

KERSTIN N. NORDSTROM

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INTERESTS

Soft matter, complex fluids, rheology, biophysics, MEMS, granular materials, network analysis

EDUCATION

University of Pennsylvania, Philadelphia, Pennsylvania

- Ph.D. Physics, December 2010
 - Thesis Title: "Jamming and Flow of Soft Particle Suspensions"
 - Advisors: Doug Durian and Jerry Gollub
- M.S., Physics, 2006

Bryn Mawr College, Bryn Mawr, PA

- B.A., Physics and Mathematics, with honors, 2004
 - Thesis Title: "A Solid State Nuclear Magnetic Resonance Relaxation Study of 1,3-dimethoxy-4-tert-butylcalix[4]arene"
 - Advisor: Peter Beckmann

PROFESSIONAL EXPERIENCE

Clare Boothe Luce Assistant Professor, 2014-present

–Department of Physics, Mount Holyoke College

Postdoctoral Researcher 2011-2014

–IREAP, University of Maryland
–Impact dynamics in a granular bed, collective dynamics of epithelial and embryonic cells
–Advisor: Wolfgang Losert

Research Assistant, 2006-2010

–Department of Physics and Astronomy, University of Pennsylvania
–Microfluidics, microfabrication, complex fluids, jamming, biophysics, synthesis and characterization of microgel colloids, optical microscopy
–Advisors: Doug Durian and Jerry Gollub

Researcher, 2004-05

–Department of Physics and Astronomy, University of Pennsylvania
–Synthesis of nanoparticles, nanofabrication, design of an AFM cold finger
–Advisor: Marija Drndic

Undergraduate Researcher, 2003-04

–Department of Physics, Bryn Mawr College
–Solid-state NMR of organic molecules
–Advisor: Peter Beckmann

Undergraduate Research Fellow, 2004

–Department of Chemistry, Columbia University, New York, NY
–Synthesis and characterization of nanoparticles (REU)
–Advisor: Nicholas Turro

15. S. Arrington, D. Powers, W. Losert, and K. N. Nordstrom, "Impact into Saturated Granular Material," in preparation.
14. K. N. Nordstrom, D. S. Dorsch, W. Losert, A. G. Winter, V, "A Microstructural View of Burrowing with Roboclam," in preparation.
13. (Book Chapter) K.N. Nordstrom and W. Losert, "Microstructure Evolution During Impact using Refractive Index Matched Granular Matter," part of *Rapid Penetration into Granular Media*, Elsevier (2014), M. Iskander editor.
12. A. Basu, Y. Xu, T. Still, P. E. Arratia, Z. Zhang, K. N. Nordstrom, J. P. Gollub, D. J. Durian, and A. G. Yodh, "Rheology of Soft Colloids Near Rigidity Onset: Critical Scaling, Thermal, and Non-thermal Responses, *Soft Matter* **10**, 2017 (2014).
11. M. Harrington, M. Lin, K. N. Nordstrom, and W. Losert, "Experimental Measurements of Orientation and Rotation of Dense 3D Packings of Spheres," *Granular Matter* **16**, 185 (2014).
10. K. N. Nordstrom, E. Lim, M. Harrington, and W. Losert, "Granular Dynamics During Impact," *Physical Review Letters* **112**, 228002 (2014).
9. R.M. Lee, D.H. Kelley, K.N. Nordstrom, N.T. Ouellette, and W. Losert, "Quantifying stretching and rearrangement in epithelial sheet migration," *New Journal of Physics* **15** 025036 (2013).
8. N. Murdoch, B. Rozitis, K. Nordstrom, S.F. Green, P. Michel, T-L. de Lophem, and W. Losert, "Granular Convection in Microgravity," *Physical Review Letters* **110**, 018307 (2013).
7. N. Murdoch, P. Michel, D.C. Richardson, K. Nordstrom, C.R. Berardi, S.F. Green, and W. Losert, "Numerical simulations of granular dynamics II. Particle dynamics in a shaken granular material," *Icarus*, **219**, 321 (2012).
6. K.N. Nordstrom, J.P. Gollub, and D.J Durian, "Dynamical Heterogeneities in Sheared Suspensions," *Physical Review E*, **84**, 021403 (2011).
5. C.D. Jones, K. N. Nordstrom, and D.J. Durian, "Rheology of Nearly Ideal 3D Foams."
4. K.N. Nordstrom, E. Verneuil, W.G. Ellenbroek, T.C. Lubensky, J.P. Gollub, and D.J. Durian, "Centrifugal compression of soft particle packings: theory and experiment," *Physical Review E*, **82**, 041403 (2010).
3. K.N. Nordstrom, E. Verneuil, P.E. Arratia, A. Basu, Z. Zhang, A.G. Yodh, J.P. Gollub, and D.J. Durian, "Microfluidic Rheology of Soft Colloids Above and Below Jamming," *Physical Review Letters*, **105**, 175701 (2010).
2. F.J. Byfield, Q. Wen, I. Levental, K. Nordstrom, P.E. Arratia, R.T. Miller, and P.A. Jamney, "Absence of Filamin A Prevents Cells from Responding to Stiffness Gradients on Gels Coated with Collagen but not Fibronectin," *Biophysical Journal*, **96**, 5095 (2009).
1. P.A. Beckmann, J. Rosenberg, K. Nordstrom, C.W. Mallory, and F.B. Mallory, "CF3 rotation in 3-(trifluoromethyl)phenanthrene: Solid state F-19 and H-1 NMR relaxation and Bloch-Wangsness-Redfield theory," *Journal of Physical Chemistry A*, **110**, 3947 (2006).

AWARDS,
FELLOWSHIPS, AND
SERVICE

Advisor

- Society of Physics Students
- Mount Holyoke College

Referee

- Physical Review Letters*
- Granular Matter*
- Physica D*

Grant Preparation

- 2013: NSF-DMR - Research proposal to study particle and mesoscale rotational motion in granular materials.
- 2013: NIH-K25 - Quantitative Research Development Award, supporting physical scientists to study biology.

APS Committee on the Status of Women in Physics (CSWP)

- Selected as a member in 2013, three year term 2014-2017.

AAAS Mass Media Fellow, 2012

- Covered the science beat for the *Raleigh News and Observer*.
- Learned about the intersection of science, the media, and the public.

Teaching Fellow, Center for Teaching and Learning, 2005

- Trained other TAs to teach during their first year.
- School of Arts and Sciences, University of Pennsylvania

Chairman's Teaching Award, 2005

- Selected via student evaluations of teaching.
- Department of Physics and Astronomy, University of Pennsylvania

TEACHING AND
RELATED
EXPERIENCE

Instructor, Fall 2014

- Physics 110 - Force, Energy, and Motion
- Calculus-based mechanics course.
- In addition to lecturing, developed and co-taught associated laboratories with Teresa Herd.
- Department of Physics, Mount Holyoke College

Big Top Physics, April 26, 2014

- APS Booth at the USA Science and Engineering Festival
- Ran the smoke ring cannon station, demonstrating vortex formation in turbulent fluids.

NEXUS Project: Introductory Physics for Life Sciences Majors

- Physics 131-132: Physics for Biologists
- Department of Physics, University of Maryland
- Developed materials for a new, biology-driven physics course sequence for future health care workers and biomedical researchers.
- Participated in course planning and design with Joe Redish and Wolfgang Losert, as well as other members of the Physics Education Research Group (PERG) at Maryland.
- Served as the Technical Director for 132 labs. In collaboration with Kim Moore (head TA), developed and tested new labs, modified existing labs, and trained TAs.

Undergraduate Mentoring, Spring 2013-Fall 2014

- Supervised Andrew Shaw, a UMD undergraduate, developing a macro-confocal microscope.

Undergraduate Mentoring, Spring 2013-present

- Supervised Dylan Powers and Sam Arrington, studying impacts into wet granular systems.
- Part of a new course: Physics 299 “Bootcamp for Freshman Majors.”
- The students will continue this work through their undergraduate careers.

Instructor, Spring 2013

- Physics 115 - Inquiry into Physics
- Students, who are restricted to Elementary and Secondary education majors, learn introductory physics solely by *asking and doing*.
- Held frequent discussions about the course with Vashti Sawtelle and John Layman, members of the Physics Education Research Group (PERG) at Maryland.
- Department of Physics, University of Maryland

Graduate Mentoring, Fall 2012

- Supervised John Giannini, a biophysics graduate student, measuring collective nuclear motions in *Drosophila* embryo development.

Undergraduate Mentoring, Fall 2012-Spring 2014

- Supervised Michael Lin, a UMD undergraduate, measuring bead-scale rotations in granular materials, for the first time *ever* in a 3D system.
- Culminated in a publication.
- Michael has now started graduate school in complex systems.

Undergraduate Mentoring, Summer 2012

- Supervised Emily Lim, a visiting student from Duke University, working on granular impacts.
- Part of the TREND (Training and Research Experiences in Nonlinear Dynamics) program, an NSF REU.
- Culminated in the student formally presenting her data to the TREND program and assisting with presenting at the DTRA (funding agency) poster review session, as well as coauthorship on a paper.

Physics at Six Flags Day, April 20, 2012

- Helped to set up and run the accelerometer (Tower of Doom) and oobleck stations.
- Worked with employees of APS and AIP to demonstrate and explain physical concepts to high school students.

Adjunct Professor, Spring 2011

- Ran laboratories for Introductory Physics, developed and graded lab exams.
- Received excellent student course evaluations.
- Department of Physics, University of the Sciences in Philadelphia

Teaching Certificate, Center for Teaching and Learning, 2010

- Fulfilled 5 requirements, which included: intensive development of a teaching philosophy and having my teaching observed and discussed.
- School of Arts and Sciences, University of Pennsylvania

Substitute Lecturer, 2010

- Two weeks of classes for Physics 151 - Calculus-based Mechanics (Engineering Sequence).
- Department of Physics, University of Pennsylvania

Department Tutor, 2008-2011

- Department of Physics, University of Pennsylvania

Girls In Focus with Technology (GIFT) conference, 2011

–Invited talk to middle school girls "Physical Science and Engineering: Getting Involved."

Mary McLeod Bethune School Science Fair, 2011

–Judged 7th and 8th grade projects.

Philadelphia Area Girls Enjoying Science (PAGES), 2010

–Lead three sessions experimenting with viscosity and non-Newtonian fluids.

Tool Guru, Wolf Nanofabrication Facility, UPenn, 2008-present

–Responsible for training new users as well as routine maintenance of equipment.

High School Math and Science tutor, 2005-2011

–Greater Philadelphia area

College and University Teaching Course (EDUC 545), Spring 2006

–Learned techniques for course development and discussed prevalent issues in learning and classroom settings.

–Graduate School of Education, University of Pennsylvania

–Professor: Dr. Marybeth Gasman

Substitute Lecturer, 2006

–One week of classes for Astronomy 007

–Department of Physics, University of Pennsylvania

NanoDay @ Penn, 2005

–Designed and presented a booth about Drndic Lab research

–Nano/Bio Interface Center (NBIC), University of Pennsylvania

Teaching Assistant, 2004-06

–Physics 150 (Introductory lab, Engineers and Majors, semester 1)

–Physics 151 (Introductory lab, Engineers and Majors, semester 2)

–Physics 171 (Introductory lab, Honors, semester 2)

–Astronomy 007 (Lecture, The Big Bang and Beyond)

–Astronomy 012 (Lecture, Introduction to Astrophysics)

–Department of Physics and Astronomy, University of Pennsylvania

Teaching Assistant, 2001-04

–Introductory Physics Laboratory

–Taught both semesters, as well as both sequences (with/without calculus).

–Department of Physics, Bryn Mawr College

INVITED TALKS

Condensed Matter and Biophysics Seminar

–September 24, 2013, NC State University

Applied Dynamics Seminar

–November 8, 2012, University of Maryland

NSF-MRSEC seminar

–January 21, 2011, University of Pennsylvania

Princeton Soft Matter Meeting

–December 16, 2010, Princeton University

NYU Soft Matter Meeting

–May 1, 2009, New York University

NSF-MRSEC seminar

–June 29, 2007, University of Pennsylvania

CONFERENCE AND
WORKSHOP
PARTICIPATION

Gordon Research Conference, Granular and Granular-Fluid Flow

–Poster

–July 2014, Stonehill College

APS March Meeting

–Contributed Talk

–March 3-7, 2014, Denver, CO

SES 50th Annual Technical Meeting

–One biological and one granular talk

–July 28-31, 2013, Providence, RI

UMD - JHU - GWU Postdoc/Grad Student Symposium

–Talk

–May 21, 2013, Baltimore, MD

EuroMech Colloquium: Dense Flows of Soft Objects

–Talk

–May 13-15, 2013, Grenoble, France

APS March Meeting

–Contributed Talk

–March 18-22, 2013, Baltimore, MD

March Meeting Professional Development Workshop 2013

–March 17, 2013, Baltimore, MD

Dynamics Days 2013

–Chosen Short Talk - Granular Impact

–Poster - Cell Migration

–January 3-6, 2013, Denver, CO

ASCE Earth and Space Conference 2012

–Contributed Talk

–April 15-18, 2012, Pasadena, CA

Dynamics Days 2012

–Poster

–January 4-7, 2012, Baltimore, MD

64th Annual Meeting of the APS Division of Fluid Dynamics

–Contributed Talk

–November 20-22, 2011, Baltimore, MD

Frontiers of Discovery: AWIS at 40

–October 20-21, 2011, Chemical Heritage Foundation

Summer School: Granular Materials: from Simulations to Astrophysical Applications

–June 13-17, 2011, University of Maryland

Santa Fe Science Writing Workshop

–May 30-June 4, 2011, Santa Fe, NM

Nonlinear Dynamics and Fluid Instabilities in the 21st Century

–May 19-20, 2011, Haverford College

APS March Meeting

–Contributed Talk

–March 15-19, 2010, Portland, OR

61st Annual Meeting of the APS Division of Fluid Dynamics

–Contributed Talk

–November 23-25, 2008, San Antonio, TX

2nd Metro Gotham Condensed Matter Conference

–Poster

–April 9, 2010, New York Academy of Sciences

1st Metro Gotham Condensed Matter Conference

–November 21, 2009, New York Academy of Sciences

Mid-Atlantic Soft Matter Workshop

–Short Talk

–November 20, 2009, Johns Hopkins University

APS March Meeting

–Contributed Talk

–March 16-20, 2009, Pittsburgh, PA

Royal Society Meeting: Colloids, grains and dense suspensions

–Poster (Jerry Gollub presenting)

–March 9-10, 2009, London, UK

Mid-Atlantic Soft Matter Workshop

–Short Talk

–October 17, 2008, University of Delaware

Gordon Research Conference, Granular and Granular-Fluid Flow

–Poster

–June 22-27, 2008, Colby College

100th Statistical Mechanics Conference

–Short talk

–December 13-18, 2008, Rutgers University

J-Fest Workshop

–Speaker

–October 24, 2007, University of Pennsylvania

APS March Meeting

–March 5-9, 2007, Denver, CO

Soft Matter Workshop

- Short talk
- November 2, 2006, University of Pennsylvania

4th Annual Northeastern Granular Materials Workshop

- June 9, 2006, City College of New York

PROFESSIONAL SKILLS

- *Imaging and Microscopy*: Bright-field, fluorescence, confocal, TEM, SEM, AFM, laser sheet scanning
- *Micro/Nanofabrication*: Photolithography, ebeam lithography, soft lithography
- *Physical Analysis*: Rheometry, ultracentrifugation, dynamic light scattering
- *Chemical Analysis*: NMR, FT-IR, HPLC
- *Image Analysis*: Particle tracking, particle image velocimetry, motion and network analysis
- *Synthesis*: Gels, microgel particles, nanoparticles

COMPUTER SKILLS

- *Software*: Microsoft Office, Adobe CS, Matlab, Mathematica, Maple, Labview, Origin, Kaleidagraph, Igor, IDL, COMSOL, ImageJ.
- *Languages*: C/C++, Fortran, Linux shell scripts
- *Operating systems*: Windows, Linux, Mac OS 9/X
- *Other Skills*: HTML, L^AT_EX

AFFILIATIONS

- American Physical Society (APS)
- American Association for the Advancement of Science (AAAS)
- National Association of Science Writers (NASW)
- LGBTIQQAP+ Physicists

REFERENCES

RESEARCH

Wolfgang Losert - Current supervisor

Department of Physics, University of Maryland
(301) 405-0629
wlosert@umd.edu

Jerry Gollub - Graduate thesis supervisor

Department of Physics, Haverford College
(610) 896-1196
jgollub@haverford.edu

Douglas Durian - Graduate thesis supervisor

Department of Physics, University of Pennsylvania
(215) 898-8147
djdurian@physics.upenn.edu

Paulo Arratia - Graduate thesis mentor

Department of Mechanical Engineering, University of Pennsylvania
(215) 746-2174
parratia@seas.upenn.edu

Peter Beckmann - Undergraduate thesis supervisor

Department of Physics, Bryn Mawr College
(610) 526-5634
pbeckman@brynmawr.edu

TEACHING

Joe Redish - UMD

redish@physics.umd.edu

Tom Cohen - UMD

cohen@umd.edu

John Layman - UMD

jlayman@umd.edu

Elia Eschenazi - Department Chair, USciences

University of the Sciences in Philadelphia
(215) 596-8707
e.eschen@usciences.edu

Lisa Gelman - Director of Main Line Tutorial

www.mainlinetutorial.com
(610) 649-5829

Marybeth Gasman - Education Professor at Penn

Graduate School of Education, University of Pennsylvania
(215) 573-3990
mgasman@gse.upenn.edu

Larry Robbins - Former Director of the Center for Teaching and Learning at Penn

Department of English, University of Pennsylvania
(215) 898-1686
robbinsl@sas.upenn.edu

Juan Burciaga - Undergraduate TA supervisor

Department of Physics, Mount Holyoke College
(413) 538-3522
jburciag@mtholyoke.edu

WRITING

Richard Stradling - Editor, Raleigh News & Observer

rstradling@newsobserver.com

George Johnson - Science Writer, Instructor at SF Workshop

johnson@nytimes.com

Rebecca Widiss - Cofounder of FigureOne blog

rwidiss@gmail.com