

Carl P. Goodrich

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Education

University of Pennsylvania, Philadelphia, PA August 2015
Ph.D. in Physics and Astronomy
Thesis: “Unearthing the anticrystal: criticality in the linear response of disordered solids”
Advisors: Andrea J. Liu and Sidney R. Nagel

Syracuse University, Syracuse, NY May 2009
B.S. in Physics and Mathematics, *summa cum laude*

Research Positions

IST Austria starting August 2020
Assistant Professor

Harvard University September 2015 - present
Postdoctoral Fellow
Advisor: Michael P. Brenner

University of Pennsylvania May 2009 - August 2015
Graduate Research Assistant
Advisors: Andrea J. Liu and Sidney R. Nagel

Syracuse University September 2005 - May 2009
Undergraduate Research Assistant
Advisors: A. Alan Middleton, Marina Artuso and Liviu Movileanu

Rice University June 2008 - August 2008
REU Research Assistant
Advisor: Bruce R. Johnson

Publications

23. [C.P. Goodrich](#), K. Ribbeck and M.P. Brenner “Enhanced diffusion by binding to the crosslinks of a polymer gel,” *Nat. Commun.* **9**, 4348 (2018).
Featured as an Editors’ Highlight.
22. J.P. Sethna, M.K. Bierbaum, K.A. Dahmen, [C.P. Goodrich](#), J.R. Greer, L.X. Hayden, J.P. Kent-Dobias, E.D. Lee, D.B. Liarte, X. Ni, K.N. Quinn, A. Raju, D.Z. Rocklin, A. Shekhawat and S. Zapperi. “Deformation of Crystals: Connections with Statistical Physics,” *Annu. Rev. Mater. Res.* **47**, 217 (2017).
21. M Baity-Jesi, [C.P. Goodrich](#), A.J. Liu, S.R. Nagel and J.P. Sethna. “Emergent SO(3) Symmetry of the Frictionless Shear Jamming Transition,” *J. Stat. Phys.* **167**, 735 (2017).

20. J.W. Rocks, N. Pashine, I. Bischofberger, [C.P. Goodrich](#), A.J. Liu and S.R. Nagel. “Designing allostery-inspired response in mechanical networks,” *Proc. Nat. Acad. Sci.* **114**, 2520 (2017).
19. [C.P. Goodrich](#) and M.P. Brenner. “Using active colloids as machines to weave and braid on the micrometer scale,” *Proc. Nat. Acad. Sci.* **114**, 257 (2017).
18. [C.P. Goodrich](#), A.J. Liu and J.P. Sethna. “Scaling ansatz for the jamming transition,” *Proc. Nat. Acad. Sci.* **113**, 9745 (2016).
17. A.L. Graves, S. Nashed, E. Padgett, [C.P. Goodrich](#), A.J. Liu and J.P. Sethna. “Pinning Susceptibility: The effect of dilute, quenched disorder on jamming,” *Phys. Rev. Lett.* **116**, 235501 (2016).
16. D.M. Sussman, [C.P. Goodrich](#) and A.J. Liu. “Spatial structure of states of self stress in jammed systems,” *Soft Matter* **12**, 3982 (2016).
15. J.M. Rieser, [C.P. Goodrich](#), A.J. Liu and D.J. Durian. “Divergence of Voronoi cell anisotropy vector: A threshold-free characterization of local structure in amorphous materials,” *Phys. Rev. Lett.* **116**, 088001 (2016).
14. R. Lombardini, R. Acevedo, A. Kuczala, K.P. Keys, [C.P. Goodrich](#) and B.R. Johnson. “Higher-order wavelet reconstruction/differentiation filters and Gibbs phenomena,” *J. Comp. Phys.* **305**, 244 (2016).
13. [C.P. Goodrich](#), A.J. Liu and S.R. Nagel. “The Principle of Independent Bond-Level Response: Tuning by Pruning to Exploit Disorder for Global Behavior,” *Phys. Rev. Lett.* **114**, 225501 (2015).
12. D.M. Sussman, [C.P. Goodrich](#), A.J. Liu and S.R. Nagel. “Disordered surface vibrations in jammed sphere packings,” *Soft Matter* **11**, 2745 (2015).
11. R. van Drongelen, A. Pal, [C.P. Goodrich](#) and T. Idema. “Collective dynamics of soft active particles,” *Phys. Rev. E* **91**, 032706 (2015).
10. M.A. Lohr, T. Still, R. Ganti, M.D. Gratale, Z.S. Davidson, K.B. Aptowicz, [C.P. Goodrich](#), D.M. Sussman and A.G. Yodh. “Vibrational and Structural Signatures of the Crossover Between Dense Glassy and Sparse Gel-Like Attractive Colloidal Packings,” *Phys. Rev. E* **90**, 062305 (2014).
9. [C.P. Goodrich](#), S. Dagois-Bohy, B.P. Tighe, M. van Hecke, A.J. Liu and S.R. Nagel. “Jamming in finite systems: stability, anisotropy, fluctuations and scaling,” *Phys. Rev. E* **90**, 022138 (2014).
Editors’ Suggestion.
8. [C.P. Goodrich](#), A.J. Liu and S.R. Nagel. “Contact nonlinearities and linear response in jammed particulate packings,” *Phys. Rev. E* **90**, 022201 (2014).
7. [C.P. Goodrich](#), A.J. Liu and S.R. Nagel. “Solids between the mechanical extremes of order and disorder,” *Nature Physics* **10**, 578 (2014).
See associated News and Views by Giulio Biroli.
6. [C.P. Goodrich](#), A.J. Liu and S.R. Nagel. “Comment on ‘Repulsive contact interactions make jammed particulate systems inherently nonharmonic,’” *Phys. Rev. Lett.* **112**, 049801 (2014).
5. T. Still, [C.P. Goodrich](#), K. Chen, P.J. Yunker, S.S. Schoenholz, A.J. Liu and A.G. Yodh. “Phonon dispersion and elastic moduli of two-dimensional disordered colloidal packings of soft particles with frictional interactions,” *Phys. Rev. E* **89**, 012301 (2014).
4. S.S. Schoenholz, [C.P. Goodrich](#), O. Kogan, A.J. Liu and S.R. Nagel. “Stability of jammed packings II: the transverse length scale,” *Soft Matter* **9**, 11000 (2013).

3. C.P. Goodrich, W.G. Ellenbroek and A.J. Liu. "Stability of jammed packings I: the rigidity length scale," *Soft Matter* **9**, 10993 (2013).
2. C.P. Goodrich, A.J. Liu and S.R. Nagel. "Finite-Size Scaling at the Jamming Transition," *Phys. Rev. Lett.* **109**, 095704 (2012).
Editors' Suggestion, see associated Viewpoint by Eric Corwin.
1. C.P. Goodrich, S. Kirmizialtin, B.M. Huyghues-Despointes, A. Zhu, J.M. Scholtz, D.E. Makarov and L. Movileanu. "Single-Molecule Electrophoresis of β -Hairpin Peptides by Electrical Recordings and Langevin Dynamics Simulations," *J. Phys. Chem. B* **111** (**13**), 3332 (2007).

Teaching Experience

<i>Lecturer:</i> Instabilities and Patterns in Soft Matter and Biophysics Harvard University	Fall 2017
<i>Guest Lecturer:</i> Introduction to Soft Matter Harvard University	Fall 2015
<i>Teaching Assistant:</i> General Physics Laboratory University of Pennsylvania	Fall 2009-Spring 2010
<i>Assistant TA:</i> Introductory Mechanics and E&M Syracuse University	Fall 2007-Spring 2009

Honors and Awards

<i>Herbert B. Callen Memorial Prize</i> "For his outstanding work in jamming transitions and discovering new properties of disordered solids including tunability of their mechanical behavior." Department of Physics and Astronomy, University of Pennsylvania	Spring 2015
<i>Dissertation Completion Fellowship</i> On tenure Fall 2014 - Spring 2015 School of Arts and Sciences, University of Pennsylvania	Spring 2014
<i>Dissertation Research Fellowship</i> On tenure Fall 2013 - Summer 2014 School of Arts and Sciences, University of Pennsylvania	Spring 2013
<i>Chair's Teaching Award</i> "In recognition of distinguished performance in [the Department's] teaching program during the 2009-2010 academic year." Department of Physics and Astronomy, University of Pennsylvania	Fall 2010
<i>Graduate Research Fellowship</i> On tenure Fall 2010 - Summer 2013 National Science Foundation	Spring 2010
<i>Paul M. Gelling Scholarship</i> Department of Physics, Syracuse University	Spring 2009

Presentations

Invited

IST Austria	March 2019
University of Amsterdam	March 2019
University of Illinois Urbana-Champaign	February 2019
Emory	January 2019
Northwestern	January 2019
University of Florida	December 2018
SIAM Materials Meeting	July 2018
LASSP Colloquium, Cornell University	April 2018
Johns Hopkins University	February 2018
University of California Santa Barbara	February 2018
University of Texas at Austin	February 2018
Cornell University	February 2018
University of Michigan	January 2018
Widely Applied Math Seminar, Harvard University	November 2017
Biological Soft Matter Meeting	November 2017
Soft materials, structures, devices seminar, MIT	February 2017
Biological physics/soft matter seminar, UCLA	February 2017
Soft matter seminar, Autonomous University of San Luis Potosi	December 2015
Harvard University	March 2015
Leiden University	February 2015
University of Cambridge	February 2015
University of Michigan	January 2015

Contributed

APS March Meeting, Boston, MA	March 2019
APS March Meeting, Los Angeles, CA	March 2018
APS March Meeting, New Orleans, LA	March 2017
Active and Smart Matter, Syracuse, NY	June 2016
APS March Meeting, Baltimore, MD	March 2016
APS March Meeting, San Antonio, TX	March 2015
ACS 2014 Colloid & Surface Science Symposium, Philadelphia, PA	June 2014
111th Statistical Mechanics Conference, Rutgers University	May 2014
APS March Meeting, Denver, CO	March 2014
7th Int'l Discussion Meeting on Relaxations in Complex Systems, Barcelona, Spain	July 2013
APS March Meeting, Baltimore, MD	March 2013
APS March Meeting, Boston, MA	February 2012
APS March Meeting, Dallas, TX	March 2011

Poster

Soft Condensed Matter Physics Gordon Research Conference, New London, NH	August 2017
Soft Condensed Matter Physics Gordon Research Seminar, New London, NH	August 2017
Complex Active and Adaptive Material Systems GRC, Ventura, CA	February 2017
Soft Condensed Matter Physics Gordon Research Conference, New London, NH	August 2015
Soft Condensed Matter Physics Gordon Research Seminar, New London, NH	August 2015
Unifying Concepts in Glass Physics, Aspen Center for Physics	February 2015
Soft Condensed Matter Physics Gordon Research Conference, New London, NH	August 2013
Soft Condensed Matter Physics Gordon Research Seminar, New London, NH	August 2013
Evolution of Colloidal Matter, New York, NY	June 2013

Active Jammed Systems, New York, NY	May 2012
Soft Condensed Matter Physics Gordon Research Conference, New London, NH	August 2011
Soft Condensed Matter Physics Gordon Research Seminar, New London, NH	August 2011
Boulder School for Condensed Matter and Material Physics, Boulder, CO	July 2011
Gotham Metro Condensed Matter Meeting, New York, NY	April 2011
Gotham Metro Condensed Matter Meeting, New York, NY	November 2010
Soft Solids and Complex Fluids Summer School, Amherst, MA	June 2010

Professional Activities

<i>Organizer:</i> Kavli Seminar	September 2015 - September 2018
<i>Co-chair:</i> Gordon Research Seminar on Collective Phenomena in Soft Matter	August 2015
<i>Co-organizer:</i> Gotham Metro Condensed Matter Meeting	November 2012
<i>Co-organizer:</i> Gotham Metro Condensed Matter Meeting	April 2012