Personal Information

Name: Anton Souslov
Address: Department of Physics
University of Bath
Claverton Down
BA2 7AY
Bath, United Kingdom
Web: https://people.bath.ac.uk/as3764/

Employment

Associate Professor (Reader) *2022–*

Assistant Professor (Lecturer) *2018–2022*

Department of Physics,
University of Bath. Bath, UK.

Postdoctoral Researcher

James Franck Institute, *2017–2018*
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.

Education

2011 *Ph.D.* Physics, University of Pennsylvania, USA.
Topic: Soft lattices *Advisor:* Prof. Tom C. Lubensky

2009 *M.S.* Physics, University of Pennsylvania, USA.

2006 *B.S.* Physics, Mathematics. Florida State University, USA.

Honours and awards

2021 Recognising Excellence Award, University of Bath.

2021 Fellowship, Bath Institute for Mathematical Innovation (IMI).

2022–2025 Grant, European Office of the U.S. Air Force Office of Scientific Research.

2021–2022 Royal Society Research Grant (UK).

2020–2023 New Investigator Award, EPSRC.

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

2005 Urhan Award: Outstanding Rising Junior. Department of Mathematics, Florida State University.

Postdoctoral researchers

Jack Binysh	2020–2023

PhD students

Guido Baardink	2019–2023
Nathan Roberts	2020–2024
Jamie Mclauchlan	2021–2025

Project supervision

Master's projects:

Continued studies:
Gino Cassella (since, PhD student, Imperial College London)
Luke Neville (since, PhD student, University of Bristol)
Ciara MacKellar (since, PhD student, Univesity of Bristol)
Henry de Libero (since, PhD student, University of Manchester)
Achilles Bergne (since, PhD student, DTU, Denmark)

Private sector:
Ewan Davies, Simon Garnett, Benjamin Hilton, Christopher Alden, Chris Short, Isaac Chidlow, Jack Fulls, James Farrar, Jesper Beer, Toby Gibson, Annabel Biggs

Bachelor's projects:

Continued studies:
M. Sohaib Khalid (since, PhD student, SISSA, Italy)

Private sector:
Matthew Parry, Nicholas Liu, Pravek Patel

Other mentorship experience at Bath

First- and second-year tutorials.	2018–
Communicating Physics (outreach projects)	2018–
Industry Team projects	2020–
PhD candidate confirmation vivas:	Surani Gunasekera Thijs Smolders Jamie Lerpiniere
PhD viva, external examiner:	Hamed Abbaszadeh (Leiden University) Yushi Yang (University of Bristol) Viktor Skultety (University of Edinburgh)
PhD viva, internal examiner:	Matthew Cook

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, 2019–2020

Research publications

Journal articles

1. N. Roberts, G. Baardink, J. Nunn, P. J. Mosley, A. Souslov
Topological supermodes in photonic crystal fibre
Science Advances 8, add3522 (2022).
2. A. Bergne, G. Baardink, E.G. Loukaides, A. Souslov
Scalable 3D printing for topological mechanical metamaterials
Extreme Mechanics Letters 57, 101911 (2022).
3. M. X. Lim, B. VanSaders, A. Souslov, and H. M. Jaeger.
Mechanical properties of acoustically levitated granular rafts
Physical Review X 12, 021017 (2022).
4. J. Binysh, T. R. Wilks, and A. Souslov.
Active elastocapillarity in soft solids with negative surface tension
Science Advances 8, abk3079 (2022).
5. E. Fodor and A. Souslov
Optimal power and efficiency of odd engines
Physical Review E 104, L062602 (2022).
6. D. Banerjee, A. Souslov, and V. Vitelli.
Hydrodynamic correlation functions of chiral active fluids
Physical Review Fluids 7, 043301 (2022).
7. A. Aranda-Díaz, C. Rodrigues, A. Grote, J. Sun, C. Schreck, O. Hallatschek, A. Souslov, W. Möbius, and K. C. Huang
Bacterial filamentation drives colony chirality
mBio 12, e01542-21 (2021).
8. G. Baardink, G. Cassella, L. Neville, P. A. Milewski, and A. Souslov.
Complete absorption of topologically protected waves
Physical Review E 104, 014603 (2021).
9. H. Kedia, A. Souslov, and D. Z. Rocklin.
Soft topological modes protected by symmetry in rigid mechanical metamaterials
Physical Review B 103, L060104 (2021).
10. C. Scheibner*, A. Souslov*, D. Banerjee, P. Surowka, W. T. M. Irvine, and V. Vitelli.
Odd elasticity
Nature Physics 16, 475 (2020).
11. B. Zhang, B. Hilton, C. Short, A. Souslov, and A. Snezhko.
Oscillatory chiral flows in confined active fluids with obstacles
Physical Review Research 2, 043225 (2020).
12. A. Souslov, A. Gromov, and V. Vitelli.
Anisotropic odd viscosity via a time-modulated drive
Physical Review E 101, 052606 (2020). *(Editors' Suggestion)*
13. Z. Hua, J. R. Jones, M. Thomas, M. C. Arno, A. Souslov, T. R. Wilks, and R. K. O'Reilly.
Anisotropic polymer nanoparticles with controlled dimensions from the morphological transformation of isotropic seeds
Nature Communications 10, 5406 (2019).
14. A. Souslov, K. Dasbiswas, M. Fruchart, S. Vaikuntanathan, and V. Vitelli.
Topological waves in fluids with odd viscosity
Physical Review Letters 122, 128001 (2019).

Journal articles (continued)

15. 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).
16. R. P. Pedro, J. Paulose, A. Souslov, M. Dresselhaus, and V. Vitelli.
Topological protection can arise from thermal fluctuations and interactions
Physical Review Letters 122, 118001 (2019).
17. G. Baardink, A. Souslov, J. Paulose, and V. Vitelli.
Localizing softness along loops in three-dimensional topological metamaterials
Proc. Natl. Acad. Sci. USA 115, 489 (2018).
18. B. Loewe, A. Souslov, and P. M. Goldbart.
Flocking from a quantum analogy: Spin-orbit coupling in an active fluid
New Journal of Physics 20, 013020 (2018).
19. 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
Physical Review E 98, 020501 (2018).
20. A. Souslov, B. C. van Zuiden, D. Bartolo, and V. Vitelli.
Topological sound in active-liquid metamaterials
Nature Physics 13, 1091–1094 (2017).
21. S. R. Waitukaitis, A. Zuiderwijk, A. Souslov, C. Coulais, and M. v. Hecke.
Coupling the Leidenfrost effect and elastic deformations to power sustained bouncing
Nature Physics 13, 1095–1099 (2017).
22. D. Banerjee*, A. Souslov*, A. G. Abanov, and V. Vitelli.
Odd viscosity in chiral active fluids
Nature Communications 8, 1573 (2017).
23. 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).
24. A. Souslov, Jennifer E. Curtis, and P. M. Goldbart.
Beads on a string: Structure of aggregates composed of globular particles bound to long polymer chains
Soft Matter 11, 8092 (2015).
25. A. Souslov, B. Loewe, and P. M. Goldbart.
Emergent tilt order in Dirac polymer liquids
Physical Review E 92, 030601 (2015).
26. X. Mao, A. Souslov, C. I. Mendoza, and T. C. Lubensky.
Mechanical instability at finite temperature
Nature Communications 6, 5968 (2015).
27. 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).
28. A. Souslov, D. Zeb Rocklin, and P. M. Goldbart.
Organization of strongly interacting directed polymer liquids in the presence of stringent constraints
Physical Review Letters 111, 096401 (2013).

* denotes equal contribution

Journal articles (continued)

29. K. Sun, A. Souslov, X. Mao, and T. C. Lubensky.
Surface phonons, elastic response, and conformal invariance in twisted kagome lattices
Proc. Natl. Acad. Sci. USA 109, 12369 (2012).
30. Y. Shokef, A. 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).
31. A. Souslov, A. J. Liu, and T. C. Lubensky.
Elasticity and response in nearly isostatic periodic lattices
Physical Review Letters 103, 205503 (2009).

Review articles

32. S. Shankar, A. Souslov, M. J. Bowick, M. C. Marchetti, V. Vitelli.
Topological active matter
Nature Reviews Physics (2022).
33. 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).
34. 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).

Short surveys

35. J. Binysh, A. Souslov
Odd living matter defies golden rule of mechanics *Nature* 607, 246 (2022).
36. J. Binysh, A. Souslov
Active solids sync up *Nature Physics* 18, 1142 (2022).
37. A. Souslov
A little frustration to sharpen the metamaterial *Journal Club for Cond. Mat. Phys.* (2022).
38. A. Souslov, V. Vitelli.
Geometry for mechanics *Nature Physics* 15, 623 (2019).

PhD Thesis

39. A. Souslov **Soft lattices** Penn Dissertations, 978 (2011).

Submitted for publication

40. J. Binysh, I. Chakraborty, M.V. Chubynsky, V.L.D. Melian, S.R. Waitukaitis, J.E. Sprittles, A. Souslov
Thermodynamic lubrication in the elastic Leidenfrost effect
arXiv:2207.02769 (2022).
41. A. Doak, G. Baardink, P. A. Milewski, A. Souslov
Nonlinear shallow-water waves with vertical odd viscosity arXiv:2204.09375
in press, SIAM Journal on Applied Mathematics (2022).
42. P. Surowka, A. Souslov, F. Julicher, D. Banerjee
Odd Cosserat elasticity in active materials arXiv:2210.13606 (2022).

Press coverage of research

- **Acoustically levitated granular rafts** *Phys. Rev. X* (2022).
  Mark Buchanan. **Floating Particle Clump Mimics Asteroids and Nuclei**. *Physics* (APS).
  Featured in: Popular Science, phys.org, Newsbreak.
- **Active elastocapillarity**. . . *Science Advances* (2022).
  Featured in: 77+ articles including The Robot Report, Innovation Origins, Technology.org, The Engineer, SciTechDaily, ScienceDaily, Nanowerk, EurekAlert!, Bioengineer.org, Scienmag, Bath Uni. press release.
- **Complete absorption**. . . *Phys. Rev. E* (2021).
  Jon Cartwright. **It's topology, naturally**. *PhysicsWorld* (IoP).
- **Odd elasticity** *Nature Physics* (2020).
  V. Peri and S. Huber. **Structural oddities** *ibid.*
  Featured in the Cond. Mat. Journal Club: Aparna Baskaran **Nonintegrable mechanics** (2019).
- **Anisotropic polymer nanoparticles with controlled dimensions. . .** *Nature Commun.* (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** *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.
- **Topological sound in active-liquid metamaterials** *Nature Physics* (2017).
  Cover mention and with commentary: Andrea Alù, **Topological order gets active** *ibid.*, 1038.
  Featured in the Cond. Mat. Journal Club: M. Cristina Marchetti **Topological meta-fluids** (2017).
  Featured in: ECN Magazine, phys.org, pro-physik.de (German), Leiden Uni. press release.
- **Coupling the Leidenfrost effect and elastic deformations. . .** *Nature Physics* (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.* (2018).
  Featured in: Physics World (UK).
- **Surface phonons . . . in twisted kagome lattices** *Proc. Natl. Acad. Sci. USA* (2012).
  From the cover and with commentary: Vincenzo Vitelli. **Topological soft matter** *ibid.*, 12266.

Invited conference presentations

Isaac Newton Institute program "New statistical physics in living matter." Cambridge, UK (2023).

CECAM workshop "Chiral Active Systems." Lausanne, Switzerland (2023).

Nordita program on "Soft and biological active matter." Stockholm, Sweden (2022).

Workshop on "Odd elasticity." Amsterdam, Netherlands (2022).

Workshop on "Emergent Hydrodynamics in Condensed Matter . . . " Dresden, Germany (2022).

IEEE COMCAS International Conference on Microwaves, Communications, . . . Tel Aviv, Israel (2021).

Interdisciplinary Challenges in Nonequilibrium Physics. Vienna, AT (2021).

Rank Prize Funds Symposium on Acoustics and EMR. Grasmere, UK (2019).

Meeting on “Horizons in Emergence and Non-Equilibrium Physics.” London, UK (2019).
Workshop “Soft matter out of equilibrium,” Kavli Institute, Beijing, China (2019).
Workshop “Optimal design of soft matter,” Isaac Newton Institute (INI), Cambridge, UK (2019).
Workshop “Hydrodynamics: across the scales,” Enrico Fermi Institute, University of Chicago (2019).
CECAM Workshop “Condensed Matter Analogies . . . ” Tel-Aviv, Israel (2019).
9th International Soft Matter Workshop. Fowey, Cornwall, UK (2019).
Lorentz Center workshop “Topology in complex fluids.” Leiden, the Netherlands (2018).
Workshop “Topological protection in messy matter” Georgia Institute of Technology, US (2018).
Workshop “Topological dynamics.” New Jersey Institute of Technology. Newark, USA (2017).
Workshop of the International Institute of Physics (IIP-UFRN). Natal, Brazil (2017).
March Meeting of the American Physical Society. New Orleans, LA. USA (2017).
Aspen Center for Physics Conference: “Topological Metamaterials.” Aspen, CO. USA (2017).
“Self-assembly: From atoms to life.” Workshop in honor of Bill Gelbart. Chiapas, Mexico (2016).
2016 International Soft Matter Symposium. Tianjin, China (2016).
Workshop: “Topological States of Light and Beyond.” IBS–PCS. Daejeon, South Korea (2016).
20th Dutch Soft Matter Meeting. Amsterdam, the Netherlands (2016).
Lorentz Center workshop “Topological Matter at Hbar Zero.” Leiden, the Netherlands (2016).

Invited seminars and colloquia

DIEP seminar, University of Amsterdam UvA (2022)
Physics theory seminar, University of Warwick, UK (2022)
Physics colloquium, University of Dundee, UK (2022)
Mathematical Physics Seminar, Imperial College London (2021)
Biosoft seminar, Tel Aviv University, Israel (2021)
Soft matter-ish seminar, Institute of Science and Technology Austria (2020)
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, 2022 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.

Professional organisations

Member of the American Physical Society, USA (APS).

Member of the Institute of Physics, UK (IoP).

Member of the European Physical Society (EPS).

Fellow of the Higher Education Academy, UK (FHEA).

Conference organisation

Co-organiser, UK Metamaterials Network Annual Conference	2022
Co-organiser, Workshop “Biological Metamaterials.” Lorentz Center, Leiden University, Netherlands	2022
Co-organiser, IoP CMQM Conference University of Bath, UK	2022
Co-organiser, Frontiers in Condensed Matter Physics Conference Bristol, UK	2020
Co-organiser, APS March Meeting Focus Sessions “Mechanics of active, robotic, and living materials”	2021–22
Co-organiser, APS March Meeting Focus Session “Non-reciprocity in soft and active matter”	2023
Co-organiser, APS March Meeting Invited Session “Materials that do things by themselves”	2023
Co-organiser, METANANO Conference Session “Active mechanical metamaterials”	2021

Professional service

EPSRC UK Metamaterials Network: Lead of the Horizons Scanning Forum and Member of the Leadership Team	2021–
Co-Director, Bath Centre for Nonlinear Mechanics	2022–
Deputy Director, Centre for Networks and Collective Behaviour	2021–22
Organiser, Bath Physics Colloquia	2020–
Member, Physics Research and Knowledge Exchange Committee, University of Bath	2022–
Member, Physics Executive Committee, University of Bath	2019–22
Communications Committee, Atlanta Science Festival	2015
Editorial Board, *Frontiers in Physics*. Soft matter physics section.	2022–

Referee for journals *Nature*, *Nature Physics*, *Nature Communications*, *Soft Matter*, *Europhysics Letters (EPL)*, *Physical Review X/Letters/Materials/Applied/B/E*, *Applied Physics Letters*, *Journal of Applied Physics*, *Journal of Physics Communications*, *New Journal of Physics*, *Proc. Roy. Soc. Lond. A*, *Science Advances*, and *Proc. Natl. Acad. Sci. USA*.

Grant reviewer for *Swiss National Science Foundation (SNSF)*, *German Research Foundation (DFG)*, *Israel Science Foundation (ISF)*, *US-Israel Binational Science Foundation (BSF)*, *Czech Science Foundation (GACR)*, *EPSRC (UK)*, and *The Royal Society, UK*.