

Anton Souslov

Contact information

Department of Physics
University of Bath
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Bath, United Kingdom
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Employment

Assistant Professor (University Lecturer). 2018–
Department of Physics,
University of Bath. Bath, UK.

Postdoctoral Researcher. 2017–2018
James Franck Institute,
University of Chicago. Chicago, IL. USA.

Lorentz Institute, 2015–2017
Leiden University. Leiden, the Netherlands.

School of Physics, 2011–2015
Georgia Institute of Technology. Atlanta, GA. USA.

Graduate Research Assistant. 2006–2011
Department of Physics and Astronomy,
University of Pennsylvania. Philadelphia, PA. USA.
Advisor: Prof. Tom C. Lubensky

Research interests

Theoretical soft condensed matter physics:
Topological phases of soft matter
Mechanical and acoustic metamaterials
Physics of active matter
Polymer physics in the context of biological materials

Education

Ph.D. Physics. University of Pennsylvania. (2011)
M.S. Physics. University of Pennsylvania. (2009)
B.S. Physics, Mathematics. Florida State University. (2006)

**Research
publications**

1. C. Scheibner*, A. Souslov*, D. Banerjee, P. Surowka, W. T. M. Irvine, V. Vitelli.
Odd elasticity *Nature Physics* **16**, 475 (2020).
2. A. Souslov, A. Gromov, V. Vitelli.
Anisotropic odd viscosity via a time-modulated drive *Physical Review E* **101**, 052606 (2020). (*Editors' Suggestion*)
3. Z. Hua, J.R. Jones, M. Thomas, M.C. Arno, A. Souslov, T.R. Wilks, R. K. O'Reilly. **Anisotropic polymer nanoparticles with controlled dimensions from the morphological transformation of isotropic seeds** *Nature Communications* **10**, 5406 (2019).
4. A. Souslov, K. Dasbiswas, M. Fruchart, S. Vaikuntanathan, and V. Vitelli. **Topological waves in fluids with odd viscosity** *Physical Review Letters* **122**, 128001 (2019).
5. M. X. Lim, A. Souslov, V. Vitelli, and H. M. Jaeger.
Cluster formation by acoustic forces and active fluctuations in levitated granular matter *Nature Physics* **15**, 460–464 (2019).
6. R. P. Pedro, J. Paulose, A. Souslov, M. Dresselhaus, and V. Vitelli.
Topological patterning of interacting polymers *Physical Review Letters* **122**, 118001 (2019).
7. G. Baardink, A. Souslov, J. Paulose, and V. Vitelli.
Localizing softness and stress along loops in three-dimensional topological metamaterials *Proc. Natl. Acad. Sci. USA* **115**, 489 (2018).
8. Benjamin Loewe, Anton Souslov, and Paul M. Goldbart.
Flocking from a quantum analogy: Spin-orbit coupling in an active fluid *New Journal of Physics* **20**, 013020 (2018).
9. Y.-W. Chang, M. S. Dimitriyev, A. Souslov, N. V. Svetoslav, S. M. Marquez, A. Alexeev, P. M. Goldbart, and A. Fernández-Nieves.
Extreme thermodynamics with polymer gel tori: Harnessing thermodynamic instabilities for large-scale deformations *Physical Review E* **98**, 020501 (2018).
10. A. Souslov, B. C. van Zuiden, D. Bartolo, and V. Vitelli.
Topological sound in active-liquid metamaterials *Nature Physics* **13**, 1091–1094 (2017).
11. S. R. Waitukaitis, A. Zuiderwijk, A. Souslov, C. Coullais, and M. v. Hecke.
Coupling the Leidenfrost effect and elastic deformations to power sustained bouncing *Nature Physics* **13**, 1095–1099 (2017).

**Research
publications**
(continued)

12. D. Banerjee*, A. Souslov*, A. G. Abanov, and V. Vitelli.
Odd viscosity in chiral active fluids
Nature Communications **8**, 1573 (2017).
13. H. Abbaszadeh*, A. Souslov*, J. Paulose, H. Schomerus, and V. Vitelli.
Sonic Landau levels and synthetic gauge fields in mechanical metamaterials
Physical Review Letters **119**, 195502 (2017).
14. Anton Souslov, Jennifer E. Curtis, and Paul M. Goldbart.
Beads on a string: Structure of aggregates composed of globular particles bound to long polymer chains
Soft Matter **11**, 8092 (2015).
15. Anton Souslov, Benjamin Loewe, and Paul M. Goldbart.
Emergent tilt order in Dirac polymer liquids
Physical Review E **92**, 030601 (2015).
16. X. Mao, A. Souslov, C. I. Mendoza, and T. C. Lubensky.
Mechanical instability at finite temperature
Nature Communications **6**, 5968 (2015).
17. M. Pelaez-Fernandez, A. Souslov, L. A. Lyon, P. M. Goldbart, and A. Fernandez-Nieves.
Impact of single-particle compressibility on the fluid-solid phase transition for ionic microgel suspensions
Physical Review Letters **114**, 098303 (2015).
18. Anton Souslov, D. Zeb Rocklin, and Paul M. Goldbart.
Organization of strongly interacting directed polymer liquids in the presence of stringent constraints
Physical Review Letters **111**, 096401 (2013).
19. Kai Sun, Anton Souslov, Xiaoming Mao, and T. C. Lubensky.
Surface phonons, elastic response, and conformal invariance in twisted kagome lattices
Proc. Natl. Acad. Sci. USA **109**, 12369 (2012).
20. Yair Shokef, Anton Souslov, and T. C. Lubensky.
Order by disorder in the antiferromagnetic Ising model on an elastic triangular lattice
Proc. Natl. Acad. Sci. USA **108**, 11804 (2011).
21. Anton Souslov, Andrea J. Liu, and T. C. Lubensky.
Elasticity and response in nearly isostatic periodic lattices
Physical Review Letters **103**, 205503 (2009).

* denotes equal contribution

- Review articles**
22. T. C. Lubensky, C. L. Kane, X. Mao, A. Souslov, and K. Sun.
Phonons and elasticity in critically coordinated lattices
Reports on Progress in Physics **78**, 073901 (2015).
23. Y. Shokef, Y. Han, A. Souslov, A. G. Yodh, and T. C. Lubensky.
Buckled colloidal monolayers connect geometric frustration in soft and hard matter
Soft Matter **9**, 6565 (2013).
- Editorials**
24. A. Souslov, V. Vitelli.
Geometry for mechanics *Nature Physics* **15**, 623 (2019).
- PhD Thesis**
25. A. Souslov **Soft Lattices** Penn Dissertations, 978 (2011).
- Submitted for publication**
26. H. Kedia, A. Souslov, and D. Z. Rocklin.
Soft topological modes protected by symmetry in rigid mechanical metamaterials arXiv:2008.01914 (2020).
27. D. Banerjee, A. Souslov, and V. Vitelli.
Hydrodynamic correlation functions of chiral active fluids arXiv:2005.00621 (2020).
28. B. Zhang, B. Hilton, C. Short, A. Souslov, and A. Snezhko.
Chiral flows in confined active fluids with obstacles (2020).
- Press coverage**
- **Odd elasticity** *Nature Physics* (2020).
Commentary by V. Peri and S. Huber: **Structural oddities** *ibid.*
Featured in the Condensed Matter Journal Club:
Aparna Baskaran **Nonintegrable mechanics** (2019).
- **Anisotropic polymer nanoparticles with controlled dimensions. . .**
Nature Communications (2019).
Featured in: Nanowerk, Science Daily, The Science Advisory Board, The Medical News, Technology Networks, EurekAlert!, Phys.org, Birmingham Uni. and Bath Uni. press releases.
- **Cluster formation by acoustic forces and active fluctuations in levitated granular matter**, *Nature Physics* (2019).
Commentary by Bruce Drinkwater: **An ultrasonic shake-up** *ibid.*
Featured in *UK*: BBC Science Focus Magazine, Metro (Newspaper), Institution of Mechanical Engineers, The Engineer, Phoneweek, Bioengineer.org, Scienmag; *US*: NSF, Remonews, SpaceDaily.Com, Bright Surf, ScienceDaily, Health Medicine Network, Newswise, Nanowerk, EurekAlert!, Phys.org; *Spain*: Periodista Digital, Europa Press. Bath Uni. and UChicago press releases.

**Press
coverage**
(continued)

- **Topological sound in active-liquid metamaterials** *Nat. Phys.* (2017).
Cover mention and with commentary by Andrea Alù:
Metamaterials: Topological order gets active *ibid.*, 1038.
Featured in the Condensed Matter Journal Club:
M. Cristina Marchetti **Topological meta-fluids** (2017).
Featured in: ECN Magazine, phys.org, pro-physik.de (German), Leiden Uni. press release (English and Dutch).
- **Coupling the Leidenfrost effect and elastic deformations to power sustained bouncing** *Nature Physics* **13**, 1095–1099 (2017).
Cover art. Featured in: The Washington Post, The State Journal-Register, New Scientist, phys.org, Inverse magazine, Science Alert, Discover, Manawatu Standard (NZ); in Dutch: RTL 4 news, De Volkskrant, KIJK, Blikopnieuws, NRC, engineersonline.nl; pro-physik.de (German), Leiden Uni. press release (English and Dutch).
- **Flocking from a quantum analogy** *New J. Phys.* **20**, 013020 (2018).
Featured in: Physics World (UK).
- **Surface phonons, elastic response, and conformal invariance in twisted kagome lattices** *Proc. Natl. Acad. Sci. USA* **109**, 12369 (2012).
From the cover and accompanied by commentary: Vincenzo Vitelli. **Topological soft matter** *ibid.*, 12266.

**Invited
conference
presentations**

1. Rank Prize Funds Symposium on Acoustics and EMR.
Grasmere, UK (2019).
2. Meeting on “Horizons in Emergence and Non-Equilibrium Physics.”
London, UK (2019).
3. Workshop “Soft matter out of equilibrium,”
Kavli Institute for Theoretical Sciences, Beijing, China (2019).
4. Workshop “Optimal design of soft matter,”
Isaac Newton Institute (INI), University of Cambridge, UK (2019).
5. Workshop “Hydrodynamics: across the scales,”
Enrico Fermi Institute, University of Chicago (2019).
6. CECAM Workshop “Condensed Matter Analogies . . .”
Tel-Aviv, Israel (2019).
7. 9th International Soft Matter Workshop.
Fowey, Cornwall, UK (2019).
8. Lorentz Center workshop “Topology in complex fluids.”
Leiden, the Netherlands (2018).
9. Workshop “Topological protection in messy matter”
Georgia Institute of Technology. Atlanta, US (2018).
Video of presentation on Georgia Tech website.

**Invited
conference
presentations**
(continued)

10. Workshop “Topological dynamics.”
New Jersey Institute of Technology. Newark, USA (2017).
11. Workshop of the International Institute of Physics (IIP-UFRN).
Natal, Brazil (2017).
Video of presentation on YouTube.
12. March Meeting of the American Physical Society.
New Orleans, LA. USA (2017).
13. Aspen Center for Physics Conference: “Topological Metamaterials.”
Aspen, CO. USA (2017).
14. “Self-assembly: From atoms to life.”
Workshop in honor of Bill Gelbart. Chiapas, Mexico (2016).
15. 2016 International Soft Matter Symposium. Tianjin, China (2016).
16. Workshop: “Topological States of Light and Beyond.” IBS–PCS.
Daejeon, South Korea (2016).
17. 20th Dutch Soft Matter Meeting.
Amsterdam, the Netherlands (2016).
18. Lorentz Center workshop “Topological Matter at \hbar Zero.”
Leiden, the Netherlands (2016).

**Seminars
and
colloquia**

- Theory Seminar, ITMO University St. Petersburg, Russia (2020)
 University of Leeds, UK (2020)
 Weizmann Institute of Science, Israel (2020)
 Hebrew University of Jerusalem, Israel (2020)
 Technion, Haifa, Israel (2020)
 Ludwig Maximilian University of Munich (LMU) (2019)
 Technical University of Munich (TUM) (2019)
 DAMTP, University of Cambridge (2019)
 Chemistry, University of Birmingham, UK (2019)
 Metamaterials Colloquium, University of Exeter, UK (2019)
 Physics, University of Warwick, UK (2019)
 Nanoscience Seminar, University of Bath, UK (2018)
 Center for Biological Physics, University of California, Los Angeles. (2018)
 Lorentz Institute, Leiden University. (2018)
 James Franck Institute, University of Chicago. (2018)
 Physics, University of Bristol, UK (2018)
 Applied and Interdisciplinary Mathematics, University of Bath, UK (2018)
 Condensed Matter Theory, University of Bath, UK (2018)
 Metamaterials Seminar, ITMO University, Saint Petersburg, Russia (2018)
 Physics, University of Amsterdam, Netherlands (2018)
 Physics, Florida State University, Tallahassee, FL (2018)
 Physics, University of Bath, U.K. (2017)

IBS Center for Soft and Living Matter. Ulsan, South Korea (2017)
 Physics Colloquium, University of California, Los Angeles (2017)
 Physics, University of Lincoln, U.K. (2017)
 School of Physics, Georgia Institute of Technology, Atlanta, GA (2017)
 Materials Science, University of Illinois at Urbana–Champaign (2017)
 Condensed Matter Theory Group, SISSA. Trieste, Italy (2016)
 School of Physics, Georgia Institute of Technology, U.S.A. (2015)
 James Franck Institute, University of Chicago. (2015)
 Faculty of Physics, University of Munich (LMU), Germany. (2015)
 Lorentz Institute, Leiden University. (2015)
 School of Physics, Georgia Institute of Technology, Atlanta, GA. (2011)
 Department of Chemistry, University of California–Berkeley, U.S.A. (2011)
 MRSEC, University of Pennsylvania, Philadelphia, PA. (2011)
 ESPCI ParisTech, Paris, France. (2011)
 Lorentz Institute, Leiden University. (2011)

**Conferences
and
workshops
attended**

2020 Kavli Institute for Theoretical Physics program: “Symmetry, Thermodynamics and Topology in Active Matter.” University of California, Santa Barbara. US.
 2019 Aspen Center for Physics program: “Active and driven matter.” (Pedagogical talk)
 2019 Edwards Symposium. Cambridge UK.
 2019 Dutch Institute for Emergent Phenomena workshop. Utrecht, NL (Contributed talk)
 2019 Particle Networks Workshop. Dresden, Germany (Contributed talk)
 2019 NetworkPlus workshop “Statistical physics meets movement ecology.” Bristol, UK.
 2019 Frontiers in Condensed Matter Physics Conference. Bristol, UK. (Contributed talk)
 2018 Edwards Symposium. Cambridge, UK.
 2017 NanoFront Winter Retreat. Courchevel, France. (Contributed talk)
 2017 Lorentz Center Workshop: “Structured Soft Interfaces: Caught Between Multi-Scale Simulation and Application.” (Poster)
 2016 Advanced Study Group: “Topological States of Light and Beyond.” Theoretical Physics of Complex Systems – IBS. Daejeon, South Korea.
 2015 Lorentz Center Workshop: “Active Liquids.”
 2015 Gordon Research Conference on Soft Condensed Matter. (Poster)
 2014 American Chemical Society (ACS)
 Colloid and Surface Science Symposium. (Contributed talk)
 2013 Gordon Research Conference on Soft Condensed Matter. (Poster)

2012 Conference “Active Jammed Systems” New York, NY. USA.
 2011 Aspen Center for Physics Conference: Materials and Imagination.
 2008 Conference on “Mathematical Aspects of Materials Science.”
 Society for Industrial and Applied Mathematics (SIAM). Philadelphia.
 2009–2018 March Meetings of the American Physical Society.
 (Contributed talks)

**Summer
schools
attended**

Boulder Schools for Condensed Matter and Materials Physics:
 2011, “Hydrodynamics.”
 2009, “Non-Equilibrium Statistical Mechanics.”
 University of Colorado – Boulder.
 2008 Summer School on “Soft Solids and Complex Fluids.”
 University of Massachusetts – Amherst.
 2007 Princeton Center for Complex Materials Summer School.
 Princeton, NJ.

**PhD students
(Bath)**

Guido Baardink 2019–
 Nathan Roberts 2020–

Postdocs

Jack Binysh 2020–

**Other
mentorship
experience
(Bath)**

Final-year Master’s projects:
 Achilles Bergne, Henry de Libero, Ewan Davies, Simon Garnett
 Benjamin Hilton, Christopher Alden, Chris Short, Gino Cassella,
 Isaac Chidlow, Jack Fulls, James Farrar, Luke Neville 2019–21

Final-year Bachelor’s projects:
 M. Sohaib Khalid, Matthew Parry, Nicholas Liu, Pravek Patel 2018–21

Exploratory Training Project: Ciara MacKellar 2019
 First- and second-year tutorials. 2018–
 Communicating Physics (outreach projects) 2018–
 PhD candidate transfer vivas: Surani Gunasekera, Thijs Smolders

**Professional
organizations**

Member of the American Physical Society, USA (APS).
 Member of the Institute of Physics, UK (IoP).
 Fellow of the Higher Education Academy, UK (FHEA).

Teaching experience

Lecturer, University of Bath:

- PH30056, Computational Physics B. Semester 2, 2019–
- PH40073, Mathematical Physics. Semester 2, 2019–
- PH20029, Thermal physics. Semester 1, 2019–
- PH30024, Contemporary physics. Semester 1, 2019–

Teaching Assistant, University of Pennsylvania:

- Graduate-level Statistical Mechanics. Fall 2008
- Honors Physics I. Fall 2008
- Physics I and II with Calculus. Fall 2006 to Spring 2007

Honors and awards

2019 New Investigator Award, Engineering and Physical Sciences Research Council (UK).

2011 Finalist, Student Speaker Award of the Group on Statistical and Nonlinear Physics (G SNP), American Physical Society (APS).

2006 Honorary Organizations, Florida State University Chapters:

- Sigma Pi Sigma (Physics)
- Pi Mu Epsilon (Mathematics)
- Phi Beta Kappa (College of Arts and Sciences)
- Phi Kappa Phi
- FSU Honors Program

2005 Urhan Award: an Outstanding Rising Junior.

Department of Mathematics, Florida State University.

Professional service

EPSRC UK Metamaterials Network: Lead of the Horizons Scanning Forum and Member of the Leadership Team 2021–

Organizer, Workshop “Biological Metamaterials.”

Lorentz Center, Leiden University, Netherlands 2022

Organizer, Frontiers in Condensed Matter Physics Conference
Bristol, UK 9–10 Jan 2020Referee for journals *Physical Review X/Letters/Materials/Applied/B/E*, *Europhysics Letters (EPL)*, *Applied Physics Letters*, *Journal of Physics Communications*, *New Journal of Physics*, *Proc. Roy. Soc. Lond. A*, *Nature Communications*, *Science Advances*, and *Proc. Natl. Acad. Sci. USA*.Grant reviewer for *Swiss National Science Foundation (SNF)*, *German Research Foundation (DFG)*, *US-Israel Binational Science Foundation (BSF)*, and *The Royal Society, UK*.

Organizer, Bath Soft Matter Seminars 2019–

Communications Committee, Atlanta Science Festival 2015