

Assistant Professor

Department of Physics, School of Natural Sciences
University of California, Merced

July 2018 – Present

Contact:

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Prior Positions

Postdoctoral Research Associate

Brown University School of Engineering
Supervisor: Thomas R. Powers

Sept. 2017 – June 2018

Postdoctoral Research Fellow

Harvard University, Cambridge, MA
Department of Physics
Supervisor: David R. Nelson

Aug. 2016 – Aug. 2017

George F. Carrier Post-Doctoral Fellow in Widely Applied Mathematics,
School of Engineering and Applied Sciences

Aug. 2014 – Aug. 2016

Education

University of Pennsylvania, Philadelphia, PA

Ph.D. in Physics and Astronomy

April 2014

Advisor: Randall D. Kamien

Thesis: “Controlling defects in nematic and smectic liquid crystals through
boundary geometry”

Brandeis University, Waltham, MA

B.S. in Physics with highest honors, B.A. in Mathematics

May 2010

Summa cum laude, Phi Beta Kappa

Research Interests

Theory and simulation of soft matter and biological physics, including: liquid crystals, topological defects, active matter, 2D order and elasticity, plasticity, and biological population dynamics.

Peer-Reviewed Publications

(* denotes shared first-author contribution)

1. G. Duclos, R. Adkins, D. Banerjee, M.S.E. Peterson, M. Varghese, A. Baskaran, M.F. Hagan, A. Baskaran, S.J. Streichan, F. Toschi, V. Vitelli, R.A. Pelcovits, T.R. Powers, D.A. Beller, and Z. Dogic. “Topological structure and dynamics of three dimensional active nematics.” *Science* **367** (2020) 1120–1124.

2. D.M. Sussman and D.A. Beller. “Fast, scalable, and interactive software for Landau-de Gennes numerical modeling of nematic topological defects” *Frontiers in Physics* **7** (2019) 204.
3. Y. Luo, T. Yao, D.A. Beller, F. Serra, and K.J. Stebe. “Deck the walls with anisotropic colloids in nematic liquid crystals”, *Langmuir* **35** (2019) 9274–9285.
4. S. Chu, M. Kardar, D.R. Nelson, and D.A. Beller. “Evolution in range expansions with competition at rough boundaries”, *Journal of Theoretical Biology* **478** (2019) 153–160.
5. A. Suh, M.-J. Gim, D. Beller, and D.K. Yoon. “Topological defects and geometric memory across the nematic-smectic A liquid crystal phase transition”, *Soft Matter* **15** (2019) 5835–5841.
6. G. Boniello, Y. Luo, D.A. Beller, F. Serra, and K.J. Stebe. “Colloids in confined liquid crystals: a plot twist in the lock-and-key mechanism”, *Soft Matter* **15** (2019) 5220–5226.
7. D.A. Beller, K.M.J. Alards, F. Tesser, R.A. Mosna, F. Toschi, and W. Möbius. “Evolution of populations expanding on curved surfaces”, *Europhysics Letters* **123** (2018) 58005.
8. Y. Luo, D.A. Beller, G. Boniello, F. Serra, K.J. Stebe. “Tunable colloid trajectories in nematic liquid crystals near wavy walls”, *Nature Communications* **9** (2018) 3841.
9. M.A. Gharbi, D.A. Beller, N.S. Mood, R. Gupta, R.D. Kamien, S. Yang, and K.J. Stebe. “Elastocapillary driven assembly of particles at free-standing smectic-A films”, *Langmuir* **34** (2018) 2006–2013.
10. M.-J. Gim*, D.A. Beller*, and D.K. Yoon. “Morphogenesis of liquid crystal topological defects during the nematic-smectic A phase transition”, *Nature Communications* **8** (2017) 15453.
11. D.A. Beller and D.R. Nelson. “Plastic deformation of tubular crystals by dislocation glide”, *Physical Review E* **94** (2016) 033004.
12. L. Tran, M.O. Lavrentovich, D.A. Beller, N. Li, K.J. Stebe, and R.D. Kamien. “Lassoing saddle splay and the geometrical control of topological defects”, *Proceedings of the National Academy of Sciences* **113** (2016) 7106–7111.
13. Y. Xia, E. Lee, H. Hu, M.A. Gharbi, D.A. Beller, E.-K. Fleischmann, R.D. Kamien, R. Zentel, and S. Yang. “Better actuation through chemistry: Using surface coatings to create uniform director fields in nematic liquid crystal elastomers”, *ACS Applied Materials & Interfaces* **8** (2016) 12466–12472.
14. Y. Luo, F. Serra, D.A. Beller, M.A. Gharbi, N. Li, S. Yang, R.D. Kamien, and K.J. Stebe. “Around the corner: Colloidal assembly and wiring in groovy nematic cells”, *Physical Review E* **93** (2016) 032705.
15. A. Honglawan, D.S. Kim, D.A. Beller, D.K. Yoon, M.A. Gharbi, K.J. Stebe, R.D. Kamien, and S. Yang. “Synergistic assembly of nanoparticles in smectic liquid crystals”, *Soft Matter* **11** (2015) 7367–7375.
16. D.A. Beller, M.A. Gharbi, and I.B. Liu. “Shape-controlled orientation and assembly of colloids with sharp edges in nematic liquid crystals”, *Soft Matter* **11** (2015) 1078–1086.
17. D.A. Beller, T. Machon, S. Čopar, D.M. Sussman, G.P. Alexander, R.D. Kamien, and R.A. Mosna. “Geometry of the cholesteric phase”, *Physical Review X* **4** (2014) 031050.
18. M.A. Lohr, M. Cavallaro Jr., D.A. Beller, K.J. Stebe, R.D. Kamien, P.J. Collings, and A.G. Yodh. “Elasticity-dependent self-assembly of micro-templated chromonic liquid crystal films”, *Soft Matter* **10** (2014) 3477–3484.
19. D.A. Beller*, M.A. Gharbi*, A. Honglawan*, K.J. Stebe, S. Yang, and R.D. Kamien. “Focal conic flower textures at curved interfaces”, *Physical Review X* **3** (2013) 041026.
Popular press coverage: *Scientific American*, NSF News, *Materials Views*, discovery.com, phys.org.
20. M. Cavallaro*, M.A. Gharbi*, D.A. Beller*, S. Čopar, Z. Shi, T. Baumgart, S. Yang, R.D. Kamien, and K.J. Stebe. “Exploiting imperfections: Assembling surface colloids via bulk topological defects”, *Proceedings of the National Academy of Sciences* **110** (2013) 18804–18808.

21. M. Cavallaro*, M.A. Gharbi*, D.A. Beller*, S. Čopar, Z. Shi, T. Baumgart, R.D. Kamien, S. Yang, and K.J. Stebe. “Ring around the colloid”, *Soft Matter* **9** (2013) 9099–9102.
22. M.A. Gharbi, M. Cavallaro, G. Wu, D.A. Beller, R.D. Kamien, S. Yang, and K.J. Stebe. “Microbullet assembly: interactions of oriented dipoles in confined nematic liquid crystal”, *Liquid Crystals* **40** (2013) 1619–1627.
23. A. Honglawan*, D.A. Beller*, M. Cavallaro, R.D. Kamien, K.J. Stebe, and S. Yang. “Topographically induced hierarchical assembly and geometrical transformation of focal conic domain arrays in smectic liquid crystals”, *Proceedings of the National Academy of Sciences* **110** (2013) 34–39.
24. R.A. Mosna, D.A. Beller, and R.D. Kamien. “Breaking the rules for topological defects: Smectic order on conical substrates”, *Physical Review E* **86** (2012) 011707.
25. A. Honglawan, D.A. Beller, M. Cavallaro, R.D. Kamien, K.J. Stebe, and S. Yang. “Pillar-assisted epitaxial assembly of toric focal conic domains of smectic-A liquid crystals”, *Advanced Materials* **23** (2011) 5519–5523.
26. E. Barry, D. Beller, and Z. Dogic. “A model liquid crystalline system based on rodlike viruses with variable chirality and persistence length”, *Soft Matter* **5** (2009) 2563–2570.

Manuscripts Under Review

- R1. N. Tanjeem, W.H. Wilkin, D.A. Beller, C.H. Rycroft, and V.N. Manoharan, “Crystallization on a cylinder” (2020).

Invited Commentaries

- C1. M.A. Gharbi, D.A. Beller, A. Honglawan, K.J. Stebe, S. Yang, and R.D. Kamien. “Controlling liquid crystal defects”, *SPIE Newsroom* (2014) 10.1117/2.1201402.005369.

Talks and Presentations

Invited Talks since 2018

Active Liquid Crystals and their Topological Defect Loops

Telluride Science Summer Lecture Series

Telluride Science Research Center (given remotely)

June 2020

Topological defect structure and dynamics in 3D active nematics

Condensed Matter Seminar

Case Western Reserve University

November 2019

AMLCI/CPIP Seminar

Kent State University

November 2019

Condensed Matter Seminar

Johns Hopkins University

October 2019

Topological defect loops in liquid crystals far from equilibrium

Soft/Bio Seminar

University of California, Santa Barbara

April 2019

Physics & Astronomy Colloquium

San Francisco State University

April 2019

Defect loops in 3D active nematics

APS March Meeting, Focus Session E61: “Active Matter II”

Boston, MA

March 2019

<i>Topological defect lines and loops in liquid crystals, in and far from equilibrium</i> [Link to video] Physics Colloquium University of California, Merced	February 2019
<i>Topological defect loops in liquid crystals, in and far from equilibrium</i> Physics Theory Seminar University of Exeter, UK	January 2019
<i>Defect loops in 3D active nematics</i> [Link to video] Workshop “Optimal design of complex materials” Isaac Newton Institute, University of Cambridge, UK	January 2019
<i>Tubular crystals: How helical motion of defects plastically deforms cylindrical lattices</i> Fresno State University Physics Colloquium	September 2018
<i>Three-dimensional geometries of frustrated and active soft matter</i> “Geometry of Soft Matter” Workshop International Institute of Physics, Natal, RN, Brazil	May 2018
<i>Frustration, defects, and geometric memory at a liquid crystal phase transition</i> Workshop on “Liquid Crystals, Soft-matter Packing, and Active Systems: Materials and Biological Applications” Institute for Mathematics and its Applications (IMA), Minneapolis, MN	Jan. 2018

Honors and Awards

Brazil-U.S. Physics Ph.D. Student and Post-doc Visitation Program Award Sociedade Brasileira de Física and American Physical Society	Oct. 2015 and Feb. 2017
Glenn H. Brown Prize (Thesis Prize) International Liquid Crystal Society <i>“For his outstanding theoretical work to identify the rich possibilities and outcomes of controlling defects in nematic and smectic liquid crystals under a variety of boundary conditions. The demonstration of the well controlled disclinations and focal conics is expected to open up a novel route for self-assembly in soft-ordered materials.”</i>	Aug. 2016
Elias Burstein Prize in Condensed Matter Physics University of Pennsylvania	Fall 2013
Teece Fellowship University of Pennsylvania	2013 – 2014
Werner B. Teutsch Prize Department of Physics and Astronomy, University of Pennsylvania <i>“Awarded annually to the graduate student who, by his or her performance in the first year courses, shows the most promise for outstanding achievement in research.”</i>	Fall 2011
Graduate Research Fellowship National Science Foundation	2011 – 2014
Stephan Berko Memorial Prize in Physics Martin A. Fisher School of Physics, Brandeis University	Spring 2010
Schiff Memorial Award in Science Brandeis University	Spring 2010
Undergraduate Departmental Representative Award <i>For work as student representative of the Department of Physics</i> Brandeis University	Spring 2010
Elihu A. Silver Prize for Undergraduate Research in Science Brandeis University	Spring 2009

Daniel A. Beller

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Norman S. Rabb Scholar, Justice Brandeis Scholar
Brandeis University

2006 – 2010

Maryland Distinguished Scholar

2006

Teaching

PHYS 126 Special Relativity Minicourse	Spring 2020
PHYS 138 Quantum Mechanics II Core	Spring 2020
PHYS 205 Graduate Classical Mechanics	Fall 2018, 2019
University of California, Merced	
Center for Teaching and Learning (CTL) Teaching Certificate	Spring 2014
University of Pennsylvania	
<i>Teaching Assistant: Mathematical Methods of Physics</i>	Fall 2013
<i>Teaching Assistant: Statistical Mechanics</i>	Fall 2011
<i>Teaching Assistant: General Physics Laboratory</i>	Fall 2010 – Spring 2011
University of Pennsylvania	

Professional Activities

<i>Membership Committee: Topical Group on Soft Matter, APS</i>	2015 – 2019
<i>Membership Committee Chair</i>	2018 – 2019
<i>Organizer: Widely Applied Mathematics Seminar, Harvard University</i>	Fall 2014 – Spring 2016
<i>Co-organizer: Gordon Research Conference on Liquid Crystals Student Session</i>	June 2013

Workshops and Other Programs Attended

Programme “The Mathematical Design of New Materials” Isaac Newton Institute, University of Cambridge, UK	January 2019
AAAPT Workshop for New Physics and Astronomy Faculty College Park, MD	October 2018
Aspen Center for Physics Program: “The Packing of Continua” Aspen, CO	June – July 2017
KITP Program: “Geometry, Elasticity, Fluctuations, and Order in 2D Soft Matter” University of California, Santa Barbara	January 2016

Science and Math Outreach

CREST Science and Computing Research Summer Program University of California, Merced	July 2019
“Dinner with a Scientist” University of California, Merced	March 2019
Instructor, “Crazy 8s” After-School Math Club Cambridgeport School, Cambridge, MA	2016 – 2017
Visiting Scientist, “Einstein in the Classroom” (Cambridge Science Festival) King K-8 School, Dorchester, MA	Spring 2015
Science demonstration leader, “Science at the Sixers” night Wells Fargo Center, Philadelphia, PA	Feb. 2014