

CURRICULUM VITAE

Name: Arpita Upadhyaya

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Education:

Ph.D., Physics, University of Notre Dame, Notre Dame, IN, 2000. Dissertation title: Thermodynamic and liquid properties of cells and tissues.

M.Sc. (Hons.) in Physics and B.E. (Hons.) in Electrical Engineering, Birla Institute of Technology and Science, Pilani, India, 1994.

Professional Experience:

Associate Professor, 2014 – present, Department of Physics and Institute for Physical Science and Technology, University of Maryland, College Park

Assistant Professor, 2006 – 2014, Department of Physics and Institute for Physical Science and Technology, University of Maryland, College Park

Visiting Research Associate, 2005-2006, Department of Cell and Developmental Biology, UNC Chapel Hill

Pappalardo Fellow, 2002 - 2005, Department of Physics, Massachusetts Institute of Technology

Postdoctoral Research Associate, 2001 - 2002, Department of Physics, Massachusetts Institute of Technology

Postdoctoral Research Associate, 2000 - 2001, Department of Mechanical Engineering, Massachusetts Institute of Technology

Graduate Research Assistant, 1994 - 1999, Department of Physics, University of Notre Dame.

Fellowships, Prizes, and Awards:

1. Richard A. Ferrell Distinguished Faculty Fellowship, which recognizes outstanding personal effort and expertise in physics as well as dedicated service to the UMD Department of Physics (2013).
2. Semester Research and Scholarship Award, UMD (2011-2012).
3. Sloan Research Fellowship, Alfred P. Sloan Foundation (2008-2010).
4. Pappalardo Fellowship in Physics, Massachusetts Institute of Technology (2002-2005).
5. Howard Hughes Medical Institute Educational Program Scholarship Funding, Marine Biological Laboratory (1996, summer).
6. Zahm Fellowship for Biophysics, Biochemistry and Molecular Biology, University of Notre Dame (1996)

Articles in Refereed Journals:

1. C. M. Ketchum, X. Sun, J. T. Fourkas, W. Song and **A. Upadhyaya**, Substrate topography modulates actin dynamics and signaling in B cells, *Mol. Biol. Cell*, in press, (2018).
2. M. Guo, P. Chandris, J. P. Giannini, A. J. Trexler, R. Fischer, J. Chen, H. D. Vishwasrao, I. Rey-Suarez, Y. Wu, X. Wu, C. M. Waterman, G. H. Patterson, **A. Upadhyaya**, J. Taraska, H. Shroff, Single-shot super-resolution total internal reflection fluorescence microscopy, *Nature Methods*, 15, 425, (2018).
3. Y. Wu, A. Kumar, C. Smith, E. Ardiel, P. Chandris, R. Christensen, I. Rey-Suarez, M. Guo, H.D. Vishwasrao, J. Chen, J. Tang, **A. Upadhyaya**, P.J. La Riviere, H. Shroff, Reflective imaging improves spatiotemporal resolution and collection efficiency in light sheet microscopy, *Nature Communications*, 8, 1452, (2017).
4. K.L. Hui and **A. Upadhyaya**, Dynamic microtubules regulate cellular contractility during T-cell activation, *PNAS*, 114, E4175 (2017).
5. M. Azatov, X. Sun, A. Suberi, J. T. Fourkas and **A. Upadhyaya**, Topography on a subcellular scale modulates cellular adhesions and actin stress fiber dynamics in tumor associated fibroblasts, *Physical Biology*, doi: 10.1088/1478-3975/aa7acc, Epub (2017).
6. **A. Upadhyaya**, Mechanosensing in the immune response, *Seminars in Cell and Developmental Biology*, 71,137, (2017).
7. I. Rey, D. A. Garcia, B. W. Wheatley, W. Song and **A. Upadhyaya**, Biophysical techniques to study B cell activation: single molecule imaging and force measurements, *Methods in Molecular Biology*, *Methods Mol Biol.*, 1707, 51, (2017).
8. M. Azatov, S. M. Goicoechea, C. A. Otey and **A. Upadhyaya**, The actin crosslinking protein palladin modulates force generation and mechanosensitivity of tumor associated fibroblasts, *Sci. Rep.* 6, 28805 (2016).
9. K.L. Hui, L. Balagopalan, L.E. Samelson, and **A. Upadhyaya**, Cytoskeletal forces during signaling activation in Jurkat T-cells. *Mol Biol Cell*. 2015 Feb 15;26(4):685-95.
10. M.K. Seeley-Fallen, L.J. Liu, M.R. Shapiro, O.O. Onabajo, S. Palaniyandi, X. Zhu, T.H. Tan, **A. Upadhyaya**, and W. Song. Actin-binding protein 1 links B-cell antigen receptors to negative signaling pathways. *Proc Natl Acad Sci U S A*. 2014 Jul 8;111(27):9881-6.
11. W. Song, C. Liu, **A. Upadhyaya**, The pivotal position of the actin cytoskeleton in the initiation and regulation of B cell receptor activation. *Biochim Biophys Acta*. 2014 Feb;1838(2):569-78.
12. C. M. Ketchum, H. Miller, W. Song and **A. Upadhyaya**. Ligand mobility regulates B cell receptor clustering and signaling activation. *Biophys J*. 2014 Jan 7;106(1):26-36.
13. K.L. Hui, S.I. Kwak and **A. Upadhyaya**, Adhesion-dependent modulation of actin dynamics in Jurkat T cells. *Cytoskeleton (Hoboken)*. 2014 Feb;71(2):119-35.
14. C. Liu, X. Bai, J. Wu, S. Sharma, **A. Upadhyaya**, C. Dahlberg, L. S. Westerberg, S. B. Snapper, X. Zhao, and W. Song, N-WASP is essential for the negative regulation of B cell antigen receptor signaling, *PLoS Biol.*, 11, e1001704 (2013).
15. W. Song, C. Liu, M. K. Seeley-Fallen, H. Miller, C. Ketchum and **A. Upadhyaya**, Actin-mediated feedback loops in B cell receptor signaling, *Immunological Reviews*, 256, 177 (2013).
16. C. Liu, M. K. Fallen, H. Miller, **A. Upadhyaya**, and W. Song, The actin cytoskeleton coordinates the signal transduction and antigen processing functions of the B cell antigen receptor, *Frontiers in Biology*, 8, 475 (2013).
17. K.L. Hui, C. Wang, B. Grooman, J. Wayt and **A. Upadhyaya**, Membrane dynamics correlate with formation of signaling clusters during cell spreading. *Biophys J*. 2012 Apr 4;102(7):1524-33.

18. C. Liu, H. Miller, G. Orlowski, H. Hang, **A. Upadhyaya**, and W. Song, Actin reorganization is required for the formation of polarized B cell receptor signalosomes in response to both soluble and membrane-associated antigens. *J Immunol.* 2012 Apr 1;188(7):3237-46.
19. B. Grooman, I. Fujiwara, C. A. Otey and **A. Upadhyaya**, Morphology and viscoelasticity of actin networks crosslinked with the mutually interacting crosslinkers: palladin and alpha-actinin, *PLoS One*, 7, e42773 (2012).
20. C. Liu, H. Miller, S. Sharma, A. Beaven, K. Richard, **A. Upadhyaya**, and W. Song, Analyzing actin dynamics during the activation of the B cell receptor in live B cells, *Biochem. Biophys. Res. Commun.* 427, 202, (2012).
21. C. Liu, H. Miller, K. L. Hui, B. Grooman, S. Bolland, **A. Upadhyaya**, and W. Song, A balance of Bruton's tyrosine kinase and SHIP activation regulates B cell receptor cluster formation by controlling actin remodeling, *J. Immunology*, **187**, 230 (2011).
22. **A. Upadhyaya**, M. Baraban, J. Wong, P. Matsudaira, A. van Oudenaarden, and L. Mahadevan, Power-limited contraction dynamics of *Vorticella convallaria*: an ultrafast biological spring. *Biophys J.* 2008 Jan 1;94(1):265-72.
23. W. G. Tharp, R. Yadav, D. Irimia, **A. Upadhyaya et al.** Neutrophil chemorepulsion in defined interleukin-8 gradients in vitro and in vivo, *J. Leukocyt. Biol.* 79, 539-554 (2006).
24. **A. Upadhyaya** and A. van Oudenaarden, Actin polymerization: forcing flat faces forward, *Curr. Biol.* 14, R467 (2004).
25. **A. Upadhyaya** and M.P. Sheetz, Tension in tubulovesicular networks of Golgi and endoplasmic reticulum membranes. *Biophys J.* 2004 May;86(5):2923-8.
26. B. T. Nguyen, **A. Upadhyaya**, A. van Oudenaarden and M.P. Brenner, Elastic instability in a growing yeast droplet, *Biophys. J.*, 86, 2720 (2004).
27. **A. Upadhyaya** and A. van Oudenaarden, Biomimetic systems for studying actin-based motility. *Curr Biol.* 2003 Sep 16;13(18):R734-44.
28. **A. Upadhyaya**, J.R. Chabot, A. Andreeva, A. Samadani, and A. van Oudenaarden, Probing polymerization forces by using actin-propelled lipid vesicles. *Proc Natl Acad Sci U S A.* 2003 Apr 15;100(8):4521-6.
29. N. B. Ouchi, J. A. Glazier, J. P. Rieu, **A. Upadhyaya**, and Y. Sawada, Improving the realism of the cellular Potts model in simulations of biological cells, *Physica A*, 329, 451 (2003).
30. **A. Upadhyaya** and A. van Oudenaarden, Biomimetic systems for studying actin-based motility, *Curr. Biol.* 13, R734 (2003).
31. M. J. Powers, K. Domansky, M. R. Kaazempur-Mofrad, A. Kalezi, A. Capitano, **A. Upadhyaya**, P. Kurzawski, K. E. Wack, D. B. Stolz, R. Kamm, and L. G. Griffith, A microfabricated array bioreactor for perfused 3D liver culture, *Biotechnol. Bioeng.* 78, 257 (2002).
32. J. C. M. Mombach, R. M. C. de Almeida, G. L. Thomas, **A. Upadhyaya**, and J. A. Glazier, Bursts and cavity formation in *Hydra* cell aggregates: Experiments and simulations, *Physica A*, 297, 495 (2001).
33. **Upadhyaya, A.**, J. P. Rieu, Y. Sawada, J. A. Glazier, Anomalous diffusion and non-Gaussian velocity distribution of *Hydra* cells in cellular aggregates, *Physica A*, 293, 549 (2001).
34. J. P. Rieu, **A. Upadhyaya**, Y. Sawada, N.B. Ouchi and J. A. Glazier, Diffusion and deformations of single *Hydra* cells in cellular aggregates, *Biophys. J.*, 79, 1903 (2000).
35. J. A. Glazier and **A. Upadhyaya**, First steps towards a comprehensive model of tissues, *Dynamical Networks in Physics and Biology*, ed. D. Beysens and G. Forgacs, (1998).

A partial list of published work can be found at:

<https://www.ncbi.nlm.nih.gov/sites/myncbi/1FaXffN0ghj/bibliography/40212495/public/?sort=date&direction=ascending>

Invited talks:

- Symposium on “Computation in Cell Biology”, American Society for Cell Biology, San Francisco, 2002
- Department of Applied Mathematics and Theoretical Physics, Cambridge University, 2003
- Theory Division, Los Alamos National Laboratory, Los Alamos, 2003
- Boston Complex Fluids Society Meeting, U Mass. Boston, 2003
- Department of Physics, Indian Institute of Science, Bangalore 2004
- Department of Physics, University of Arizona, 2005
- Department of Physics, Washington University, St. Louis, 2005
- Department of Physics, University of California, Berkeley, 2005
- Department of Physics, University of Maryland, College Park, 2005
- Department of Biomolecular Sciences and Engineering, University of California, Santa Barbara, 2005
- Department of Physics, Brown University, 2005
- Department of Physics, New York University, 2005
- Department of Physics, California Institute of Technology, 2005
- Department of Physics, Ohio State University, 2005
- Pacific Institute for Mathematical Sciences, University of British Columbia, Vancouver, 2006
- Friday Harbor Laboratories, University of Washington, Seattle, 2006
- Department of Theoretical and Applied Mechanics, Cornell University, 2007
- Department of Physics, Kenyon College, 2007
- American Society for Cell Biology, Symposium on “Building the Cell”, Washington DC, 2007
- Department of Physics, Georgetown University, 2008
- Department of Physics, Howard University, 2009
- Department of Physics, Rutgers University, 2009
- Cell Mechanics and Motility Symposium, University of Maryland, 2009
- “The Cellular Cytoskeleton” Workshop, Colorado State University, June 2010
- Pappalardo Symposium, Department of Physics, Massachusetts Institute of Technology, October 2010
- Institute for Physical Science and Technology, University of Maryland, November 2010
- Department of Physics, University of Michigan, March 2011
- “Mathematical Biology of the Cell: Cytoskeleton and Motility” Workshop, Banff International Research Station, August 2011
- American Physical Society, Focus session on “Biophysics of the Cytoskeleton”, Boston, Massachusetts, March 2012
- Department of Physics, University of California, Merced, May 2012
- Society for Mathematical Biology, Minisymposium on “Intracellular pattern formation: Advances in experiments and modeling”, Knoxville, Tennessee, July 2012
- “Physics of the Cell” Conference, Hyeres, France, September 2012
- Biophysical Society Pennsylvania Network Meeting, Lehigh University, September 2012

- Department of Physics, Georgetown University, October 2012
- Department of Physics, Georgia Tech University, October 2012
- American Society for Cell Biology, Subgroup meeting on “Cytoskeletal dynamics - Quantitative approaches to understanding form and function”, San Francisco, California, December 2012
- Department of Physics, Tokyo University, Japan, January 2013
- Department of Physics, Gakushuin University, Japan, January 2013
- Department of Biology, RIKEN, Japan, January 2013
- Department of Physics, University of Pennsylvania, February 2013
- Department of Cell Biology, Johns Hopkins University, February 2013
- Department of Physics, Rochester Institute of Technology, April 2013
- School of Engineering and Applied Science, Harvard University, April 2013
- Department of Bioengineering, Massachusetts Institute of Technology, May 2013
- “Physics of functional biological assemblies: pushing, pulling and sensing”, Aspen Center for Physics, June 2013
- NSF Physics of Living Systems, Student Research Network, Princeton University, August 2013
- McNulty Program Annual Lecture for Excellence in Science and Math for Women, Department of Biology, St. Joseph University, October 2013
- American Society for Cell Biology, Subgroup meeting on “Cytoskeletal dynamics - Quantitative approaches to understanding form and function”, New Orleans, Louisiana, December 2013
- Biophysical Society Annual Meeting, Invited Mini-symposium on Cell Surface Mechanics, San Francisco, California, February 2014
- American Physical Society March Meeting, Focus Session on Mechanics of Cells and Biological Networks, Denver, Colorado, March 2014
- Department of Physics, University of California, Irvine, June 2014
- Department of Physics, Heidelberg University, Germany, July 2014
- “Mathematical Biology of the Cell: Cytoskeleton and Motility” Workshop, Banff International Research Station, September 2014
- Department of Physics, Yale University, October 2014
- Department of Physics, Rutgers University, October 2014
- American Society for Cell Biology, Subgroup meeting on “Cytoskeletal dynamics - Quantitative approaches to understanding form and function”, Philadelphia, Pennsylvania, December 2014
- Quantifying Cell Dynamics Workshop, University of California, San Francisco, January 2015
- Society for Mathematical Biology, Atlanta, Georgia, July 2015
- NSF Physics of Living Systems, Student Research Network Annual Meeting, Arlington, Virginia, July 2015
- Mechanobiology Institute, National University of Singapore, Singapore, July 2015
- National Center for Biological Sciences, Bangalore, India, August 2015
- The Center for Theoretical Biological Physics, Rice University, November 2015
- Quantifying Cell Dynamics Workshop, Half Moon Bay, California, January 2016
- “Mechanobiology Subgroup Meeting”, Biophysical Society Annual Meeting, Los Angeles, California, February 2016

- Physics of Development and Disease, Aspen Center for Physics, Aspen, Colorado, March 2016
- Department of Chemical and Biomolecular Engineering, University of Tennessee, April 2016
- Department of Mathematics and Statistics, Georgia State University, April 2016
- Physics of Living Systems Annual Meeting, Harvard University, July 2016
- Center for Cell Dynamics, Johns Hopkins University, January 2017
- Department of Mechanical Engineering, Johns Hopkins University, April 2017
- Chesapeake Bay Area Single Molecule Meeting, Baltimore, Maryland, April 2017
- Biophysics Symposium on Mechanobiology of the Cytoskeleton, University of Maryland, College Park, May 2017
- Journal of Cell Science meeting on Cellular Dynamics, Southbridge, Massachusetts, May 2017
- University of Maryland – Lund University workshop on Dynamics Across Scales, Lund, Sweden, May 2017
- International Physics of Living Systems Annual Meeting, Paris, France, June 2017
- Workshop on Active Living Matter, Aspen Center for Physics, September 2017
- PhysicoChimie Curie, Curie Institute, Paris, France, October 2017
- Institute of Bioengineering of Catalonia, Barcelona, Spain, October 2017
- NCI/UMD Cancer Technology Partnership Symposium, NIH, February 2018
- Invited Symposium on Self Organization in the Cytoskeleton, American Physical Society Annual Meeting, March 2018
- Cell Modeling Workshop, Half Moon Bay, California, March 2018
- Department of Cell and Tissue Biology, University of California, San Francisco, March 2018.
- Department of Chemical Engineering, Colorado State University, April 2018
- Bollum Symposium on Mechanobiology, University of Minnesota, May 2018
- Symposium, Biophysical Society of Canada Annual Meeting, Vancouver, Canada, May 2018
- Invited Session on Mathematical Modeling in Health and Disease, AIMS, Taipei, July 2018
- Mechbio Conference: The mechanome in action, University of California, Irvine July 2018
- Mathematics of the Cell Workshop, Banff International Research Station, Banff, Canada, August 2018
- Molecular Life Sciences Seminar, Ohio State University, September 2018
- Symposium on Immuno-engineering, BMES Annual Meeting, Atlanta, Georgia, October 2018.

Editorial and Reviewing Activities:

Reviewer for: Biophysical Journal, Physical Review Letters, Physical Review E, Journal of Computational Physics, Journal of Cell Biology, Physical Biology, Nature Immunology, New Journal of Physics, Experimental Mechanics, Cell Reports, Journal of Cell Science, Current Biology, Proceedings of the National Academy of Science

Synergistic activities:

- Co-director of the Research Interaction Team (RIT) on Biomembranes: Experiments, Mathematical Modeling, and Numerical Simulation (Mathematics and IPST, Spring 2007).

- Co-Organizer of Focus Session on Cytoskeletal Dynamics, American Physical Society March Meeting (March 2007)
- Co-Organizer of Biophysics Symposium, University of Maryland: “Cell Mechanics and Motility”, (May 2009); “Cell Dynamics”, (March 2012)
- Co-organizer of Special Interest Subgroup meeting at American Society for Cell Biology annual meeting, “Cytoskeletal dynamics: Quantitative approaches to understanding form and function” (December 2012, 2013, 2014) (Attracted over 200 national and international researchers in the audience)
- Lead organizer of Biophysics Symposium: “Mechanobiology of the Cytoskeleton: Molecular and Cellular Principles”, University of Maryland (May 2017)
- Co-organizer of workshop Mathematics of the Cell: Mechanical and Chemical Signaling across Scales, Banff International Research Station, Banff, Canada (August 2018)

Contracts and Grants:

1. National Science Foundation
(09/15/2016 - 08/31/2019)
PHY, Physics of Living Systems: “Physics of Centrosome Reorientation During Signaling Activation in Immune Cells”
Role: Principal Investigator
2. National Institutes of Health
(06/01/2016 - 05/31/2018)
National Institute of Allergy and Infectious Diseases: “Nanotopographic Modulation of B cell Signaling Activation”
Role: Principal Investigator
3. National Science Foundation
(05/01/2016 - 04/30/2019)
CMMI, Biomechanics and Mechanobiology: “Mechanisms of Immune Cell Response to Mechanical Load”
Role: Principal Investigator
4. UMD-NCI Cancer Technology Partnership
(05/01/2016 – 04/30/2019)
“Mechanical regulation of nuclear and transcription factor dynamics”
Role: Principal Investigator
5. National Science Foundation
(08/01/2019-07/31/2024)
PHY, Physics of Living Systems: “Collaborative Research: Formation of a High Flux Student Research Network (HF-SRN) as a Laboratory for Enhancing Interaction in the PoLS SRN”
Role: Principal Investigator

Advising: Research Direction

Undergraduate:

1. Jacqueline King (Biology, 2007)
2. Isaac Carruthers (Physics, 2007)
3. Suehyun Cho (Physics, 2007-2010, Louis Stokes Alliance for Minorities Program, LSAMP Fellowship, was awarded the best presentation prize; currently a graduate student at University of Colorado, Dept. of Electrical Engineering)
4. Jessica Wayt (Biology, 2007-2008, currently a graduate student at Cornell University, Dept. of Biology)
5. Olawale Jaiyeola (Physics, 2007-2008)
6. Megan Riordan (Biology, 2009-2010)
7. Peter Frank (Physics, 2010 summer)
8. Ming Zhang (Bioengineering, 2010-present)
9. Shirong Zhang (Physics, 2010-present)
10. Payam Fathi (Bioengineering, 2011-2012)
11. Sae In Kwak (Biochemistry, 2012-present)
12. Kevin Hu (Duke University, Dept. of Bioengineering, summer TREND program at UMD, winner of the best presentation award, 2012)
13. Yooni Choi (Biology, 2012-present)
14. Jacob Fondriest (University of Alabama, Biophysics, summer TREND program at UMD, 2013)
15. Maesah Bernard (Physics, 2014)
16. Kevin Belnap (Brigham Young University, summer TREND program at UMD, 2014)
17. Ashley Matos (Bioengineering, 2014)
18. Emily Dement (Biology, 2014)
19. Kevin Lam (Biochemistry, 2014)
20. Sarah Kerr (Physics, 2015 - current)
21. Sung Ho Kim (Bioengineering, 2015)
22. Rami Yanes (Biology, 2015)
23. Deepak Salem (Neurobiology, 2016 - current)
24. Lakshmi Sheetala Vijaya (Neurobiology, 2016)
25. Thomas Curtis (Physics, 2016 - current)
26. Colton Treadwell (Physics, 2017 – current)
27. Tyler McDonnell (Physics, 2017)
28. Deven Appel (Bioengineering, 2017)
29. Nathan Rogers (Physics, 2018)

Postbaccalaureate:

1. Brittany Wheatley
2. Deepak Salem

Master's:

Shen Li (Animal Sciences, jointly with Lisa Taneyhill, UMD)

Doctoral:

Thesis advisor for:

1. Brian Grooman (Physics; defended Ph.D. thesis in December 2013)
2. King Lam Hui (Physics; defended Ph.D. thesis in September 2015)
3. Christy Ketchum (Biophysics; was awarded the ARCS fellowship; defended Ph. D. thesis in March 2016)
4. Michael Azatov (Physics; defended Ph.D. thesis in May 2015)
5. Ivan Adolfo Rey Suarez (Biophysics)

6. David Garcia (Physics)
7. Kaustubh Wagh (Physics)

Thesis co-advisor for:

Ashutosh Gupta (Physics, Ph. D. 2012, with David Levens, NIH)

Research advising:

Qin Ni (with Garyk Papoian)

Anshuman Bhanja (with Wenxia Song)

Postdoctoral Associate:

Altug Ozcelikkale

Offices and committee memberships:

Associate Director, Chemical Physics Program, IPST (2016-current)

Member, Abstract Sorting Committee, Division of Biological Physics, American Physical Society (2008 – present)

Focus Session Chair, American Physical Society, March Meeting, 2007-2016

Member-at-large, Executive Committee of the Division of Biological Physics, American Physical Society (2014-2017)