

THOMAS MACHON

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Employment

- May 2018 – **Lecturer (Assistant Professor)**
School of Physics, University of Bristol.
- May 2016 – May 2018 **Postdoctoral Fellow**
Department of Physics & Astronomy, University of Pennsylvania.
Supervisor: Randall D. Kamien.
- Oct 2015 – Apr 2016 **Early Career Fellow**
Institute for Advanced Study, University of Warwick.

Education

- 2016 **PhD**, Physics and Complexity Science, University of Warwick, UK
Thesis: *Aspects of Geometry and Topology in Liquid Crystalline Order*
Supervisors: Gareth P. Alexander and Miha Ravnik (University of Ljubljana).
Science Faculty PhD Thesis Prize.
- 2013 **MSc**, Complexity Science, University of Warwick, UK (Distinction)
Theses: *Swarming and phase transitions in Danio Rerio*
and *Knotted Defects in Nematic Liquid Crystals*.
- 2011 **MPhys**, Physics, University of Warwick, UK (1st class)

Awards, Fellowships and Prizes

- 2018 Glenn H. Brown Prize, International Liquid Crystal Society.
- 2016 Science Faculty PhD Thesis Prize, University of Warwick, UK.
- 2015 IAS Early Career Fellowship, University of Warwick, UK.
- 2012 Chancellor's International Scholarship, University of Warwick, UK.
- 2011 Jersey Bursary, States of Jersey, Channel Islands.
- 2011 Styles Prize (ranked 1st in graduating class), Department of Physics, University of Warwick, UK.

Research interests

Topological defects, liquid crystals, topological fluid dynamics, symplectic and Poisson geometry.

Preprints

1. T. Machon, *Poisson structures on sets of Maurer-Cartan elements*, submitted (2022), arXiv:2203.02310 [math.DG]
2. T. Machon, *Some Morse-type inequalities for symplectic manifolds*, submitted (2021), arXiv:2109.13010 [math.SG]
3. Y. Hu and T. Machon, *Stability of highly-twisted Skyrmions from contact topology*, submitted (2021), arXiv:2102.13126 [cond-mat.mes-hall]

Publications

21. B.J. Hocking and T. Machon, *Anti-holomorphic modes in vortex lattices*, SciPost Phys., accepted (2022) arXiv:2201.05200 [physics.flu-dyn]
20. Y. Han, J. Dalby, B.D.M. Carter, A. Majumdar and T. Machon *Uniaxial versus biaxial pathways in one-dimensional cholesteric liquid crystals* Phys. Rev. Res. **4**, L032018 (2022).
19. T. Machon, *A Poisson bracket on the space of Poisson structures*, J. Symplectic Geom., accepted, arXiv:2008.11074 [math.DG]
18. B.J. Hocking, H.S. Ansell, R.D. Kamien and T. Machon, *The topological origin of the Peirels-Nabarro barrier*, Proc. R. Soc. A **478**, 20210725 (2022) featured in cond. mat. journal club by Brian Skinner
17. J. Eun, J. Pollard, S.-J. Kim, T. Machon and J. Jeong, *Layering transitions and metastable structures of cholesteric liquid crystals in cylindrical confinement*, Proc. Natl. Acad. Sci. USA **118** e2102926116. *From the cover.*
16. R.D. Kamien and T. Machon, *Geodesic fibrations for packing diabolic domains*, Proc. Natl. Acad. Sci. USA **117**, 24102 (2020).
15. T. Machon, *The Godbillon-Vey invariant as topological vorticity compression and obstruction to steady flow in ideal fluids*, Proc. R. Soc. A **476**, 20190851 (2020).
14. G.P. Alexander and T. Machon, *A Björling Representation for Jacobi Fields on Minimal Surfaces and Soap Film Instabilities*, Proc. R. Soc. A **476**, 20190903 (2020)
13. T. Machon, *The Godbillon-Vey Invariant as a Restricted Casimir of Three-dimensional Ideal Fluids*, J. Phys. A **53**, 235701 (2020).
12. T. Machon, *The Topology of Knots and Links in Nematics*, Liq. Crys. Today **28**, 58 (2019).
11. T. Machon, H. Aharoni, Y. Hu and R.D. Kamien, *Aspects of Defect Topology in Smectic Liquid Crystals*, Commun. Math. Phys. **372**, 525 (2019).
10. T. Machon and G.P. Alexander, *Woven Nematic Defects, Skyrmions and the Abelian Sandpile Model*, Phys. Rev. Lett. **121**, 237801 (2018).
9. T. Machon, *Equilibrium Description of Absorbing States in the Manna Model*, Phys. Rev. E **98**, 062104 (2018).
8. T. Machon, *Contact Topology and the Structure and Dynamics of Cholesterics*, New J. Phys. **19**, 113030 (2017).
7. H. Aharoni, T. Machon and R.D. Kamien, *Composite Dislocations in Smectic Liquid Crystals*, Phys. Rev. Lett. **118**, 257801 (2017).
6. T. Machon and G.P. Alexander, *Global Defect Topology in Nematic Liquid Crystals*, Proc. R. Soc. A **472**, 20160265 (2016).
5. T. Machon, R.E. Goldstein, A.I. Pesci and G.P. Alexander, *Instabilities and Solitons in Minimal Strips*, Phys. Rev. Lett. **117**, 017801 (2016).
4. T. Machon and G.P. Alexander, *Umbilic Lines in Orientational Order*, Phys. Rev. X **6**, 011033 (2016).
3. D.A. Beller, T. Machon, S. Copar, D.M. Sussman, G.P. Alexander, R.D. Kamien and R.A. Mosna, *Geometry of the Cholesteric Phase*, Phys. Rev. X **4**, 031050 (2014).

2. T. Machon and G.P. Alexander, *Knotted Defects in Nematic Liquid Crystals*, Phys. Rev. Lett. **113**, 027801 (2014).
1. T. Machon and G.P. Alexander, *Knots and non-orientable surfaces in chiral nematics*, Proc. Natl. Acad. Sci. USA **110**, 14174 (2013).
Also featured in Liquid Crystals Today **22**, 72 (2013).

Presentations

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| November 2022 | Applied Mathematics Seminar, <i>Open University</i> . |
| July 2022 | Poisson 2022 <i>ICMAT, Madrid</i> (contributed). |
| June 2022 | Lecture series on topological defects, EUTOPIA Summer School, <i>Université Paris Cité</i> . |
| June 2022 | Gulliver Lab Seminar, <i>ESPCI</i> . |
| March 2022 | Liquid Crystals Seminar, <i>Kent State University</i> . |
| December 2021 | CCB Seminar, <i>Flatiron Institute</i> (postponed due to COVID). |
| November 2021 | Theoretical Physics Seminar, <i>University of Birmingham</i> . |
| October 2021 | Soft Matter Physics Seminar, <i>University of Ljubljana</i> . |
| May 2021 | SIAM MS21, Mathematical Aspects of Materials Science (online). |
| February 2021 | Third EUTOPIA Annual Meeting, (online). |
| September 2020 | Applied Mathematics Seminar, <i>University of Southampton</i> |
| April 2020 | Clore Seminar, <i>Weizmann Institute of Science</i> (postponed due to COVID). |
| March 2020 | Physics Colloquium, <i>School of Physics, University of Bristol</i> . |
| February 2020 | Mathematical Physics Seminar, <i>School of Maths, University of Bristol</i> . |
| February 2020 | Seminar, <i>ICMAT, Madrid</i> . |
| November 2019 | APS DFD Meeting 2019, <i>Seattle</i> (contributed). |
| November 2019 | Applied Topology Workshop: Identifying Order in Complex Systems, <i>University of Delaware</i> . |
| November 2019 | Second EUTOPIA Annual Meeting, <i>San Sebastian</i> . |
| July 2019 | Condensed Matter Physics Seminar, <i>University of Edinburgh</i> . |
| May 2019 | Optimal Design of Soft Matter, <i>Newton Institute</i> (contributed). |
| March 2019 | International Soft Matter Workshop, <i>Fowey, Cornwall</i> . |
| October 2018 | Theory Seminar, <i>School of Physics, University of Bristol</i> . |
| March 2018 | APS March Meeting, <i>Los Angeles</i> (contributed). |
| January 2018 | IMA Workshop on Liquid Crystals, Soft-matter Packing, and Active Systems, <i>University of Minnesota</i> . |
| July 2017 | SIAM Conference on Applied Algebraic Geometry <i>Georgia Institute of Technology</i> . |
| June 2017 | GRC on Liquid Crystals <i>University of New England, Maine</i> (contributed). |
| March 2017 | APS March Meeting <i>New Orleans</i> (contributed). |
| October 2016 | Applied Topology Workshop: Identifying Order in Complex Systems, <i>Department of Physics & Astronomy, University of Pennsylvania</i> . |
| September 2016 | Knots and Links in Biological and Soft Matter Systems <i>ICTP</i> (contributed). |

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| October 2015 | Applied Topology Seminar <i>Department of Physics, University of Bristol.</i> |
| September 2014 | CECAM Workshop, Knots in Soft Condensed Matter <i>University of Vienna.</i> |
| April 2014 | The Physics of Soft and Biological Matter Conference <i>Homerton College, University of Cambridge</i> (contributed). |
| May 2013 | The Mathematics of Liquid Crystals Workshop <i>Newton Institute</i> (contributed). |
| May 2013 | Physics Seminar <i>Department of Physics, University of Ljubljana.</i> |

Support

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| 2019– | EUTOPIA (COST Network, management committee member). |
| 2019 | School of Physics pump priming grant. |
| 2015 | IAS Early Career Fellowship, University of Warwick, UK. |

Teaching

Courses Taught

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| 2021 – 2022 | PHYS20028 <i>Mechanics and Oscillations</i> , University of Bristol (co-taught). |
| 2020 – 2022 | PHYS30008 <i>Analytical Mechanics</i> , University of Bristol. |
| 2018 – 2022 | PHYSM0300 <i>Physic of Phase Transitions</i> , University of Bristol. |
| 2017 | Physics 611 <i>Statistical Mechanics</i> , University of Pennsylvania. |

Other Teaching

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| 2018 – 2022 | Personal tutor, University of Bristol. |
| 2021 | First-year physics workshops, University of Bristol. |
| 2019 – 2020 | Second-year computing laboratory, University of Bristol. |
| 2018 – 2022 | Undergraduate thesis supervision (circa 20 Masters and Bachelors theses). |

Graduate Students

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| 2021–2022 | Dr. Yushi Yang (co-supervised with C.P Royall). |
| 2021– | Mr. Maxmillian Kloucek (co-supervised with C.P Royall and F. Turci). |
| 2020 – 2022 | Mr. Brook Hocking (left for private sector). |
| 2019 – | Mr. Benjamin Carter. |

Service

Reviewer for Nature family journals, National Academy of Sciences, Royal Society and others. COST network Management Committee Member (EUTOPIA). Internal and external Phd thesis committee service. Seminar organisation (University of Bristol). Sustainability committee (Univeristy of Bristol).