

RANJIANGSHANG RAN, Ph.D.

Tarbutton Postdoctoral Research Fellow

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

Research Interests: Fluid Mechanics, Rheology, Soft Matter, Complex Fluids, Microbiology

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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).

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, Fellow of the American Physical Society.

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, V. M. Ortega-Jimenez, *Electrostatics facilitate mid-air host attachment in parasitic jumping nematodes*, **Proceedings of the National Academy of Sciences**, Accepted (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

Tarbuton Postdoctoral Fellowship

Emory College of Arts and Sciences

06/2024 - 05/2025

Atlanta, GA

- Granted to distinguished postdoctoral fellows for excellence in research.

Gallery of Fluid Motion Award

American Physical Society, Division of Fluid Dynamics

11/2021

Phoenix, AZ

- Honored as a winner of the 74th *Gallery of Fluid Motion*.

Outstanding Academic Award: Honorable Mention

School of Engineering and Applied Science

05/2019

Philadelphia, PA

- Acknowledged for exceptional academic accomplishments.

MEAM MSE Merit Scholarship

Department of Mechanical Engineering and Applied Mechanics

05/2018

Philadelphia, PA

- Awarded to Master's students with remarkable research achievements.

Bachelor's degree with Honors

School of Mechanical Engineering, Shanghai Jiao Tong University

06/2017

Shanghai, CN

- Graduated with honors for outstanding academic achievement.

CONFERENCE PRESENTATIONS

2025 American Physical Society (APS) Global Physics Summit

TALK TITLE: *Collective particle dynamics in rotating drops under acoustic levitation.*

03/2025

Anaheim, CA

77th Annual Meeting of the APS Division of Fluid Dynamics (DFD)

TALK TITLE: *Dynamic self-assembly of microparticles in rotating drops under acoustic levitation.*

11/2024

Salt Lake City, UT

76th Annual Meeting of the APS Division of Fluid Dynamics (DFD)

TALK TITLE: *Transport barriers and elliptic islands—Mixing with swimming microorganisms in chaotic flows.*

11/2023

Washington, DC

75th Annual Meeting of the APS Division of Fluid Dynamics (DFD)

TALK TITLE: *Enhanced transport barriers with swimming microorganisms in*

11/2022

Indianapolis, IN

93rd Annual Meeting of the Society of Rheology (SoR)	10/2022
TALK TITLE: <i>Understanding the rheology of clay suspensions using Bayesian inference.</i>	Chicago, IL
2022 American Physical Society (APS) March Meeting	03/2022
TALK TITLE: <i>Polymers in two-dimensional bacterial turbulence.</i>	Chicago, IL
74th Annual Meeting of the APS Division of Fluid Dynamics (DFD)	11/2021
TALK TITLE: <i>Bacteria hinder large-scale transport & mixing in time-periodic flows.</i>	Phoenix, AZ
18th International Congress on Rheology (ICR), Virtual	12/2020
TALK TITLE: <i>Predicting the rheology of kaolinite clay suspensions using Bayesian inference.</i>	Rio de Janeiro, Brazil
73rd Annual Meeting of the APS Division of Fluid Dynamics (DFD), Virtual	11/2020
TALK TITLE: <i>Bacteria hinder large scale transport in 2D time-periodic flows.</i>	Chicago, IL
72nd Annual Meeting of the APS Division of Fluid Dynamics (DFD)	11/2019
TALK TITLE: <i>Transport & dynamics of swimming microorganisms in time-periodic flow.</i>	Seattle, WA
10th Northeast Complex Fluids and Soft Matter Workshop (NCS10)	01/2019
TALK TITLE: <i>Symmetry breaking instability in cross-slot: a 3D experiment view.</i>	New Brunswick, NJ
9th Northeast Complex Fluids and Soft Matter Workshop (NCS9)	05/2018
TALK TITLE: <i>Holographic PTV in cross-slot instability of viscoelastic fluids.</i>	Philadelphia, PA
19th Mid-Atlantic Soft Matter Workshop (MASM19)	02/2018
TALK TITLE: <i>Holographic PTV & pressure fluctuations in cross-slot instability.</i>	College Park, MD

PROFESSIONAL CONTRIBUTIONS

Session Chair , American Physical Society (APS) Global Physics Summit 2025	03/2025
SESSION TITLE: <i>M64: Soft and Living Matter in Complex Environments I (Focus).</i>	Anaheim, CA
Session Chair , 77th Annual Meeting of the APS Division of Fluid Dynamics (DFD)	11/2024
SESSION TITLE: <i>ZC09: Drops: Drops with Additives.</i>	Salt Lake City, UT
Session Chair , 76th Annual Meeting of the APS Division of Fluid Dynamics (DFD)	11/2023
SESSION TITLE: <i>ZC10: Biofluids: Low Re Swimming IV.</i>	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

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

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

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.*

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.*

SERVICE AND OUTREACH

Facilitator, *Emory Science Club*, Laurel Ridge Elementary *09/2023 - Present*
Monthly after-school activities for 4th to 6th graders promoting STEM education at Laurel Ridge Elementary, a local elementary school at Dekalb county, Georgia.

Member, *Engineering Dean's Advisory Board (EDAB)* *01/2023 - 05/2023*
Student organization advising the Dean of the School of Engineering and Applied Science at the University of Pennsylvania via bi-weekly meetings.

Member, *Mechanical Engineering Graduate Association (MEGA)* *09/2018 - 05/2023*
Graduate student association at the University of Pennsylvania organizing departmental events such as the *MEGA Coffee Hours* and the *MEAM Holiday Party*.