RANJIANGSHANG RAN, Ph.D.

Tarbutton Postdoctoral Research Fellow

Department of Physics, Emory University, Atlanta, GA 30322, USA

Research Interests: Fluid Mechanics, Fluid Dynamics, Rheology, Microbiology, Marine Ecology

Phone: (+1) 267-787-7929 Email: ranjiangshang.ran@emory.edu

PROFESSIONAL EXPERIENCE

Emory University *09/2023 - Present*

Tarbutton Postdoctoral Research Fellow at Department of Physics.

Advisor: Dr. Justin C. Burton, Fellow of the American Physical Society (2024).

EDUCATION

University of Pennsylvania *01/2019 - 08/2023*

Ph. D. in Mechanical Engineering and Applied Mechanics. GPA: 4.0/4.0

Advisor: Dr. Paulo E. Arratia, Fellow of the American Physical Society (2022), Fellow of The Society of Rheology (2025).

Dissertation: *Transport and mixing with swimming microorganisms in chaotic flows.*

University of Pennsylvania *01/2017 - 12/2018*

M. Sc. Eng in Mechanical Engineering and Applied Mechanics. GPA: 4.0/4.0

Advisor: Dr. Paulo E. Arratia

Shanghai Jiao Tong University *09/2013 - 06/2017*

B. Eng (Hons.) in Power and Energy Engineering. GPA: 3.81/4.30

School of Mechanical Engineering first class honours degree. (Dept. Rank: 1st)

PUBLICATIONS

1. R. Ran, J. C. Burton, S. Kumar, S. Bhamla, A. R. Dillman, V. M. Ortega-Jimenez, *Electrostatics facilitate mid-air host attachment in parasitic jumping nematodes*, **Proceedings of the National Academy of Sciences**, In Press (2025).

2. R. Ran, Q. Brosseau, B. C. Blackwell, B. Qin, R. L. Winter, and P. E. Arratia, *Bacteria hinder large-scale transport and enhance small-scale mixing in time-periodic flows*, **Proceedings of the National Academy of Sciences** 118, e2108548118 (2021).

3. R. Ran and P. E. Arratia, *Enhancing transport barriers with swimming microorganisms in chaotic flows*, **Journal of Fluid Mechanics** 988, A25 (2024).
   † Featured in *Focus on Fluids*: *Bacterial barriers*, **Journal of Fluid Mechanics** 988, F1 (2024).

4. R. Ran, S. Pradeep, S. Kosgodagan Acharige, B. C. Blackwell, C. Kammer, D. J. Jerolmack, and P. E. Arratia, *Understanding the rheology of kaolinite clay suspensions using Bayesian inference*, **Journal of Rheology** 67, 241–252 (2023).
   † Featured Article by *Editors' Choice*.

5. R. Ran, Q. Brosseau, B. C. Blackwell, B. Qin, R. L. Winter, and P. E. Arratia, *Mixing in chaotic flows with swimming bacteria*, **Physical Review Fluids** 7, 110511 (2022).
   † Invited Article as the 74th *Gallery of Fluid Motion* Poster Winner.

6. J. Li, R. Ran, H. Wang, Y. Wang, Y. Chen, S. Niu, P. E. Arratia, and S. Yang, *Aerodynamics-assisted, efficient and scalable kirigami fog collectors*, **Nature Communications** 12, 5484 (2021).

7. B. Qin, R. Ran, P. F. Salipante, S. D. Hudson, and P. E. Arratia, *Three-dimensional structures and symmetry breaking in viscoelastic cross-channel flow*, **Soft Matter** 16, 6969–6974 (2020).
† Featured as Journal Front Cover Image.

8. Q. Brosseau, R. Ran, I. Graham, D. J. Jerolmack, and P. E. Arratia, *Flow and aerosol dispersion from wind musical instruments*, **Physics of Fluids** 34, 087115 (2022).
† Featured Article by *Editors' Choice*.

9. B. O. T. Maldonado, R. Ran, K. L. Galloway, Q. Brosseau, S. Pradeep, and P. E. Arratia, *Phase-separation during sedimentation of dilute bacterial suspensions*, **Physics of Fluids** 34, 113305 (2022).

10. B. O. T. Maldonado, S. Pradeep, R. Ran, D. J. Jerolmack, and P. E. Arratia, *Sedimentation dynamics of passive particles in dilute bacterial suspensions: emergence of bioconvection*, **Journal of Fluid Mechanics** 988, A9 (2024).

11. R. Ran, D. A. Gagnon, A. Morozov, and P. E. Arratia, *Polymers in swarming bacterial turbulence*, ArXiv Preprint, arXiv:2111.00068v2.

AWARDS AND HONORS

Tarbutton Postdoctoral Fellowship *05/2024*
Emory College of Arts and Sciences *Atlanta, GA*
- Granted to distinguished postdoctoral fellows for excellence in research.

Gallery of Fluid Motion Award *11/2021*
American Physical Society, Division of Fluid Dynamics *Phoenix, AZ*
- Honored as a winner of the 74$^{\text{th}}$ *Gallery of Fluid Motion*.

Outstanding Academic Award: Honorable Mention *05/2019*
School of Engineering and Applied Science *Philadelphia, PA*
- Acknowledged for exceptional academic accomplishments.

MEAM MSE Merit Scholarship *05/2018*
Department of Mechanical Engineering and Applied Mechanics *Philadelphia, PA*
- Awarded to Master's students with remarkable research achievements.

Bachelor's degree with Honors *06/2017*
School of Mechanical Engineering, Shanghai Jiao Tong University *Shanghai, CN*
- Graduated with honors for outstanding academic achievement.

CONFERENCE PRESENTATIONS

2025 American Physical Society (APS) Global Physics Summit *03/2025*
TALK TITLE: *Collective particle dynamics in rotating drops under acoustic levitation.* *Anaheim, CA*

77th Annual Meeting of the APS Division of Fluid Dynamics (DFD) *11/2024*
TALK TITLE: *Dynamic self-assembly of microparticles in rotating drops under acoustic levitation.* *Salt Lake City, UT*

76th Annual Meeting of the APS Division of Fluid Dynamics (DFD) *11/2023*
TALK TITLE: *Transport barriers and elliptic islands—Mixing with swimming microorganisms in chaotic flows.* *Washington, DC*

75th Annual Meeting of the APS Division of Fluid Dynamics (DFD) *11/2022*
TALK TITLE: *Enhanced transport barriers with swimming microorganisms in chaotic flows.* *Indianapolis, IN*

93rd Annual Meeting of the Society of Rheology (SoR) *10/2022*
TALK TITLE: *Understanding the rheology of clay suspensions using Bayesian inference.* *Chicago, IL*

2022 American Physical Society (APS) March Meeting *03/2022*
TALK TITLE: *Polymers in two-dimensional bacterial turbulence.* *Chicago, IL*

74th Annual Meeting of the APS Division of Fluid Dynamics (DFD) *11/2021*
TALK TITLE: *Bacteria hinder large-scale transport & mixing in time-periodic flows.* *Phoenix, AZ*

18th International Congress on Rheology (ICR), Virtual *12/2020*
TALK TITLE: *Predicting the rheology of kaolinite clay suspensions using Bayesian inference.* *Rio de Janeiro, Brazil*

73rd Annual Meeting of the APS Division of Fluid Dynamics (DFD), Virtual *11/2020*
TALK TITLE: *Bacteria hinder large scale transport in 2D time-periodic flows.* *Chicago, IL*

72nd Annual Meeting of the APS Division of Fluid Dynamics (DFD) *11/2019*
TALK TITLE: *Transport & dynamics of swimming microorganisms in time-periodic flow.* *Seattle, WA*

10th Northeast Complex Fluids and Soft Matter Workshop (NCS10) *01/2019*
TALK TITLE: *Symmetry breaking instability in cross-slot: a 3D experiment view.* *New Brunswick, NJ*

9th Northeast Complex Fluids and Soft Matter Workshop (NCS9) *05/2018*
TALK TITLE: *Holographic PTV in cross-slot instability of viscoelastic fluids.* *Philadelphia, PA*

19th Mid-Atlantic Soft Matter Workshop (MASM19) *02/2018*
TALK TITLE: *Holographic PTV & pressure fluctuations in cross-slot instability.* *College Park, MD*

PROFESSIONAL CONTRIBUTIONS

Session Chair, American Physical Society (APS) Global Physics Summit 2025 *03/2025*
SESSION TITLE: *M64: Soft and Living Matter in Complex Environments I (Focus).* *Anaheim, CA*

Session Chair, 77th Annual Meeting of the APS Division of Fluid Dynamics (DFD) *11/2024*
SESSION TITLE: *ZC09: Drops: Drops with Additives.* *Salt Lake City, UT*

Session Chair, 76th Annual Meeting of the APS Division of Fluid Dynamics (DFD) *11/2023*
SESSION TITLE: *ZC10: Biofluids: Low Re Swimming IV.* *Washington, DC*

Organizer, 9th Northeast Complex Fluids and Soft Matter Workshop (NCS9) *05/2018*
Helped organize and hosted the event. *Philadelphia, PA*

PEER REVIEW ACTIVITIES

- *Physics of Fluids* *12/2023, 10/2024, 11/2024, 06/2025*
- *Proceedings of the National Academy of Sciences*† *12/2021, 08/2022*
- *Journal of Fluid Mechanics*† *05/2021, 09/2022*
- *Physical Review Fluids*† *10/2021*
- *Soft Matter*† *05/2021*
- *Journal of Non-Newtonian Fluid Mechanics*† *12/2019, 04/2021*
- *Chaos: An Interdisciplinary Journal of Nonlinear Science*† *12/2019*

† Co-reviewed with Dr. Paulo E. Arratia.

PROFESSIONAL AFFILIATION

Member, Society of Rheology (SoR) *2022 - Present*

Member, American Physical Society (APS) *2019 - Present*

- Topical Group on Statistical & Nonlinear Physics (GSNP) *2023 - Present*
- Division of Biological Physics (DBIO) *2023 - Present*
- Division of Soft Matter (DSOFT) *2022 - Present*
- Division of Fluid Dynamics (DFD) *2019 - Present*

TEACHING EXPERIENCE

Teaching Assistant, University of Pennsylvania

MEAM 302 Fluid Mechanics (Instructor: Dr. George I. Park) *Fall 2022*
Junior level course on fundamental fluid mechanics.

MEAM 536 Viscous Fluid Flow (Instructor: Dr. Paulo E. Arratia) *Spring 2022*
Senior/graduate level course on fluid mechanics, rheology, and complex fluids.

MEAM 570 Transport Phenomena (Instructor: Dr. Paulo E. Arratia) *Fall 2020*
Graduate level course on heat, mass, and momentum transfer.

MEAM 536 Viscous Fluid Flow (Instructor: Dr. Howard H. Hu) *Spring 2020*
Senior/graduate level course on fluid mechanics, rheology, and complex fluids.

MEAM 527 Finite Element Analysis (Instructor: Dr. Howard H. Hu) *Fall 2019*
Senior/graduate level course on finite element analysis and numerical methods.

MEAM 580 Electrochemistry (Instructor: Dr. James H. Pikul) *Spring 2018*
Graduate level course on electrochemical phenomena such as electrolysis and battery.

MENTORING EXPERIENCE

Avery Dolins, undergraduate student in Physics, Emory University *08/2024 - Present*
PROJECT: *Understanding the survival of airborne microbes during desiccation.*

Mica Einhorn, undergraduate student in Physics, Emory University *08/2024 - 12/2024*
PROJECT: *Effects of relative humidity on electrostatic induction in sand grains.*

Derrick Rodriguez, undergraduate student in Physics, Emory University *05/2024 - 09/2023*
PROJECT: *Effects of relative humidity on electrostatic induction in sand grains.*

Julia Radzio, PhD student in Mechanical Engineering, University of Pennsylvania *01/2022 - 12/2022*
PROJECT: *Passive sorting of droplets for high-throughput screening of biomolecules.*

Shaun Fedrick, undergraduate student in Physics, University of Pennsylvania *05/2018 - 08/2018*
PROJECT: *Touchdown of a sphere in viscoelastic fluids.*