

William H. Guilford

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I. Academic Appointments

7/2004	Associate Professor	University of Virginia, Biomedical Engineering
9/1997	Assistant Professor	University of Virginia, Biomedical Engineering

II. Education

1993-97	Postdoc	University of Vermont (David M. Warshaw, advisor)
1993	Ph.D.	University of Arizona, Physiology (Robert W. Gore, advisor)
1986	B.S.	Saint Francis College, Biology and Chemistry. <i>Magna cum lauda.</i>
1982	H.S.	Wauseon High School, Wauseon, Ohio. <i>Cum lauda.</i>

III. Honors and Awards

2005	Academy of Distinguished Educators	University of Virginia
2005	Finalist, Teaching Excellence Awards	State Council for Higher Education in Virginia
2004	All University Outstanding Teaching Award	University of Virginia
1997	Institutional Research Fellowship	University of Virginia
1992	Meritorious Performance in Teaching	University of Arizona Foundation
1992	Most Outstanding Performance by a Teaching Assistant	University of Arizona, College of Medicine
1992	Graduate Academic Scholarship	University of Arizona
1991	Meritorious Performance in Teaching	University of Arizona Foundation
1991	Most Outstanding Performance by a Teaching Assistant	University of Arizona, College of Medicine
1986	Research Participation Program	Argonne National Laboratory

IV. Professional Affiliations

Biophysical Society
American Society for Engineering Education

V. Extramural Funding

A. Current

NIH EB002185 "Biomechanics of Leukocytes and Molecular Imaging Agents" Klaus Ley P.I.
2006-2011 Total direct costs: \$ 4,425,795 (\$319,340, Dr. Guilford's project only)

B. Previous

NIH HL64381 "Biomechanics of Adhesion Molecules." 1999-2004 (R24) Total direct costs (Dr. Guilford's project only): \$369,072 (This was one of four projects funded under a Bioengineering Research Partnership, Klaus Ley P.I.).

NIH AR45604 "The Molecular Mechanics of Myosin Filaments." 1999-2003 (R01) Total direct costs: \$501,780

National Research Service Award, "Direct Measurement of Smooth Muscle Myosin Mechanics *in Vitro*" 1993-96.

Sigma Xi Grant-in-Aid. "Three-Dimensional Arrangement of Fibrous Connective Tissue Surrounding Arterioles in the Hamster Cheek Pouch." 1991-92.

VI. Committees

A. Societies

2005-present Education Committee, Biophysical Society

B. School

2004-present SEAS Undergraduate Curriculum Committee

1998-2005 Computer Environment Committee (SEAS)

C. Department

2004-present BME Undergraduate Curriculum Committee

1998-99 Teaching Excellence Committee

1998-99 M.E. Committee

1999 Chair, Systems Administrator search committee

VII. Other Service Activities

2006-present Undergraduate Program Director, Biomedical Engineering

2006 HighSTeP director (High school Science Training Program)

2005-present Board of Editors, Molecular and Cellular Biomechanics

2004-present ABET Accreditation Director

2002 Conference Organizer, 3rd Annual Colloquium on the Biomechanics of Adhesion Molecules

2000-2002 Director, Biotechnology Training Program Seminar Series

1998-1999 Department Webmaster / Systems administrator

1998 *ad hoc* member, BBCB study section, NIH

1998 Teaching Resource Center department liaison

Manuscript review: *Biophysical Journal*, *PNAS*, *FEBS Letters*, *AJP*, *Microvascular Research*, *Journal of Muscle Research and Cell Motility*, *IEEE Trans. Image Processing*, *Lanmuir*, *Physical Biology*, *IEEE Trans. Adv. Packaging*, *Circulation*, *Journal of Biological Chemistry*

VIII. Invited Lectures and Sessions Chaired

2006 Asilomar Conference on Signals, Systems and Computers

2006 University of Illinois, Chicago, Department of Physiology and Biophysics

2005 James Madison University, Department of Chemistry

2005 Mayo Clinic, Department of Pulmonary and Critical Care Medicine

2005 Davidson College, Departments of Biology and Physics

2005 Effects of Force on Molecules *Session Co-chair*, BMES Annual Meeting

2003 Mayo Clinic, Department of Biomedical Engineering

2002 Pennsylvania State University, Bio medical Engineering

2002 Virginia Polytechnic Institute, Biogeochemistry
 2001 Virginia Biotechnology Summit, Alexandria, VA.
 1998 Molecular Motors *Session Co-chair*, Biophysical Society Annual Meeting
 1997 XXVI European Muscle Congress, Schneverdingen, BRD
 1997 American Society for Cell Biology Annual Meeting, Special Interest Subgroup
 1996 Meeting of the American Thoracic Society and American Lung Association
 1996 Meeting of the Biomedical Engineering Society
 1995 University of Arizona Vascular Biology Group

IX. Teaching Activities

A. Present

<u>Year(s)</u>	<u>Course</u>	<u>Course Name</u>	<u>Responsibility</u>
1998-present	BIOM 204/304	Cell and Molecular Biology for Engineers	100 %
1998-present	BIOM 823	Cell Adhesion, Locomotion and Mechanics	100 %
2003-present	MED 610	Physiology (muscle physiology)	16 %
2003-present	BIOM 380	BME Ideas Lab	15 %
1999-present	BIMS 812	Cell Structure (muscle cell biology)	8 %
2004-present	BIMS 832	Physiology	16 %
2004-present	ENGR 897/997	Teaching Skills Seminar	30 %

B. Previous

<u>Year(s)</u>	<u>Activity</u>	<u>Institution</u>
2000-2005	Methods in Physiology (BIMS 832)	U. Virginia
2001	Short course on Cell Biology for engineering faculty	U. Virginia
1996	Human Physiology for Medical Students, tutor	U. Vermont
1994	Human Physiology for non-majors, laboratory	U. Vermont
1988	Cell Physiology, teaching assistant	U. Arizona
1988	Laboratory Methods in Biochemistry, laboratory	U. Arizona
1987-93	Human Physiology for Medical Students	U. Arizona
1987-92	Physiology for Engineers, lecture and laboratory	U. Arizona

X. Theses Directed

A. Ph.D.

1. Guo, Bin (2006): The mechanokinetics of actomyosin bonds.
2. Rao, Vijay (current): Regulation of tropomyosin and its role in left ventricular dysfunction.
Jeremy Snook (current): Forward kinetics of selectin-ligand bonds.

B. Masters

1. Rinko, Linda (2002): "The Load-dependant Bond Rupture Kinetics of L and P-selectin from PSGL-1 Measured in the Laser Trap."
2. Tournas, Joshua A. (1999) "Novel Concepts in Time-shared Laser Trap Design"

C. Undergraduate

1. Alicia Evangelista (2006) "Novel Effects of Nitric Oxide on Cardiac Muscle Myosin: Finding a Mechanism for Heart Disease" (**2nd place, Undergraduate Research and Design Symposium**)
2. Python, Johanne (2005) "The viscoelastic properties of receptor-specific membrane tethers." (**1st place, Undergraduate Research and Design Symposium**)
3. Simnowitz, Sarah (2005) "Measuring two-dimensional specific on-rates of selectins for understanding inflammation."
4. Watson, Douglas (2004) "Impairment of kinesin-driven microtubule motility by peroxynitrite in vitro."
5. La Bonte, Laura (2003) "The role of myosin in left ventricular dysfunction"
6. Petrie, Caren (2003) "A quantitative comparison of blocking agents used in the *in vitro* motility assay"
7. Ramos, Brett (2002) "Dynamic laser control and sensor calibration in a time-shared laser trap"
8. Dascalu, Dragos (2001) "Use Custom software for high speed laser trap control and data acquisition."
9. Loyer, Amie T. (1999) "A Comparison Study of Tracking Algorithms for Nanometer-scale Objects"

Current: Jiahui Li, Elisha Marongelli, Raha Dastgheyb

High School student interns: Nyieka Walker (2006); Laura Aust (2005-2006); Kaitlyn Robbins (2004); Daren Purnell (1999)

XI. Publications

A. Peer-Reviewed Journal Articles and Refereed Proceedings

1. Crissman, R.S. and **W.H. Guilford** (1984) "The Three-Dimensional Architecture of the Elastic Fiber Network in Canine Hepatic Portal System." *American Journal of Anatomy* 171: 401-13.
2. Grdina, D.J., **W.H. Guilford**, C.P. Sigdestad and C.S. Giometti (1988) "Effects of Radioprotectors on DNA Damage and Repair, Proteins, and Cell-cycle Progression." *Pharmacology and Therapeutics* 39: 133-7.
3. Sigdestad, C.P., **W. Guilford**, J. Perrin and D.J. Grdina (1988) "Cell Cycle Redistribution of Cultured Cells After Treatment With Chemical Radiation Protectors." *Cell and Tissue Kinetics* 21(3): 193-200.
4. **Guilford, W.H.** R.W. Gore (1992) "A Novel, Remote-Sensing, Isometric Force Transducer for Micro-Mechanics Studies" *American Journal of Physiology* 263 (Cell Physiology 32): C700-707.

5. VanBuren, P., **W.H. Guilford**, G. Kennedy, J. Wu and D.M. Warshaw (1995) "Smooth Muscle Myosin: A High Force-Generating Molecular Motor" *Biophysical Journal*, 68: 256s-259s.
6. **Guilford, W.H.**, R.W. Gore and R.C. Lantz (1995) "The locomotive forces produced by single leukocytes in vivo and in vitro" *American Journal of Physiology*, 268 (Cell Physiology 37): C1308-12 .
7. **Guilford, W. H.** and R.W. Gore (1995) "The Mechanics of Arteriolar-Tissue Interaction." *Microvascular Research*, 50: 260-287.
8. Dupuis, D.E., **W.H. Guilford**, J. Wu and D.M. Warshaw (1996) "Actin Filament Mechanics in the Laser Trap" *Journal of Muscle Research and Cell Motility*, 18 (1): 17-30.
9. **Guilford, W.H.**, D.E. Dupuis, G. Kennedy, J. Wu, J.B. Patlak and D.M. Warshaw (1997) "Smooth and Skeletal Muscle Myosins Produce Similar Unitary Forces and Displacements in the Laser Trap." *Biophysical Journal*, 72 (3): 1006-21
10. **Guilford, W.H.** and D.M. Warshaw (1998) "The Molecular Mechanics of Smooth Muscle Myosin" *Comparative Biochemistry and Physiology, Part B*, 119: 451-58.
11. Tyska, M.J., D.E. Dupuis, **W.H. Guilford**, J.B. Patlak, G.S. Waller, K.M. Trybus, D.M. Warshaw, and S. Lowey (1999) "Two Heads of Myosin are Better than One for Generating Force and Motion" *Proceedings of the National Academy of Sciences*, 96: 4402-7.
12. Warshaw, D.M. **W.H. Guilford**, Y. Freyzon, E. Kremmentsova, K.A. Palmiter, M.J. Tyska, J.E. Baker, and K.M. Trybus (2000) "The Light Chain Binding Domain of Expressed Smooth Muscle Heavy Meromyosin Acts as a Mechanical Lever" *Journal of Biological Chemistry*, 275: 37167-37172.
13. **Guilford, W.H.** (2001) "A problem-based approach to teaching cell and molecular biology to engineers." *Proceedings of the ASEE Annual Conference and Exposition*, Albuquerque, New Mexico.
14. **Guilford, W.H.** (2001) "Teaching Peer-review and the Process of Scientific Writing" *Advances in Physiology Education*, 25: 167-175.
15. Cheezum, M.K., W.F. Walker and **W.H. Guilford** (2001) "Quantitative comparison of algorithms for tracking single fluorescent particles." *Biophysical Journal*, 81: 2378-88.
16. Rinko, L.J., M.B. Lawrance and **W.H. Guilford** (2004) "The Molecular Mechanics of P- and L-selectin Lectin Domains Binding to PSGL-1" *Biophysical Journal*, 86: 544-54.
17. **Guilford, W.H.**, J.A. Tournas, D. Dascalu, and D.S. Watson (2004) "Creating multiple, time-shared laser traps with simultaneous displacement detection using digital signal processing hardware." *Analytical Biochemistry*, 326(2): 153-66.
18. Guo, B. and **W.H. Guilford** (2004) "The Tail of Myosin Reduces Actin Filament Velocity in the in vitro Motility Assay" *Cell Motility and the Cytoskeleton*, 59: 264-72.
19. **Guilford, W.H.** (2005) "Shrink Wrapping" Lectures: Teaching Cell and Molecular Biology within the Context of Human Pathologies" *Cell Biology Education*, 4: 138-142.
20. Guo, B. and **W.H. Guilford** (2006) "Actomyosin is a "catch" bond that is tuned to muscle contraction" *Proceedings of the National Academy of Sciences*, 103(26): 9844-9849.
21. **Guilford, W.H.**, L.E. Aust, and K.K. Bernd "Whole-cell flagellum-based motility studied using back focal plane interferometry in a laser trap transducer" **In press** for *Conference Record of the Thirty-Ninth Asilomar Conference on Signals, Systems and Computers, 2006*.

B. Thesis / Book Chapters

1. Winfree, A.T. and **W. Guilford** (1988) "The Dynamics of Organizing Centers: Numerical Experiments in Differential Geometry." in *Biomathematics and Related Computational Problems*, ed. L.M. Ricciardi (Kluwer Academic Publishers), pp. 697-716.

2. **Guilford, W.H.** (1993) "Mechanical Interactions between Arterioles and the Interstitium" Dissertation, University of Arizona, Tucson.
3. **Guilford, W.H.** (2001) "Laser Traps in Cell Biology and Biophysics" in *Methods in Cellular Imaging*, ed. A. Periasami (Oxford University Press), pp. 381-94.

C. Other Publications

1. **Guilford, W.H.** (2003) "The Business of Teaching" *C-VILLE* 15(16): 5.
2. **Guilford, W.H.** (2003) "Motors as they were meant to be." *BioEssays*, 25(10): 1021-22.

D. Conference Presentations

1. Crissman, R.S. and W.H. Guilford (1981) "A SEM Study of the Elastic Network in the Canine Hepatic Portal Vein." *Anatomical Record* 199: 60A - 61A.
2. Crissman, R.S., W.H. Guilford and M.L. Fitzpatrick (1982) "The Network of Elastic Fibers in Venous Valves as Observed by Scanning Electron Microscopy." *Anatomical Record* 202: 37A - 38A.
3. Guilford, W.H. and R.S. Crissman (1983) "Mechanical Properties of the Networks of Elastic Fibers in the Canine Lateral Saphenous Vein." *Ohio Journal of Science* 83(2): 30.
4. Guilford, W.H. and R.W. Gore (1991) "A New, Remote-Sensing Micro-Force Transducer" *Proceedings of the Fifth World Congress on Microcirculation* (Louisville, KY) pg. 34.
5. Guilford, W.H. and R.W. Gore (1992) "A New Remote-Sensing Isometric Force Transducer" *FASEB Journal* 6(1): A172 (985).
6. Guilford, W.H. and R.W. Gore (1992) "The Micro-Mechanical Properties of the Interstitium Surrounding Arterioles in the Hamster Cheek Pouch" *FASEB Journal* 6(5): A2074 (M035).
7. Guilford, W.H., R.C. Lantz and R.W. Gore (1993) "The Forces Generated by Single Neutrophils and Macrophages Migrating *in vivo* and *in vitro*" *FASEB Journal* 7(3): A365 (2112).
8. Guilford, W.H., R.C. Lantz and R.W. Gore (1994) "The forces generated by single alveolar macrophages stimulated by chemoattractants." *FASEB Journal* 8(4): A45 (258).
9. Guilford, W.H., R.C. Lantz and R.W. Gore (1994) "The forces generated by single leukocytes during spontaneous movement." *FASEB Journal* 8(4): A1041 (M056).
10. Guilford, W.H. and R.W. Gore (1994) "Mechanical interactions between arterioles and the interstitium." *FASEB Journal* 8(4): A1041 (M055).
11. Gore, R.W. and W.H. Guilford. (1994) "Quantitative measurements of forces generated by single leukocytes during spontaneous migration *in vivo* and *in vitro*." *18th European Conference for Microcirculation. Rome, Italy. September 4-8, 1994.*
12. Gore, R.W. and W.H. Guilford. (1994) "Quantitative measurements of forces generated by single alveolar macrophages stimulated by the chemoattractant (fMLP)." *18th European Conference for Microcirculation. Rome, Italy. September 4-8, 1994.*
13. Guilford, W.H., J. Wu, G. Kennedy and D.W. Warshaw (1995) "Step size and unitary force measured in both smooth and skeletal muscle myosin" *Biophysical Journal*, 68 (2, part 2): A238.
14. Dupuis, D.E., W.H. Guilford and D.M. Warshaw (1996) "Flexural rigidity of actin filaments studied in the laser light trap" *Biophysical Journal*, 70 (2, part 2): A268.
15. Guilford, W.H., M.J. Tyska, Y. Freyzon, D.M. Warshaw and K.M. Trybus (1996) "Smooth muscle myosin with an elongated neck region produces greater unitary displacements *in vitro*" *Biophysical Journal*, 70 (2, part 2): A127.

16. Guilford, W.H., J.B. Patlak and D.M. Warshaw (1997) "Mean-variance analysis of forces and displacements generated by myosin in the laser trap." *Biophysical Journal*, 72(2): A181.
17. Guilford, W.H., A.M. Lauzon, Y. Freyzon, D.M. Warshaw and K.M. Trybus (1997) "Myosin without the putative lever arm still generates steps in the laser trap." *Biophysical Journal*, 72(2): A221.
18. Guilford, W.H., D.E. Dupuis, D.M. Warshaw, S. Guillermina, K.M. Trybus and S. Lowey (1998) "Double-headed smooth and skeletal muscle myosins generate displacements by cooperative action of the two heads." *Biophysical Journal*, 74(2): A225.
19. Cheezum, M.K., W.F. Walker and W.H. Guilford (1999) "A comparison of algorithms for tracking fluorescent particles." *Second Conference on the Development of Technology in Medicine in Virginia*, November 1, 1999, P-9.
20. Cheezum, M.K., W.F. Walker and W.H. Guilford (2000) "A comparison of particle tracking algorithms: implications for *in vitro* motility and single molecule fluorescence." *Biophysical Journal*, 78(1): 249A.
21. Dascalu, D., J.A. Tournas and W.H. Guilford (2001) "Controlling time-shared laser traps using a digital signal processing board." *Biophysical Journal*, 80(1):73a.
22. Dascalu, D., B.A. Ramos and W.H. Guilford (2001) "Simultaneous creation and monitoring of multiple laser traps by digital signal processing and back focal plane interferometry." 55th *Annual Meeting and Symposium of the Society of General Physiologists*, Woods Hole, Massachusetts.
23. Guilford, W.H., K. Kirby-Smith, L.R. La Bonte, L.J. Rinko, B. Guo and B.A. French (2001) "Peroxyntirite affects the performance of actin and cardiac myosin in the *in vitro* motility assay" 5th *International Muscle Energetics Conference*, Burlington, Vermont
24. Rinko, Linda K., William H. Guilford, Michael B. Lawrence and Klaus F. Ley. (2002) "The Load-dependant Bond Rupture Kinetics of L and P-selectin from PSGL-1 Measured in the Laser Trap" 3rd *Annual Colloquium on the Biomechanics of Adhesion Molecules*, University of Virginia, Charlottesville.
25. Kirby-Smith, C., L.R. La Bonte and W.H. Guilford (2003) "Peroxyntirite reduces the calcium sensitivity of cardiac thin filaments" *Annual Meeting of the Biophysical Society*, San Antonio, TX.
26. La Bonte, L.R., Z. Yang, W.H. Guilford and B.A. French (2003) "Left Ventricular Dysfunction in Non-infarcted Regions of the Heart Early After Myocardial Infarction: A Disease of Myosin?" *Annual Meeting of the Biophysical Society*, San Antonio, TX.
27. Petrie, C.E. and W.H. Guilford (2003) "A Quantitative Comparison of Blocking Agents Used in the *In Vitro* Motility Assay" *Annual Meeting of the Biophysical Society*, San Antonio, TX.
28. Guo, B. and W.H. Guilford (2003) "Energy Landscapes of Actin-Myosin Bonds in Different Nucleotide Binding States" 4th *Annual Colloquium on Cellular and Molecular Biomechanics*, Charlottesville, VA.
29. Watson, D.S., W.O. Hancock and W.H. Guilford (2004) "Peroxyntirite Impairs Kinesin-Driven Microtubule Motility *In Vitro*" *Biophysical Journal*, 86(1S): 409a.
30. Guo, B. and W.H. Guilford (2004) "Energy Landscapes of Actin-myosin Bonds in Different Nucleotide States" *Biophysical Journal*, 86(1S): 53a.
31. Guo, B. and W.H. Guilford (2004) "The Tail of Myosin Reduces Actin Filament Velocities in the *In Vitro* Motility Assay" *Biophysical Journal*, 86(1S): 53a.
32. Guo, B. and W.H. Guilford (2005) "Actomyosin is a 'catch' bond." *Biophysical Journal*, 88(1): 179a

33. Python, J.L., M.B. Lawrence and W.H. Guilford (2005) "High resolution mechanics of membrane tethers pulled via PSGL-1" *Annual meeting of the Biomedical Engineering Society*.
34. Guo, B. and W.H. Guilford (2005) "Actomyosin is a "catch" bond that is mechanically tuned to contraction" *Annual meeting of the Biomedical Engineering Society*.
35. Rao, V., L.R. La Bonte, Y. Xu, Z. Yang, B.A. French and W.H. Guilford (2005) "The Role of Myosin in the Dysfunction of Non-ischemic Myocardium Early After Myocardial Infarction" *Annual meeting of the Biomedical Engineering Society*.
36. Guilford, W.H. (2005) "Molecular motors: from single molecule biophysics to pathology" *Annual meeting of the Biomedical Engineering Society*.
37. Rao, V.S., L.R. La Bonte, B. Guo, Y. Xu, Z. Yang, B.A. French, W.H. Guilford (2006) Myosin function and thin filament velocity, but not calcium sensitivity, are affected in non-ischemic myocardium early after myocardial infarction. *Biophysical Journal*, 90. 1264.
38. Python, J.L., M.B. Lawrence and W.H. Guilford (2006) High Resolution Mechanics of Membrane Tethers Pulled via PSGL-1. *Biophysical Journal*, 90. 2720.
39. Snook, J., A. Evangelista, and W.H. Guilford (2006) Effects of peroxynitrite on cardiac myofibrillar protein mechanics. *Oxidative Post Translational Modifications in Cardiovascular Disease*, October 3-6, Boston, MA.
40. Guilford, W.H., L.E. Aust, and K.K. Bernd "Whole-cell flagellum-based motility studied using back focal plane interferometry in a laser trap transducer" *Asilomar Conference on Signals, Systems and Computers*, October 29-November 1, Pacific Grove, CA.

E. Submitted manuscripts

1. Rao, V., L.R. La Bonte, Y. Xu, Z. Yang, B.A. French and **W.H. Guilford** "Myosin function is impaired in non-infarcted regions of the myocardium early after myocardial infarction" **In review** for *The American Journal of Physiology*.
2. Paschall, C.D., **W.H. Guilford** and M.B. Lawrence "Enhancement of L-selectin, but not P-selectin, Bond Formation Frequency by Convective Flow" **In revision** at *Biophysical Journal*
3. Watson, D., W. Hancock and **W.H. Guilford** "Peroxynitrite treatment of kinesin but not tubulin inhibits kinesin-driven motility of microtubules" **In revision** for *Free Radical Biology and Medicine*

F. Manuscripts in preparation

1. Petrie, C.E. and W.H. Guilford "A quantitative comparison of blocking agents used in the *in vitro* motility assay" In preparation for *Nanotechnology*
2. J. Snook, T.N. Burks, L.R. La Bonte and W.H. Guilford "The effects of peroxynitrite on cardiac myosin and thin-filament mechanics." In preparation for *Free Radical Biology and Medicine*.
3. Python, J.L., M.B. Lawrence and W.H. Guilford "The viscoelastic properties of tethers pulled from monocytes via the adhesion receptor PSGL-1" In preparation for *Molecular and Cellular Biomechanics*

Revised December 1, 2006