

**Ashok Prasad**  
Associate Professor  
Chemical and Biological Engineering  
Colorado State University  
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### Education

St. Stephens College, University of Delhi, India	Physics	B.Sc. (Hons) 1985
Delhi School of Economics University of Delhi, India	Economics	M.A. 1988
Brandeis University, Waltham, MA	Physics	M.S. 2004
Brandeis University, Waltham, MA	Physics	Ph.D. 2006
Massachusetts Institute of Technology Cambridge, MA	Computational Immunology	Postdoctoral Research 2006-2008

### Professional Experience

1. *July 2015 to date*: Associate Professor, Colorado State University, Dept. of Chemical & Biological Engineering, Fort Collins, CO.
2. *February 2016 – May 2016*: Visiting Research Scientist, Department of Neuroscience, Columbia University, New York, NY (*on sabbatical from CSU*).
3. *September 2015-January 2016*: Visiting Research Scientist, Dept. of Physics, Jawaharlal Nehru University, Delhi, India (*on sabbatical from CSU*).
4. *Jan 2009 to June 2015*: Assistant Professor, Colorado State University, Dept. of Chemical & Biological Engineering, Fort Collins, CO.  
(Additional appointments in the School of Biomedical Engineering, the Cellular and Molecular Biology Program and the Molecular, Cellular and Integrative Neuroscience Program, Colorado State University)
5. *Sept. 2006 – Dec. 2008*: Postdoctoral Associate, Computational Immunology Laboratory (Arup Chakraborty Group), Chemical Engineering Dept., Massachusetts Institute of Technology, Cambridge, MA
6. *Sept. 2001 – August 2006*: Graduate Research Fellow, Dept. of Physics, Brandeis University, Waltham, MA.
7. *July 1988-July 2001*: Lecturer in Economics, Khalsa College (E), University of Delhi, India.

### Publications

1. Prasad, Ashok and Alizadeh, Elaheh, Cell form and function: interpreting and controlling the shape of adherent cells, *Trends in Biotechnology*, 2018, doi:10.1016/j.tibtech.2018.09.007
2. Xu, Wenlong, Alizadeh, Elaheh, Prasad, Ashok, ",Force Spectrum Microscopy Using Mitochondrial Fluctuations of Control and ATP-Depleted Cells, *Biophysical Journal*, 114(12), 2933-2944, 2018
3. Joshi CJ, Peebles C, Prasad A. Modeling and analysis of flux distribution and bioproduct formation in *Synechocystis* sp. PCC 6803 using a new genome-scale metabolic reconstruction. *Algal Research*, v27, pp295-310, 2017
4. Prasad, A., If Life Keeps Throwing Curveballs, You've Probably Reached a Wall. *Biophysical journal*. 2017; 112(6):1047-1049.
5. Simulation of the M13 life cycle I: Assembly of a genetically-structured deterministic chemical kinetic simulation, SW Smeal, MA Schmitt, RR Pereira, A Prasad, JD Fisk, *Virology* 500, 259-274 (2017)

6. Simulation of the M13 life cycle II: Investigation of the control mechanisms of M13 infection and establishment of the carrier state, SW Smeal, MA Schmitt, RR Pereira, A Prasad, JD Fisk, *Virology* 500, 275-284 (2017)
7. Measuring systematic changes in invasive cancer cell shape using Zernike moments  
E Alizadeh, SM Lyons, JM Castle, A Prasad, *Integrative Biology* 8 (11), 1183-1193 (2016)
8. June I Medford, Ashok Prasad Towards programmable plant genetic circuits, *The Plant Journal* 87(1), 139-148, 2016
9. Samantha M. Lyons, Elaheh Alizadeh, Joshua Mannheimer, Katherine Schuamberg, Jordan Castle, Bryce Schroder, Philip Turk, Douglas Thamm, Ashok Prasad, Changes in Cell Shape Are Correlated with Metastatic Potential in Murine and Human Osteosarcomas, *Biology Open* 2016 5: 289-299;  
doi: 10.1242/bio.013409
10. Katherine A. Schaumberg, Mauricio S. Antunes, Tessema K. Kassaw, Wenlong Xu, Christopher S. Zalewski, June I. Medford, Ashok Prasad, Quantitative characterization of genetic parts and circuits for plant synthetic biology, *Nature Methods*, v13, 94-100 2016,
11. June Medford and Ashok Prasad, Plant Synthetic Biology takes root, *Invited Perspective, Science*, 346 no. 6206 pp. 162-163, October 2014
12. Chintan J. Joshi and Ashok Prasad, Epistatic interactions among metabolic genes depend upon environmental conditions, *Molecular Biosystems*, 2014, 10 (10), 2578 – 2589, doi: 10.1039/C4MB00181H
13. S. M. Lyons, W. Xu, J. Medford, Ashok Prasad, Loads Bias Genetic and Signaling Switches in Synthetic and Natural Systems. *PLoS Computational Biology*, 2014, 10(3): e1003533. doi:10.1371/journal.pcbi.1003533
14. Dipjyoti Das, Dibyendu Das and Ashok Prasad, Effective birth processes in microbial ecologies, *Journal of Theoretical Biology*, 308, 96-104, 2012
15. Dustin Robert Berger, Ketul Papat, Ashok Prasad, PCL Nanopillars Vs Nanofibers: A Contrast in Progenitor Cell Morphology, Proliferation, and Fate Determination, *Advanced Engineering Materials*, 14(6), B351-B356, 2012
16. S. M. Lyons, Ashok Prasad, Cross-talk and information transfer in mammalian and bacterial signaling, *PLoS ONE* 7(4): e34488. (2012)  
doi:10.1371/journal.pone.0034488
17. Ashok Prasad, Computational Modeling of Signal Transduction Networks: A Pedagogical Exposition, *Chapter 10 in "Computational Modeling of Signaling Networks", Methods of Molecular Biology Series*, edited by X. Liu and M. Betterton, Springer. 2011
18. A. W. C. Lau, Ashok Prasad and Z. Dogic: Condensation of isolated semi-flexible filaments driven by depletion interactions, *European Physical Letters* 87, 48006 (2009)  
<http://www.iop.org/EJ/abstract/-search=69463715.6/0295-5075/87/4/48006>
19. Ashok Prasad, Julie Zikherman, Jayajit Das, Jeroem Roose, Arthur Weiss, Arup Chakraborty: Origin of the sharp boundary that discriminates positive and negative selection in thymocytes, *Proceedings of the National Academy of Sciences* 106, 528-533 (2009).
20. Vivek B. Shenoy, Dhananjay T. Tambe, Ashok Prasad and Julie A. Theriot A kinematic description of the trajectories of *Listeria monocytogenes* propelled by actin comet tails, *Proceedings of the National Academy of Sciences* 104, 8229 (2007).
21. Ashok Prasad, Howard Stone and Jane' Kondev: Drift in Supported Membranes, *Physics of Fluids*, 19, 113103 (2007).  
<http://link.aip.org/link/?PHFLE6/19/113103/1>

22. Yuko Hori, Ashok Prasad and Jane' Kondev: Stretching short biopolymers by fields and forces, *Physical Review E* 75, 041904 (2007).  
<http://pre.aps.org/abstract/PRE/v75/i4/e041904>
23. Ashok Prasad, Yuko Hori and Jane' Kondev: Elasticity of semiflexible polymers in two dimensions, *Physical Review E* 72, 041918 (2005).

#### **Manuscripts under review or in preparation**

1. Alizadeh, Elaheh, Xu, Wenlong, Castle, Jordan, Foss, Jacqueline, Prasad, Ashok "TISMorph: A tool to quantify texture, irregularity and spreading of single cells" *bioRxiv* #372755, 2018 (*under review*)
2. Joshua D. Mannheimer, Dawn L. Duval, Ashok Prasad, Daniel L. Gustafson "A systematic analysis of genomics-based modeling approaches for prediction of drug response to cytotoxic chemotherapies" (*under review*)
3. Allison Werner, Corey D. Broeckling, Ashok Prasad, Christie A.M. Peebles "A comprehensive time-course metabolite profiling of the model cyanobacterium *Synechocystis* sp. PCC 6803 under diurnal light:dark cycles" (*under review*)
4. Tessema K. Kassaw, Wenlong Xu, Christopher S. Zalewski, Katherine A. Kiwimagi, Ron Weiss, Mauricio S. Antunes\*, Ashok Prasad\*, June I. Medford\*; "A Genetic Toggle Switch in Plants". (*In preparation*)
5. Elaheh Alizadeh, Jordan Castle, Wenlong Xu, Ashok Prasad; "Changes in actin structure and cell shape are predictive of cancer progression". (*In preparation*)
6. Xu, Wenlong and Prasad, Ashok; "Measurement of intracellular mechanical properties using fluorescent probes loaded by glass beads". (*In preparation*)
7. Ziaee, Morteza, Xu, Wenlong, Prasad, Ashok; "Analysis of anomalous diffusion of PEG-coated nanoparticles in living cells using passive microrheology". (*In preparation*)

#### **Selected Conference Proceedings/Transactions:**

10. Mitochondrial fluctuations as a measure of active biomechanical properties of mammalian cells, Xu W, Alizadeh E, Castle J, Prasad A. *Bulletin of the American Physical Society* 62. American Physical Society Annual March Meeting; 2017 March
9. Mitochondrial Fluctuations as a Measure of Biomechanical Properties of Murine Cells W Xu, E Alizadeh, J Castle, A Prasad, *Biophysical Journal* 112 (3), 436a (2017)
8. Is Shape of Cancer Cell Correlated with its Invasiveness?, E Alizadeh, SM Lyons, JM Castle, JI Foss, A Prasad, *Biophysical Journal* 112 (3), 124a-125a (2017)
7. Predicting drug sensitivity based on gene array data for cytotoxic chemotherapeutic agents, J Mannheimer, JS Fowles, K Shaumberg, DL Duval, A Prasad, D. Gustafson *Cancer Research* 76 (14 Supplement), 1522-1522 (2016)
6. Characteristics of Cell Shape in Two Dimensions, E Alizadeh, SM Lyons, J Mannheimer, J Castle, R Plomondon, A Prasad *Biophysical Journal* 108 (2), 139a-140a (2015)
5. Does Cell Shape Determine Cell Fate? SM Lyons, E Alizadeh, J. Mannheimer, J. Castle, B. Schroeder, D. Krapf, D. Thamm, A. Prasad, *Biophysical Journal* 108 (2), 140a (2015)
4. Metabolic Channeling and Spatial Effects of Bifunctional Enzymes W Xu, A Prasad, *Biophysical Journal* 108 (2), 464a (2015)
3. S. M. Lyons, Ashok Prasad, 2013, Loads Bias Bistable Switches in Synthetic and Natural Systems, *Biophysical Society Meeting Abstracts, Biophysical Journal*, 104, 661a (2013)
2. C. Joshi, Ashok Prasad, 2013, Comparison of Resilience against Genetic Perturbations in Microbial Metabolism, *Biophysical Society Meeting Abstracts, Biophysical Journal*, 104, 661a (2013)

1. D.R. Berger, K. Papat, Ashok Prasad, 2012, Nanotopography Driven Mesenchymal Stem Cell Differentiation and Proliferation, Biophysical Society Meeting Abstracts, Biophysical Journal, 102, 705a-706a (2012)

#### **Awards and Honors:**

1. Scialog Fellow, 2015-17, Research Corporation and Moore Foundation
2. National Science Foundation CAREER Award, 2012
3. Berko Graduate Student Award, Brandeis University, May 2005
4. Junior Research Fellowship Award, University Grants Commission, Govt. of India 1988 (Declined)
5. National Talent Search Award, Government of India, 1980-1985

#### **Selected Talks and Presentations**

- 2018 July "Mechanical Spectroscopy of Cells", Invited Seminar, Dept. of Physics, Indian Institute of Technology Bombay, Mumbai, India
- 2018 Feb "Mechanical Spectroscopy of Cells", Physics Colloquium, Denver University, Denver, Colorado.
- 2018 Jan "Development of synthetic switches in plants", Invited seminar, Indian Institute of Science Education and Research (IISER), Pune, India
- 2017 Nov "Reading the Tea Leaves of Tumors", Invited Seminar, School of Biomedical Engineering, Colorado State University, Fort Collins, CO.
- 2016 Dec "Rational Design and Biological Complexity: quantitative measurement and prediction of synthetic circuits using plant protoplasts", Invited Speaker, International Conference on Plant Synthetic Biology (AICHE), Miami, Florida
- 2016 Dec "Quantitative characterization of genetic parts and circuits using protoplasts for plant synthetic biology", Minisymposium presentation, American Society for Cell Biology Annual Meeting, San Francisco, CA.
- 2016 April "Biological Switches and Modularity in Theory and Practice", Invited Seminar, Center for Bioinformatics and Computational Biology", University of Delaware, Newark, Delaware.
- 2016 Feb "Interpreting changes in cell shape", Invited Talk, Mathematical Biosciences Institute, Ohio State University, Columbus, Ohio
- 2016 Jan "Explorations in Quantitative and Systems Biology", Invited Seminar, Dept. of Physics, Jawaharlal Nehru University, Delhi, India
- 2015 April "Biological Switches in Theory and Practice", Invited Seminar, Department of Chemical Engineering and Materials Science, University of California at Irvine.
- 2015 June "Complexity and Modularity in Biology", Invited Talk, Telluride Science Research Workshop on "The Complexity of Dynamics and Kinetics from Single Molecules to Cells"
- 2015 Feb "Synthetic Biology for Plants: Development and characterization of synthetic parts and circuits", Contributed Talk, qBio Winter Meeting
- 2014 Dec Does cell shape determine cell fate? Invited Talk, Zing Conference on Mathematical Medicine, Cancun
- 2014 June "Complexity and Modularity in Biology", Invited Seminar, The Research Institute at the Nationwide Children's Hospital, Ohio State University, Columbus, Ohio.
- 2014 April "Complexity and Modularity in Biology", Invited Physics Colloquium, Department of Physics, University of New Mexico, Albuquerque, New Mexico.

- 2014 April "Hydrodynamics and Macromolecule dynamics in Lipid membranes", Invited Biophysics Seminar, Department of Physics, University of New Mexico, Albuquerque, New Mexico.
- 2014 Feb "Are genetic circuits plug-n-play?", Applied Math Seminar Series, Colorado State University, Fort Collins, Colorado
- 2012 Nov "Information, modularity and robustness in biological networks", Invited Colloquium, Physics Department Colloquium Series, Lehigh University, Bethlehem, Pennsylvania.
- 2012 Oct "Computational modeling to interrogate metabolic robustness in cyanobacteria", Invited Seminar, National Renewable Energy Laboratory, Golden, Colorado.
- 2012 June "Mathematical modeling to design and understand protein networks", Invited Seminar, International Training Institute for Materials Science, Hanoi University for Science and Technology, Vietnam.
- 2011 July "Cross talk and information transfer in some simple signaling circuits", Invited Seminar, Indian Institute of Technology, Bombay, Mumbai, India.
- 2011 July "Cross talk and information transfer in some simple signaling circuits", Invited Seminar, Institute of Mathematical Sciences, Chennai, India
- 2012 Mar "Fluctuations in microbial and viral populations", Physics at CSU VPR Conference, Fort Collins.
- 2012 Mar "Fluctuations in microbial populations", Applied Dynamics Lab, Dept. of Mathematics, Colorado State University, Fort Collins, Colorado
- 2011 Nov "Mathematical modeling to design and understand protein networks", Biochemistry and Molecular Biology Department, Colorado State University, Fort Collins, Colorado.

### **Contracts and Grants Awarded**

1. Antunes, M. S. (CoPI), Medford, J. I. (PI), Prasad, A. (CoPI), "Synthetic Biological Desalination," DOD-US Department of Defense (DARPA), \$2,069,264.00. (October 30, 2015 - October 29, 2017).
2. Prasad, A. (PI), "CAREER: The Landscape of Differentiation: Understanding the Mesenchymal Stem Cell Response to the Topography of the environment" NSF-National Science Foundation, \$417,805.00. (September 1, 2012 - August 31, 2018).
3. Prasad, A. (CoPI), Peebles, C. A. M. (PI), "SusChEM: Metabolic Analysis and Optimization of Biofuel Production during Light-dark Cycles in Synechocystis," NSF-National Science Foundation, \$492,852.00. (July 15, 2013 - June 30, 2017).
4. Medford, June (PI), Prasad, Ashok (co-PI), Antunes, Mauricio (co-PI), "Synthetic Gene Circuits to enhance the Production of Transgenic Bioenergy Crops, Dept. Of Energy, ARPA-E, \$1,661,549.62 (2013-2016)

### **Teaching and Mentoring Activities:**

*Ph.D. students graduated (as main advisor).*

1. Katherine Kiwimagi 2015 (currently postdoc at MIT).
2. Chintan J. Joshi (2016) (currently postdoc at UCSD).
3. Samanthe M. Lyons (2017) PhD-DVM (practicing veterinary medicine in Florida).
4. Elaheh Alizadeh (2018) (currently postdoc at University of Arizona).
5. Wenlong Xu (2018) (currently postdoc at MIT)

*Masters Student graduated as main advisor:*

1. Dustin Berger, 2011, (MS)
2. Keira Havens, 2013, (MS)
3. Steven Smeal, 2014, (MS)

*Courses Taught:*

CBE 406 Advanced Transport Phenomena; CBE 331 Momentum transfer and Mechanical Separations; CBE 503 Transport Phenomena; BIOM 422 Biochemical kinetics and cell mechanics; BIOM 570 Biomedical Engineering.

### **Service as Referee and Reviewer**

Participant in NSF Review Panels (twice).

Ad hoc reviewer for the NSF (most years).

Ad hoc referee for the following journals: PNAS, Synthetic Biology, Nature Communications, Physical Rev. (E), Phys. Rev. Lett., Scientific Reports, Soft Matter, Biophysical Journal, Cell Systems, Frontiers in Plant Science, PLoS Computational Biology, Journal of Biological Physics, Journal of Chemical Physics, Physical Biology, Biochemistry and PLoS ONE.

### **Synergistic Activities**

Dr. Prasad began an educational initiative to use agent based modeling to develop simulation software that K12 science teachers can use in their class for helping students gain insight into complex biological and physical processes. Workshops were also conducted with teachers and students to introduce modeling and simulation in science.

Completed models are hosted here:

<http://projects-web.engr.colostate.edu/SimuScience/Home.html>