of Cambridge  
 2004 Visiting Fellow, Clare Hall, University of Cambridge  
 2006-2007 Acting Department Head, Department of Biomedical Engineering, University of Minnesota  
 2007- Professor, Department of Biomedical Engineering, University of Minnesota  
 2007- Graduate Faculty Member, Molecular, Cell, Developmental Biology, & Genetics  
 2007- Advisory Board Member, Institute for Advanced Study, University of Minnesota  
 2007- Editorial Board, *Current Biology*, (published by Cell Press, Elsevier)  
 2007- Founding Co-Editor-In-Chief, *Cellular and Molecular Bioengineering*, (published by Springer on behalf of the Biomedical Engineering Society)  
 2009- Instructor, Physiology Course, Marine Biological Laboratory, Woods Hole, MA  
 2011- Editorial Board, *Physical Biology*, (published by the Institute of Physics)  
 2011- Associate Editor, *Biophysical Journal* (published by Cell Press on behalf of the Biophysical Society)

*Honors:*

- 1999 James and Lorna Mack Endowed Professorship in Cellular and Molecular Bioengineering  
 2000-2001 Institute of Technology Student Board Award as Outstanding Professor in Biomedical Engineering  
 2000-2004 National Science Foundation CAREER Award  
 2002-2004 McKnight Land-Grant Professorship  
 2006 Paper of the Year, *Molecular Biology of the Cell* (Senior Author)  
 2007 Elected to College of Fellows, American Institute of Medical and Biological Engineering  
 2008 Rutgers University School of Engineering Outstanding Young Alumnus  
 2009 George W. Taylor Award for Distinguished Research, College of Science & Engineering  
 2010 Elected Fellow of the Biomedical Engineering Society  
 2011 Stanley Lecture, Dept. of Chemical and Biological Engineering, Iowa State Univ.

**Professional Memberships:**

American Soc. for Cell Biology (1993-), Biomedical Engineering Soc. (1994-), Biophysical Society (2002-), American Association for the Advancement of Science (2008-)

**B. Selected peer-reviewed publications (in chronological order). Selected from 59 total since 1995.**

1. Odde, D. J., L. Cassimeris and H. M. Buettner, "Kinetics of microtubule catastrophe assessed by probabilistic analysis," *Biophysical Journal*, **69**, 796-802 (1995).
2. 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).
3. 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).
4. 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).
5. 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).
6. Odde, D. J., "Estimation of the diffusion-limited rate of microtubule assembly," *Biophysical Journal*, **73**, 88-96 (1997).
7. Odde, D. J., "Diffusion inside microtubules," *European Biophysics Journal*, **27**, 514-520 (1998).
8. 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).
9. Odde, D. J. and M. J. Renn, "Laser-guided direct writing for applications in biotechnology," *Trends in Biotechnology*, **17**, 385-389 (1999).
10. 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).
11. Odde, D. J. and M. J. Renn, "Laser-guided direct writing of living cells," *Biotechnology and Bioengineering*, **67**, 312-318 (2000).
12. 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).
13. 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).
14. 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). Correction in **101**, p.14989 (2004).
15. 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).
16. 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," *Proceedings of the SPIE*, **4608**, 245-250 (2002).
17. 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).
18. Fass, J.N., and D.J. Odde, "Tensile force-dependent neurite elicitation via anti-beta1 integrin antibody-coated magnetic beads," *Biophysical Journal*, **85**, 623-36 (2003).
19. Sprague, B. L., C. G. Pearson, P. S. Maddox, K. 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).
20. 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).
21. 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).
22. 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).
23. Odde, D.J., "Chromosome capture: take me to your kinetochore," *Current Biology*, **15**, R328-30 (2005).

24. 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).
25. Odde, D. J., "Mitotic Spindle: Disturbing a Subtle Balance," *Current Biology*, **15**, R1-3 (2005).
26. VanBuren, V., L.U. Cassimeris, and D.J. Odde, "A mechanochemical model of microtubule structure and kinetics," *Biophysical Journal*, **89**, 2911-2926 (2005).
27. Fischer, T.M., P.N. Steinmetz, 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).
28. 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).
29. 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).
30. Pearson C\*, Gardner M\*, Paliulis L, Salmon ED, Odde DJ, Bloom K., "Measuring nanometer scale gradients in spindle microtubule dynamics using model convolution microscopy," *Molecular Biology of the Cell*, **17**, 4069-4079 (2006). \*Authors contributed equally.
31. 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.
32. Gardner, M.K. and D. J. Odde, "Modeling kinetochore motility in mitosis," *Current Opinion in Cell Biology*, **18**, 639-647 (2006).
33. 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).
34. Nahmias, Y., R.E. Schwartz, W.S. Hu, C.M. Verfaillie, and D.J. Odde, "Endothelium-Mediated Hepatocyte Recruitment in the Establishment of Liver-like Tissue In Vitro," *Tissue Engineering*, **12**, 1627-1638 (2006).
35. Nahmias Y. and D. J. Odde, "Micropatterning of hepatic-endothelial sinusoid-like structures by laser-guided direct writing," *Nature Protocols*, **1**, 2288-2296 (2006).
36. Gardner, M.K., and Odde, D.J., "Asymmetric Division: Motor Persistence Pays Off," *Current Biology*, **16**, R1021-1023 (2006).
37. DeSilva, M.N., J. Paulsen, M.J. Renn, 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)
38. Bicek AD, Tuzel E, Kroll DM, Odde DJ, "Analysis of microtubule curvature," *Methods in Cell Biology*, **83**, 237-68 (2007).
39. Gardner M, D. J. Odde, and K. Bloom, "Hypothesis testing via integrated computer modeling and digital fluorescence microscopy," *METHODS*, **41**, 231-237 (2007).
40. Schek HT, 3rd,\* Gardner MK,\* Cheng J, Odde DJ,\*\* Hunt AJ,\*\* "Microtubule assembly dynamics at the nanoscale," *Current Biology*, **17**, 1445-55 (2007). \*denotes authors contributed equally. \*\* denotes authors co-directed the project equally.
41. Gardner, M.K. and D.J. Odde, "Dam1 complexes go it alone on disassembling microtubules," *Nature Cell Biology*, **10**(4): p. 379-81 (2008).
42. 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).
43. Lipkow, K. and D.J. Odde, "Model for protein concentration gradients in the cytoplasm," *Cellular and Molecular Bioengineering*, **1**, 84-92 (2008).
44. 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).
45. Gardner, M.K., J. Haase, M.B. Anderson, J.N. Molk, K. Myhre, 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).
46. 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*, **135**(5): p. 894-906 (2008).

47. Chan, C.E. and D.J. Odde, "Traction dynamics of filopodia on compliant substrates," *Science*, **322**(5908): p. 1687-91 (2008).
48. 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).
49. Gardner, M.K., Sprague, B.L., Pearson, C.G., Cosgrove, B.D., Bicek, A.D., Bloom, K., Salmon, E.D., and D.J. Odde, "Model convolution: A computational approach to digital image interpretation," *Cellular and Molecular Bioengineering*, **3**, 163-170 (2010).
50. Seetapun, D. and D.J. Odde. "Cell-length-dependent microtubule accumulation during polarization," *Current Biology*, **20**, 979-988 (2010).
51. Gardner, M.K. and D.J. Odde, "Stochastic simulation and graphic visualization of mitotic processes," *Methods*, **51**, 251-256 (2010).
52. 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).
53. 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).
54. Odde, D.J., "Getting cells and tissues into shape," *Cell*, **144**, 325-326 (2011).
55. Gardner, M.K., Charlebois, B.D., Janosi, I.M., Howard, J., Hunt, A.J., and D.J. Odde, "Rapid microtubule self-assembly kinetics," *Cell*, in press.

## C. Research Support

### Ongoing Research Support

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

"Modeling Microtubule Dynamics in Mitosis" (1/06-12/13)

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

*National Institute of General Medical Sciences, R01-GM-76177, subcontract from Univ. of Michigan*

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

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: co-I (PI is Alan Hunt, Univ. of Michigan)

*National Cancer Institute, RC1-CA-145044*

"Microsystems and Modeling Approach to Glioma Migration and Metastasis" (09/09-08/11)

Goals: To develop predictive computational models for glioma migration as a function of environmental mechanical stiffness and micro-architecture 2) Develop *in vitro* microsystems to mimic *in vivo* micro-architecture and mechanical properties 3) Measure the brain micromechanical properties that are sensed by migrating gliomas Our goal will be to use these mechanochemical models for glioma migration to guide development of novel therapeutic strategies to interfere with glioma dispersion within the brain.

Role: co-PI (with Steve Rosenfeld, Columbia Univ.)

Principal Investigator/Program Director (Last, First, Middle):

Completed Research Support

*National Science Foundation*

“Chemical and Mechanical Interactions in Microtubules” (8/06-7/10)

Goals: To understand the mechanochemical basis of microtubule assembly in vitro and in living cells. Use live cell imaging combined with computational modeling to understand the influence of forces on microtubules and their distribution in living cells.

Role: PI