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EDUCATION

PhD Physics, City University of New York Sep 2013
Graduate Center & City College, with Prof. Joel Koplik
BS Physics, Fudan University Jul 2007
Department of Physics

PROFESSIONAL EXPERIENCE

Assistant Professor Mar 2020 – present
Department of Physics
The Hong Kong University of Science and Technology
Affiliate Member Feb 2024 – present
The International Institute for Sustainability with Knotted
Chiral Meta Matter
Hiroshima University
Distinguished Research Associate May 2018 – Mar 2020
Pritzker School of Molecular Engineering
The University of Chicago
Postdoctoral Scholar, with Prof. Juan J. de Pablo Jan 2014 – May 2018
Pritzker School of Molecular Engineering
The University of Chicago
Research Assistant & Adjunct Lecturer Sep 2009 – Dec 2013
Levich Institute & Physics Department
City College of New York

RESEARCH INTERESTS

Theoretical & Computational Soft Matter Physics: Liquid Crystals; Active Matter;
Micro/Nanofluidics; Polymer Physics; Colloids; Mechanical Metamaterials.

SELECTED PUBLICATIONS†

1. Weiqiang Wang, Haijie Ren and **Rui Zhang**#, Symmetry Breaking of Self-Propelled Topological Defects in Thin-Film Active Chiral Nematics, *Phys. Rev. Lett.* **132**, 038301 (2024).
2. Chung Wing Chan*, Daihui Wu*, Kaiyao Qiao, Kin Long Fong, Zhiyu Yang, Yilong Han and **Rui Zhang**#, Chiral Active Particles are Sensitive Reporters to Environmental Geometry, *Nat.*

- Commun.* **15**, 1406 (2024). Featured in “*Applied physics and mathematics*” by *Nature Communications*.
3. Xinyu Wang*, Jinghua Jiang*, Juan Chen*, Asilehan Zhawure, Wentao Tang, Chenhui Peng# and **Rui Zhang#**, Moiré Effect Enables Versatile Design of Topological Defects in Nematic Liquid Crystals, *Nat. Commun.* **15**, 1655 (2024).
 4. Haijie Ren, Weiqiang Wang, Wentao Tang and **Rui Zhang#**, Machine Eye for Defects: Machine Learning-Based Solution to Identify and Characterize Topological Defects in Textured Images of Nematic Materials, *Phys. Rev. Research*, in press (2024).
 5. Qing Zhang*#, Weiqiang Wang*, Shuang Zhou, **Rui Zhang#** and Irmgard Bischofberger#, Flow-induced periodic chiral structures in an achiral nematic liquid crystal, *Nat. Commun.* **15**, 7 (2024). Featured in “*Applied physics and mathematics*” by *Nature Communications*.
 6. Yulu Huang, Weiqiang Wang, Jonathan K. Whitmer and **Rui Zhang#**, Structures, Thermodynamics and Dynamics of Topological Defects in Gay–Berne Nematic Liquid Crystals, *Soft Matter* **19**, 483–496 (2023).
 7. Jinghua Jiang*, Xinyu Wang*, Oluwafemi Isaac Akomolafe*, Wentao Tang, Asilehan Zhawure, Kamal Ranabhat, **Rui Zhang#** and Chenhui Peng#, Collective transport and reconfigurable assembly of nematic colloids by light-driven cooperative molecular reorientations, *Proc. Natl. Acad. Sci. U. S. A.* **120** (16) e2221718120 (2023).
 8. Haoran Xu, Yulu Huang, **Rui Zhang** and Yilin Wu, Autonomous waves and global motion modes in elastic active solids, *Nature Physics* **19**, 46–51 (2023).
 9. **Rui Zhang#**, Ali Mozaffari and Juan J. de Pablo#, Logic Operations with Active Topological Defects, *Science Advances* **8**, eabg9060 (2022).
 10. Jinghua Jiang*, Kamal Ranabhat*, Xinyu Wang*, Hailey Rich, **Rui Zhang#** and Chenhui Peng#, Active Transformations of Topological Structures in Light-Driven Nematic Disclination Networks, *Proc. Natl. Acad. Sci. U. S. A.* **119** (23) e2122226119 (2022).
 11. Tejal Pawale*, Shengzhu Yi*, Xiaowei Wang, **Rui Zhang#** and Xiao Li#, The Fate of Liquid Crystal Topological Defects on Chemically Patterned Surfaces during Phase Transitions, *Soft Matter* **18**, 5939–5948 (2022). Featured in [Cover](#).
 12. Mohsen Esmaeili, Kyle George, Nader Taheri Qazvini, **Rui Zhang#** and Monirosadat Sadati#, Capillary Flow Characterization of Chiral Nematic Cellulose Nanocrystal Suspensions, *Langmuir* **38** (7), 875–882 (2022). Featured in [Cover](#).
 13. **Rui Zhang***, Steven Redford*, Paul Ruijrok, Nitin Kumar, Ali Mozaffari, Sasha Zemsky, Aaron Dinner, Vincenzo Vitelli, Zev Bryant, Margaret Gardel and Juan J. de Pablo, Spatiotemporal Control of Liquid Crystal Structure and Dynamics Through Activity Patterning, *Nature Materials* **20**, 875–882 (2021).
 14. **Rui Zhang***, Ali Mozaffari* and Juan J. de Pablo, Autonomous Materials Systems from Active Liquid Crystals, *Nature Reviews Materials* **6**, 437–453 (2021).
 15. Weiqiang Wang and **Rui Zhang#**, Interplay of Active Stress and Driven Flow in Self-Assembled, Tumbling Active Nematics, *Crystals* **11**, 1071 (2021) (invited article).
 16. Ali Mozaffari*, **Rui Zhang***, Noe Atzin and Juan J. de Pablo, Defect Spirograph: Dynamical Behavior of Defects in Spatially Patterned Active Nematics, *Phys. Rev. Lett.* **126**, 227801 (2021).
 17. Qing Zhang*, **Rui Zhang***, Baoliang Ge*, Zahi Yaqoob, Peter T. C. So and Irmgard Bischofberger, Structures and topological defects in pressure-driven lyotropic chromonic liquid crystals, *Proc. Natl. Acad. Sci. U. S. A.* **118** (35) e2108361118 (2021).

18. Tadej Emersic*, **Rui Zhang***, Ziga Kos*, Simon Copar*, Natan Osterman, Juan J. de Pablo and Uros Tkalec, Sculpting phase-separated orientational domains in non-equilibrium anisotropic fluids, *Science Advances* **5**, eaav4283 (2019).
19. **Rui Zhang***, Nitin Kumar*, Jennifer Ross, Margaret L. Gardel and Juan J. de Pablo, Interplay of Structure, Elasticity and Dynamics in Actin-Based Nematic Materials, *Proc. Natl. Acad. Sci. U. S. A.* **115** (2) E124–E133 (2018).
20. Nitin Kumar*, **Rui Zhang***, Juan J. de Pablo and Margaret L. Gardel, Tunable Structure and Dynamics of Active Liquid Crystals, *Science Advances* **4** (10), eaat7779 (2018).
21. **Rui Zhang**, Ye Zhou, Mohammad Rahimi and Juan J. de Pablo, Dynamic structure of active nematic shells, *Nat. Commun.* **7**, 13483 (2016). Featured in “*Active Matter*” collection by Nature Portfolio.
22. **Rui Zhang**, Ye Zhou, Jose A. Martinez-Gonzalez, Juan P. Hernandez-Ortiz, Nicholas L. Abbott and Juan J. de Pablo, Controlled deformation of vesicles by flexible structured media, *Science Advances* **2** (8), e1600978 (2016).
23. **Rui Zhang**, Tyler Roberts, Igor Aranson and Juan J. de Pablo, Lattice Boltzmann simulation of asymmetric flow in nematic liquid crystals with finite anchoring, *J. Chem. Phys.* **144**, 084905 (2016).
24. **Rui Zhang**, Samaneh Farokhirad, Taehun Lee and Joel Koplik, Multiscale liquid drop impact on wettable and textured surfaces, *Phys. Fluids* **26**, 082003 (2014).
25. **Rui Zhang** and Joel Koplik, Separation of Nanoparticles by Flow past a Patterned Substrate, *Phys. Rev. E* **85**, 026314 (2012).

† Full publication list can be found in [Google Scholar](#).

* Equal contribution; # Corresponding author.

RESEARCH GRANTS

PI, “*Investigation of Emergent Patterns and Elastic Waves in Active Soft Solids*”, NSFC-RGC Joint Research Scheme N_HKUST627/23, 2024–2027.

PI, “*Design of Reconfigurable, Chiral Materials Through Field Modulating Liquid Crystals*”, ASPIRE League Partnership Seed Fund Program, 2022–2023.

PI, “*Computational Study of Viscoelastic Active Matter*”, Hong Kong Research Grant Council (RGC) General Research Fund (GRF) 16300221, 2022–2024.

PI, “*Computational Design of Multiphysics Coupled Three-Dimensional Liquid Crystal Elastomers*”, Guangdong Natural Science Foundation 2022A1515011186, 2022–2024.

PI, “*Multi Scale Study of Chiral Active Matter*”, Hong Kong Research Grant Council (RGC) Early Career Scheme (ECS) 26302320, 2020–2023.

Co-PI, “*Living Active Protein Materials for Axon Regeneration*”, Hong Kong Research Grant Council (RGC) Young Collaborative Research Fund C6001-23Y, 2024–2027.

Co-PI, “*Design Paradigm of Multiphase Soft Composite Materials with Emergent Mechanical Properties*”, Hong Kong Research Grant Council (RGC) Young Collaborative Research Fund C6004-22Y, 2023–2026.

Co-PI, “*Programmable Materials from Macroscopic to Microscopic Scale*”, HKUST VPRDO 30 for 30 Research Initiative Scheme, 2023–2025.

Contributor, “*A Unified Framework for Description of Lyotropic and Active Liquid Crystals Far from Equilibrium*”, NSF-DMR 1710318, 2017–2020.

MEDIA COVERAGE

“*Logic Operations with Active Topological Defects*” published in *Science Advances* (2022) was reported by [Croucher](#), [UChicago News](#), [Deeptech](#), [iScientist](#), [EurekAlert](#) and other news outlets.

“*Autonomous Materials Systems for Active Liquid Crystals*” published in *Nature Reviews Materials* (2021) was reported by [HKUSTNews](#), [EurekAlert](#) and other news outlets.

“*Spatiotemporal Control of Liquid Crystal Structure and Dynamics Through Activity Patterning*” published in *Nature Materials* (2021) was highlighted by [UChicagoNews](#).

“*Emergence of Radial Tree of Bend Stripes in Active Nematics*” published in *Physical Review X* (2019) is highlighted by [UChicagoNews](#).

“*Controlled deformation of vesicles by flexible structured media*” published in *Science Advances* (2016) was reported by [UChicagoNews](#), [ScienceDaily](#), [phys.org](#) and etc. Quotes from the UChicago report: “... The technique has potential for use in biology, medicine, and advanced materials development... The scientists built sophisticated models that produced this behavior on the computer and then reproduced it in the real world, testing the model's predictions.”

“*Separation of nanoparticles by flow past a patterned substrate*” published in APS journal *Physical Review E* (2012) was highlighted in [Physics Synopsis](#) of APS.

HONORS

Liquid Crystal Gordon Research Conference “*Most Active Discussion Participant*”, 2019.

Fudan University “*Wang Dao*” Fellowship, 2007.