

Patrick W. Oakes, Ph.D.

June 14th, 2019

Department of Physics & Astronomy

Department of Biology

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Academic Appointments

- 16–present Assistant Professor, Biophysics, Structural and Computational Biology Program, University of Rochester Medical Center
- 16–present Assistant Professor, Dept. of Biology, University of Rochester
- 16–present Assistant Professor, Dept. of Physics & Astronomy, University of Rochester

Education & Training

- 09–16 Postdoctoral Scholar, Institute for Biophysical Dynamics, Dept. of Physics, James Franck Institute, University of Chicago (Advisor: Margaret L. Gardel)
- 09 Physiology Course, Marine Biology Laboratory at Woods Hole
- 07–09 Research collaboration, Dept. of Surgery, Rhode Island Hospital, Warren Alpert Medical School of Brown University (Collaborator: Jonathan S. Reichner)
- 05–09 Ph.D. in Physics, Brown University (Advisor: Jay X. Tang)
- 04–05 Sc.M. in Physics, Brown University
- 00–04 B.Sc. in Physics, magna cum laude, Boston College

Honors & Awards

- 18 NSF CAREER Award
- 09 MBL Physiology Course Scholarship
- 04 Makepeace Fellowship, Brown University
- 04 Phi Beta Kappa
- 04 Order of the Cross and Crown, Boston College Honor Society

Grant Awards

Ongoing

- | | | | |
|----|---|----------------|--|
| 1. | CAREER 1749302
NSF-CMMI-BMMB
CAREER: Mechanobiology of Septins in the Cytoskeleton
Role: PI | Oakes, PW (PI) | 03/01/18 – 02/28/23
\$334,925 (Direct Costs)
\$507,400 (Total) |
| 2. | Scientific Advisory Committee Incubator
University of Rochester Medical School
Imaging and Manipulating Stem Cell Division in Vivo
Role: Co-PI | Biteau, B (PI) | 09/01/17 – 08/31/19
\$200,000
(\$72,508 to Oakes) |

Completed

- | | | | |
|----|--|----------------|---------------------------------|
| 1. | Advanced Immune Bioimaging Pilot
University of Rochester Medical School
Physical Cues in the Extracellular Environment Steer Leukocyte Migration
Role: PI | Oakes, PW (PI) | 01/01/17 – 12/31/18
\$60,000 |
|----|--|----------------|---------------------------------|

Publications

(Full details also available online: [Google Scholar Profile](#) | [PubMed Bibliography](#) | [ORCID](#))

Original Investigations (Oakes Students shown in *Bold Italics*)

1. Bidone TC, ***Skeeters AV, Oakes PW***, Voth GA. (2019) Multiscale model of integrin adhesion assembly. *PLoS Comput Biol.* 15(6):e1007077 ([PMID: 31163027](#))
2. Barger S, ***Reilly NS***, Shutova MS, Li Q, Maiuri P, Heddleston JM, Mooseker MS, Flavell RA, Svitkina T, ***Oakes PW***, Krendel M, Gauthier NC. (2019) Membrane-cytoskeletal crosstalk mediated by myosin-I regulates adhesion turnover during phagocytosis. *Nat Commun.* 10:1249 ([PMID: 30890704](#))
3. Finegan TM, Na D, Cammarota C, ***Skeeters AV***, Nádasí TJ, Dawney NS, Fletcher AG, ***Oakes PW***, Bergstralh DT. (2019) Tissue tension and not interphase cell shape determines cell division orientation in the *Drosophila* follicular epithelium. *EMBO J* 38(3):e100072 ([PMID: 30478193](#))
4. Seara DS, Yadav V, Linsmeier I, Tabatabai AP, ***Oakes PW***, Tabei SMA, Banerjee S, Murrell MP. (2018) Entropy production rate is maximized in non-contractile actomyosin. *Nat Commun* 9:4948 ([PMID: 30470750](#))
5. ***Oakes PW***, Bidone TC, Beckham Y, ***Skeeters AV***, Voth GA, Gardel ML. (2018) Lamellipodium is a myosin independent mechanosensor. *Proc Natl Acad Sci USA.* 115(11):2646-2651 ([PMID: 294877208](#))
6. Fessenden TB, Beckham Y, Perez-Neut M, Chourasia AH, Macleod KF, ***Oakes PW***, Gardel ML. (2018) Dia1-dependent adhesions are required by epithelial tissues to initiate invasion. *J Cell Biol.* 217(4) ([PMID: 29437785](#))
7. ***Oakes PW***, Wagner E, Brand CA, Probst D, Linke M, Schwarz US, Glotzer M, Gardel ML. (2017) Optogenetic Control of RhoA Reveals Zyxin-mediated Elasticity of Stress Fibers. *Nat Commun.* 8:15817 ([PMID: 28604737](#))
8. Hissa B, ***Oakes PW***, Pontes B, Ramirez-San Juan GR, Gardel ML. (2017) Cholesterol depletion impairs contractile machinery in neonatal rat cardiomyocytes *Sci Rep.* 7:43764 ([PMID: 28256617](#))
9. Ramirez-San Juan GR, ***Oakes PW***, Gardel ML. (2017) Contact guidance requires spatial control of leading edge protrusion. *Mol Biol Cell.* 28(8):1043-1053 ([PMID: 28228548](#))
10. Quillen AC, Askari H, Kelley DH, Friedmann T, ***Oakes PW***. (2016) A Coin Vibrational Motor Swimming at Low Reynolds Number. *Regul Chaotic Dyn.* 21:902-917
11. Linsmeier I, Banerjee S, ***Oakes PW***, Wonyeong J, Kim T, Murrell MP. (2016) Disordered Actomyosin Networks are Sufficient to Produce Cooperative and Telescopic Contractility. *Nat Commun.* 7:12615 ([PMID:27558758](#))
12. Bridges AA, Jentzch MS, ***Oakes PW***, Occhipinti P, Gladfelter AS. (2016) Micron-scale plasma membrane curvature is recognized by the septin cytoskeleton. *J Cell Biol.* 213(1):23-32 ([PMID:27044896](#))
13. Soiné JRD, Brand CA, Stricker J, ***Oakes PW***, Gardel ML, Schwarz US. (2015) Model-based Traction Force Microscopy Reveals Differential Tension in Cellular Actin Bundles. *PLoS Comput Biol.* 11(3):e1004076 ([PMID: 25748431](#))
14. Cetera M, Ramirez-San Juan GR, ***Oakes PW***, Lewellyn L, Fairchild MJ, Tanentzapf G, Gardel ML, Horne-Badovinac S. (2014) Epithelial rotation promotes the global alignment of contractile actin bundles during *Drosophila* egg chamber elongation. *Nat Commun.* 5:5511 ([PMID: 25413675](#))
15. ***Oakes PW***, Banerjee S, Marchetti CM, Gardel ML. (2014) Geometry Regulates Traction Stresses in Adherent Cells. *Biophys J.* 107(4): 825-833 ([PMID: 25140417](#))
16. Falzone TT, ***Oakes PW***, Sees J, Kovar DR, Gardel ML. (2013) Actin Assembly Factors Regulate the Gelation Kinetics and Architecture of F-actin Networks. *Biophys J.* 104(8): 1709-1719 ([PMID: 2361318](#))
17. ***Oakes PW***, Beckham Y, Stricker J, Gardel ML. (2012) Tension is Required but Not Sufficient for Focal Adhesion Maturation without a Stress Fiber Template. *J Cell Biol.* 196(3): 363-374 ([PMID: 22291038](#))
18. Stricker J, Aratyn-Schaus Y, ***Oakes PW***, Gardel ML. (2011) Spatiotemporal Constraints on the Force-Dependent Growth of Focal Adhesions. *Biophys J.* 100(12): 2883-93 ([PMID:21689521](#)) 93

19. Aratyn-Schaus Y, **Oakes PW**, Gardel ML. (2011) Dynamic and Structural Signatures of Lamellar Actomyosin Force Generation. *Mol Biol Cell*. 22: 1330-1339 ([PMID:213073339](#))
20. Aratyn-Schaus Y, **Oakes PW**, Stricker J, Winter SP, Gardel ML. (2010) Preparation of Compliant Matrices for Quantifying Cellular Contraction. *J Vis Exp*. 46 ([PMID:21178972](#))
21. **Oakes PW**, Patel DC, Morin NA, Zitterbart DP, Fabry B, Reichner JS, Tang JX. (2009) Neutrophil Morphology and Migration are Affected by Substrate Elasticity. *Blood*. 114: 1387-1395 ([PMID:19491394](#))
22. Morin NA, **Oakes PW**, Hyun Y-M, Lee D, Chin EY, King MR, Springer TA, Shimaoka M, Tang JX, Reichner JS, Kim M. (2008) Nonmuscle Myosin Heavy Chain IIA Mediates Integrin LFA-1 De-adhesion During T Lymphocyte Migration. *J Exp Med*. 205: 195-205 ([PMID:18195072](#))
23. **Oakes PW**, Viamontes J, Tang JX. (2007) Growth of tactoidal droplets during the first-order isotropic to nematic phase transition of F-actin. *Phys Rev E*. 75: 061902 ([PMID:17677295](#))
24. Viamontes J, **Oakes PW**, Tang JX. (2006) The Isotropic to Nematic Liquid Crystalline Phase Transition of F-actin Varies from Continuous to First Order. *Phys Rev Lett*. 97: 118103 ([PMID:17025933](#))

Reviews & Commentaries

1. **Oakes PW**, Fowell DJ. (2018) CCR7 Fuels and LFA-1 Grips. *Nat Immunol*. 19(6):516-518 ([PMID: 29777210](#))
2. **Oakes PW**. (2018) Balancing Forces in Migration. *Curr Opin Cell Biol*. 54:43-49 ([PMID: 29723736](#))
3. Murrell M, **Oakes PW**, Lenz M, Gardel ML. (2015) Forcing Cells into Shape: the mechanics of actomyosin contractility. *Nat Rev Mol Cell Biol*. 16(8):486-498. ([PMID:26130009](#))
4. **Oakes PW**, Gardel ML. (2014) Stressing the Limits of Focal Adhesion Mechanosensitivity. *Curr Opin Cell Biol*. 30:68-73 ([PMID: 24998185](#))

Books

1. Gardel ML, **Oakes PW**. (2015) Measuring Cell Mechanics. In: "Colloquium Series on Quantitative Cell Biology: Vol 3" Ed. Marshal WF. [DOI: 10.4199/C00137ED1V01Y201508CB003](#)

Submitted

1. Reilly EC, Emo KL, Buckley PM, **Reilly NS**, Chaves FA, **Oakes PW**, Topham DJ. The Roles of CD103 and CD49a in CD8 T Cell Motility: Two sides of the same coin. (2018)
2. Fernandes NRJ, Reilly NS, Schrock DC, Sottile J, Hocking DC, Oakes PW, Fowell DJ. Fibronectin manipulation exacerbates T cell accumulation and enhances cytokine production in the inflamed skin (2019)

Press Coverage

1. Manning LA & Peifer M. (2019) Getting into shape: tissue tension drives oriented cell divisions during organogenesis. *EMBO J*. 38(3):e101246 ([PMID:30679198](#))
2. Scepanovic G & Fernandez-Gonzalez R. (2018) Oriented Cell Division: The Pull of the Pole. *Dev Cell*. 47(6):686-687 ([PMID:30562509](#))
3. Lobato-Márquez D & Mostowy S. (2016) Septins recognize micron-scale membrane curvature. *J Cell Biol*. 213(1):5-6 ([PMID:27044893](#))
4. Pok S & Jacot JG. (2014) Work and Tension: New Evidence that Adherent Cells of the Same Area Do the Same Work Independent of Stiffness and Focal Adhesions. *Biophys J*. 107(4):798-799 ([PMID: 25140413](#))
5. Short B (2012) In Focus: Stress fibers guide focal adhesions to maturity. *J Cell Biol*. 196(3):301
6. Faculty of 1000 – for Oakes et al. (2012) *J Cell Biol*. (www.f1000.com/prime/13628956)
7. Highlights from MBoC for Aratyn-Schaus et al. (2011) *Mol Biol Cell*. ([link](#))

Invited TalksNational & International (*denotes upcoming)

09/20* EMBO Septin 2020 Meeting, Berlin, Germany
 12/19* Material Research Society Fall Meeting
 09/19* Cornell University, Biophysics Colloquia Series
 05/19 Kansas University Medical Center, Dept. of Anatomy & Cell Biology
 03/19 Syracuse University, Dept. of Physics
 02/19 Loyola University Stritch School of Medicine, Dept. Cell & Molecular Physiology
 01/19 Complex and Adaptive Material Systems, Gordon Research Conference
 10/18 University of Michigan, Dept. of Molecular, Cellular & Developmental Biology
 10/17 Soft Matter Symposium, University of Florida
 09/17 Rockefeller University, Center for Studies in Physics & Biology
 09/17 Abercrombie Meeting 2017, Oxford, UK
 06/17 Cell Contact & Adhesion, Gordon Research Conference
 04/17 University of Heidelberg, BioQuant Research Institute
 04/17 Mechanisms of Actin Dependent Force Generation, EMBO Practical Course, EMBL
 12/16 American Society for Cell Biology Annual Meeting
 11/16 Rochester Institute of Technology, School of Physics & Astronomy
 10/16 Modeling and Quantifying Cell Function: 25 years of Cell Mechanobiology, Banff International Research Station
 02/16 Washington University St. Louis, Dept. of Physics
 01/16 University of Rochester, Dept. of Physics
 01/16 Syracuse University, Dept. of Physics
 12/15 American Society for Cell Biology Annual Meeting
 10/15 Quantitative Cell Biology Network Workshop
 03/15 Cellular Dynamics and Models Meeting, Cold Spring Harbor Laboratory
 02/15 SUNY Upstate Medical University, Dept. of Cell & Developmental Biology
 02/15 University of California Irvine, Dept. of Physics & Astronomy
 12/14 American Society for Cell Biology Annual Meeting
 11/14 University of San Diego, Dept. of Physics
 06/14 University of Minnesota, Dept. of Genetics, Cell Biology and Development
 04/14 Experimental Biology Annual Meeting
 03/14 École Polytechnique Fédérale de Lausanne, Institute of Physics of Biological Systems
 02/14 University of Denver, Dept. of Biological Sciences
 02/14 Biophysical Society Annual Meeting
 12/13 American Society for Cell Biology Annual Meeting
 09/13 Chicago Cytoskeleton Meeting
 03/13 American Physical Society Annual Meeting
 02/13 Fibronectin, Integrins and Related Molecules, Gordon Research Conference
 07/12 University of Ottawa, Cell Biophysics Summer School
 11/11 National University of Singapore: Mechanobiology Institute Training Workshop

Institutional

03/19 University of Rochester, Aab Cardiovascular Research Institute
 11/18 4th Annual Immune Imaging Symposium, Program for Advanced Immune Bioimaging
 04/18 University of Rochester Medical Center, Genetics Day
 02/17 University of Rochester, Dept. of Biomedical Genetics

01/17	University of Rochester School of Medicine and Ernest J. Del Monte Institute for Neuromedicine, Seeds of Collaboration
11/16	University of Rochester, Dept. of Biomedical Engineering
10/16	University of Rochester, Dept. of Biophysics, Structural and Computational Biology Retreat
10/16	University of Rochester, Dept. of Biology
10/16	University of Rochester, Physical Models of Biological Systems Workshop

Posters by Trainees (presenting author underlined, trainees in ***Bold Italics***)

1. ***Skeeters AV*** & Oakes PW, “Modeling of Thermal Fluctuations and Curvature-Sensing Properties of Geometrically Complex, Filamentous Proteins”, - Poster – Complex and Adaptive Material Systems Gordon Research Conference, Ventura, CA 2019
2. ***Sala S*** & Oakes PW, “Mechanosensitivity mechanisms of the LIM domain protein testin”, Poster - ASCB Annual Meeting, San Diego, CA 2018.
3. ***Reilly NS***, Fernandes NR, Satheesh M, Miller J, Fowell DJ, Oakes PW, “ $\alpha_v\beta_3$ Integrin Expression Regulates CD4+ T cell Migration Phenotypes”, Poster – ASCB Annual Meeting, San Diego, CA 2018
4. ***Ortega Ioni DA*** & Oakes PW, “Analysis of Changes in Polyacrylamide Gel Stiffness to Measure Substrate Stiffness Effects on MDCK’s Spread Area”, Poster – UBMC, 2018
5. ***Reilly NS***, Martinez L, Rodriguez Garcia L, Oakes PW, “Effect of influenza infection on epithelial monolayer integrity”, Poster – ASCB Annual Meeting, Philadelphia, PA 2017
6. Finegan TM, ***Na D***, ***Skeeters AV***, Dawney NS, Oakes PW, Fletcher AG, Bergstralh DT, “Breaking Hertwig’s Rule in the Drosophila Follicular Epithelium”, Poster – Annual ASCB Meeting, Philadelphia, PA 2017
7. Oakes PW, Bidone TC, Beckham YM, ***Skeeters AV***, Ramirez-San Juan G, Winter SP, Voth GA, Gardel ML, “The lamellipodium is a myosin independent mechanosensor”, Poster – ASCB Annual Meeting, Philadelphia, PA 2017

Teaching & Mentoring

Classes

19 Spring	PHY 464 – Biological Physics: Quantitative Imaging
18 Fall	PHY 113 – General Physics I
18 Spring	PHY 113 – General Physics I (Introductory Physics for Life Science Majors)
17 Spring	PHY 121 – Mechanics
16 – Present	BIO 581 – Topics in Cell, Developmental & Molecular Biology (1 Lecture each Fall)
16 Fall	PHY 253/464 – Biological Physics

Trainees

19	Maham Zia	Undergraduate REU Student Reed College
19	Gabrielle Kosoy	PhD Student (rotation) Biophysics, Structural and Computational Biology Program
19	Lydia Petricca	Undergraduate Student & REU Student Biochemistry Major
19	Ashlin J. Poruthoor	PhD Student (rotation) Biophysics, Structural and Computational Biology Program
18	Mingyi Zhu	PhD Student (rotation) Dept. of Biology
18	Denis A. Ortega Ioni	Undergraduate REU student Florida International University
18–present	Stefano R. Sala	Postdoctoral Scholar
17–present	Austin V. Skeeters	PhD Student Dept. of Physics Barnard Fellow
17–present	Nicholas S. Reilly	PhD Student Dept. of Physics

Qualifying Exam Committees

06/19	Nicholas S. Reilly	Physics
04/19	Kyle Murray	Physics
04/19	Arun Venkataraman	Physics
11/18	Daxiang Na	Genetics
06/18	Mukta Palshikar	Biophysics, Structural & Computational Biology
06/17	Chang Rho	Physics
05/17	Ben Ecker	Physics
03/17	Sam Knarr	Physics
09/16	Steven Rogers	Physics

Thesis Committees

05/19	Chang Rho	Physics
02/19	Steven Rogers	Physics
06/17	Amanda Davis	Physics
05/17	Michael Sloma	Biochemistry & Computational Biology

ServiceDepartment

17–present	Undergraduate Education Committee
17–present	Technical Computing Committee
16–17	Graduate Education Committee
16–present	Medical Physics Certificate Committee
16–present	Graduate Admissions Committee

Institution

17–present	University Research Award Reviewer
16–present	Light Microscopy Executive Committee, University of Rochester Medical Center

Extramural

19	NSF Grant Reviewer
19	CNY Cytoskeleton Regional Meeting Organizer
18–present	Cytoskeleton, Editorial Board
18	ASCB/EMBO Abstract Review Task Force

Journal Reviewing

Nature Cell Biology | Nature Communications | Journal of Cell Biology | Proceedings of the National Academy of Sciences USA | Molecular Biology of the Cell | Biophysical Journal | Journal of Cell Science | PLoS Computational Biology | Soft Matter | Cytoskeleton | Stem Cell Reports | Scientific Reports | PLoS One | FASEB Journal | Journal of Visualized Experiments | Journal of Biomechanics | Annals of Biomedical Engineering | Colloids and Surfaces | Computer Methods in Biomechanics and Biomedical Engineering | APL Bioengineering | ACS Biomaterials Science & Engineering

Professional Organizations

American Society for Cell Biology
American Physical Society