

BIOGRAPHICAL SKETCH

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NAME Wirtz, Denis		POSITION TITLE Professor of Chemical and Biomolecular Engineering	
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
Free University of Brussels, Belgium	Phys. Deg.	1983-1988	Physics Engineering
Stanford University, Stanford, CA	M.S.	1989	Chemical Engineering
Stanford University, Stanford, CA	Ph.D.	1993	Chemical Engineering
ESPCI, Paris, France	postdoc	1993-1994	Biophysics

A. Positions and Honors**Positions and Employment**

- 1994-2001 Assistant Professor, Department of Chemical Engineering, Johns Hopkins University
 1997-2001 Assistant Professor, Department of Materials Science and Engineering, Johns Hopkins University
 1995-present Member, Molecular Biophysics Program, Johns Hopkins University
 2001-2004 Associate Professor, Department of Materials Science and Engineering, Johns Hopkins University
 2001-2004 Associate Professor, Department of Chemical Engineering, Johns Hopkins University
 2004-present Professor, Department of Chemical and Biomolecular Engineering, Johns Hopkins University

Other Experience and Professional Memberships

- 1993-present Member American Physical Society; Member, American Institute of Chemical Engineers; Member, Biophysical Society; Member, American Society for Cell Biology; Member, American Society of Microbiology
 2005-present Co-Director of the Institute for NanoBioTechnology at Johns Hopkins University
 2005-present Director of the HHMI graduate training program in nanotechnology for medicine

Honors

- 1988-1989 Hoover Fellowship, Belgian-American Educational Foundation (BAEF)
 1989 Claes Prize for best Engineering/Science Dissertation, Belgian Academy of Science
 1993-1994 Post-Doctoral "Mobility" Fellowship, European Union
 1996-2001 National Science Foundation, Career Award
 1997-2000 Whitaker Foundation, Biomedical Engineering Foundation Award
 2005-present Fellow, American Institute for Medical and Biological Engineering
 2005-present Member Editorial Boards of *Biophysical Journal*, *Cell Adhesion and Migration*, and *Physical Biology*
 2008-present Editor-in-Chief, *Cell Health and the Cytoskeleton*

B. Selected peer-reviewed publications (in chronological order) (out of 104).

17. W. Petka, J.H. Harden, J. McGrath, D. Wirtz, and D.A. Tirrell, "Reversible hydrogels from self-assembling artificial proteins", *Science* **281**: 389-392 (1998)
 23. P. Leduc, C. Haber, G. Bao, and D. Wirtz, "Dynamics of individual flexible polymers in a shear flow", *Nature* **399**: 564-566 (1999)
 24. L. Ma, J. Xu, P.A. Coulombe, and D. Wirtz, "Epidermal keratin suspensions show unique micromechanical properties", *Journal of Biological Chemistry* **274**: 19145-19151 (1999)

28. C. Haber, S.A. Ruiz, and D. Wirtz, "Shape anisotropy of a single random-walk polymer", *PNAS* **97**: 10792-10795 (2000)
29. J. Xu, Y. Tseng, and D. Wirtz, "Strain-hardening of actin filament networks: regulation by the dynamic crosslinking protein α -actinin", *Journal of Biological Chemistry* **275**: 35886-35892 (2000)
33. L. Ma, S. Yamada, D. Wirtz, and P.A. Coulombe, "A "hot-spot" mutation alters the mechanical properties of keratin filament networks", *Nature Cell Biology* **3**: 503-506 (2001)
34. Y. Tseng, E. Fedorov, M. McCaffery, S.C. Almo, and D. Wirtz, "Micromechanics and ultrastructure of actin filament networks crosslinked by fascin: A comparison with α -actinin", *Journal of Molecular Biology* **310**: 351-366 (2001)
36. O. Bousquet, et al., "The non-helical tail domain of keratin 14 promotes filament bundling and enhances the mechanical properties of keratin intermediate filaments *in vitro*", *Journal of Cell Biology* **155**: 747-754 (2001)
37. S. Yamada, D. Wirtz, and P.A. Coulombe, "Pairwise assembly determines the intrinsic potential for self-organization and mechanical properties of keratin filaments", *Molecular Biology of the Cell* **13**: 382-391 (2002)
43. Y. Tseng, B.W. Schafer, S.C. Almo, and D. Wirtz, "Functional synergy of actin filament crosslinking proteins", *Journal of Biological Chemistry* **277**: 25609-25616 (2002)
45. J. Suh, D. Wirtz, and J. Hanes, "Effective active transport of gene nanocarriers to the cell nucleus", *PNAS* **100**: 3878-3882 (2003)
46. H.Y. Li, D. Wirtz, and Y. Zheng, "A mechanism of coupling RCC1 mobility to RanGTP production on the chromatin *in vivo*", *Journal of Cell Biology* **160**: 635-644 (2003)
47. W. Hanley, O. McCarty, S. Jadhav, Y. Tseng, D. Wirtz, and K. Konstantopoulos*, "Single-molecule characterization of P-selectin/ligand binding", *Journal of Biological Chemistry* **278**: 10556-10561 (2003)
50. K. Konstantopoulos, W. Hanley, and D. Wirtz, "Receptor/ligand binding: "catch" bonds finally captured experimentally", *Current Biology* **13**: R611-615 (2003)
51. M. Dawson, D. Wirtz, and J. Hanes, "Enhanced viscoelasticity of human cystic fibrotic sputum correlates with increasing microheterogeneity in particle transport", *Journal of Biological Chemistry* **278**: 50393-50401 (2003)
54. S.R. Heidemann and D. Wirtz, "Towards a regional approach to cell mechanics", *Trends in Cell Biology* **14**: 160-166 (2004)
56. Y. Tseng, J.S.H. Lee, T.P. Kole, I. Jiang, and D. Wirtz, "Micro-organization and visco-elasticity of the nucleus revealed by particle nanotracking", *Journal of Cell Science* **117**: 2159-2167 (2004)
57. W.D. Hanley, D. Wirtz, and K. Konstantopoulos, "Distinct kinetic and mechanical properties govern selectin-leukocyte interactions", *Journal of Cell Science* **117**: 2503-2511 (2004)
58. T.P. Kole, Y. Tseng, I. Jiang, J.L. Katz, and D. Wirtz, "Rho kinase regulates the micromechanical response of adherent cells to Rho activation", *Molecular Biology of the Cell* **15**: 3475-3484 (2004)
59. M.G. Klein, W. Shi, Y. Tseng, D. Wirtz, D.R. Kovar, C.J. Straiger, and S.C. Almo, "Structure of the actin-crosslinking core of *Arabidopsis* fimbrin", *Structure* **12**: 999-1013 (2004)
66. J.S.H. Lee, Y. Tseng, and D. Wirtz, "Cdc42 mediates nucleus movement and MTOC polarization in Swiss 3T3 fibroblasts under shear", *Molecular Biology of the Cell* **16**: 871-880 (2005)
69. S.L. Gupton, R.S. Fischer, T.P. Kole, A. Ponti, G. Danuser, S. E. Hitchcock-DeGregori, V.M. Fowler, D. Wirtz, D. Hanein, and C.M. Waterman-Storer, "Cell migration without a lamellipodium: Translation of actin dynamics into cell movement mediated by tropomyosin", *Journal of Cell Biology* **168**: 619 (2005)
71. M.I. Chang, P. Panorchan, T. Dobrowsky, Y. Tseng, and D. Wirtz, "Single-molecule analysis of HIV-1 gp120-receptor interactions in living cells", *Journal of Virology* **79**: 14748-14755 (2005)
72. T.P. Kole, Y. Tseng, J.L. Katz, and D. Wirtz, "Intracellular mechanics of migrating fibroblasts", *Molecular Biology of the Cell* **16**: 328-338 (2005)
73. E. Atilgan, S.X. Sun, and D. Wirtz, "Morphology of the lamellipodium and the organization of actin at the leading edge of crawling cells", *Biophysical Journal* **89**: 3589-3602 (2005)
75. P. Panorchan, M. S. Thompson, K. J. Davis, Y. Tseng, K. Konstantopoulos, and D. Wirtz, "Single-molecule analysis of cadherin-mediated cell-cell adhesion", *Journal of Cell Science* **119**: 66-73 (2006)
76. P. Panorchan, J.P. George, and D. Wirtz, "Probing intercellular interactions between vascular endothelial cadherin pairs at single-molecule resolution and in living cells" *Journal of Molecular Biology* **358**: 665-674 (2006)

77. J.S.H. Lee, P. Panorchan, C.M. Hale, S.B. Khatau, Y. Tseng, and D. Wirtz, "Ballistic intracellular nanorheology reveals ROCK-hard stiffening response in to fluid flow", *Journal of Cell Science* **119**: 1760-1768 (2006)
79. B.R. Daniels, B.C. Masi, and D. Wirtz, "Probing single-cell micromechanics *in vivo*: the microrheology of *C. elegans* developing embryos", *Biophysical Journal* **90**: 4712-4719 (2006)
80. P. Panorchan, J.S.H. Lee, T.P. Kole, Y. Tseng, and D. Wirtz, "Microrheology and ROCK signaling of human endothelial cells embedded in a 3D matrix", *Biophysical Journal* **91**: 3499-3507 (2006)
81. O. Esue et al., "A direct interaction between actin and vimentin filaments mediated by the tail domain of vimentin", *Journal of Biological Chemistry* **281**: 30393-30399 (2006)
82. P. Panorchan, J.S.H. Lee, T.P. Kole, Y. Tseng, and D. Wirtz, "Probing cell mechanics responses to stimuli using ballistic intracellular nanorheology", *Methods in Cell Biology* **83**: 113-140 (2007)
83. T. Dobrowsky, P. Panorchan, K. Konstantopoulos, and D. Wirtz, "Live-cell single-molecule force spectroscopy", *Methods in Cell Biology* **89**: 411-432 (2008)
84. J.S.H. Lee, C.M. Hale, P. Panorchan, S.B. Khatau, J.P. George, C. L. Stewart, D. Hodzic, and D. Wirtz, "Nuclear lamin A/C deficiency induces defects in cell mechanics, polarization and migration", *Biophysical Journal* **93**: 2542-2552 (2007).
85. A. Dajkovic, S.X. Sun, J. Lutkenhaus, and D. Wirtz, "MinC spatially controls bacterial cytokinesis by antagonizing the scaffolding function of FtsZ", *Current Biology* **18**: 235-244 (2008)
- 86 P.J. Stewart-Hutchinson, C.M Hale, D. Wirtz, and D. Hodzic, "Structural requirements for the assembly of LINC complexes and their function in cellular mechanical stiffness", *Experimental Cell Research* **314**: 1892-905 (2008)
- 87 X. Zhou *et al.*, "Fibronectin fibrillogenesis regulates 3-dimensional neovessel formation", *Genes and Development* **22**: 1231-43 (2008)
- 88T.M. Dobrowsky, Y. Zhou, S.X. Sun, R.F. Siliciano, and D. Wirtz "Monitoring early fusion dynamics of human immunodeficiency virus type 1 at single-molecule resolution", *Journal of Virology* **82**: 7022-7033 (2008)
- 89 R.J. Bloom, J. P. George, A. Celedon, S.X. Sun, and D. Wirtz, "Mapping local matrix remodeling induced by a migrating tumor cell using 3-D multiple-particle tracking", *Biophysical Journal* **95**: 4077-4088 (2008)
- 90 G. Lan, A. Dajkovic, D. Wirtz, and S.X. Sun, "Polymerization and bundling kinetics of FtsZ filaments", *Biophysical Journal* **95**: 4045-4056 (2008)
- 91 O. Esue , E.S. Harris, H.N. Higgs, and D. Wirtz, "The F-actin crosslinking/bundling activity of mammalian formins", *Journal of Molecular Biology* **384**: 324 -334 (2008)
- 92 C.M. Hale, A.L. Shrestha, S.B. Khatau, P.J. Stewart-Hutchinson, L. Hernandez, C.L. Stewart, D. Hodzic, and D. Wirtz, "Dysfunctional connections between the nucleus and the actin and microtubule networks in laminopathic models", *Biophysical Journal* **95**: 5462-5475 (2008)
- 93 S. Bajpai, J. Correia, Y. Feng, J. Figueiredo, S.X. Sun, G.D. Longmore, G. Suriano, and D. Wirtz, "a-Catenin mediates initial E-cadherin-dependent cell-cell recognition and subsequent bond strengthening", *Proceedings of the National Academy of Sciences*, **105**: 18331-18336 (2008)
- 96 G. Lan, B.R. Daniels, T.M. Dobrowsky, D. Wirtz, and Sean X. Sun, "Condensation of FtsZ filaments drives bacterial cell division", *Proceedings of the National Academy of Sciences* **106**: 121-126 (2009)
- 98 B.R. Daniels, E.M. Perkins, T.M. Dobrowsky, S.X. Sun, and D. Wirtz, "Asymmetric enrichment of PIE-1 in the *C. elegans* zygote is mediated by binary counter-diffusion", *Journal of Cell Biology* **184**: 473-479 (2009)
- 100 B. Wildt, D. Wirtz, and P.C. Searson, "Programmed sub-cellular release for studying the dynamics of cell detachment", *Nature Methods* **6**: 211-213 (2009).
102. S. Bajpai, Y. Feng, R. Krishnamurthy, G.D. Longmore, and D. Wirtz, "Loss of a-catenin decreases the strength of single E-cadherin bonds between human cancer cells", *Journal of Biological Chemistry* **184**: 18252-18259 (2009).
- 103 D. Wirtz, "Particle tracking microrheology of living cells: principles and applications", *Annual Review of Biophysics* **38**: 301-326 (2009)