Shiladitya Banerjee, Ph.D.

CONTACT INFORMATION

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EMPLOYMENT

University College London, London, UK — 2018 - present
Department of Physics & Astronomy
Lecturer (Assistant Professor, tenured)

University College London, London, UK — 2016 - 2018
Department of Physics & Astronomy
Junior Group Leader (tenure-track PI)

University of Chicago, Chicago, USA — 2013 - 2016
James Franck Institute
Postdoctoral Fellow
Advisors: Prof. A.R. Dinner, Prof. M.L. Gardel, Prof. N.F. Scherer.

Syracuse University, Syracuse, USA — 2009 - 2013
Department of Physics
Research Assistant
Advisor: Prof. M.C. Marchetti

EDUCATION

Syracuse University, USA — 2008 - 2013
Ph.D. Physics, 2013
Advisor: Prof. M. Cristina Marchetti

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

PHD THESIS

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

HONORS AND AWARDS

- HFSP Young Investigator Award (2018).
- EPSRC New Investigator Award (2018).
- UCL Global Engagement Fund (2017).
- Strategic Fellowship, UCL Institute for the Physics of Living Systems (2016-2019).
- Kharasch Postdoc Award, Department of Chemistry, University of Chicago (2016).
- American Physical Society Prize for *Outstanding Doctoral Thesis Research in Biological Physics* (2014).
- Kadanoff-Rice Postdoctoral Fellowship, University of Chicago, NSF Materials Research Science and Engineering Center (2013-2016).
- *All-Univeristy Doctoral Prize*, The College of Arts and Sciences, Syracuse University (2013).
- Best five student speakers, American Physical Society March Meeting, Group on Statistical and Nonlinear Physics (2012).
- Institute for Complex Adaptive Matter, Junior Travel Award (2010).
- Gold Medal for Excellence, Chennai Mathematical Institute (2008).

PUBLICATIONS

28. V. Ajeti, A.P. Tabatabai, A.J. Fleszar, M.F. Staddon, D.S. Seara, C. Suarez, S. Yousafzai, D. Bi, D.R. Kovar, **S. Banerjee** and M.P. Murrell, "Epithelial wound healing coordinates distinct actin network architectures to conserve mechanical work and balance power", Under review in *Nature Physics* (2018).

27. S. Karki, D.E. Kennedy, K. Mclean, A.T. Grzybowski, M. Maienschein-Cline, **S. Banerjee**, H. Xu, E. Davis, M. Mandal, C. Labno, S.E. Powers, M. M. Le Beau, A.R. Dinner, H. Singh, A.J. Ruthenburg, and M.R. Clark, "Regulated capture of V-κ gene topological associating domains by transcription factories", Under review in *Science Immunology* (2018).

26. D.S. Seara, I. Linsmerier, A.P. Tabatabai, P.W. Oakes, S.M. Ali Tabei, **S. Banerjee*** and M.P. Murrell*, "Filament bending promotes dynamic stability in unconventional soft active nematics", Under revision in *Nature Materials* (2018).
*corresponding authors

25. S.L. Freedman, G.M. Hocky, **S. Banerjee***, and A.R. Dinner*, "Design principles for selective self-assembly of active networks", arXiv:1712.02498 (2018).
*corresponding authors

24. S. Stam, S.L. Freedman, **S. Banerjee**, K.L. Weirich, A.R. Dinner and M.L. Gardel, "Filament rigidity and connectivity tune the deformation modes of active biopolymer networks", Proc. Natl. Acad. Sci. U.S.A. **114**, E10037-E10045 (2017).

23. A. Bove, D. Gradeci, Y. Fujita, **S. Banerjee***, G.T. Charras* and A.R. Lowe*, "Local cellular neighbourhood controls proliferation in cell competition", Molecular Biology of the Cell **28**, 3215 (2017). *corresponding authors.

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". Biophysical Journal **113**, 448 (2017).

21. **S. Banerjee**, K. Lo, M. Daddysman, A. Selewa, T. Kuntz, A.R. Dinner and N.F. Scherer, "Biphasic growth dynamics control cell division in *Caulobacter crescentus*". Nature Microbiology **2**, 17116 (2017).

20. K.L. Weirich, **S. Banerjee**, K. Dasbiswas, T.A. Witten, S. Vaikuntanathan and M.L. Gardel, "Liquid behavior of cross-linked actin bundles". Proc. Natl. Acad. Sci. U.S.A **114**, 2131 (2017).

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). Selected as **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). **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). **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).

RESEARCH SUPPORT

- HFSP Young Investigator Award 2018-2021
- EPSRC New Investigator Award 2018-2020
- EPSRC PhD studentship for Michael Staddon (UCL) 2016-2020
- EPSRC PhD studentship for Daniel Gradeci (UCL) 2016-2019
- UCL Global Engagement Fund 2017-2018
- UCL IPLS Strategic Fellowship 2016-2019
- Kadanoff-Rice Postdoctoral Fellowship, University of Chicago 2013-2016
- Institute for Complex Adaptive Matter Travel Grant 2009-2010

INVITED TALKS

- Physics of Cells: from biochemical to mechanical 2018
  PhysCell2018, Harrogate, UK. (upcoming)
- Kavli Institute for Theoretical Sciences, Beijing, China 2018
  Program on *Jamming in Bioloigcal Systems*. (upcoming)
- Applied Mathematics Seminar, University of Southampton, UK (upcoming). 2018
- Department of Biology Seminar, University of Maryland, USA. 2018
- Materials Science & Engineering Seminar, University of Illinois at 2018
  Urbana-Champaign, USA
- CUNY Graduate Center, New York, USA 2018
  Symposium on *Structure and Dynamics, Control and Evolution*
- Physics Department Seminar, Pennsylvania State University, USA 2018
- Physics-Biology Interface Seminar, Universite Paris-Sud, Orsay, France 2018
- Mathematical Biology Seminar, University of Edinburgh, UK. 2018
- 118th Statistical Mechanics Conference, Rutgers University, USA. 2017
- Keynote speaker, UCL cross-disciplinary network on Soft Materials 2017
- CECAM workshop on Cell and Tissue Motility, Lausanne, Switzerland. 2017
- Biophysics Seminar, University of Sheffield, UK. 2016
- Computational Biology Seminar, University of Dundee, UK. 2016
- LMCB seminar, University College London, UK. 2016
- *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

- *Quantitative Approaches to Antimicrobial Resistance*, IOP conference, 2017
  Physics of Life Network, Edinburgh, UK (Talk). 2017
- 7th European Cell Mechanics Meeting, Windermere, UK (Talk).
- International conference on Active and Smart Matter, Syracuse, NY (Talk). 2016
- Gordon Research Conference on *Self Assembly and Active Matter*, 2015

New London, NH, USA. (Poster)
- 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 2017-
  (4th Year MSci/1st Year MSc Physics Module)
- PHASG810: Advanced Biophysical Theories 2018-
  (MSc Biological Physics Module)

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

ADVISING

PhD Supervision at UCL
- Michael Staddon, PhD candidate in Physics (Expected 2020). Topic: 'Mechanics of epithelial remodelling and self-repair'. Funding: EPSRC
- Daniel Gradeci, PhD candidate in Physics (Expected 2019). Topic: 'Physics of cancer cell competition'. Co-supervised with Prof. Guillaume Charras. Funding: EPSRC

MSci/MSc Research Project Supervision at UCL
- Thomas Jones, MSci Physics 2018. Undergraduate Project: 'Polarisation of actin cytoskeleton under mechanical stress'
- Tsz Wai Yu, MSci Physics 2018. Undergraduate Project: 'Modelling the evolution of bacterial resistance to ribosome-targeting antibiotics'.
- Roisin Stephens, MSci Physics 2017, Undegraduate Project: 'Physics of bacterial growth control and antibiotic resistance'.
- Jason Pereira, MSci Physics 2017, Undegraduate Project: 'Physics of membrane perforation during bacterial immune attack'.
- Ferhan Janjua, MSc Physics 2017. Project: 'Excitable dynamics in developing embryos'.

SERVICE

- **Editorial Board Member**, Scientific Reports (2017 - present).
- **Manuscript Referee**: Physical Review Letters, PNAS, Nature Communications, Nature Cell Biology, Current Biology, Soft Matter, Journal of Royal Society Interface, Biophysical Journal, New Journal of Physics, Scientific Reports, Europhysics Letters, Physical Biology, Physical Review E, European Physical Journal E, BBA

Molecular Cell Research.

- **Grant Referee**: EPSRC (Engineering and Physical Sciences Research Council, UK), Swiss National Science Foundation.
- **Co-organizer**, *IPLS Seminar*, University College London (2016-).
- **Co-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*.