Shiladitya Banerjee, Ph.D.

CONTACT INFORMATION

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EMPLOYMENT

University College London, **Department of Physics & Astronomy** 2016 - present
Institute for the Physics of Living Systems
Junior Group Leader (Principal Investigator)

University of Chicago, **James Franck Institute** 2013 - 2016
Postdoctoral Scholar

Syracuse University, **Department of Physics** 2009 - 2013
Research Assistant

EDUCATION

Syracuse University, Syracuse, NY, USA 2008 - 2013
Ph.D., Physics, 2013
Thesis: "Cell Mechanics: From cytoskeletal dynamics to tissue-scale mechanical phenomena"
Advisor: M. Cristina Marchetti
Area: Soft Matter Theory and Biological Physics

Chennai Mathmatical Institute, Chennai, India 2005 - 2008
B.Sc. (Honors), Physics, 2008

HONORS AND AWARDS

- Strategic Fellowship, Institute for the Physics of Living Systems, University College London (2016-2019).
- Kharasch Travel Award for Postdoctoral Scholars, Department of Chemistry, University of Chicago (2016).
- American Physical Society Prize for Outstanding Doctoral Thesis Research in Biological Physics (2013).
- Kadanoff-Rice Postdoctoral Fellowship, University of Chicago, NSF Materials Research Science and Engineering Center (2013-2015).
- All-Univeristy Doctoral Prize, The College of Arts and Sciences, Syracuse University (2013).
- American Physical Society March Meeting, Group on Statistical and Nonlinear Physics, best five student speakers (2012).
- I2CAM Junior Travel Award (2010).
- Gold Medal for Excellence in Physics, Chennai Mathematical Institute (2008).

RESEARCH

- Active Soft Matter
- Actin Cytoskeleton
- Bacterial Cell Physics
- Cell Mechanics and Motility
- Tissue Mechanics

PUBLICATIONS

23. K.L. Weirich, **S. Banerjee**, K. Dasbiswas, S. Vaikuntanathan and M.L. Gardel, "Liquid behavior of crosslinked actin bundles", *Submitted* (2016).

22. S.L. Freedman, **S. Banerjee**, G.M. Hocky and A.R. Dinner, "A versatile framework for simulating the dynamic mechanical structure of cytoskeletal networks", *Submitted* (2016).

21. S. Karki, **S. Banerjee**, M. Maienschein-Cline, H. Xu, E. Davis, P. Collins, M. Mandal, C. Labno, S.E. Powers, E. Oltz, H. Singh, M.M. Le Beau, A.R. Dinner and M.R. Clark, "Stochastic capture of chromatin topological domains by nuclear matrix RNA polymerase II determines monogenic choice", *In Revision* (2016).

20. **S. Banerjee**, K. Lo, A. Selewa, T. Kuntz, M. Daddysman, A.R. Dinner and N.F. Scherer, "Crossover in the dynamics of cell wall growth controls bacterial division times", bioRxiv: 047589 (2016).

19. I. Linsmeier, **S. Banerjee**, P.W. Oakes, W. Jung, T.Y. Kim and M.P. Murrell, "Disordered Actomyosin Networks are Sufficient to Produce Cooperative and Telescopic Contractility", Nature Communications **7**, 12615 (2016).

18. J. Notbohm*, **S. Banerjee***, K.J.C. Utuje, B. Gweon, H. Jang, Y. Park, J. Shin, J. Butler, J.J. Fredberg and M.C. Marchetti, "Cellular contraction and polarization drive collective cellular motions", Biophysical Journal **110**, 2729 (2016). * equal contribution

17. W.G. Liang, C. Triandafillou, D.Y. Hwang, M.M.L. Zulueta, **S. Banerjee**, A.R. Dinner, S.C. Hung and W.J. Tang, "Structural basis for oligomerization and glycosaminoglycan binding of CCL5 and CCL3", Proc. Natl. Acad. Sci. U.S.A **113**, 5000 (2016).

16. **S. Banerjee**, N.F. Scherer and A.R. Dinner, "Shape dynamics of growing cell walls", Soft Matter **12**, 3442 (2016).

15. **S. Banerjee**, K.J.C. Utuje and M.C. Marchetti, "Propagating Stress Waves During Epithelial Expansion", Physical Review Letters **114**, 228101 (2015). Featured in **Editor's suggestions**.

14. C.S. Wright*, **S. Banerjee***, S. Iyer-Biswas, S. Crosson, A.R. Dinner and N.F. Scherer, "Intergenerational continuity of cell shape dynamics in *Caulobacter crescentus*", Scientific Reports **5**, 9155 (2015). * equal contribution

13. E.J. Hemingway, A. Maitra, **S. Banerjee**, M.C. Marchetti, S. Ramaswamy, S.M. Fielding and M.E. Cates, "Active Viscoelastic Matter: from Bacterial Drag Reduction to Turbulent Solids", Physical Review Letters **114**, 098302 (2015).

12. P.W. Oakes, **S. Banerjee**, M.C. Marchetti and M.L. Gardel, "Geometry regulates traction stresses in adherent cells", Biophysical Journal **107**, 825 (2014). **Journal cover article**; Featured in **New and Notable**.

11. **S. Banerjee**, R. Sknepnek and M.C. Marchetti, "Optimal shapes and stresses in adherent cells on patterned substrates", Soft Matter **10**, 2424 (2014).

10. **S. Banerjee** and L. Giomi, "Polymorphism and bistability in adherent cells", Soft Matter **9**, 5251 (2013).

9. **S. Banerjee** and M.C. Marchetti, "Controlling cell-matrix traction forces by extracellular geometry", New Journal of Physics **15**, 035015 (2013). Featured in **Highlights of 2013**.

8. A.F. Mertz, Y. Che, **S. Banerjee**, J. Goldstein, S. Revilla, C. Niessen, M.C. Marchetti, E.R. Dufresne and V. Horsley, "Cadherin-Based Intercellular Adhesions Organize Epithelial Cell-Matrix Traction Forces", Proc. Natl. Acad. Sci. U.S.A **110**, 842 (2013). Recommended by **F1000 Prime**.

7. **S. Banerjee** and M.C. Marchetti, "Contractile Stresses in Cohesive Cell Layers on Finite-Thickness Substrates", Physical Review Letters **109**, 108101 (2012).

6. G.K. German, W.C. Engl, E. Pashkovski, **S. Banerjee**, Y. Xu, A.F. Mertz, C. Hyland and E.R. Dufresne, "Heterogeneous Drying Stresses in *Stratum Corneum*", Biophysical Journal **102**, 2424 (2012).

5. A.F. Mertz, **S. Banerjee**, Y. Che, G. German, Y. Xu, C. Hyland, M.C. Marchetti, V. Horsley and E.R. Dufresne, "Scaling of Traction Forces with the Size of Cohesive Cell Colonies", Physical Review Letters **108**, 198101 (2012). Featured in **Editor's suggestions.**

4. **S. Banerjee**, T.B. Liverpool and M.C. Marchetti, "Generic phases of cross-linked active gels: Relaxation, oscillation and contractility", Europhysics Letters **96**, 58004 (2011).

3. **S. Banerjee** and M.C. Marchetti, "Substrate rigidity deforms and polarizes active gels", Europhysics Letters **96**, 28003 (2011).

2. **S. Banerjee**, M.C. Marchetti and K.K. Müller-Nedebock, "Motor-driven dynamics of cytoskeletal filaments in motility assays", Physical Review E **84**, 011914 (2011).

1. **S. Banerjee** and M.C. Marchetti, "Instabilities and oscillations in isotropic active gels", Soft Matter **7**, 463 (2011).

Additional Publications

1. **S. Banerjee**, "Cell Mechanics : From cytoskeletal dynamics to tissue-scale mechanical phenomena", Physics - Doctoral Dissertations, Paper 131, Syracuse University (2013).

Invited Talks

- *Quantitative Biology of Cytoskeletal Mechanics* Workshop, Chicago, USA. 2015
- University College London, MRC Laboratory for Molecular Cell Biology. 2015
- University of Bristol, Department of Applied Mathematics, Bristol, UK. 2015
- *Computations in Science* seminar, University of Chicago, Chicago, IL, USA. 2015
- Chennai Mathematical Institute Alumni Conference, Chennai, India. 2015
- APS March Meeting, Denver, CO, USA 2014
  Symposium on *Active Matter and the cytoskeleton*.
- Program on *Active Matter: Cytoskeleton, cells, tissues and flocks* 2014
  Kavli Institute of Theoretical Physics, Santa Barbara, CA, USA.
- *Dynamics of suspensions, gels, cells and tissues*, 2013
  Isaac Newton Institute for Mathematical Sciences, Cambridge, UK.
- APS March Meeting, Baltimore, MD, USA. 2013
  Symposium on *From cells to tissues: the material properties of living matter*.
- Squishy Physics Seminar, Harvard University, USA. 2013
- Biophysics Seminar, Lewis-Sigler Institute, Princeton University, USA. 2012
- Seminar, TIFR Center for Interdisciplinary Sciences, Hyderabad, India. 2012
- GSNP Student Speaker Award talk, APS March Meeting, Boston, MA, USA. 2012
- Condensed Matter and Biological Physics Seminar, Syracuse University, USA. 2011
- Theoretical Physics Seminar, Stellenbosch University, South Africa. 2010

CONTRIBUTED PRESENTATIONS

- International conference on Active and Smart Matter, Syracuse, NY (Talk). 2016
- Gordon Research Conference on *Self Assembly and Active Matter*, New London, NH, USA. (Poster) 2015
- Workshop on Soft|Meta matter, University of Chicago, USA. 2014
- APS March Meeting, Baltimore, MD, USA. (Talk) 2013
- 13th New York Complex Matter Workshop, Syracuse University, USA. (Talk) 2012
- APS March Meeting, Boston, MA, USA. (Talk) 2012
- Gordon Research Conference, New London , NH, USA. (Poster) 2011
  Soft Matter Far from Equilibrium
- 11th New York Complex Matter Workshop, Syracuse University, USA. (Talk) 2011
- APS March Meeting, Dallas, TX, USA. (Talk) 2011
- Workshop on Active Materials, Stellenbosch, South Africa. (Talk) 2010
- 10th New York Complex Matter Workshop, Cornell University, USA. (Talk) 2010
- 9th New York Complex Matter Workshop, RIT, Rochester, USA. (Talk) 2009
- Boulder School for Condensed Matter Physics, UC Boulder, USA. (Poster) 2009
- Summer school on *Soft Solids and Complex Fluids*, UMass Amherst, USA. 2009
- ICAM Conference on Soft Active Materials, Syracuse University, USA. (Talk) 2009

TEACHING

University College London

- PHASM800/PHASG800: Molecular Biophysics Spring 2017

Syracuse University

- PHY 531: Thermodynamics and Statistical Mechanics Spring 2013
- PHY 360: Vibrations, Waves and Optics Fall 2012
- PHY 305: Solar Energy Science and Architecture Fall 2012
- PHY 312: Relativity, Cosmology and Beyond Spring 2011, 2012
- PHY 221: General Physics I: Mechanics Spring 2009
- PHY 222: General Physics II: Electricity, Magnetism and Light Fall 2008

SERVICE

- **Organizer**, *Computations in Science Seminar*, The University of Chicago (2014-2016).
- **Organizer and chair**, APS March Meeting 2015 invited symposium: *From bacteria to eukaryotes: shape organization in living matter*.
- **Manuscript Referee**: Nature Communications, Physical Review Letters, Physical Review E, Biophysical Journal, New Journal of Physics, Physical Biology, Nature Scientific Reports, Europhysics Letters, European Physical Journal E, BBA Molecular Cell Research.
- **Member**, American Physical Society (2008 - present).

REFERENCES

Prof. M. Cristina Marchetti, mcmarche@syr.edu
Department of Physics and Syracuse Biomaterials Institute, Syracuse University, Syracuse, NY 13244, USA.

Prof. Aaron R. Dinner, dinner@uchicago.edu
Department of Chemistry, James Franck Institute and Institute for Biophysical Dynamics, University of Chicago, Chicago, IL 60637, USA.

Prof. Margaret L. Gardel, gardel@uchicago.edu
Department of Physics, James Franck Institute and Institute for Biophysical Dynamics, University of Chicago, Chicago, IL 60637, USA.

Prof. Norbert F. Scherer, nfschere@uchicago.edu
Department of Chemistry, James Franck Institute and Institute for Biophysical Dynamics, University of Chicago, Chicago, IL 60637, USA.