

# PAUL A. WIGGINS

## *Curriculum Vitæ*

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**Physics Department**  
**University of Washington**  
Box 351560  
3910 15th Avenue Northeast  
Seattle, WA 98195.

Phone: (626) 437-3761  
Fax: (206) 685-0635  
E-mail: [pwiggins@uw.edu](mailto:pwiggin@uw.edu)  
Webpage: [Wiggins Lab](#)  
[Google Scholar](#)

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## Educational History

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- **Whitehead Institute for Biomedical Research**, Cambridge, MA.  
Whitehead Fellow, 2010.
  - **California Institute of Technology**, Pasadena, CA.  
PhD Physics, June 2005.  
Thesis topic: **Statistical Mechanics of Biomolecules**  
Thesis adviser: Professor **Rob Phillips**
  - **Cornell University**, Ithaca, NY.  
BS Applied & Engineering Physics, June 1999.
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## Employment History

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### **University of Washington**

Seattle, Washington.

- 2016-present: Associate Professor of Physics and Bioengineering
- 2010-2016: Assistant Professor of Physics and Bioengineering
- 2013-present: Adjunct Assistant Professor of Microbiology

### **Whitehead Institute for Biomedical Research**

Cambridge, Massachusetts.

- 2005-2010: Whitehead Fellow

## California Institute of Technology

Pasadena, California.

- 2002-2005: NSF fellow, graduate research assistant, and teaching assistant in the Department of Applied Physics at Caltech. Supervisor: Professor Rob Phillips.
- 2000-2002: NSF fellow and graduate research assistant in the Particle Theory group at Caltech. Supervisor: Professor John Schwarz.

## Cornell University

Ithaca, New York.

- 1998-2000: Teaching assistant in the Departments of Physics and Applied and Engineering Physics at Cornell University for three semesters. Supervisors: Professors Richard Lovelace, Saul Teukolsky, and Matthias Neubert.
- 1997-1999: Research assistant, Department of Physics, Cornell University. Visualization of numerical relativity computations. Supervisor: Professor Saul Teukolsky.
- Summer 1996: Summer research assistant, Physics department, Cornell University. Wrote data acquisition software for femtosecond pulse lasers.  
Supervisor: Professor Wilson Ho.

## University of Michigan

Ann Arbor, Michigan.

- Summers 1994,1995: Summer research assistant, Bioengineering department of the University of Michigan. Designed apparatus to measure the elasticity of small tissue samples.  
Supervisor: Professor Matt O'Donnell.

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## Academic Honors

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**University of Washington** , 2010-present:

- NSF CAREER Grant, 2012, The National Science Foundation.
- Sloan Research Fellow, 2011, The Alfred P. Sloan Foundation.

**Whitehead Institute for Biomedical Research**, 2005-present:

- **Wiggins Lab Research Profiled in Physics World**, Jul 1, 2009.
- Skeggs Fellow, 2007-2008, Whitehead Institute for Biomedical Research.

**California Institute of Technology, Department of Physics**, 2000-2005:

- NSF Fellowship, 2000-2003, The National Science Foundation.

**Cornell University, School of Engineering**, 1995-2000:

- Outstanding Undergraduate Research Award Lecture, 2000, Astronomical Society of New York.
- Dorothy and Fred Chau Undergraduate Research Award (Honorable mention), 2000, Department of Applied and Engineering Physics, Cornell University.
- Cucindal Award, 1999, Department of Applied and Engineering Physics, Cornell University.  
(For most promising student in the Applied and Engineering Physics Department at graduation.)

- Graduated **Summa Cum Laude with Honors**, 1999, Department of Applied and Engineering Physics, Cornell University..
- Dean's List, 1995-1999, Cornell University.
- John McMullen Dean's Merit Scholarship, 1995-1996, Cornell University.

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## Affiliation and Other Appointments

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- **Assistant Professor**, Department of Physics (University of Washington).
- **Assistant Professor**, Department of Bioengineering (University of Washington).
- **Adjunct Assistant Professor**, Department of Microbiology (University of Washington).

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## Publications

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### Journal Publications:

- [1] C. H. LaMont and **Paul A. Wiggins**, “A correspondence between thermodynamics and inference.” *Accepted PRE.*, 2019.
- [2] S.-Y. Ting, D. E. Bosch, S. M. Mangiameli, M. C. Radey, S. Huang, Y.-J. Park, K. A. Kelly, S. K. Filip, Y. A. Goo, J. K. Eng, M. Allaire, D. Veessler, **Paul A. Wiggins**, S. B. Peterson, and J. D. Mougous, “Bifunctional immunity proteins protect bacteria against FtsZ-targeting ADP-ribosylating toxins,” *Cell*, vol. 175, no. 5, pp. 1380–1392.e14, Nov 2018.
- [3] S. M. Mangiameli, J. A. Cass, H. Merrikh, and **Paul A. Wiggins**, “The bacterial replisome has factory-like localization,” *Curr Genet*, vol. 64, no. 5, pp. 1029–1036, Oct 2018.
- [4] J. Corbitt, J. S. Yeo, C. I. Davis, M. LeRoux, and **Paul A. Wiggins**, “Type VI secretion system dynamics reveals a novel secretion mechanism in *Pseudomonas aeruginosa*,” *J Bacteriol*, vol. 200, no. 11, Jun 2018.
- [5] S. Stylianidou, T. J. Lampo, A. J. Spakowitz, and **Paul A. Wiggins**, “Strong disorder leads to scale invariance in complex biological systems,” *Phys Rev E*, vol. 97, no. 6-1, p. 062410, Jun 2018.
- [6] J. R. Russell, M. T. Cabeen, P. A. Wiggins, J. Paulsson, and R. Losick, “Noise in a phosphorelay drives stochastic entry into sporulation in *Bacillus subtilis*,” *EMBO J*, vol. 36, no. 19, pp. 2856–2869, 10 2017.
- [7] S. M. Mangiameli, B. T. Veit, H. Merrikh, and **Paul A. Wiggins**, “[The Replisomes Remain Spatially Proximal throughout the Cell Cycle in Bacteria](#),” *PLoS Genet*, vol. 13, no. 1, p. e1006582, Jan 2017.
- [8] S. M. Mangiameli, C. N. Merrikh, **Paul A. Wiggins**, and H. Merrikh, “[Transcription leads to pervasive replisome instability in bacteria](#),” *Elife*, vol. 6, Jan 2017.
- [9] T. J. Lampo, S. Stylianidou, M. P. Backlund, **Paul A. Wiggins**, and A. J. Spakowitz, “[Cytoplasmic RNA-Protein Particles Exhibit Non-Gaussian Subdiffusive Behavior](#),” *Biophys J*, vol. 112, no. 3, pp. 532–542, Feb 2017.
- [10] J. A. Cass, S. Stylianidou, N. J. Kuwada, B. Traxler, and **Paul A. Wiggins**, “[Probing bacterial cell biology using image cytometry](#),” *Mol Microbiol*, vol. 103, no. 5, pp. 818–828, Mar 2017.
- [11] S. Stylianidou, C. Brennan, S. B. Nissen, N. J. Kuwada, and **Paul A. Wiggins**, “[SuperSegger: robust image segmentation, analysis and lineage tracking of bacterial cells](#),” *Mol Microbiol*, vol. 102, no. 4, pp. 690–700, Nov 2016.
- [12] J. A. Cass, N. J. Kuwada, B. Traxler, and **Paul A. Wiggins**, “[Escherichia coli Chromosomal Loci Segregate from Midcell with Universal Dynamics](#),” *Biophys J*, vol. 110, no. 12, pp. 2597–609, Jun 2016.
- [13] C. H. LaMont and **Paul A. Wiggins**, “The development of an information criterion for change-point analysis,” *Neural Comput*, vol. 28, no. 3, pp. 594–612, Mar 2016.
- [14] P. A. Wiggins, “[An Information-Based Approach to Change-Point Analysis with Applications to Biophysics and Cell Biology](#),” *Biophys J*, vol. 109, no. 2, pp. 346–54, Jul 2015.
- [15] T. J. Lampo, N. J. Kuwada, **Paul A. Wiggins**, and A. J. Spakowitz, “[Physical modeling of chromosome segregation in Escherichia coli reveals impact of force and DNA relaxation](#),” *Biophys J*, vol. 108, no. 1, pp. 146–53, Jan 2015.
- [16] M. LeRoux, R. L. Kirkpatrick, E. I. Montauti, B. Q. Tran, S. B. Peterson, B. N. Harding, J. C. Whitney, A. B. Russell, B. Traxler, Y. A. Goo, D. R. Goodlett, **Paul A. Wiggins**, and J. D. Mougous, “[Kin cell lysis is a danger signal that activates antibacterial pathways of Pseudomonas aeruginosa](#).” *Elife*, vol. 4, 2015.
- [17] N. J. Kuwada, B. Traxler, and **Paul A. Wiggins**, “[High-throughput cell-cycle imaging opens new doors for discovery](#),” *Curr Genet*, no. 1-4, May 2015.

- [18] —, “Genome-scale quantitative characterization of bacterial protein localization dynamics throughout the cell cycle,” *Mol Microbiol*, vol. 95, no. 1, pp. 64–79, Jan 2015.
- [19] E. V. Dolgosheina, S. C. Y. Jeng, S. S. S. Panchapakesan, R. Cojocar, P. S. K. Chen, P. D. Wilson, N. Hawkins, **Paul A. Wiggins**, and P. J. Unrau, “RNA mango aptamer-fluorophore: a bright, high-affinity complex for RNA labeling and tracking,” *ACS Chem Biol*, vol. 9, no. 10, pp. 2412–20, Oct 2014.
- [20] C. Garmendia-Torres, A. Skupin, S. A. Michael, P. Ruusuuvuori, N. J. Kuwada, D. Falconnet, G. A. Cary, C. Hansen, **Paul A. Wiggins**, and A. M. Dudley, “Unidirectional P-body transport during the yeast cell cycle,” *PLoS One*, vol. 9, no. 6, p. e99428, 2014.
- [21] S. Stylianidou, N. J. Kuwada, and **Paul A. Wiggins**, “Cytoplasmic dynamics reveals two modes of nucleoid-dependent mobility,” *Biophys J*, vol. 107, no. 11, pp. 2684–92, Dec 2014.
- [22] A. Javer, N. J. Kuwada, Z. Long, V. G. Benza, K. D. Dorfman, **Paul A. Wiggins**, P. Cicuti, and M. C. Lagomarsino, “Persistent super-diffusive motion of *Escherichia coli* chromosomal loci,” *Nat Commun*, vol. 5, p. 3854, 2014.
- [23] M. Venkatarreddy, S. Wang, Y. Yang, S. Patel, L. Wickman, R. Nishizono, M. Chowdhury, J. Hodgkin, **Paul A. Wiggins**, and R. C. Wiggins, “Estimating podocyte number and density using a single histologic section,” *J Am Soc Nephrol*, vol. 25, no. 5, pp. 1118–29, May 2014.
- [24] B. C. Ross and **Paul A. Wiggins**, “Calculator for conformational statistics of DNA and applications to high-curvature bending,” *Physical Review E*, vol. 87, p. 032707, 2013.
- [25] B. R. Kulasekara, C. Kamischke, H. D. Kulasekara, M. Christen, **Paul A. Wiggins**, and S. I. Miller, “c-di-GMP heterogeneity is generated by the chemotaxis machinery to regulate flagellar motility,” *Elife*, vol. 2, p. e01402, 2013.
- [26] N. J. Kuwada, K. C. Cheveralls, B. Traxler, and **Paul A. Wiggins**, “Mapping the driving forces of chromosome structure and segregation in *Escherichia coli*,” *Nucleic Acids Res*, vol. 41, no. 15, pp. 7370–7, Aug 2013.
- [27] A. B. Russell, M. LeRoux, K. Hathazi, D. M. Agnello, T. Ishikawa, **Paul A. Wiggins**, S. N. Wai, and J. D. Mougous, “Diverse type VI secretion phospholipases are functionally plastic antibacterial effectors,” *Nature*, vol. 496, no. 7446, pp. 508–12, Apr 2013.
- [28] B. C. Ross and **Paul A. Wiggins**, “Measuring chromosome conformation with degenerate labels,” *Phys Rev E Stat Nonlin Soft Matter Phys*, vol. 86, no. 1 Pt 1, p. 011918, Jul 2012.
- [29] J. R. O’Connor, N. J. Kuwada, V. Huangyutitham, **Paul A. Wiggins**, and C. S. Harwood, “Surface sensing and lateral subcellular localization of WspA, the receptor in a chemosensory-like system leading to c-di-GMP production,” *Mol Microbiol*, vol. 86, no. 3, pp. 720–9, Nov 2012.
- [30] R. T. Dame, O. Espéli, D. C. Grainger, and **Paul A. Wiggins**, “Multidisciplinary perspectives on bacterial genome organization and dynamics,” *Mol Microbiol*, vol. 86, no. 5, pp. 1023–30, Dec 2012.
- [31] D. Van Valen, D. Wu, Y.-J. Chen, H. Tuson, **Paul A. Wiggins**, and R. Phillips, “A single-molecule Hershey-Chase experiment,” *Curr Biol*, vol. 22, no. 14, pp. 1339–43, Jul 2012.
- [32] M. Fritsche, S. Li, D. W. Heermann, and **Paul A. Wiggins**, “A model for *Escherichia coli* chromosome packaging supports transcription factor-induced DNA domain formation,” *Nucleic Acids Res*, vol. 40, no. 3, pp. 972–80, Feb 2012.
- [33] M. LeRoux, J. A. De Leon, N. J. Kuwada, A. B. Russell, D. Pinto-Santini, R. D. Hood, D. M. Agnello, S. M. Robertson, **Paul A. Wiggins**, and J. D. Mougous, “Quantitative single-cell characterization of bacterial interactions reveals type VI secretion is a double-edged sword,” *Proc Natl Acad Sci U S A*, vol. 109, no. 48, pp. 19 804–9, Nov 2012.
- [34] C. L. Chaffer, I. Brueckmann, C. Scheel, A. J. Kaestli, **Paul A. Wiggins**, L. O. Rodrigues, M. Brooks, F. Reinhardt, Y. Su, K. Polyak, L. M. Arendt, C. Kuperwasser, B. Bierie, and R. A. Weinberg, “Normal and neoplastic nonstem cells can spontaneously convert to a stem-like state,” *Proc Natl Acad Sci U S A*, vol. 108, no. 19, pp. 7950–5, May 2011.

- [35] **Paul A. Wiggins**, K. C. Cheveralls, J. S. Martin, R. Lintner, and J. Kondev, “[Strong intranucleoid interactions organize the \*Escherichia coli\* chromosome into a nucleoid filament](#),” *Proc Natl Acad Sci U S A*, vol. 107, no. 11, pp. 4991–5, Mar 2010.
- [36] **Paul A. Wiggins**, R. T. Dame, M. C. Noom, and G. J. Wuite, “[Protein-mediated molecular bridging: a key mechanism in biopolymer organization](#),” *Biophysical journal*, vol. 97, no. 7, pp. 1997–2003, 2009.
- [37] R. Phillips, T. Ursell, **Paul A. Wiggins**, and P. Sens, “[Emerging roles for lipids in shaping membrane-protein function](#),” *Nature*, vol. 459, no. 7245, pp. 379–85, May 2009.
- [38] **Paul A. Wiggins**, R. T. Dame, M. C. Noom, and G. J. L. Wuite, “[Protein-mediated molecular bridging: a key mechanism in biopolymer organization](#),” *Biophys J*, vol. 97, no. 7, pp. 1997–2003, Oct 2009.
- [39] H. J. Lee, E. L. Peterson, R. Phillips, W. S. Klug, and **Paul A. Wiggins**, “[Membrane shape as a reporter for applied forces](#),” *Proceedings of the National Academy of Sciences*, vol. 105, no. 49, pp. 19 253–19 257, 2008.
- [40] H. G. Garcia, P. Grayson, L. Han, M. Inamdar, J. Kondev, P. C. Nelson, R. Phillips, J. Widom, and **Paul A. Wiggins**, “[Biological consequences of tightly bent DNA: the other life of a macromolecular celebrity](#),” *Biopolymers*, vol. 85, no. 2, pp. 115–130, 2007.
- [41] **Paul A. Wiggins** and P. C. Nelson, “[Generalized theory of semiflexible polymers](#),” *Physical Review E*, vol. 73, no. 3, p. 031906, 2006.
- [42] **Paul A. Wiggins**, T. Van Der Heijden, F. Moreno-Herrero, A. Spakowitz, R. Phillips, J. Widom, C. Dekker, and P. C. Nelson, “[High flexibility of DNA on short length scales probed by atomic force microscopy](#),” *Nature nanotechnology*, vol. 1, no. 2, pp. 137–141, 2006.
- [43] **Paul A. Wiggins**, R. Phillips, and P. C. Nelson, “[Exact theory of kinkable elastic polymers](#),” *Physical Review E*, vol. 71, no. 2, p. 021909, 2005.
- [44] **Paul A. Wiggins** and R. Phillips, “[Membrane-protein interactions in mechanosensitive channels](#),” *Biophysical journal*, vol. 88, no. 2, pp. 880–902, 2005.
- [45] —, “[Analytic models for mechanotransduction: gating a mechanosensitive channel](#),” *Proceedings of the National Academy of Sciences*, vol. 101, no. 12, pp. 4071–4076, 2004.
- [46] **Paul A. Wiggins** and D. Lai, “[Star-Black Hole Tidal Interaction](#),” *The Astrophysical Journal*, vol. 532, pp. 530–539, 2000.
- [47] R. Q. Erkamp, **Paul A. Wiggins**, A. R. Skovoroda, S. Y. Emelianov, and M. O’Donnell, “[Measuring the elastic modulus of small tissue samples](#),” *Ultrason Imaging*, vol. 20, no. 1, pp. 17–28, Jan 1998.

### Book Chapters:

- [48] T. Ursell, J. Kondev, D. Reeves, P. A. Wiggins, and R. RobPhillips, “Role of lipid bilayer mechanics in mechanosensation,” in *Mechanosensitive Ion Channels*. Springer, 2008, pp. 37–70.

### Submitted Journal Publications:

- [49] C. H. LaMont and **Paul A. Wiggins**, “Information-based inference in sloppy and singular models.” *Submitted to Journal of Machine Learning Research*. ([arXiv:1506.05855](#)), 2016.
- [50] —, “The Lindley Paradox: Resolution loss in bayesian model selection.” *Submitted to statistical sciences.*, 2016.

### Publications in preparation:

- [51] C. Brennan and **Paul A. Wiggins**, “An informative geometric measure of fluorescence localization for cell biology.” *In preparation for scientific reports.*, 2016.