

RANJIANGSHANG RAN, Ph.D.

Tarbutton Postdoctoral Research Fellow

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

Research Interests: Fluid Mechanics, Rheology, 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, 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**, *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

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| <p>Tarbutton Postdoctoral Fellowship
 <i>Emory College of Arts and Sciences</i></p> <ul style="list-style-type: none"> • Granted to distinguished postdoctoral fellows for excellence in research. | <p>06/2024 - 05/2025
 Atlanta, GA</p> |
| <p>Gallery of Fluid Motion Award
 <i>American Physical Society, Division of Fluid Dynamics</i></p> <ul style="list-style-type: none"> • Honored as a winner of the 74th <i>Gallery of Fluid Motion</i>. | <p>11/2021
 Phoenix, AZ</p> |
| <p>Outstanding Academic Award: Honorable Mention
 <i>School of Engineering and Applied Science</i></p> <ul style="list-style-type: none"> • Acknowledged for exceptional academic accomplishments. | <p>05/2019
 Philadelphia, PA</p> |
| <p>MEAM MSE Merit Scholarship
 <i>Department of Mechanical Engineering and Applied Mechanics</i></p> <ul style="list-style-type: none"> • Awarded to Master's students with remarkable research achievements. | <p>05/2018
 Philadelphia, PA</p> |
| <p>Bachelor's degree with Honors
 <i>School of Mechanical Engineering, Shanghai Jiao Tong University</i></p> <ul style="list-style-type: none"> • Graduated with honors for outstanding academic achievement. | <p>06/2017
 Shanghai, CN</p> |

CONFERENCE PRESENTATIONS

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| <p>2025 American Physical Society (APS) Global Physics Summit
 TALK TITLE: <i>Collective particle dynamics in rotating drops under acoustic levitation.</i></p> | <p>03/2025
 Anaheim, CA</p> |
| <p>77th Annual Meeting of the APS Division of Fluid Dynamics (DFD)
 TALK TITLE: <i>Dynamic self-assembly of microparticles in rotating drops under acoustic levitation.</i></p> | <p>11/2024
 Salt Lake City, UT</p> |
| <p>76th Annual Meeting of the APS Division of Fluid Dynamics (DFD)
 TALK TITLE: <i>Transport barriers and elliptic islands—Mixing with swimming microorganisms in chaotic flows.</i></p> | <p>11/2023
 Washington, DC</p> |
| <p>75th Annual Meeting of the APS Division of Fluid Dynamics (DFD)
 TALK TITLE: <i>Enhanced transport barriers with swimming microorganisms in</i></p> | <p>11/2022
 Indianapolis, IN</p> |

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.

PROFESSIONAL AFFILIATION

Member, Society of Rheology (SoR)	<i>2022 - Present</i>
Member, American Physical Society (APS)	<i>2019 - Present</i>
• Topical Group on Statistical & Nonlinear Physics (GSPN)	<i>2023 - Present</i>
• Division of Soft Matter (DSOFT)	<i>2022 - Present</i>
• Division of Fluid Dynamics (DFD)	<i>2019 - Present</i>

TEACHING EXPERIENCE

Teaching Assistant, University of Pennsylvania

MEAM 302 Fluid Mechanics (Instructor: Dr. George I. Park) Junior level course on fundamental fluid mechanics.	<i>Fall 2022</i>
MEAM 536 Viscous Fluid Flow (Instructor: Dr. Paulo E. Arratia) Senior/graduate level course on fluid mechanics, rheology, and complex fluids.	<i>Spring 2022</i>
MEAM 570 Transport Phenomena (Instructor: Dr. Paulo E. Arratia) Graduate level course on heat, mass, and momentum transfer.	<i>Fall 2020</i>
MEAM 536 Viscous Fluid Flow (Instructor: Dr. Howard H. Hu) Senior/graduate level course on fluid mechanics, rheology, and complex fluids.	<i>Spring 2020</i>
MEAM 527 Finite Element Analysis (Instructor: Dr. Howard H. Hu) Senior/graduate level course on finite element analysis and numerical methods.	<i>Fall 2019</i>
MEAM 580 Electrochemistry (Instructor: Dr. James H. Pikul) Graduate level course on electrochemical phenomena such as electrolysis and battery.	<i>Spring 2018</i>

MENTORING EXPERIENCE

Avery Dolins, undergraduate student in Physics, Emory University PROJECT: <i>Understanding the survival of airborne microbes during desiccation.</i>	<i>08/2024 - Present</i>
Mica Einhorn, undergraduate student in Physics, Emory University PROJECT: <i>Effects of relative humidity on electrostatic induction in sand grains.</i>	<i>08/2024 - 12/2024</i>
Julia Radzio, PhD student in Mechanical Engineering, University of Pennsylvania PROJECT: <i>Passive sorting of droplets for high-throughput screening of biomolecules.</i>	<i>01/2022 - 12/2022</i>
Shaun Fedrick, undergraduate student in Physics, University of Pennsylvania PROJECT: <i>Touchdown of a sphere in viscoelastic fluids.</i>	<i>05/2018 - 08/2018</i>