

# Shiladitya Banerjee, Ph.D.

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CONTACT INFORMATION	Department of Physics and Astronomy University College London Gower Street London WC1E 6BT, UK	Phone (Office): (+44) 020 7679 7209 E-mail: <a href="mailto:shiladitya.banerjee@ucl.ac.uk">shiladitya.banerjee@ucl.ac.uk</a> Web: <a href="http://shiladitya-banerjee.com">http://shiladitya-banerjee.com</a>
EMPLOYMENT	<b>University College London</b> , London, UK <b>Department of Physics &amp; Astronomy</b> Lecturer (tenured PI) <b>University College London</b> , London, UK <b>Department of Physics &amp; Astronomy</b> Junior Group Leader (tenure-track PI) <b>University of Chicago</b> , Chicago, USA <b>James Franck Institute</b> Postdoctoral Fellow Advisors: Prof. A.R. Dinner, Prof. M.L. Gardel, Prof. N.F. Scherer. <b>Syracuse University</b> , Syracuse, USA <b>Department of Physics</b> Research Assistant Advisor: Prof. M.C. Marchetti	2018 - present  2016 - 2018  2013 - 2016  2009 - 2013
EDUCATION	<b>Syracuse University</b> , USA Ph.D. Physics, 2013 Advisor: Prof. M. Cristina Marchetti <b>Chennai Mathematical Institute</b> , India B.Sc. (Honors), Physics, 2008	2008 - 2013  2005 - 2008
PHD THESIS	<b>S. Banerjee</b> , "Cell Mechanics : From cytoskeletal dynamics to tissue-scale mechanical phenomena", Physics - Doctoral Dissertations, Paper 131, Syracuse University (2013).	
HONORS AND AWARDS	<ul style="list-style-type: none"><li>• HFSP Young Investigator Award (2018).</li><li>• EPSRC New Investigator Award (2018).</li><li>• UCL Global Engagement Fund (2017).</li><li>• Strategic Fellowship, UCL Institute for the Physics of Living Systems (2016-2019).</li><li>• Kharasch Postdoc Award, Department of Chemistry, University of Chicago (2016).</li><li>• American Physical Society Prize for <i>Outstanding Doctoral Thesis Research in Biological Physics</i> (2014).</li><li>• Kadanoff-Rice Postdoctoral Fellowship, University of Chicago, NSF Materials Research Science and Engineering Center (2013-2016).</li><li>• <i>All-University Doctoral Prize</i>, The College of Arts and Sciences, Syracuse University (2013).</li><li>• Best five student speakers, American Physical Society March Meeting, Group on Statistical and Nonlinear Physics (2012).</li><li>• Institute for Complex Adaptive Matter, Junior Travel Award (2010).</li><li>• Gold Medal for Excellence, Chennai Mathematical Institute (2008).</li></ul>	

## PUBLICATIONS

29. M.F. Staddon, D. Bi, A.P. Tabatabai, M.P. Murrell, and **S. Banerjee**, "Collective cell guidance and local tissue remodeling optimizes wound repair", submitted (2018).
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 (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  $V_{\kappa}$  gene topological associating domains by transcription factories", Under review (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 (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](https://arxiv.org/abs/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	<ul style="list-style-type: none"> <li>• HFSP Young Investigator Award 2018-2021</li> <li>• EPSRC New Investigator Award 2018-2020</li> <li>• EPSRC PhD studentship for Michael Staddon (UCL) 2016-2020</li> <li>• EPSRC PhD studentship for Daniel Gradeci (UCL) 2016-2019</li> <li>• UCL Global Engagement Fund 2017-2018</li> <li>• UCL IPLS Strategic Fellowship 2016-2019</li> <li>• Kadanoff-Rice Postdoctoral Fellowship, University of Chicago 2013-2016</li> <li>• Institute for Complex Adaptive Matter Travel Grant 2009-2010</li> </ul>
INVITED TALKS	<ul style="list-style-type: none"> <li>• Applied Mathematics Seminar, University of Southampton, UK 2018</li> <li>• Department of Biology Seminar, University of Maryland, USA. 2018</li> <li>• Materials Science &amp; Engineering Seminar, University of Illinois at Urbana-Champaign, USA 2018</li> <li>• CUNY Graduate Center, New York, USA 2018 Symposium on <i>Structure and Dynamics, Control and Evolution</i></li> <li>• Physics Department Seminar, Pennsylvania State University, USA 2018</li> <li>• Physics-Biology Interface Seminar, Universite Paris-Sud, Orsay, France 2018</li> <li>• Mathematical Biology Seminar, University of Edinburgh, UK. 2018</li> <li>• 118th Statistical Mechanics Conference, Rutgers University, USA. 2017</li> <li>• Keynote speaker, UCL cross-disciplinary network on Soft Materials 2017</li> <li>• CECAM workshop on Cell and Tissue Motility, Lausanne, Switzerland. 2017</li> <li>• Biophysics Seminar, University of Sheffield, UK. 2016</li> <li>• Computational Biology Seminar, University of Dundee, UK. 2016</li> <li>• LMCB seminar, University College London, UK. 2016</li> <li>• <i>Quantitative Biology of Cytoskeletal Mechanics</i> Workshop, Chicago, USA. 2015</li> <li>• University College London, MRC Laboratory for Molecular Cell Biology. 2015</li> <li>• University of Bristol, Department of Applied Mathematics, Bristol, UK. 2015</li> <li>• <i>Computations in Science</i> seminar, University of Chicago, Chicago, IL, USA. 2015</li> <li>• Chennai Mathematical Institute Alumni Conference, Chennai, India. 2015</li> <li>• APS March Meeting, Denver, CO, USA 2014 Symposium on <i>Active Matter and the cytoskeleton.</i></li> <li>• Program on <i>Active Matter: Cytoskeleton, cells, tissues and flocks</i> 2014 Kavli Institute of Theoretical Physics, Santa Barbara, CA, USA.</li> <li>• <i>Dynamics of suspensions, gels, cells and tissues,</i> 2013 Isaac Newton Institute for Mathematical Sciences, Cambridge, UK.</li> <li>• APS March Meeting, Baltimore, MD, USA. 2013 Symposium on <i>From cells to tissues: the material properties of living matter.</i></li> <li>• Squishy Physics Seminar, Harvard University, USA. 2013</li> <li>• Biophysics Seminar, Lewis-Sigler Institute, Princeton University, USA. 2012</li> <li>• Seminar, TIFR Center for Interdisciplinary Sciences, Hyderabad, India. 2012</li> <li>• GSNP Student Speaker Award talk, APS March Meeting, Boston, MA, USA. 2012</li> <li>• Condensed Matter and Biological Physics Seminar, Syracuse University, USA. 2011</li> <li>• Theoretical Physics Seminar, Stellenbosch University, South Africa. 2010</li> </ul>
CONTRIBUTED PRESENTATIONS	<ul style="list-style-type: none"> <li>• <i>Quantitative Approaches to Antimicrobial Resistance</i>, IOP conference, 2017 Physics of Life Network, Edinburgh, UK (Talk).</li> <li>• 7th European Cell Mechanics Meeting, Windermere, UK (Talk). 2017</li> <li>• International conference on Active and Smart Matter, Syracuse, NY (Talk). 2016</li> <li>• Gordon Research Conference on <i>Self Assembly and Active Matter</i>, 2015 New London, NH, USA. (Poster)</li> <li>• Workshop on Soft Meta matter, University of Chicago, USA. 2014</li> <li>• APS March Meeting, Baltimore, MD, USA. (Talk) 2013</li> <li>• 13th New York Complex Matter Workshop, Syracuse University, USA. (Talk) 2012</li> </ul>

- 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 (4th Year MSci/1st Year MSc Physics Module) 2017-
- PHASG810: Advanced Biophysical Theories (MSc Biological Physics Module) 2018-

##### 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

- **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*.