

# Perry W.M. Ellis

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## EMPLOYMENT

**Harvard University**, Cambridge, MA

Postdoctoral Fellow

Advisor: David. A Weitz

September 2018 – Present

## EDUCATION

**Georgia Institute of Technology**, Atlanta, GA

Ph.D., Physics, G.P.A. 3.9/4.0

May 2018

Advisor: Alberto Fernandez-Nieves

Dissertation: *Nematic materials in curved spaces*

Master of Science, Physics, G.P.A 3.9/4.0

December 2012

**Harvey Mudd College**, Claremont, CA

Bachelor of Science, Physics, G.P.A. 3.4/4.0

May 2011

## Study Abroad

University of Granada, Granada, Spain

Spring 2010

## HONORS AND AWARDS

FLAMEL Doctoral Fellowship, Georgia Institute of Technology, Fall 2015 – Summer 2017 • Member, Gamma Beta Phi, Georgia Institute of Technology Chapter, Summer 2012 – Spring 2014 • National Merit Scholar, 2007 – 2011 • Harvey Mudd Merit Scholarship, 2007 – 2011 • Harvey Mudd College Dean's List, Spring 2008, 2009, 2011, Fall 2009, 2010

## PUBLICATIONS

J.P. McInerney, P.W. Ellis, D.Z. Rocklin, A. Fernández-Nieves, E.A. Matsumoto, *Curved boundaries and chiral instabilities — two sources of twist in homeotropic nematic tori*, Soft Matter. (2019)

P.W. Ellis, K. Nayani, J.P. McInerney, D.Z. Rocklin, M. Srinivasarao, E.A. Matsumoto, A. Fernández-Nieves, *Curvature-induced twist in homeotropic nematics*, PRL. **121**, 247803 (2018)

P.W. Ellis, S. Huang, S. Klaneček, J. Vallamkondu, E. Dannemiller, M. Vernon, Y.W. Chang, P.M. Goldbart, A. Fernández-Nieves, *Defect transitions in nematic liquid crystal capillary bridges*, PRE. **97**, 040701(R) (2018)

P.W. Ellis, D.J.G. Pearce, Y.W. Chang, G. Goldsztein, L. Gioni, A. Fernández-Nieves, *Curvature-induced defect unbinding and dynamics in active nematic toroids*, Nat. Phys. **14**, 85 (2018)

K. Nayani, R. Chang, J. Fu, P.W. Ellis, A. Fernández-Nieves, J.O. Park, M. Srinivasarao, *Spontaneous emergence of chirality in achiral lyotropic chromonic liquid crystals confined to cylinders*, Nat. Comm. **6**, 8067 (2015)

A. Fragkopoulou, P.W. Ellis, A. Fernández-Nieves, *Teaching Rayleigh-Plateau instabilities in the lab*, EJP. **36**, 055023 (2015)

E. Pairam, J. Vallamkondu, V. Koning, B. C. van Zuiden, P. W. Ellis, M. A. Bates, V. Vitelli, A. Fernández-Nieves, *Stable nematic droplets with handles*, PNAS. **110**, 9295 (2013)

D.J.G. Pearce, P.W. Ellis, A. Fernández-Nieves, L. Gioni *Geometrical control of active turbulence in curved topographies*, (Submitted to PRL)

P.W. Ellis, A. Fernández-Nieves, *Polarized optical microscopy textures of nematic liquid crystal tori*,  
(Submitted to Phys. D: App. Phys.)

P.W. Ellis, S. Klaneček, A. Fernández-Nieves, *Imaging nematic liquid crystals in highly curved geometries: polarized epifluorescence microscopy*, (In preparation)

## PRESENTATIONS

*Active nematics on a toroid: exploring the interactions between order, curvature, and activity.* P.W. Ellis, J. Nambisan, A. Fernandez-Nieves. Physics Colloquium, University of Massachusetts—Boston, November 1, 2019. Oral Presentation

*Active nematics on the surface of a toroid.* P.W. Ellis, A. Fernandez-Nieves. Squishy Physics Seminar, Harvard University, October 10, 2019. Oral Presentation

*Defects in an active nematic confined to a toroid.* P.W. Ellis, D. Pearce, L. Giomi, and A. Fernandez-Nieves. Soft Matter Forefronts, Georgia Institute of Technology, April 18, 2019. Oral Presentation

*Defects in an active nematic confined to a toroid.* P.W. Ellis, D. Pearce, L. Giomi, and A. Fernandez-Nieves. APS March Meeting, March 8, 2018. Oral Presentation

*Defects in an active nematic confined to a toroid.* P.W. Ellis, D. Pearce, L. Giomi, and A. Fernandez-Nieves. APS March Meeting, March 16, 2017. Oral Presentation

*Defect unbinding in active nematic toroids.* P.W. Ellis, Y.W. Chang, and A. Fernandez-Nieves. ACS Colloids and Surface Science Symposium, June 6, 2016. Oral Presentation

*Active nematics on the surface of a torus.* P.W. Ellis, Y.W. Chang, and A. Fernandez-Nieves. APS March Meeting, March 14, 2016. Oral Presentation

*Simulated textures of toroidal nematic liquid crystal droplets.* P.W. Ellis and A. Fernandez-Nieves. ACS Colloids and Surface Symposium, June 2014. Poster Presentation

*Simulated textures of toroidal nematic liquid crystal droplets.* P.W. Ellis and A. Fernandez-Nieves. APS March Meeting, March 4 2014. Oral Presentation

*Simulating nematic textures using Jones Matrices.* P.W. Ellis and A. Fernandez-Nieves. Soft matter bag lunch, Georgia Institute of Technology, November 13 2013. Oral Presentation

## PROJECT AND RESEARCH EXPERIENCE

**Postdoctoral Fellow**, Harvard University, Cambridge, MA Fall 2019 – Present

- Develop a microfluidic platform to screen human embryonic stem cell cysts for proper development
- Differentiate human embryonic stem cell cysts to study organ development
- Use human embryonic stem cell cysts to identify pathogenic bacteria

**Graduate Researcher**, Georgia Institute of Technology, Atlanta, GA Spring 2015 – Spring 2018

- Use fluorescence confocal microscopy to study an active nematic liquid crystal confined to a toroidal surface
- See defect density dependence on the local Gaussian curvature, the activity, and the toroid aspect ratio
- See curvature-induced defect unbinding in the time-averaged defect charge

**Graduate Researcher**, Georgia Institute of Technology, Atlanta, GA Fall 2014 – Spring 2018

- Investigate nematic liquid crystal confined to a toroidal droplet with homeotropic boundary conditions
- Use optical microscopy and simulation to investigate the role of curvature in the defect and director configuration
- Find a structural transition away from an escaped radial configuration depending on the aspect ratio of the toroidal droplet

**Graduate Researcher**, Georgia Institute of Technology, Atlanta, GA Spring 2014 – Spring 2018

- Investigate nematic liquid crystal confined between parallel plates with variable separation
- Use polarized microscopy, fluorescence microscopy, and simulation to determine defect structure and type as a function of plate separation and droplet volume
- Find a transition between a ring defect and a point defect depending on bridge aspect ratio
- Find that the Gaussian curvature of the free surface of the liquid crystal determines the sign of the defect

**Graduate Researcher**, Georgia Institute of Technology, Atlanta, GA Fall 2012 – Spring 2018

- Simulate nematic textures based on a given director field and confining geometry.
- Used simulation in conjunction with experimental results to confirm a director hypothesis for toroidal nematic liquid crystal droplets.

**Lawrence Livermore National Laboratory Clinic Team**, Claremont, CA Fall 2010 – Spring 2011

- Developed a test bed to evaluate the photocathode for a dynamic transmission electron microscope in order to overcome limiting factors in the current setup.
- Served as team leader: managed the four-person team and interacted with the project liaisons.

## TEACHING EXPERIENCE

**Graduate Teaching Assistant**, Georgia Institute of Technology, Atlanta, GA Fall 2013 – Spring 2014

- Develop a laboratory section for a future graduate course in Soft Condensed Matter.
- Designed lab experiments to introduce the student to important broad concepts in Soft Condensed Matter while developing critical thinking and experimental technique.

**Graduate Teaching Assistant**, Georgia Institute of Technology, Atlanta, GA Spring 2013 – Summer 2013

- Developed a laboratory section for a future class, P21CS, Physics for 21<sup>st</sup> Century Students.
- Designed course to impart an intuitive understanding of basic physics concepts relevant for the modern citizen without focusing on the math.

**Graduate Teaching Assistant**, Georgia Institute of Technology, Atlanta, GA Fall 2012

- Lectured, held office hours, and graded homework and exams for Physics 3141, Thermodynamics.

**Graduate Teaching Assistant**, Georgia Institute of Technology, Atlanta, GA Fall 2011 – Summer 2011

- Taught laboratory and recitation sections, tutored students, and graded exams for Physics 2211, Calculus-based Mechanics.

**Graduate Teaching Assistant**, Scripps College, Claremont, CA Summer 2011

- Assisted with laboratory sessions, tutored students, and graded homework assignments for General Physics 31, Calculus-based Electricity and Magnetism.

## SERVICE

### Professional Service

**PURA reviewer**, Georgia Institute of Technology, Atlanta, GA Spring 2013 - Present

- Reviewed applicants for the President's Undergraduate Research Awards (PURA), a program funding undergraduate research under a faculty mentor.
- Evaluated applications on scientific merit, student ability, and faculty endorsement of the student.

### Community Service

**Member of Gamma Beta Phi**, Georgia Institute of Technology, Atlanta, GA Summer 2012 – Spring 2014

- A national honor society focused on community service.

## HOBBIES

Cooking • Rock Climbing • Brazilian Jiu-Jitsu • Tabletop Games • Water Polo • Hiking • Swimming