

ANDREW MUGLER

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EDUCATION

Columbia University	Physics	Ph.D.	2010
Harvey Mudd College	Physics	B.S.	2004

APPOINTMENTS

2014- *Assistant Professor*, Department of Physics and Astronomy, Purdue University
2017- *Member*, Purdue Center for Cancer Research, Purdue University
2013-2014 *Postdoctoral Fellow*, Department of Physics, Emory University
2010-2013 *Postdoctoral Researcher*, FOM Institute AMOLF, Amsterdam

DISTINCTIONS

2015-2020 Simons Investigator in the Mathematical Modeling of Living Systems
2017 Faculty Fellow of the Year, First Street Towers, Purdue University
2016 Spira Award for Outstanding Undergraduate Teaching, Purdue University Physics and Astronomy
2008-2010 National Science Foundation Graduate STEM Fellow in K-12 Education
2008 Allan M. Sachs Teaching Award, Columbia University Physics
2002-2004 Achievement Rewards for College Scientists Scholar
2002 Rojansky Prize, Harvey Mudd College Physics
2000-2004 Robert C. Byrd Scholar, State of Virginia

PEER-REVIEWED PUBLICATIONS

38. X. Zhai, J. W. Larkin, K. Kikuchi, S. E. Redford, U. Roy, G. M. Süel, and **A. Mugler**. Statistics of correlated percolation in a bacterial community. *PLoS Computational Biology*, accepted.
37. T. A. Byrd*, A. Erez*, R. M. Vogel, C. Peterson, M. Vennettilli, G. Altan-Bonnet, and **A. Mugler** (*equal contributors). Critical slowing down in biochemical networks with feedback. *Physical Review E* 100:022415, 2019.
36. A. T. Blanchard, A. S. Bazrafshan, J. Yi, J. T. Eisman, K. M. Yehl, T. Bian, **A. Mugler**, and K. Salaita. Highly polyvalent DNA motors generate 100+ pN of force via autochemophoresis. *Nano Letters* 19:6977-6986, 2019.
35. J. Varennes*, H. Moon*, S. Saha, **A. Mugler**, and B. Han (*equal contributors). Physical constraints on accuracy and persistence during breast cancer cell chemotaxis. *PLoS Computational Biology*, 15(4):e1006961, 2019.
34. A. Erez*, T. A. Byrd*, R. M. Vogel, G. Altan-Bonnet, and **A. Mugler** (*equal contributors). Universality of biochemical feedback and its application to immune cells. *Physical Review E*, 99:022422, 2019.
33. J. W. Larkin, X. Zhai, K. Kikuchi, S. Redford, A. Prindle, J. Liu, S. Greenfield, A. M. Walczak, J. Garcia-Ojalvo, **A. Mugler**, and G. M. Süel. Signal percolation within a bacterial community. *Cell Systems*, 7(2):137-145, 2018.

32. S. Gupta, J. Varennes, H. C. Korswagen, and **A. Mugler**. Temporal precision of regulated gene expression. *PLoS Computational Biology*, 14(6):e1006201, 2018.
31. A. Erez, R. Vogel, **A. Mugler**, A. Belmonte, and G. Altan-Bonnet. Modeling of cytometry data in logarithmic space: When is a bimodal distribution not bimodal? *Cytometry A*, 93(6):611-619, 2018.
30. J. Varennes, S. Fancher, B. Han, and **A. Mugler**. Emergent versus individual-based multicellular chemotaxis. *Physical Review Letters*, 119:188101, 2017.
29. X. Shao, **A. Mugler**, J. Kim, H. J. Jeong, B. Levin, and I. Nemenman. Growth of bacteria in 3-d colonies. *PLoS Computational Biology*, 13(7):e1005679, 2017.
28. G. D. Potter, T. A. Byrd, **A. Mugler**, and B. Sun. Dynamic sampling and information encoding in biochemical networks. *Biophysical Journal*, 112(4):795-804, 2017.
27. S. Fancher and **A. Mugler**. Fundamental limits to collective concentration sensing in cell populations. *Physical Review Letters*, 118:078101, 2017.
26. G. D. Potter*, T. A. Byrd*, **A. Mugler**, and B. Sun (*equal contributors). Communication shapes sensory response in multicellular networks. *Proceedings of the National Academy of Sciences, USA*, 113(37):10334-10339, 2016.
25. J. Varennes, B. Han, and **A. Mugler**. Collective chemotaxis through noisy multicellular gradient sensing. *Biophysical Journal*, 111(3):640-649, 2016.
24. T. Smith*, S. Fancher*, A. Levchenko, I. Nemenman, and **A. Mugler** (*equal contributors). Role of spatial averaging in multicellular gradient sensing. *Physical Biology*, 13(3):035004, 2016.
23. E. Roob III*, N. Trendel*, P. R. ten Wolde, and **A. Mugler** (*equal contributors). Cooperative clustering digitizes biochemical signaling and enhances its fidelity. *Biophysical Journal*, 110(7):1661-1669, 2016.
22. **A. Mugler***, M. Kittisopikul*, L. Hayden, J. Liu, C. H. Wiggins, G. M. Suel, A. M. Walczak (*equal contributors). Noise expands the response range of the *Bacillus subtilis* competence circuit. *PLoS Computational Biology*, 12(3):e1004793, 2016.
21. J. Varennes and **A. Mugler**. Sense and sensitivity: physical limits to multicellular sensing, migration and drug response. *Molecular Pharmaceutics*, 13(7):2224-2232, 2016.
20. **A. Mugler**, A. Levchenko, and I. Nemenman. Limits to the precision of gradient sensing with spatial communication and temporal integration. *Proceedings of the National Academy of Sciences, USA*, 13(6):E689-E695, 2016.
19. D. Ellison*, **A. Mugler***, M. D. Brennan*, S. H. Lee, R. Huebner, E. Shamir, L. A. Woo, J. Kim, P. Amar, I. Nemenman, A. J. Ewald, and A. Levchenko (*equal contributors). Cell-cell communication enhances the capacity of cell ensembles to sense shallow gradients during morphogenesis. *Proceedings of the National Academy of Sciences, USA*, 13(6):E679-E688, 2016.
18. P. R. ten Wolde, N. B. Becker, T. E. Ouldridge, **A. Mugler**. Fundamental limits to cellular sensing. *Journal of Statistical Physics*, 162:1395-1424, 2016.
17. K. Yehl, **A. Mugler**, S. Vivek, Y. Liu, Y. Zhang, E. R. Weeks, and K. Salaita. Rolling DNA-based motors with superdiffusive transport. *Nature Nanotechnology*, 11:184-190, 2016.
16. N. B. Becker, **A. Mugler**, and P. R. ten Wolde. Optimal prediction by cellular signaling networks. *Physical Review Letters*, 115:258103, 2015.
15. M. Wehrens, P. R. ten Wolde, and **A. Mugler**. Positive feedback can lead to dynamic nanometer-scale clustering on cell membranes. *Journal of Chemical Physics*, 141:205102, 2014.
14. **A. Mugler**, S. J. Tans, and A. Mashaghi. Circuit topology of self-interacting chains: implications for folding and unfolding dynamics. *Physical Chemistry Chemical Physics*, 16(41):22537-22544, 2014.

13. **A. Mugler**, F. Tostevin, and P. R. ten Wolde. Spatial partitioning enhances the reliability of biochemical signaling. *Proceedings of the National Academy of Sciences, USA*, 110(15):5927-5932, 2013.
12. W. de Ronde, P. R. ten Wolde, and **A. Mugler**. Protein logic: a statistical mechanical study of signal integration at the single-molecule level. *Biophysical Journal*, 103(5):1097-1107, 2012.
11. **A. Mugler**, A. G. Bailey, K. Takahashi, and P. R. ten Wolde. Membrane clustering and the role of rebinding in biochemical signaling. *Biophysical Journal*, 102(5):1069-1078, 2012.
10. **A. Mugler**, B. Grinshpun, R. Franks, and C. H. Wiggins. Statistical method for revealing form-function relations in biological networks. *Proceedings of the National Academy of Sciences, USA*, 108(2):446-451, 2011.
9. **A. Mugler**, A. M. Walczak, and C. H. Wiggins. Information-optimal transcriptional response to oscillatory driving. *Physical Review Letters*, 105:058101, 2010.
8. R. Ginoza and **A. Mugler**. Network motifs come in sets: correlations in the randomization process. *Physical Review E*, 82:011921, 2010.
7. **A. Mugler**, A. M. Walczak, and C. H. Wiggins. Spectral solutions to stochastic models of gene expression with bursts and regulation. *Physical Review E*, 80:041921, 2009.
6. W. H. de Ronde*, B. C. Daniels*, **A. Mugler***, N. A. Sinitzyn, and I. Nemenman (*equal contributors). Mesoscopic statistical properties of multistep enzyme-mediated reactions. *IET Systems Biology*, 3(5):429-437, 2009.
5. **A. Mugler**, E. Ziv, I. Nemenman, and C. H. Wiggins. Quantifying evolvability in small biological networks. *IET Systems Biology*, 3(5):379-387, 2009.
4. A. M. Walczak, **A. Mugler**, and C. H. Wiggins. A stochastic spectral analysis of transcriptional regulatory cascades. *Proceedings of the National Academy of Sciences, USA*, 106(16):6529-6534, 2009.
3. **A. Mugler**, E. Ziv, I. Nemenman, and C. H. Wiggins. Serially-regulated biological networks fully realise a constrained set of functions. *IET Systems Biology*, 2(5):313-322, 2008.
2. T. D. Donnelly, J. Hogan, **A. Mugler**, M. Schubmehl, N. Schommer, A. J. Bernoff, S. Dasnurkar, and T. Ditmire. Using ultrasonic atomization to produce an aerosol of micron-scale particles. *Review of Scientific Instruments*, 76:113301, 2005.
1. T. D. Donnelly, J. Hogan, **A. Mugler**, N. Schommer, M. Schubmehl, A. J. Bernoff, and B. Forrest. An experimental study of micron-scale droplet aerosols produced via ultrasonic atomization. *Physics of Fluids*, 16(8):2843, 2004.

BOOK CHAPTERS

4. **A. Mugler** and S. Fancher. Stochastic modeling of gene expression, protein modification, and polymerization. Chapter 28 in *Quantitative Biology: Theory, Computational Methods, and Models* (eds. B. Munsky, W. S. Hlavacek, L. S. Tsimring), MIT Press, Cambridge, MA, 2018.
3. P. R. ten Wolde and **A. Mugler**. Importance of crowding in signaling, genetic, and metabolic networks. Chapter 12 in *International Review of Cell and Molecular Biology, Vol. 307: New Models of the Cell Nucleus: Crowding, Entropic Forces, Phase Separation, and Fractals* (eds. R. Hancock and K. Jeon), Academic Press, Waltham, MA, USA, 2014.
2. **A. Mugler** and P. R. ten Wolde. The macroscopic effects of microscopic heterogeneity in cell signaling. Chapter 5 in *Advances in Chemical Physics, Vol. 153* (eds. S. A. Rice and A. R. Dinner), John Wiley & Sons, Inc., Hoboken, NJ, USA, 2013.

1. A. M. Walczak, **A. Mugler**, and C. H. Wiggins. Analytic methods for modeling stochastic regulatory networks. Chapter 13 in *Methods in Molecular Biology, Vol. 880: Computational Modeling of Signaling Networks* (eds. X. Liu and M. Betterton), Humana Press, New York, NY, USA, 2012.

PROFESSIONAL SERVICE

- **Workshop organizing.** Co-organizing the q-bio Conference (2019-2021). Co-organized two workshops at the Banff International Research Station (2013, 2018), a session at the American Physical Society Meeting (2018) and the Fourth Midwest Quantitative Biology Symposium at Purdue University (2016).
- **Journal editing and reviewing.** Coedited special issue of *Physical Biology* (2018). Reviewing articles for 20 journals including *Physical Review Letters*, *PNAS*, *Physical Review X*, *eLife*, *Nature Communications*, *Biophysical Journal*, and *PLoS Computational Biology*.
- **Outreach.** Designed and taught an outreach workshop at Purdue's Physics Inside Out camp (2018) and the Hoosier Association of Science Teachers, Inc. (2019); 30 lessons that integrate biophysics research with seventh-grade mathematics curriculum for the NSF GK-12 program (2008-2010); and physics and mathematics courses for two summer programs at Columbia University serving minority undergraduates (2006-2007).