

Carl Modes Curriculum Vitæ

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Education

- 2008 **Ph.D. Physics and Astronomy** University of Pennsylvania, Philadelphia, PA
2002 **A.B. Physics** Princeton University, Princeton, NJ

Professional Experience

- 2011 – **Postdoctoral Associate** Laboratory of Mathematical Physics, The Rockefeller University
2008 – 2011 **Postdoctoral Research Associate** Theory of Condensed Matter Group, Department of
Physics, Cavendish Laboratory, University of Cambridge
2009 – 2010 **Teaching Supervisor** for Natural Sciences Tripos Maths IB, Corpus Christi College,
University of Cambridge
2006 – 2008 **Research Assistant** Department of Physics and Astronomy, University of Pennsylvania
2002 – 2006 **Teaching Assistant** Department of Physics and Astronomy, University of Pennsylvania
2004 – 2005 **Teaching Assistant** Department of Mathematics, University of Pennsylvania: lecturing to
recitation sections 4 hours/week
2002 – 2008 **Doctoral Candidate** Department of Physics and Astronomy, University of Pennsylvania
2001 **Undergraduate Researcher** Radio Astronomy Group, Princeton University
1999 – 2001 **Undergraduate Researcher** MiniBooNE Neutrino Oscillation Experiment, Princeton
University
1998 **Researcher** Magnetic Reconnection Experiment, Swarthmore College

Awards & Honors

Leckhampton Research Associate, Corpus Christi College, Cambridge (2009 – 2011).
Chosen as GSNP Student Speaker Award Finalist for APS March Meeting, 2008.

Peer-Reviewed Publications

1. C. D. Modes and R. D. Kamien, “Hard Discs on the Hyperbolic Plane,” *Phys. Rev. Lett.* **99** 235701 (2007). [doi:10.1103/PhysRevLett.99.235701]
2. C. D. Modes and R. D. Kamien, “Geometrical Frustration in Two Dimensions: Idealizations and Realizations of a Hard Disc Fluid in Negative Curvature,” *Phys. Rev. E* **77** 041125 (2008). *Chosen to appear in the 1 May 2008 Virtual Journal of Biological Physics Research.* [doi:10.1103/PhysRevE.77.041125]

3. M. Warner, C. D. Modes, and D. Corbett, “Curvature in Nematic Elastica Responding to Light and Heat,” *Proc. R. Soc. A* **466** 2975-2989 (2010). [doi:10.1098/rspa.2010.0135]
4. M. Warner, C. D. Modes, and D. Corbett, “Suppression of Curvature in Nematic Elastica,” *Proc. R. Soc. A* **466** 3561-3578 (2010). [doi:10.1098/rspa.2010.0139]
5. C. D. Modes, K. Bhattacharya, and M. Warner, “Disclination-Mediated Thermo-Optical Response in Nematic Glass Sheets,” *Phys. Rev. E* **81** 060701(R) (2010). [doi:10.1103/PhysRevE.81.060701]
6. C. D. Modes, M. Warner, C. L. van Oosten, and D. Corbett, “Anisotropic Response of Glassy Splay-Bend and Twist Nematic Cantilevers to Light and Heat,” *Phys. Rev. E* **82** 041111 (2010). [doi:10.1103/PhysRevE.82.041111]
7. C. D. Modes, K. Bhattacharya, and M. Warner, “Gaussian Curvature from Flat Elastica Sheets,” *Proc. R. Soc. A* **467** 1121-1140 (2011). [doi:10.1098/rspa.2010.0352]
8. C. D. Modes and M. Warner, “Blueprinting Nematic Glass: Systematically Constructing and Combining Active Points of Curvature for Emergent Morphology,” *Phys. Rev. E* **84** 021711 (2011). [doi:10.1103/PhysRevE.84.021711]

Manuscripts in Preparation

9. C. D. Modes and M. Warner, “Responsive Nematic Solid Shells: Topology, Compatibility, and Shape,” *submitted*.
10. C. D. Modes, C. Sanchez, D. Broer, and M. Warner, “Angular Deficits in Flat Space: Remotely Controllable Apertures in Nematic Solid Sheets.”
11. C. D. Modes and M. Warner, “The Activated Morphology of Grain Boundaries in Nematic Solid Sheets.”
12. C. D. Modes, B. Guilfoyle, and M. Warner, “Continuously Varying Director Fields in Nematic Glass Sheets.”
13. C. D. Modes and R. D. Kamien, “Spherical Foams in Flat Space.” [arXiv:0810.5724]

Invited Talks and Seminars

“From Sheets to Shapes: Using Topological Defects to Blueprint Curvature,” Workshop on Topology: Identifying Order in Complex Systems, Princeton Center for Theoretical Science, Princeton University, December 2011.

“From Sheets to Shapes: Using Topological Defects to Blueprint Curvature,” International Liquid Crystal Elastomers Conference, Lisbon, Portugal, September 2011.

“From Sheets to Shapes: Blueprinting Nematic Solids for Active Morphology Control,” Center for Studies in Physics and Biology Seminar Series, The Rockefeller University, May 2011.

“Hard Discs on the Hyperbolic Plane: A Proposal for a New Model of Glassy Systems,” Theoretical Physics Seminar, University of Bristol, March 2009.

“Hard Discs on the Hyperbolic Plane: A Proposal for a New Model of Glassy Systems,” Condensed Matter Seminar, Syracuse University, April 2008.

“Hard Discs on the Hyperbolic Plane: A Proposal for a New Model of Glassy Systems,” MRSEC Chalk Talk, University of Pennsylvania, February 2008.

“Hard Discs on the Hyperbolic Plane: A Proposal for a New Model of Glassy Systems,” Condensed Matter Theory Seminar, Harvard University, February 2008.

Presentations

“From Sheets to Shapes: Blueprinting Nematic Solids for Emergent Morphology,” Gordon Research Conference on Liquid Crystals, June 2011 – Poster.

“Cones and Anticones: Mechanical Response of Disclinations in Nematic Glasses,” APS March Meeting, Portland, OR, March 2010 – Contributed Talk.

“Elasticity and Shape from Texture and Light: Disclinations in Nematic Elastomer Membranes,” Gordon Research Conference on Liquid Crystals, June 2009 – Poster.

“Hard Discs on the Hyperbolic Plane: A Proposal for a New Model of Glassy Systems,” Institute for Mathematics and its Applications, University of Minnesota, July 2008 – Poster.

“Hard Discs on the Hyperbolic Plane,” APS March Meeting, New Orleans, LA, March 2008 – Contributed Talk.

“Changing the Packing Fraction by Changing the Geometry: a Hyperbolic Approach to Jamming,” APS March Meeting, Denver, CO, March 2007 – Contributed Talk.

Professional Activities

Participant, International Liquid Crystal Elastomers Conference, Universidade Nova de Lisboa, Lisbon, Portugal (September 2011).

Participant, Gordon Research Conference on Liquid Crystals, Mount Holyoke College, South Hadley, MA (June 2011).

Participant, Gordon Research Conference on Liquid Crystals, Colby-Sawyer College, New London, NH (June 2009).

Participant, Institute for Mathematics and its Applications Summer Workshop on “Geometrical Singularities and Singular Geometries,” University of Minnesota, Minneapolis, MN (July 2008).

Participant, Mid-Atlantic Soft Matter Workshop, Georgetown University, Washington D.C. (November 2007).

Participant, ACS Colloid & Surface Science Symposium, University of Delaware, Newark, DE (June 2007).

Participant, Penn-NYU Soft Matter Workshop, University of Pennsylvania, Philadelphia, PA (November 2006).

Participant, Boulder School for Condensed Matter Physics on “Physics of Soft Matter: Complex Fluids and Biological Materials,” University of Colorado, Boulder, CO (July 2006).

Penn Soft Condensed Matter Journal Club coordinator and website administrator (July 2007 – November 2008).

Referee for *Physical Review Letters* (February 2008 –).

Referee for *Physical Review E* (September 2007 –).

References

Dr. Mark Warner

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Dr. Kaushik Bhattacharya

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