

Education

- 2016–2021 **PhD, Engineering Mechanics**, *Virginia Tech*, Virginia, USA
- Advisor: Prof. Jonathan B. Boreyko
 - Dissertation title: Exploiting Interfacial Phenomena to Expel Matter from its Substrate
- 2010–2014 **B.Engg., Mechanical Engineering**, *Jadavpur University*, Kolkata, India

Industrial Experience

- 2014–2016 **Process Engineer**, *Thermax Limited*, Pune, Maharashtra, India
- Optimizing the preliminary design of Fired Heaters as per client specification and API 560 guidelines.

Research Interest Area

Experimental Soft Matter, Physics of Environmental and Biological Systems

Research Experience

Far-from-equilibrium soft matter systems and their behaviors

- 2021–current **Postdoctoral Research Associate**, *University of Minnesota*, Minneapolis, Minnesota, USA, With Prof. Sungyon Lee
- Instabilities in particle-laden fluid interfaces or granular rafts
 - Pattern formation due to particle-induced viscous fingering
- 2016–2021 **Graduate Research Assistant**, *Virginia Tech*, Blacksburg, USA, With Prof. Jonathan Boreyko
- Phase-change-induced dynamics: Jumping condensate droplets
 - Phase-change-induced dynamics: Plant pathogen dispersal through condensation and evaporation
 - Phase-change-induced dynamics: Jumping frost
 - Interfacial fluid mechanics: Super-slippery surfaces

Publications

Journal Publications

- 2025 **R. Mukherjee**, Z. Chen, X. Cheng, and S. Lee, “*Microscopic contact line dynamics dictate the emergent behaviors of particle rafts*”, **arXiv**, DOI:10.48550/arXiv.2502.11315
- 2025 M. Edalatpour, **R. Mukherjee**, and J. B. Boreyko, “*Bridging-Droplet Thermal Diodes: Modeling and Optimization*”, **Int. J. Mass Heat Trans.**, 239, 2025 DOI:10.1016/j.ijheatmasstransfer.2024.126594
- 2023 B. C. Druecke, **R. Mukherjee**, X. Cheng, S. Lee, “*Collapse of a granular raft: transition from single particle falling to collective creasing*”, **Phys. Rev. Fluids**, 8, 2023 DOI:10.1103/PhysRevFluids.8.024003
- 2022 G. J. Iliff*, **R. Mukherjee**, H. A. Gruszeński, D. G. Schmale III, S. Jung, and J. B. Boreyko, “*Phase-change-mediated transport and agglomeration of fungal spores on wheat awns*”, **Journal of Royal Society Interface**, 19, 2022 DOI:10.1098/rsif.2021.0872
- 2021 **R. Mukherjee**, S.F. Ahmadi, H. Zhang, R. Qiao, and J. B. Boreyko, “*Electrostatic Jumping of Frost*”, **ACS Nano**, 15, 2021 DOI:10.1021/acsnano.0c09153
- 2021 **R. Mukherjee**, H. A. Gruszeński, L. T. Bilyeu*, D. G. Schmale III, and J. B. Boreyko, “*Synergistic dispersal of plant pathogen spores by jumping-droplet condensation and wind*”, **Proc. Natl. Acad. Sci. U.S.A. (PNAS)**, 118, 2021 DOI:10.1073/pnas.2106938118
- 2021 H. Zhang, J. D. Poorter, **R. Mukherjee**, J. B. Boreyko, and R. Qiao, “*Thermoelectrics in ice slabs: charge dynamics and thermovoltages*”, **Phys. Chem. Chem. Phys.**, 23, 2021 DOI:10.1039/D1CP02304G
- 2020 M. Edalatpour, K. R. Murphy, **R. Mukherjee**, and J. B. Boreyko, “*Bridging-droplet thermal diodes*”, **Advanced Functional Materials**, 30, 2020 DOI:10.1002/adfm.202004451
- 2019 **R. Mukherjee**, A. S. Berrier*, K. R. Murphy, J. R. Vieitez*, and J. B. Boreyko, “*How surface orientation affects jumping-droplet condensation*”, **Joule**, 3, 2019 DOI:10.1016/j.joule.2019.03.004
- 2018 **R. Mukherjee**, M. Habibi, Z. T. Rashed*, O. Berbert, X. Shi, and J. B. Boreyko, “*Oil-Impregnated Hydrocarbon-Based Polymer Films*”, **Scientific Reports**, 8, 2018 DOI:10.1038/s41598-018-29823-7

In Preparation

- 2025 Y. Lolla, **R. Mukherjee**, and J. B. Boreyko, “**Drop Impact on a Lubricant-Infused Fiber**”

- 2025 B. C. Druecke, A. Hooshanginejad, **R. Mukherjee**, P. Poureslami, J. Brown and S. Lee, “**Particle-scale fingering from a draining suspension**”

Patent

- 2023 **US Patent: 20230251045A1, Status Pending, 2023/08/10, “Planar Bridging-droplet thermal diodes**, Inventors: J. B. Boreyko, M. Edalatpour, K. R. Murphy, **R. Mukherjee**

(* denotes undergraduate or first-year graduate researcher)

Conference Presentations

- 2024 “**Collapse of a granular raft: particle-scale features on a continuum model**”, *APS March Meeting 2024*, Minneapolis, MN, March 3–8 (Oral)
- 2023 “**Understanding the collapse of a granular raft**”, *SES Annual Technical Meeting 2023*, Minneapolis, MN, Oct 8–10 (Oral)
- 2023 “**The collapse of a granular raft under bi-axial compression**”, *APS March Meeting 2023*, Las Vegas, NV, March 5–10 (Oral)
- 2022 “**On the collapse of a granular raft in a funnel**”, *Granular Matter Gordon Research Conference*, Stonehill College, MA, USA, June 27–July 1, 2022 (Poster)
- 2021 “**Student Keynote Award Presentation: Jumping Ice**”, *Inaugural micro Flow and Interfacial Phenomena Conference*, Virtual, June 7–9, 2021 (Oral)
- 2019 “**Jumping Frost**”, *72nd Annual Meeting of the American Physical Society Division of Fluid Dynamics*, Seattle, WA, November 23–26, 2019 (Oral)
- 2019 “**How Surface Orientation Affects Jumping-Droplet Condensation**”, *Gordon Research Conference on Micro and Nanoscale Phase Change Heat Transfer*, Lucca, Italy, February 3–8, 2019 (Poster)
- 2018 “**Oil-infused Polyethylene Films**”, *MII Technical Conference and Review*, Virginia Tech, Blacksburg, April 16–18, 2018 (Poster)
- 2018 “**Effect of Surface Orientation on Jumping-droplet Condensation**”, *16th International Heat Transfer Conference (IHTC-16)*, Beijing, China, August 10–15, 2018 (Poster)
- 2017 “**Oil-infused Polyethylene Films**”, *70th Annual Meeting of the American Physical Society Division of Fluid Dynamics*, Denver, CO, November 19–21, 2017 (Oral)

Teaching Interest Area

Fluid Mechanics, Heat Transfer, Thermodynamics

Teaching Experience

- Spring 2017 **ESM 2304, Introduction to Dynamics**, *Virginia Tech*, Blacksburg, Virginia
Instructor: Prof. Scott Hendricks and Dr. Jared Gregg
- Fall 2016, **ESM 2104, Introduction to Statics**, *Virginia Tech*, Blacksburg, Virginia
- Fall 2020 Instructor: Prof. Scott Hendricks, Dr. Sneha Davison

Participation in Outreach Programs

- 2024 **Squishy Science Sunday**, *This was an outreach event organized to introduce concepts of soft matter physics to a general audience, APS March Meeting, Minneapolis, Minnesota*
- 2017–2020 **Virginia Tech Science Festival**, *Yearly expo-style, family-friendly events to engage with graduate scientists. Festival guests take part in hands-on activities and demonstrations at about 100 different exhibits, Blacksburg, Virginia*
- 2017–19 **C-Tech² Summer Camp**, *Yearly summer camp activity aimed at rising junior and senior high school girls. The purpose is to provide access to information for a successful STEM career. Organized by the Center for the Enhancement of Engineering Diversity (CEED), Blacksburg, Virginia*
- 2017, 2018 **Kids Tech University (KTU)**, *An educational outreach program to inspire children between ages 9–12 years in STEM education, Blacksburg, Virginia*

Professional Activities

- 2016-present **Journals reviewed for (co-reviewed with advisor):**, *Scientific Reports, Nano Energy, Advanced Functional Materials, Physical Review Letters, ACS Nano, Soft Matter, ACS AMI, Langmuir, Physical Review Fluids, Advanced Science*
- 2016-2021 **Past Member**, *Bio-Inspired Science & Technology Center at Virginia Tech*
- 2016-2021 **Past Member**, *Macromolecules and Interfaces Institute at Virginia Tech*

References

Jonathan B. Boreyko, *Associate Professor*,

Department of Mechanical Engineering, Virginia Tech, Blacksburg, Virginia
24061, USA,

email: boreyko@vt.edu

Phone: (540) 231-0469

Sungyon Lee, *Associate Professor*,

Department of Mechanical Engineering, University of Minnesota-Twin Cities,
Minneapolis, MN 55455, USA,

email: sungyon@umn.edu

Phone: (612) 625-2315

Xiang Cheng, *Professor*,

Department of Chemical Engineering and Materials Science, University of
Minnesota-Twin Cities, Minneapolis, MN 55455, USA,

email: xcheng@umn.edu

Phone: (612) 624-6165