M. Lisa Manning

CONTACT INFORMATION

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RESEARCH INTERESTS

Biophysics and Soft Matter. Modeling and analysis of collective and emergent behavior in biological tissues, as well as structure, deformation, and flow in glassy materials using theory and simulations.

EDUCATION

University of California, Santa Barbara, California, USA

Ph.D. Physics, September 2008
Dissertation title: *Effective temperature and strain localization in amorphous solids*
Committee: Jean Carlson (advisor), James Langer, Ralph Archuleta

M.A. Physics, May 2005

University of Virginia, Charlottesville, Virginia USA

B.S. Physics, *with highest distinction*, 2002

B.A. Mathematics, 2002

ACADEMIC POSITIONS

2015-present	Associate Professor, Syracuse University.
2011-2015	Assistant Professor, Syracuse University.
2008-2011	Postdoctoral Fellow, Princeton University.

AWARDS AND FELLOWSHIPS

2016	Simons Investigator MMLS, Simons Foundation.
2016	IUPAP Young Investigator Prize, C3 (Statistical Physics) commission.
2015	Cottrell Scholar, Research Corporation.
2014	Scialog Fellow, Moore Foundation & Research Corporation.
2014	Physics Department Teaching Award, Phys 211, Syracuse University.
2014	Research Fellow, Alfred P. Sloan Foundation.
2013	Physics Department Teaching Award, Phys 576, Syracuse University.
2008-2011	Postdoctoral fellowship, Princeton Center for Theoretical Science.
2008-2011	Postdoctoral fellowship, Princeton Council on Science and Technology.
2004-2008	National Science Foundation Graduate Research Fellowship, NSF.
2007	Department Chair's Service Award, UCSB Department of Physics.
2003-2004	National Science Foundation Graduate K-12 Education Fellowship, NSF.
2004-2006	Physics Circus Outreach award, Department of Physics, UCSB.
2002	Barry M. Goldwater Scholarship, University of Virginia.
2002	Elected to Phi Beta Kappa, University of Virginia.
2001	Energy Research Lab. Undergrad. Fellow, Stanford Linear Accelerator.

Research Support	7/2016-6/2021	$500,000	**Simons Foundation 454947** Simons Investigator: Mathematical Modeling of Living Systems.
	7/2016-6/2019	$686,000	**NSF-PHY-1607416** Predicting How Fluid-Solid Transitions in Cancer Tumors Help Govern Invasion and Metastasis. *With co-PIs Cristina Marchetti and Jennifer Schwarz.*
	7/2016-6/2021	$546,000	**Simons Foundation 454947** Cracking the Glass Problem Collaboration.
	7/2015-6/2018	$396,068 co-PI	**NSF ACI-1541396** CC*DNI Engineer: Leading the Way for Research Computing at Syracuse University and Beyond. *With Samuel Scozzafava,PI and 3 other co-PIs.*
	7/2015-6/2019	$ 1,020,000	**NIH-1R01GM117598** Quantitative Modeling of Cell Shape Changes During Organogenesis. *With collaborator Jeff Amack, Upstate Medical University.*
	7/2015-6/2017	$ 56,250	**Scialog** Gordon and Betty Morre Foundation.
	6/2015-5/2018	$ 75,000	**Cottrell Scholar** Research Corporation.
	6/2014-5/2016	$ 50,000	**Sloan Fellowship** Alfred P. Sloan Foundation.
	6/2014-5/2019	$ 450,000	**NSF-DMR-CMMT 1352184** CAREER: Flow, Failure, and Migration in Glassy Materials.
	7/2013-7/2017	$ 290,978 co-PI	**NSF-BMMB-CMMI 1334611** Utilization of Smart Materials and Predictive Modeling to Integrate Intracellular Dynamics with Cell Biomechanics and Collective Tissue Behavior. *with Jay Henderson(PI) and Chris Turner.*

Ph.D. Students supervised	Spring 2017	Sven Wijtmans
	expected 2017	Giuseppe Passucci
	expected 2018	Michael Czajkowski
	expected 2019	Ethan Stanifer
	expected 2020	Preeti Sahu

Postdoctoral Associates	2012-15	Dapeng (Max) Bi	Ph.D. Brandeis University 2012
	2015-16	Jonathan Dawson	Ph.D. MPI-PKS 2012
	2015-	Matthias Merkel	Ph.D. MPI-PKS 2015
	2016-	Peter Morse	Ph.D. U. Oregon 2016
	2016-	Daniel Sussman	Ph.D. Illinois 2014
	2017-	Gonca Erdemci-Tandogan	Ph.D. UC Riverside 2017

Preprints and submitted manuscripts

A. Matthias Merkel and Lisa Manning, "A geometrically controlled rigidity transition in a model for confluent 3D tissues," *submitted*, arXiv:1706.02656 (2017).

B. Fabio Giavazzi, Matteo Paoluzzi, Marta Macchi, Dapeng Bi, Giorgio Scita, M. Lisa Manning, Roberto Cerbino, M. Cristina Marchetti, "Flocking Transition in Confluent Tissues," *submitted*, arXiv:1706.01113 (2017).

C. X. Yang, Dapeng Bi, M. Czajkowski, M. Merkel, M. L. Manning, M. C. Marchetti, "Correlating Cell Shape and Cellular Stress in Motile Confluent Tissues," *submitted*, arXiv:1704.05951 (2017).

D. Agnik Dasgupta, Matthias Merkel, Andrew E. Jacob, Jonathan Dawson, M. Lisa Manning and Jeffrey D. Amack, "Asymmetric cell volume changes regulate epithelial remodeling of the left-right organizer," *submitted*, (2017).

E. Franziska Wetzel, Anatol Fritsch, Dapeng Bi, Roland Stange, Steve Pawlizak, Tobias Kiessling, Lars-Christian Horn, Klaus Bendrat, Maja Oktay, Axel Niendorf, John Condeelis, Michael Hckel, Cristina Marchetti, Lisa Manning, Josef A. Kaes, "Why do rigid tumours contain soft cancer cells?," *submitted*, (2017).

F. Sven Wijtmans and M. L. Manning, "Disentangling sounds modes and defects in disordered solids," *submitted*, arXiv:1502.00685 (2017).

Peer-reviewed Publications

24. Matthias Merkel and M. Lisa Manning, "Using cell deformation and motion to predict forces and collective behavior in morphogenesis," *Seminars in Developmental Biology* **67**, 161-169, (2017).

23. Dapeng Bi, X. Yang, M. C. Marchetti, M. L. Manning, "Motility-driven glass transitions in biological tissues," *Phys. Rex X* **6**, 021011, (2016). http://dx.doi.org/10.1103/PhysRevX.6.021011

22. Dapeng Bi, J. Lopez, J. Schwarz, M. L. Manning, "A density-independent rigidity transition in biological tissues," *Nature Physics* **11**, 1074-1079, (2015).

21. S Pawlizak, A Fritsch, S Grosser, D Ahrens, T Thalheim, S Riedel, T Kiessling, M Zink, ML Manning, and JA Kaes, "Testing the differential adhesion hypothesis across the epithelial-mesenchymal transition," *New Journal of Physics* **17**, 24 August, (2015). Corresponding New Journal of Physics Perspective Article

20. J-A Park, JH Kim, D Bi, JA Mitchel, NT Qazvini, K Tantisira, CY Park, M McGill, S-H Kim, R Steward, Jr., S Burger, W Qiu, SH Randell, A Kho, D Tambe, C Hardin, SA Shore, E Israel, DA Weitz, DJ Tschumperlin, ST. Weiss, EP Henske, ML Manning, JP Butler, J M Drazen, JJ Fredberg, "Unjamming transition to cellular hypermobility in the asthmatic airway epithelium," *Nature Materials* **14**, 1040-1048, (2015). Corresponding Nature Material News and Views Article

19. Danielle S. Bassett, Eli T. Owens, Mason A. Porter, M. Lisa Manning, Karen E. Daniels, "Extraction of Force-Chain Network Architecture in Granular Materials Using Community Detection," *Soft Matter (cover article)* **11**, 2731-2744, (2015).

18. M. L. Manning and A. J. Liu, "A random matrix definition of the boson peak," *Europhys. Lett.* **109**, 36002, (2015).

17. Craig Fox, Lisa Manning, and Jeff Amack, "Automated tracking of beads in the ciliated zebrafish organ of asymmetry to quantify the role of fluid flow in left-right patterning," *accepted as an invited chapter in* **Methods in Cell Biology; Methods in Cilia & Flagella**, Elsevier, (2015).

16. Xingbo Yang, M. Lisa Manning and M. Cristina Marchetti, "Aggregation and Segregation of confined active particles," *Soft Matter* **10**, 6477-6484, (2014). Recommended with a commentary in the Journal Club for Condensed Matter Physics

15. R. M. Baker, M. E. Brasch, M. L. Manning, J. H. Henderson, "Automated, contour-based tracking and analysis of cell behavior over long timescales in environments of varying complexity and cell density," *J. Roy. Soc. Interface* **11(97)**, 20140386, (2014).

14. Dapeng Bi, J. Lopez, J. Schwarz, M. L. Manning, "Energy barriers and cell migration in densely packed tissues," *Soft Matter* **10**, 1885-1890, (2014). Recommended with a commentary in the Journal Club for Condensed Matter Physics

13. T. Idema, J. O. Dubuis, L. Kang, M. L. Manning, P. C. Nelson, T. C. Lubensky, and A. J. Liu, "The syncytial Drosophila embryo as a mechanically excitable medium," *PLOS ONE* **8(10)**, e77216, (2013).

12. E-.M. Schoetz, M. Lanio, J. Talbot, and M. L. Manning, "Glassy dynamics in three dimensional embryonic tissues," *J. Roy. Soc. Interface* **10(89)**, 20130726, (2013).

11. J. D. Amack, M. L. Manning, "Knowing the Boundaries: Extending the Differential Adhesion Hypothesis in Embryonic Cell Sorting," *Science* **338 (6104)**, 212-215, (2012).

10. G. Wang, M. L. Manning, and J. D. Amack, "Regional Cell Shape Changes Control Form and Function of Kupffer's Vesicle in the Zebrafish Embryo," *Dev. Bio.* **370 (1)**, 52-62, (2012).

9. M. L. Manning and A. J. Liu, "Vibrational modes identify soft spots in a sheared disordered packing," *Phys. Rev. Lett.* **107**, 108302, (2011).

8. K. Chen, M. L. Manning, P. J. Yunker, W. G. Ellenbroek, Z. Zhang, A. J. Liu, and A. G. Yodh, "Measurement of Correlations between Low-Frequency Vibrational Modes and Particle Rearrangements in Quasi-Two-Dimensional Colloidal Glasses," *Phys. Rev. Lett.* **107**, 108301, (2011).

7. M. L. Manning, R. A. Foty, M. S. Steinberg, and E.-M. Schoetz, "Coaction of intercellular adhesion and cortical tension specifies tissue surface tension," *Proc. Nat. Acad. Sci.* **107**, 28 12517-12522, (2010).

6. E. G. Daub, M. L. Manning and J. M. Carlson, "Pulse-like, crack-like and supershear earthquake ruptures with shear strain localization," *J. Geophys. Res.* **115**, B05311, (2010).

5. M. L. Manning, E. G. Daub, J. S. Langer and J. M. Carlson, "Rate dependent shear bands in a shear transformation zone model for amorphous solids," *Phys. Rev. E* **79**, 016110, (2009).

4. E. G. Daub, M. L. Manning and J. M. Carlson, "Shear strain localization in elastodynamic rupture simulations," *Geo. Res. Lett.* **35**, L12310, (2008).

3. J. S. Langer and M. L. Manning, "Steady-state, effective-temperature dynamics in a glassy material," *Phys. Rev. E* **76**, 056107, (2007).

2. M. L. Manning, J. S. Langer and J. M. Carlson, "Strain localization in a shear transformation zone model for amorphous solids," *Phys. Rev. E* **76**, 056106, (2007).

1. M. Manning, J. M. Carlson and J. Doyle, "Highly Optimized Tolerance in dense and sparse resource regimes," *Phys. Rev. E* **72**, 016108, (2005).

Invited Talks

98 invited talks total

2017 Physics Colloquium, University of Chicago (May).

2017 Systems Biology seminar, Harvard University (April).

2017 Collective Motion Symposium. APS March meeting.

2017 Simons Cracking the glass Collaboration, NYC (March).

2017 Biophysical Society Mechanobiology subgroup (February).

2017 Physical Oncology Gordon Conference, Galveston, TX (February).

2017 Maryland Stat. Phys. seminar and Physics Colloquium (January).

2016 Simons Foundation Mathematical and Physical Sciences Meeting (Oct).

2016 Physics Colloquium, New York University (Oct).

2016 Biophysics seminar, Rice University (Oct).

2016 Biophysics colloquium, Cornell University (Sep).

2016 Invited talk and award, StatPhys 26, Lyon France (July).

2016 Physics colloquium and biophysics seminar, UCLA (May).

2016 Invited public lecture, ACC meeting of the minds, Syracuse NY (April).

2016 Invited public lecture, Physics of development and disease. Aspen CO (March).

2015 Frontiers in Pattern formation, Nat. Acad. of Sci. (Oct).

2015 Quantitative Cell Biology conference, Chicago, IL (Oct).

2015 Physics Colloquium, Hamilton College (Oct).

2015 Physics Colloquium, Vanderbilt University (Oct).

2015 Seminar, Max Planck Inst. Physics of Complex Systems, Dresden, Germany (Sept).

2015 Physics of Cancer conference in Leipzig, Germany (Sept).

2015 Gordon Conference on Soft Matter, Colby Sawyer College (Aug).

2015 Condensed Matter Summer School at CU Boulder in Boulder, Colorado (July).

2015 Cottrell Scholar Conference in Tucson Arizona (July).

2015 American Physical Society Meeting, Frontiers of Soft Matter Symposium (Mar).

2015 Scialog conference, Molecules come to Life (Mar).

2015 Unifying Concepts in Glass Physics, Aspen Center for Physics (Feb).

2014 Statistical Physics Conference, Rutgers, NJ (Dec).

2014 Physics Colloquium, MPIDS Gottingen, (Nov).

2014 Physics Seminar, LPTMS University Paris-Sud (Nov).

2014 Lecture, Multi-scale integration of biological systems, Institute Curie (Nov).

2014 Complexity in Mechanics conference, KITP, UCSB (Oct).

2014 Workshop on Intermittency in disordered solids, KITP, UCSB (Oct).

prior **63 additional invited talks.**

Teaching

Syracuse University, Syracuse, NY USA

Spring 2017	*Physics 215* Honors Introductory Physics
Fall 2015	*Physics 399/600* Practicum in Science Teaching
Spring 2015, Spring 2013, Fall 2011	*Physics 576* Introduction to Solid State Physics
Fall 2012, Spring 2014(2)	*Physics 211* General Physics I: Mechanics

Departmental and University Service

2016-17	Chair, Faculty Search committee in soft matter/biophysics
2016	Co-chair, Conference for Undergraduate Women in Physics
2015	Co-chair, Working Group of Syracuse Biomaterials Institute
2015	Member, Faculty Advisory Committee for College of Medicine
2014-15	Member, Soft Matter Experimental Physics Faculty Search Committee.
2014-15	Member, College of Arts and Sciences Dean Search Committee.
2013-14	Chair, Graduate Recruiting Committee, Physics Department.
2013 -	Panelist for Women in Science and Engineering (WiSE) workshops: Dual Career, Writing a Dissertation, Peer Mentoring.
2012-15	Coordinator, Soft Interfaces IGERT orientation and student seminar.
2012-	Oral exam committee member, Xingbo Yang, Jorge Lopez, Sean Sweeney, Jikai Wang (Physics), Kevin Davis, Megan Brasch, Fred Donelson (Bio. Eng.).
2011-	Thesis committee: Shiliyang Xu, Zhenwei Yao, Jorge Lopez (Physics), Kosmas Diveris (Math-Chair), Sean Delaney (Chemistry-Chair), Thomas Juliano, (Chemistry - Chair), Megan Brasch (BMCE - Chair).
2011-	Graduate Academic Advisor: Sven Wijtmans, Craig Fox, Jie Yang, Fu-Hao Chen (Physics).
2011-13	Chair('13) and co-Chair, Undergraduate Research Day, Physics Department.
2011-13	Coordinator: condensed matter theory group meeting.

Professional Activities and Outreach

–	NSF Reviewer and Review Panelist.
2017-	APS GSNP, Elected Member at Large.
2017	APS GSOFT Program committee member.
2017,15	Lecturer, Boulder Condensed Matter Summer School.
2016	Ph.D. Thesis committee member, Merlijn van Deen, Leiden University.
2015-17	APS GSOFT Membership committee chair.
2016	Co-organizer, Workshop on the Physics of Development and Disease, Aspen Center for Physics (March).
2015	Co-organizer, Random walks and nonlinearity in the life of cells workshop MPI-PKS Dresden (May).
2014	Guest lecturer, Multiscale integration of biological systems, Institute Curie.
2014	Syracuse Soft Matter Program public lecture, "The sound of disorder".
2013-	Guest Editor, New J. Phys. issue on Multicellularity and Active Matter.
2008-	Referee: Science, Proc. Nat. Acad. Science, Roc. Soc. Interface, Phys. Rev. Letters, Phys. Rev. E, Phys. Rev. B, Phys. Bio., Biophys. J., Sci. Reports, New Jour. Phys., PLOS Comp. Bio, and Rev. Mod. Phys.
2012	Jr. Science Cafe Seminar, Museum of Science and Technology (MoST), Syracuse NY
2006	Invited Speaker and Chaperone: Conference for Undergraduate Women in Physics, USC.
2003-08	WiSE graduate mentor, Chair and Webmaster: Women in Physics Group UCSB.
99-2001	Associate Editor and Staff Writer: Cavalier Daily Health and Science Section, University of Virginia.