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## Curriculum Vitæ

Randall D. Kamien

*Vicki and William Abrams Professor in the Natural Sciences*

Address *Department of Physics and Astronomy  
209 South 33<sup>rd</sup> Street  
University of Pennsylvania  
Philadelphia, PA 19104-6396, USA*

Office: +1.215.898.5940 Fax: +1.215.898.2010  
Email: [kamien@upenn.edu](mailto:kamien@upenn.edu) ORCID: 0000-0003-1598-5626  
URL: <http://www.physics.upenn.edu/~kamien/>

Current Positions 2014– Secondary Appointment, Department of Mathematics  
2006– Vicki and William Abrams Professor in the Natural Sciences  
2003– Professor of Physics and Astronomy

Education 1992 Ph.D., Physics, Harvard University  
1988 M.S., Physics, California Institute of Technology  
1988 B.S., California Institute of Technology

Prior Positions 2023–2025 Editor in Chief, American Physical Society  
2017–2025 Chief Editor (*née* Lead Editor), *Reviews of Modern Physics*  
2006 Edmund J. and Louise W. Kahn Endowed Term Professor  
2001–2005 William Smith Term Professor in the School of Arts & Sciences  
2000–2003 Associate Professor of Physics and Astronomy  
1997–2000 Assistant Professor of Physics and Astronomy  
1995–1997 Postdoctoral Research Associate, Department of Physics and  
Astronomy, University of Pennsylvania, Philadelphia, PA  
1992–1995 Member, School of Natural Sciences, Institute for Advanced  
Study, Princeton, NJ

Awards & Honors 2021 Provost's Award for Distinguished PhD Teaching and Mentoring  
2016 G.W. Gray Medal, British Liquid Crystal Society  
2013 Simons Investigator  
2010 Samsung Mid-Career Award, International Liquid Crystal Society  
2003 Fellow, American Association for the Advancement of Science  
2001 Fellow, American Physical Society (DCMP)  
1999–2001 Fellow, Alfred P. Sloan Foundation  
1998–2002 CAREER Award, National Science Foundation

Visiting Positions	Spring 2023 Kramers Chair of Theoretical Physics, Utrecht University, NL
	Spring 2019 Edwards Fellow, Edwards Centre for Soft Matter, Cambridge, UK
	July 2017 Simons Visiting Professor, Mathematisches Forschungsinstitut Oberwolfach, Germany
	2009–2010 Member, School of Mathematics, Institute for Advanced Study
	May 1998 Professeur Invité, Université Paris XI, Orsay, France
	Fall 1995 Visiting Scientist, Center for Studies in Physics and Biology, The Rockefeller University, New York, NY

### Peer-Reviewed Publications

1. R.D. Kamien, H.D. Politzer and M.B. Wise, “Universality of Random-Matrix Predictions for the Statistics of Energy Levels”, *Phys. Rev. Lett.* **60** (1988) 1995–1998.
2. L. Balents, R.D. Kamien, P. Le Doussal and E. Zaslav, “On the Isotropic-Nematic Transition for Polymers in Liquid Crystals”, *J. Phys. I France* **2** (1992) 263–272.
3. R.D. Kamien, P. Le Doussal and D.R. Nelson, “Theory of Directed Polymers”, *Phys. Rev. A* **45** (1992) 8727–8750. [[cond-mat/9204007](#)]
4. R.D. Kamien and D.R. Nelson, “Directed Polymer Melts and Quantum Critical Phenomena”, *J. Stat. Phys.* **71** (1993) 23–50. [[cond-mat/9206006](#)]
5. R.D. Kamien, “Flory Exponents from a Self-Consistent Renormalization Group”, *J. Phys. I France* **3** (1993) 1663–1670. [[cond-mat/9304004](#)]
6. R.D. Kamien, P. Le Doussal and D.R. Nelson, “Rotational Invariance and the Theory of Directed Polymer Nematics”, *Phys. Rev. E* **48** (1993) 4116–4117. [[cond-mat/9306021](#)]
7. R.D. Kamien and T.C. Lubensky, “Twisted Line Liquids”, *J. Phys. I France* **3** (1993) 2131–2138. [[cond-mat/9306043](#)]
8. R.D. Kamien and D.R. Nelson, “Iterated Moiré Maps and Braiding of Chiral Polymer Crystals”, *Phys. Rev. Lett.* **74** (1995) 2499–2502. [[cond-mat/9411039](#)]
9. R.D. Kamien and J. Toner, “Anomalous Elasticity of Polymer Cholesterics”, *Phys. Rev. Lett.* **74** (1995) 3181–3184. [[cond-mat/9408041](#)]
10. R.D. Kamien and D.R. Nelson, “Defects in Chiral Columnar Phases: Tilt Grain Boundaries and Iterated Moiré Maps”, *Phys. Rev. E* **53** (1996) 650–666. [[cond-mat/9507080](#)]
11. R.D. Kamien, “Liquids with Chiral Bond Order”, *J. Phys. II France* **6** (1996) 461–475. [[cond-mat/9507023](#)]
12. R.D. Kamien and G.S. Grest, “Structure Function of Polymer Nematic Liquid Crystals: A Monte Carlo Simulation”, *Phys. Rev. E* **55** (1997) 1197–1200. [[cond-mat/9512157](#)]
13. R.D. Kamien and T.C. Lubensky, “Chiral Lyotropic Liquid Crystals: TGB Phases and Helicoidal Structures”, *J. Phys. II France* **7** (1997) 157–163. [[cond-mat/9605129](#)]
14. A.B. Harris, R.D. Kamien and T.C. Lubensky, “On the Microscopic Origin of Cholesteric Pitch”, *Phys. Rev. Lett.* **78** (1997) 1476–1479; 2867 *erratum*. [[cond-mat/9607084](#)]
15. R.D. Kamien, T.C. Lubensky, P. Nelson and C.S. O’Hern, “Direct Determination of DNA Twist-Stretch Coupling”, *Europhys. Lett.* **38** (1997) 237–242. [[cond-mat/9611224](#)]
16. R.D. Kamien, “Smectic Order in Double-Twist Cylinders”, *J. Phys. II France* **7** (1997) 743–750. [[cond-mat/9611021](#)]

17. R.D. Kamien and T.R. Powers, “Determining the Anchoring Strength of a Capillary Using Topological Defects”, *Liq. Cryst.* **23** (1997) 213–216. [[cond-mat/9612169](#)]
18. J.D. Moroz and R.D. Kamien, “Self-Avoiding Walks with Writhe”, *Nucl. Phys. B* **506** (1997) 695–710. [[cond-mat/9705066](#)]
19. R.D. Kamien, “Local Writhing Dynamics”, *Eur. Phys. J. B* **1** (1998) 1–4. [[cond-mat/9703137](#)]
20. C.S. O’Hern, R.D. Kamien, T.C. Lubensky and P. Nelson, “Elasticity Theory of a Twisted Stack of Plates”, *Eur. Phys. J. B* **1** (1998) 95–102. [[cond-mat/9707040](#)]
21. J.E. Martin, J. Odinek, T.C. Halsey and R.D. Kamien, “Structure and Dynamics of Electrorheological Fluids”, *Phys. Rev. E* **57** (1998) 756–775.
22. R.D. Kamien, “Force-Free Configurations of Vortices in High-Temperature Superconductors near the Melting Transition”, *Phys. Rev. B* **58** (1998) 8218–8221. [[cond-mat/9804287](#)]
23. R.D. Kamien and T.C. Lubensky, “Minimal Surfaces, Screw Dislocations, and Twist Grain Boundaries”, *Phys. Rev. Lett.* **82** (1999) 2892–2895. [[cond-mat/9808306](#)]
24. M. Triantafillou and R.D. Kamien, “Polymer Shape Anisotropy and The Depletion Interaction”, *Phys. Rev. E* **59** (1999) 5621–5624. [[cond-mat/9810234](#)]
25. A.B. Harris, R.D. Kamien and T.C. Lubensky, “Molecular Chirality and Chiral Parameters”, *Rev. Mod. Phys.* **71** (1999) 1745–1757. [[cond-mat/9901174](#)]
26. R.D. Kamien, “Poisson Bracket Formulation of Nematic Polymer Dynamics”, *Phys. Rev. E* **61** (2000) 2888–2894. [[cond-mat/9906339](#)]
27. M.S. Spector, S.K. Prasad, B.T. Weslowski, R.D. Kamien, J.V. Selinger, B.R. Ratna and R. Shashidar, “Chiral Twisting of a Smectic-A Liquid Crystal”, *Phys. Rev. E* **61** (2000) 3977–3983. [[cond-mat/0001202](#)]
28. R.D. Kamien and Alex J. Levine, “Boundary Effects in Chiral Polymer Hexatics”, *Phys. Rev. Lett.* **84** (2000) 3109–3112. [[cond-mat/9904010](#)]
29. P. Zihlerl and R.D. Kamien, “Soap Froths and Crystal Structures”, *Phys. Rev. Lett.* **85** (2000) 3528–3531. [[cond-mat/0007256](#)]
30. R.D. Kamien, “Decomposition of the Height Function of Scherk’s First Surface”, *Appl. Math. Lett.* **14** (2001) 797–800. [[math-ph/0008039](#)]
31. R.D. Kamien and J.V. Selinger, “Order and Frustration in Chiral Liquid Crystals”, *J. Phys. Cond. Mat.* **13** (2001) R1–R22. [[cond-mat/0009094](#)]
32. I. Bluestein, R.D. Kamien, and T.C. Lubensky, “Dislocation Geometry in the  $TGB_A$  Phase: Linear Theory”, *Phys. Rev. E* **63** (2001) 061702:11 pages. [[cond-mat/0101270](#)]
33. P. Zihlerl and R.D. Kamien, “Maximizing Entropy by Minimizing Area: Towards a New Principle of Self-Organization”, *J. Phys. Chem. B* **105** (2001) 10147–10158 *Feature Article*. [[cond-mat/0103171](#)]
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36. R.D. Kamien, “The Geometry of Soft Materials: A Primer”, *Rev. Mod. Phys.* **74** (2002) 953–971. [[cond-mat/0203127](#)]
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  45. Y. Snir and R.D. Kamien, “Entropically Driven Helix Formation”, *Science* **307** (2005) 1067. [[cond-mat/0502520](#)]
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  47. C.D. Santangelo and R.D. Kamien, “Curvature and Topology in Smectic-A Liquid Crystals”, *Proc. R. Soc. A* **461** (2005) 2911–2921.
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  53. C.D. Santangelo and R.D. Kamien, “Triply Periodic Smectic Liquid Crystals”, *Phys. Rev. E* **75** (2007) 011702: 12 pages. [[cond-mat/0609596](#)]
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  58. C.D. Modes and R.D. Kamien, “Hard Discs on the Hyperbolic Plane”, *Phys. Rev. Lett.* **99** (2007) 235701: 4 pages. [[arxiv:0708.4334](#)]
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  64. V. Vitelli, B. Jain, and R.D. Kamien, “Topological Defects in Gravitational Lensing Shear Fields”, *JCAP* **09** (2009) 034. [[arxiv:0906.0124](#)]
  65. R.D. Kamien, D.R. Nelson, C.D. Santangelo, and V. Vitelli, “Extrinsic Curvature, Geometric Optics, and Lamellar Order on Curved Substrates”, *Phys. Rev. E* **80** (2009) 051703: 12 pages. *Chosen to appear in the 30 November 2009 Virtual Journal of Nanoscale Science and Technology* [[arxiv:0908.4358](#)]
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### Conference Proceedings, Commentaries, Reviews, and Book Chapters

1. D.R. Nelson and R.D. Kamien, “Polymer Braids and Iterated Moiré Maps”, in *The Legacy of Norbert Wiener; A Special Symposium in Honor of the 100<sup>th</sup> Anniversary of Norbert Wiener’s Birth*, edited by D. Jerison, I.M. Singer and D.W. Stroock (American Mathematical Society, Providence, RI, 1997). [[cond-mat/9412119](https://arxiv.org/abs/cond-mat/9412119)]
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3. R.D. Kamien, “Weak Chirality in Ordered DNA Phases”, in *Proceedings of “The 16<sup>th</sup> International Liquid Crystal Conference”*, Kent, OH, USA, (Mol. Cryst. Liq. Cryst. **299** (1997) 265–275). [[cond-mat/9606028](https://arxiv.org/abs/cond-mat/9606028)]
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5. T.C. Lubensky, A.B. Harris, R.D. Kamien and G. Yan, “Chirality in Liquid Crystals: From Microscopic Origins to Macroscopic Structure”, in *Proceedings of “The 6<sup>th</sup> In-*

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6. R.D. Kamien, “Chiral Mesophases of DNA”, in *Proceedings of “The 35<sup>th</sup> Annual Technical Meeting of the Society of Engineering Science*”, Pullman, WA, (*International Journal of Engineering Science* **38** (2000) 1025–1032). [[cond-mat/9812128](#)]
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  9. R.D. Kamien, “Review of *Physical Properties of Liquid Crystals: Nematics*, by Dunmur and Luckhurst”, *Liq. Cryst. Today* **11**:1 (2002).
  10. R.D. Kamien, “Soap Froths and Crystal Structures”, *Proceedings of “TH-2002: International Conference on Theoretical Physics*”, Paris, France, (*Ann. Henri Poincaré*, **4**, Suppl. 2 (2003) S679–S681).
  11. R.D. Kamien, “Topology from the Bottom Up”, *Science* **299** (2003) 1671–1673. [[cond-mat/0303353](#)]
  12. D.E. Discher and R.D. Kamien, “Towards Precision Micelles”, *Nature* **430** (2004) 519–520.
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  15. R.D. Kamien, “Better Geometry through Chemistry”, *Science* **315** (2007) 1083–1084.
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  22. R.D. Kamien, “Reviews of Modern Physics at 90”, *Physics Today* **72** (2019) 32.
  23. P.M. Goldbart and R.D. Kamien, “Tying it all together”, *Physics Today* **72** (2019) 46–47.

### Patents

1. “Patterning Structures Using Deformable Substrates”, S. Yang, Y. Zhang, R.D. Kamien, J.M. Kikkawa, E. Mastumoto, and D. Chandra. US Patent Number 8,577,341 B2 (15 October 2013).
2. “Mapping of Local Director Field of Nematic Liquid Crystals at the Nanoscale”, S. Yang, Y. Xia, F. Serra, R.D. Kamien, and K.S. Stebe. US Patent Number 11,680,207

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3. "The Kirigami Modification Of Biomedical Tissue Reinforcing Meshes And Matrices For Expansile Two-To-Three Dimensional Conversion", S. Yang, S.K. Kanchwala, R.D. Kamien, E. Jablonka, J.C. Jolly, H. Cho, and M. Tanis. US Patent Number 11,642,215 B2 (9 May 2023).
4. "Topology Optimization for Modeling and Prediction of Complex Fabric Structures and Properties", G. Dion, R.D. Kamien, M. Tanis, A. Stoltzfus, C. Knittel, and T. Castle. US Patent Number 11,761,128 B2 (19 September 2023).
5. "Modular Tool for Design of Self-Folding Knit Fabrics", G.E. Dion, C.E. Amanatides, and R.D. Kamien. US Patent Number 11,859,231 B2 (2 January 2024).

### Invited Presentations

1. "Grain Boundaries and Braiding of Chiral Polymer Crystals", Liquid Crystal Gordon Research Conference, June 1995.
2. "Twisting and Braiding of Chiral Polymer Crystals", Materials Research Society Meeting, Complex Fluids Symposium, Fall 1995.
3. "The Origin of Cholesteric Pitch", Symposium on Liquid Crystals, Colloids and Emulsions, Laboratory for Research on the Structure of Matter, University of Pennsylvania, May 1996.
4. "Weak Chirality in Ordered DNA Phases", 16<sup>th</sup> International Liquid Crystal Conference, June 1996.
5. "Chiral Mesophases of DNA", 1997 March Meeting of the American Physical Society, Session on Physical Properties of DNA, March 1997.
6. "Chiral Mesophases of DNA", National Institutes of Health Workshop on Interaction between DNA Double Helices: Chirality and Structure of DNA Liquid-Crystals, June 1997.
7. "Chiral Interactions and Structures", Materials Research Society Meeting, Complex Fluids and Biomaterials Symposium, Fall 1997.
8. "The Mystery of the Missing Chirality", Aspen Center for Physics Winter Workshop on Defects in Soft Condensed Matter, January 1998.
9. "Chiral and Polymer Liquid Crystals", International Centre for Theoretical Physics Spring College on The Statistical Mechanics and Dynamics of Soft Condensed Matter, May 1998 (*4 Lectures*).
10. "Chiral Mesophases of DNA", 35<sup>th</sup> Annual Technical Meeting of the Society of Engineering Science, Eringen Medal Symposium, September 1998.
11. "Scherk's First Surface, Twist Grain Boundaries and All That", 1999 March Meeting of the American Physical Society, Session on Defects in Polymers and Soft Materials, March 1999.
12. "Minimal Surfaces, Twist Grain Boundaries and All That", Liquid Crystal Gordon Research Conference, June 1999.
13. "The Microscopic Origin of Macroscopic Chirality", Complex Materials Conference in Honor of Philip A. Pincus, August 1999.
14. "Chiral Interactions and Structures", VIII<sup>th</sup> International Topical Meeting on Optics of Liquid Crystals, September 1999.
15. "Scherk's First Surface, Twist Grain Boundaries and All That", 3<sup>rd</sup> Society for Industrial and Applied Mathematics (SIAM) Conference on Mathematical Aspects of Materials Science, May 2000.
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- plied Mathematics (SIAM) Conference on Mathematical Aspects of Materials Science, May 2000.
17. “Minimal Surfaces and Topological Defects”, Nonlinear Analysis: 2000 →, Courant Institute, New York University, May 2000.
  18. “Macroscopic Chirality and Biaxial Correlations”, Fall 2000 National Meeting of the American Chemical Society, Liquid Dynamics: Into the New Millennium, August 2000.
  19. “Soap Froths and Crystal Structures”, 21<sup>st</sup> CNLS Annual Conference, Principles of Soft Matter, May 2001.
  20. “Bees Do It”, 6<sup>th</sup> Society for Industrial and Applied Mathematics (SIAM) Conference on Applications of Dynamical Systems, May 2001.
  21. “Bees Do It”, 7<sup>th</sup> New England Quarterly Workshop on Complex Fluids, June 2001.
  22. “Turn of the Screws”, 8<sup>th</sup> International Conference on Ferroelectric Liquid Crystals, August 2001.
  23. “The Geometry of Soft Materials”, 2002 Boulder School for Condensed Matter and Materials Physics: Physics of Soft Condensed Matter, July 2002 (*4 lectures*).
  24. “Minimal Surfaces and Crystal Structure”, Society for Industrial and Applied Mathematics (SIAM) 50<sup>th</sup> Anniversary and 2002 Annual Meeting, July 2002.
  25. “Soap Froths and Crystal Structures”, TH-2002: International Conference on Theoretical Physics, July 2002.
  26. “Packing Fuzzy Spheres”, Soft Matters, Laboratory for Research on the Structure of Matter, University of Pennsylvania, September 2002.
  27. “The Geometry of Defect Phases”, Materials Research Society Meeting, Defect-Mediated Phenomena in Ordered Polymers Symposium, December 2002.
  28. “Hard Spheres, Soap Froths and Self-Assembly”, 26<sup>th</sup> Asilomar Conference on Polymeric Materials, February 2003.
  29. “Hard Spheres, Soap Froths and Self-Assembly”, Advanced Computation Inspired by Biological Processes Conference (NSF), April 2003.
  30. “Geometric Approach to Self-Assembly”, Fall 2003 National Meeting of the American Chemical Society, September 2003.
  31. “Geometric Frustration in Soft Materials”, Modeling of Soft Matter Workshop, Institute for Mathematics and Its Applications (IMA), September 2004.
  32. “What’s Kelvin’s Problem?”, National Science Foundation Workshop on Opportunities in Materials Theory 2004, October 2004.
  33. “Smectics with Three Dimensional Periodicity”, 2005 March Meeting of the American Physical Society, Session on Novel Ordering In Smectics and other Layered Systems, March 2005.
  34. “What’s Kelvin’s Problem?”, Frontiers in Soft Condensed Matter Workshop, May 2005.
  35. “The Geometry and Topology of Smectics”, 21<sup>st</sup> International Liquid Crystal Conference, July 2006 (*Plenary Lecture*).
  36. “Geometry and Topology in Smectics”, Princeton Center for Complex Materials (PCCM) 2006 Summer School, August 2006 (*2 lectures*).
  37. “Materials Geometry”, International Seminar on Applied Geometry in Andalusia, September 2006 (*4 lectures*).
  38. “Spherical Phases of Diblocks”, 96<sup>th</sup> Statistical Mechanics Conference, Rutgers University, December 2006.

39. “Self-Assembly of Soft Spheres”, 81<sup>st</sup> ACS Colloid and Surface Science Symposium, June 2007 (*Keynote Lecture*).
40. “Defect Effects in Smectics”, Society for Industrial and Applied Mathematics (SIAM) Conference on Mathematical Aspects of Materials Science, May 2008.
41. “The Geometry of Topological Defects”, Geometrical Singularities and Singular Geometries Workshop, Institute for Mathematics and Its Applications (IMA), July 2008.
42. “Geometry of Topological Defects in Soft Matter”, Workshop on Topology and Physics, Drexel University, September 2008.
43. “What’s Kelvin’s Problem”, Colloquium Ehrenfestii, Leiden University, April 2009.
44. “Geometry and Topology of Smectics”, Hougen Symposium on Frontiers of Liquid Crystals, University of Wisconsin, April 2009.
45. “Smectic Topology, Topography, and Tomography”, Joint IAS-Rutgers workshop on Topology: Identifying Order in Complex Systems, Rutgers University, May 2009.
46. “Geometry of Soft Materials”, Soft Solids and Complex Fluids Summer School, University of Massachusetts, Amherst, June 2009.
47. “Smectics!”, Liquid Crystal Gordon Conference, June 2009.
48. “Films and Layers: Nematics and Smectics”, Variational Problems for Curves and Surfaces and Related Topics, Nara Women’s University, Japan, June 2009.
49. “Smectic Topology, Topography, and Tomography”, Variational Problems for Curves and Surfaces and Related Topics, Nara Women’s University, Japan, June 2009.
50. “New Chiral Geometries”, Chirality, July 2009.
51. “Focal Conics”, Complex energy landscapes and long time dynamics, Princeton Center for Theoretical Sciences, Princeton, November 2009.
52. “Smectics!”, Annual Meeting of the International Institute for Complex Adaptive Matter, University of California, Davis, January 2010.
53. “Smectic Topology”, 23<sup>rd</sup> International Liquid Crystal Conference, July 2010.
54. “Hidden Symmetry in Focal Conics”, Confined Liquid Crystals: Landmarks and Perspectives, Ljubljana, Slovenia, July 2010.
55. “Topological Defects in Liquid Crystals”, 2<sup>nd</sup> School of the Italian Liquid Crystal Society, Erice, Italy, July 2011.
56. “Topology and Geometry of Materials”, Topological Methods in Complex Systems, Institute for Mathematics and its Applications (IMA) Participating Institutions Graduate Students Summer Program, Philadelphia, July-August 2011.
57. “Smectics!”, 8<sup>th</sup> Liquid Matter Conference, Vienna, Austria, September 2011.
58. “Layered Liquid Crystals”, Geometry of Interfaces, Primosten, Croatia, October 2011.
59. “Constructing Smectics”, Frontiers in Soft Matter, University of Colorado, Boulder, May 2012.
60. “I Got Stripes”, Polymer Gordon Conference, July 2012.
61. “What do Burgers and Lorentz Have to Say About Smectics?”, Modern Perspectives on Thin Sheets: Geometry, Elasticity, and Statistical Physics, Lorentz Center, Leiden, The Netherlands, September 2012.
62. “Packing Sheets in Curved Space”, 2012 MRS Meeting: Colloidal Crystals, Quasicrystals, Assemblies, Jammings, and Packings, Boston, November 2012.
63. “Conformal Smectics”, 2012 MRS Meeting: Geometry and Topology of Biomolecular and Functional Nanomaterials, Boston, November 2012.

64. “Topological Defects and the Ground State Manifold”, Symmetry, Bifurcation, and Order Parameters, Isaac Newton Institute, January 2013.
65. “Topological Defects and the Ground State Manifold”, SIAM Conference on Mathematical Aspects of Materials Science, June 2013.
66. “Pure and Applied Focal Conics”, Liquid Crystal Defects and Blue Phase Structure; Elastomers and Related Systems, Isaac Newton Institute, June 2013.
67. “Homotopy Theory and Topological Defects”, I-CAMP Summer School on Liquid Crystals, Cambridge, UK, June 2013.
68. “Ring Around the Colloid”, Evolution of Colloidal Matter, NYU, June 2013.
69. “Lectures on Topological Defects”, (4 lectures), Mathematical Approaches to Complex Fluids - a Two Week Summer School, Isaac Newton Institute, July 2013.
70. “O Topology”, Waterloo Soft Matter Theory Conference, Perimeter Institute, December 2013.
71. “Pure and Applied and Pure Smectics”, British Liquid Crystal Society Meeting, Durham, UK, April 2014.
72. “Pure and Applied and Pure Smectics”, Mid-Atlantic Soft Matter Meeting, Johns Hopkins, August 2014.
73. “Making the Cut: *Kirigami* Topology”, This Week’s Discoveries Colloquium, Leiden University, October 2014.
74. “Topology of Broken Translation Invariance”, ICERM Workshop on Small Clusters, Polymer Vesicles and Unusual Minima, Providence, RI, March 2015.
75. “Liquid Crystals”, Public Lecture: Is the Abstract Mathematics of Topology Applicable to the Real World? Institute for Advanced Study, Princeton, NJ, May 2015.
76. “Cholesteric Twist”, Chirality at the Nanoscale, Kent, OH, June 2015.
77. “What Becomes a Cholesteric”, Liquid Crystal Gordon Conference, Biddeford, ME, June 2015.
78. “Liquid-Crystal/Colloid Dispersions”, (4 hours), Summer School on Soft Matter Self-Assembly, International School of Physics “Enrico Fermi”, Varenna, IT, June 2015.
79. “Are Smectics Cholesterics or What?”, Soft Matter Gordon Conference, New London, NH, August 2015.
80. “Cholesteric Geometry and Topology”, International Conference on Geometry and Physics of Spatial Random Systems, Bad Herrenalb, Germany, September 2015.
81. “Cholesteric Geometry and Topology”, 2015 MRS Meeting: Topology in Materials Science: Biological and Functional Nanomaterials, Metrology and Modeling, Boston, November 2015.
82. “Kirigami Topology”, 2015 MRS Meeting: Shape Programmable Materials, Boston, November 2015.
83. “Cholesteric Geometry and Topology”, NYU-Oxford Workshop on Mathematical Models of Defects and Patterns, New York, NY, January 2016.
84. “Cutting, Folding, and Cutting and Folding”, 2016 March Meeting of the American Physical Society, Session on Extreme Mechanics, March 2016.
85. “Linking in Liquid Crystals”, Gray Medal Lecture, Joint Meeting of the British Liquid Crystal Society and the German Liquid Crystal Society (BLCS/DFKG 2016), Edinburgh, March 2016.
86. “The Mathematics of Paper”, 2016 CLEC Lecture, Georgia Southern University, March 2016.
87. “Liquid Crystals and their (Algebraic) Topology”, Applied Algebra Days 3, Madison,

- WI, April 2016.
88. “The Topology of Defects in Smectics”, SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, May 2016.
  89. “Elasticity, Topology, and Geometry: FC Frank’s Legacy on the Field of Liquid Crystals”, Sir Charles Frank Lecture, Bristol, UK, May 2016.
  90. “Linking in Smectics”, 26<sup>th</sup> International Liquid Crystal Conference, Kent, OH, July 2016.
  91. “Putting Patterns on Spheres”, 252<sup>nd</sup> American Chemical Society National Meeting, Session on A Materials Genome Approach to Materials Structure and Function, August 2016.
  92. “Linking in Smectics”, Knots and Links in Biological and Soft Matter Systems, ICTP Trieste, September 2016.
  93. “Cholesteric Geometry”, 116<sup>th</sup> Statistical Mechanics Conference, Rutgers University, December 2016.
  94. “The Mathematics of Paper”, 2017 Maggie & Nick DeWolf Physics Lecture, Aspen, CO, January 2017.
  95. “Scissors Beats Paper”, Gordon Research Conference on Complex Active & Adaptive Materials Systems, January 2017.
  96. “Progress in Focal Conic Domains”, Geometry and Interactions in Self-Assembled Biological Systems, Orsay, France, March 2017.
  97. “Liquid Crystals: Not Just Another Pretty Phase”, Advancing and Accelerating Materials Innovation through the Synergistic Interaction among Computation, Experiment, and Theory: Opening New Frontiers, National Science Foundation, May 2017.
  98. “The Mathematics of Paper”, Personalized Intelligent Living: Human, Robot and Nature, PENN Wharton China Center, June 2017.
  99. “The Topological Character of Smectic Liquid Crystals”, Mathematisches Forschungsinstitut Oberwolfach, July 2017.
  100. “Progress in Focal Conic Domains”, Geometrically Frustrated Self-assembly, Princeton Center for Theoretical Science, November 2017.
  101. “Singularities in Three-Dimensional Smectics”, Geometric and Topological Methods in Liquid Crystals, De Morgan House, London, April 2018.
  102. “Packing Liquid Crystal Domains”, ICERM Workshop on Computation and Optimization of Energy, Packing, and Covering, Providence, RI, April 2018.
  103. “The Topological Character of Smectics”, Soft Matter Forefronts, Georgia Tech, April 2018.
  104. “Knitogami”, Geometry of Soft Matter, International Institute of Physics, Natal, Brazil, May 2018.
  105. “The Topological Character of Smectics”, 33<sup>rd</sup> Summer Conference on Topology and its Applications, Bowling Green, KY, July 2018.
  106. “The Mathematics of Paper”, 2018 Northeast Ohio REU Symposium, Kent, OH, August 2018.
  107. “Knitogami”, Optimal Design of Complex Materials, Isaac Newton Institute, January 2019.
  108. “Packing Liquid Crystal Domains”, Optimal Design of Soft Matter, Isaac Newton Institute, May 2019.
  109. “The Softest Crystals”, HKUST Jockey Club Institute for Advanced Study Distinguished Lecture, September 2019.



110. “A New Classification of Topological Defects”, 122<sup>nd</sup> Statistical Mechanics Conference, Rutgers University, December 2019.
111. “Packing Focal Conic Domains”, Soft Matter at Interfaces, Ringberg Castle, Germany, February 2020.
112. “Keeping it Together”, EMI/PMC 2021, Columbia University, NY, (Virtual) May 2021.
113. “Disclinations and Dislocations in Smectics and Crystals”, SIAM Conference on Mathematical Aspects of Materials Science, Bilbao, Spain (Virtual), May 2021.
114. “Scaffolds for Knitting”, The Geometry & Topology Behind Fabrics at Multiple Scales, Tohoku University, Japan (Virtual), May 2021.
115. “The Softest Crystals”, International Webinar on Physics, Pabna University of Science and Technology, Bangladesh (Virtual), June 2021.
116. “The Topological Origin of the Peierls-Nabarro Barrier”, Physics@Veldhoven, The Netherlands (Virtual), January 2022.
117. “Geometric Scaffolds for Knitting”, EMI 2022, Baltimore, MD, May-June 2022.
118. “Topological Linking in Liquid Crystals”, Online Interdisciplinary Workshop: Visualization and Ideal Embeddings of Entangled Structures (Virtual), July 2022.
119. “Why Topology Needs Liquid Crystals”, 28<sup>th</sup> International Liquid Crystal Conference, Lisbon, Portugal, July 2022.
120. “From Disinclinations to Disclinations: A Modern Bristol Seminar”, Fry Conference Series: Applied Mathematical Challenges and Recent Advances in the Micro-Mechanics of Matter, Bristol, UK, September 2022.
121. “Topological Lessons from Liquid Crystals”, Topological Methods in Mathematical Physics, Erice, Italy, September 2022.
122. “Knitting Scaffolds and Other Tricks with Surfaces”, The Interdisciplinary World of Tangling, Potsdam, Germany, September 2022.
123. “Tutorial: Introduction to Smectics”, Defects and Distortions of Layered Complex Fluids, Banff International Research Station, Canada, October 2022.
124. “Dislocations and disclinations in two and three dimensions.”, Defects and Distortions of Layered Complex Fluids, Banff International Research Station, Canada, October 2022.
125. “How to Classify Dislocations”, Workshop: Defects and self-organization, Institut des Nano-Sciences de Paris, France, February 2023.
126. “Non-Isometric Origami”, Symposium on Non-Equilibrium Dynamics of Complex Systems, Virginia Tech, September 2023.
127. “Ground States and Their Topology”, LII Winter Meeting on Statistical Mechanics, Puebla, Mexico (Virtual), January 2024.
128. “The Topological Origin of the Peierls-Nabarro Barrier”, 2024 SIAM Conference on Materials Science, Pittsburgh, May 2024.
129. “A Bouquet for Apollonius”, Mathematical Analysis of Soft Matter, Banff International Research Station, Canada, July 2024.
130. “Minimal Surfaces, What are they good for?”, 16<sup>th</sup> World Congress on Computational Mechanics, Vancouver, CA, July 2024.
131. “A New Classification of Dislocations and Disclinations”, SENG Distinguished Workshop Series at Hong Kong University of Science and Technology (Virtual), August 2024.

132. “Minimal Surfaces, Liquid Crystals, and All That”, Meeting on Zero Mean Curvature Surfaces, Tata Institute for Fundamental Research, Bengaluru, India (Virtual), September 2024.
133. “A Bouquet for Maurice: Focal Conics in Sessile Droplets”, The science of defects: a tribute to physicist Maurice Kléman, Paris, France, October 2024.
134. “Geometry of Materials”, Gyroid is Everywhere: Alan Schoen 100<sup>th</sup> Birth Anniversary, Kindai University, Osaka, Japan, November 2024.
135. “A Bouquet for Apollonius: Cholesteric Droplets and Their Conic Sections”, SoftComp (Virtual), February 2025.
136. “You Have to Grow Wefts to Fold Them”, 128<sup>th</sup> Statistical Mechanics Conference, Rutgers University, May 2025.
137. “The Geometry and Topology of Soft Materials”, 8<sup>th</sup> Warsaw School of Statistical Physics, Chęciny, Poland, June 2025.
138. “You Have to Grow Wefts to Fold Them”, Recent challenges in the mathematical design of new materials, Isaac Newton Institute, August 2025.

### Recent Colloquia

*Syracuse University (March 2025), Drexel University (April 2023), Rice University (April 2023), Utrecht University (February 2023), MPI Dresden (September 2022), Simons Center for Geometry and Physics (May 2022), University of Pennsylvania (February 2022), University of California, San Diego (V, October 2020), Utrecht University (February 2020), Duke University (January 2020).*

### Recent Seminars

*Texas A&M (March 2025), Hiroshima University (V, February 2025), Ecole Supérieure de Physique et de Chimie Industrielle (October 2024), Harvard University (November 2023), Utrecht University (March 2023), AMOLF (February 2023), Weizmann Institute (October 2022), Banff International Research Station (October 2022), GEOMPACK Seminar (V, April 2022), GEOTOP Seminar (V, March 2022), Israeli NSCS (V, January 2022) Kent State University (V, September 2021), Harvard University (V, August 2020), University of Chicago (V, July 2020).*

### Current Support

1. Charles E. Kaufman Foundation, *Non-Isometric Origami*, 2023–2025. KA2023-136486
2. Advanced Functional Fabrics of America (AFFOA. PI: Geneviève Dion, Drexel University), *Wearable Sensors for Multi Domain Platoon Operations (MDO) Phase 2, Soft ExoSkin Interface and Scale-Up*, 2022–2024. HQ00342190016
3. Simons Investigator Grant, 2013–2025. 291825

### Past Support

- University of Pennsylvania MRSEC Grant, National Science Foundation, 2017–2023 (Co-Leader of IRG3). DMR-1720530
- Advanced Functional Fabrics of America (AFFOA. PI: Geneviève Dion, Drexel University), *Technical Textiles for Wearable Sensors*, 2020–2022. W15QKN-16-3-0001
- University of Pennsylvania Research Foundation, *Metachemistry: Molding and Morphing with Magnets* (with C.O. Osuji), 2020–2021.
- National Science Foundation Grant, *EFRI-ODISSEI: Cutting and Pasting - Kirigami in Architecture, Technology, and Science*, 2013–2020. EFRI-1331583

- National Science Foundation Grant, *Topological and Geometrical Problems in Soft Matter*, 2013–2020. *DMR-1262047*
- University of Pennsylvania MRSEC Grant, National Science Foundation, 2011–2017 (Co-Leader of IRG1). *DMR-1120901*
- National Academies Keck Futures Initiative, *Diagnostic Design: Knitted passive probes* (Co-PI; PI Genevieve Dion, Drexel), 2016–2017.
- Charles E. Kaufman Foundation, *Living Photonic Devices: Self-assembly from Proteins as Patchy Colloids* (Co-PI; PI Alison Sweeney), 2014–2017. *KA2014-73924*
- University of Pennsylvania Research Foundation, *Topological Physics: From Elementary Particles to Electrons to Elasticity* (with C.L. Kane and M. Trodden), 2013–2014.
- National Science Foundation Grant (Co-PI; PI Shu Yang), *From a Single Micropatterned Elastic Membrane to a Library of Complex Patterns of Nanostructures: an Efficient Nanomanufacturing Route via Harnessing of Elastic Instability*, 2009–2013. *CMMI-0900468*
- National Science Foundation Grant, *Bending, Twisting and Packing: Geometry and Soft Materials*, 2006–2013. *DMR-0547230*
- University of Pennsylvania MRSEC Grant, National Science Foundation, 2005–2011.
- Petroleum Research Fund Type AC Grant, American Chemical Society, *Bending the Rules* 2005–2007.
- University of Pennsylvania Research Foundation, *Materials Geometry: The Use of Modern Geometry in Real Materials*, 2006.
- National Science Foundation Grant, *Cells and Boundaries All Around Us*, 2002–2005. *DMR-0129804*
- Nanoscience Interdisciplinary Research Team (NIRT) Grant, National Science Foundation, *Single Molecule Functional Nanostructures*, (Co-PI: PI Virgil Percec), 2001–2005.
- University of Pennsylvania Research Foundation, *Novel Spherical Phases of Diblock Copolymers*, 2003.
- Petroleum Research Fund Type AC Grant, American Chemical Society, *Soap Froths and the Rational Design of Molecular Crystals*, 2001–2003.
- National Science Foundation International Grant (with CNRS), *Structure of Smectic Blue Phases*, 2000–2003. *INT-9910017*
- Drug Delivery Team, Southeastern Pennsylvania Nanotechnology Institute, 2001–2006.
- University of Pennsylvania Research Foundation, *Soap Froths and the Rational Design of Molecular Crystals*, 2001.
- Fellowship, Alfred P. Sloan Foundation, 1999–2001.
- University of Pennsylvania MRSEC Grant, National Science Foundation, 1998–2001.
- Faculty Early Career Development (CAREER) Award, National Science Foundation, *Chiral Molecules, Structures and Materials*, 1998–2002. *DMR-9732963*
- Research Innovation Award, Research Corporation, *Entanglement Hydrodynamics of Polymer Nematics*, 1998–2000.
- Petroleum Research Fund Type G Grant, American Chemical Society, *Dynamics of Polymer Nematics*, 1998–2000.

#### **Editorships and Editorial Boards**

- Editor in Chief, American Physical Society, 2023–2025
- Chief Editor (*née Lead Editor*), Reviews of Modern Physics, 2017–2025
- Editorial Board, New Journal of Physics, 2016–2017.

- Associate Editor, *Science Advances*, 2014–2017.
- Editorial Board, *Liquid Crystals Reviews*, 2013–2017.
- Editorial Board, *Physics Reports*, 2012–2017.
- Associate Editor, *Reviews of Modern Physics*, 2006–2010.
- Associate Editor, *Physical Review E*, 2000–2003.

### Selected Professional Activities

- Member, APS Mission, Vision, and Values Working Group, 2023.
- Chair, Scientific Academic Advisory Committee Review of Soft Matter and Biophysics, Weizmann Institute, 2022.
- Honors & Awards Committee, International Liquid Crystal Society, 2016–
- Organizing Committee, 2016 International Liquid Crystal Conference, Kent, OH.
- Chair, APS Group on Soft Matter (GSOFT), 2014–2016 (Past Chair 2016–2017).
- Corresponding Member, Journal Club for Condensed Matter Physics, 2005–
- Member, Board of Directors, Boulder School for Condensed Matter and Materials Physics, 2004–2020.
- Soft Matter Organizing Committee, APS, 2014–2015.
- Session Leader on Multi/Inter-Disciplinary Courses, 2013 APS Graduate Education in Physics Conference.
- Fellowship Committee, Division of Polymer Physics, APS, 2010–2011.
- Member, KITP Advisory Board, 2009–2012.
- Scientific Committee, 23<sup>rd</sup> International Liquid Crystal Conference, Kraków, Poland 2010.
- Co-organizer, Journal Club for Condensed Matter Physics, 2009–2011.
- Discussant, *Students Lunch with the Experts*, 2009 and 2005 March Meeting of the American Physical Society.
- Selection Committee for the Lars Onsager Prize of the American Physical Society, 2008–2009.
- Summer Program Committee, Aspen Center for Physics 2006–2009 (Chair 2007 and 2008).
- Chair of Nominating Committee, Division of Condensed Matter Physics (DCMP), American Physical Society, 2006 – 2009.
- General Member, Aspen Center for Physics, 2004–2009.
- Member-at-Large, Executive Committee of the American Physical Society Topical Group on Statistical and Nonlinear Physics (GSNP), March 2001–2004

### Conferences and Schools Organized

- Co-organizer, *Principal of Condensed Matter Physics: A Symposium in Honor of Tom Lubensky*, Philadelphia, PA 4-5 November 2017.
- Co-organizer, *Different is Different: A Celebration of Sue Coppersmith's 60th Birthday*, Aspen, CO 3-4 March 2017.
- Co-organizer, *Topology in Motion*, Institute for Computational and Experimental Research in Mathematics, Providence, RI, 6 September - 9 December 2016.
- Co-organizer, *Foldable, Buildable, and Responsive Materials*, University of Pennsylvania, 22-23 August 2014.
- Chair, 2013 Gordon Research Conference on Liquid Crystals (Vice-Chair 2011).
- Co-organizer, *Knotted Fields*, Kavli Institute for Theoretical Physics, June 2012.



- Co-organizer, *Materials and the Imagination*, Aspen Center for Physics, January 2011.
- Co-organizer, *Geometry and Materials Physics: Making the Connection*, Aspen Center for Physics, June 2004.
- Co-organizer, *2002 Boulder School for Condensed Matter and Materials Physics*, July 2002.
- Co-organizer, *Symposium in Honor of the 65<sup>th</sup> Birthday of A. Brooks Harris*, University of Pennsylvania, 17-18 March 2000.
- Co-organizer, *Ten Years of the TGB Phase: A Workshop*, University of Pennsylvania, 22-24 April 1998.

### Internal Service

#### *Department of Physics and Astronomy*

- Planning Committee, 2000-05 (*ex officio*), 2006-07 (*ex officio*), 2007-08, 2010-16, 2017-18, 2020-21.
- Graduate Committee, 1998-2007, 2010-14, 2017-18.
- Chair of Colloquium Committee, 1999-2000, 2012-14.
- Chair of Bio/Nano Search Committee, 2011-12 (ending in hire of Professor Alison Sweeney).
- Associate Chair for Graduate Affairs and Chair of the Graduate Group in Physics and Astronomy, 2000-05, 2006-07, 2013-14.
- Member of search committees, organizer of seminar series, and chair and member of promotion *ad hoc* committees.
- Awards Committee, 2014-15, 2016-17.

#### *School of Arts and Sciences*

- Chair of Cluster Search Committee in Evolution, 2012-14.
- Personnel Committee, 2003-05.

#### *University of Pennsylvania*

- Provost Teaching Awards Selection Committee Meeting, 2024.
- Deputy Director, Center for Analyzing Evolved Structures as Optimized Products (AESOP), 2015–
- SAS Dean Search Committee, 2012-13.
- Co-Leader, IRG1, Laboratory for Research in the Structure of Matter, 2011-17.
- Middle States Reaccreditation Self Study Team, 2002-03, 2012-13.
- Graduate Council of Faculties, 2005-08.
- Chair, Selection Committee, Penn Prize for Excellence in Teaching by Graduate Students, 2005-08.
- Graduate Education Strategic Planning Committee, 2001.
- Focus Group on Undergraduate Brochure, 1998.

### Courses Taught

- Principles of Physics II (Physics 151/1151)
- Thermodynamics (Physics 401/4401)
- Mathematical Methods in Physics I (Physics 500/5500)
- Mathematical Methods in Physics II (Physics 500/5500)

- Classical Mechanics (Physics 514/5514)
- Introduction to Liquid Crystals (Physics 528/5528)
- Statistical Mechanics (Physics 611/6611)
- Advanced Statistical Mechanics (Physics 612/6612)
- Solid State Theory I (Physics 661/6661)
- Introduction to the Renormalization Group (Physics 696/6696)