

Ranit Mukherjee

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Education

- 2016–present **PhD, Engineering Science and Mechanics**, *Virginia Tech*, Blacksburg, Virginia.
GPA: 3.6/4.0
Advisor: [Prof. Jonathan B. Boreyko](#)
- 2010–2014 **B.S, Mechanical Engineering**, *Jadavpur University*, Kolkata, India.
GPA: 8.9/10.0

Research Experience

Virginia Tech, Blacksburg, Virginia

- 2016–present **Oil-impregnated Hydrocarbon-based Polymer Films.**
A simple, cost-effective and robust method was developed to make SLIPS from low-density extruded polymer films. The motivation behind the project was to minimize product wastage from single-serving ketchup pouches.
- Orientation Effect on Jumping-Droplet Condensation.**
Jumping droplet condensation has already been shown to be better at heat transfer than either dropwise or filmwise condensation. This is the first thorough study which further elucidates the surface orientation requirements to maximize the benefits of jumping-droplet condensation for longer periods of condensation.
- Jumping Frost.**
A study on the surprising phenomena of ice particles breaking off from a frosted surface and jumping towards opposing liquid droplets.
- Wheat-to-Wheat Pathogen Transport by Jumping Droplet Condensation.**
Rust disease is one of the most devastating and economically significant fungal diseases in wheat plants. In this study, we are assessing the importance of the jumping-droplet condensation on the short and long-distance dispersal of rust pathogens.
- Phase Change-Induced Spore Agglomeration on Wheat Awns.**
Preliminary experiments reveal how morphology of wheat awns help in the formation of spore clusters from singular *Fusarium* perithecia in the presence of condensation and evaporation. Such clustering is also shown to be conducive to easier disease spreading within a field via wind or rain.
- Bridging-Droplet Thermal Diodes.**
A novel bridging-droplet thermal diode was developed. My contribution in the project was developing the heat transfer model in the forward and reverse mode of operation.

Work Experience

- 2014–2016 **Process Engineer**, *Thermax Limited*, Pune, India.
Fired heaters are an integral part of petrochemical industries where a thermal fluid is heated to a desired temperature and pressure which is then used in subsequent processes like cracking. My job was to optimize the heater design from the client specific criteria while remaining within the guidelines of API 560 for the fired heaters.

Academic/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
- 2017-present **Graduate Research Assistant**, *Virginia Tech*.
Biomedical Engineering & Mechanics Dept., Advisor: Jonathan B. Boreyko

Professional and Synergistic Activities

- 2016-present **Member**, *Bio-Inspired Science & Technology Center at Virginia Tech*.
- 2016-present **Member**, *Macromolecules and Interfaces Institute at Virginia Tech*.
- 2017-present **Member**, *the American Physical Society (APS)*.
- 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*.

Publications

Journal Publications

- 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.
[Featured in [UK Daily Mirror](#): "Scientists develop 'super slippery' packaging that ensures you get every last drop of ketchup"]
[Featured in [Yahoo News](#): "Ketchup Packets Become the New Straws as Scientists Battle Plastic Waste"]
[Featured in [Science Daily](#): "Rethinking ketchup packets: New approach to slippery packaging aims to cut food waste"]
[Featured in [Top 50 most highly accessed Materials Science articles in 2018 in Scientific Reports](#)]
- 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.
[Highlighted in a preview article in *Joule*, DOI:10.1016/j.joule.2019.04.008]
- 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.
- 2021 **R. Mukherjee**, S.F. Ahmadi, H. Zhang, R. Qiao and J. B. Boreyko, "**Electrostatic Jumping of Frost**", *ACS Nano* DOI:10.1021/acsnano.0c09153.
[Featured in [New Scientist](#): "Electrostatic de-icing could make it easier to defrost car windows"]
[Featured in [Chembytes](#): "De-icing surfaces by making frost jump"]

Conference Proceedings

- 2018 **R. Mukherjee**, A. S. Berrier, J. R. Vieitez, K. R. Murphy, and J. B. Boreyko, "Effects of Surface Orientation on Jumping-Droplet Condensation", Proceedings of the 16th International Heat Transfer Conference (IHTC-16), 2018.

Provisional Patents

- 2017 **R. Mukherjee**, M. Habibi, Z. T. Rashed, O. Berbert, X. Shi, and J. B. Boreyko, "Slippery Hydrocarbon-Based Polymer Films via Lubricant Impregnation", U.S. Provisional Patent Application No.: 62/531,635, filed 2017.
- 2020 **M. Edalatpour**, K. R. Murphy, **R. Mukherjee** and J. B. Boreyko, "Planar Bridging-Droplet Thermal Diodes", U.S. Provisional Patent Application No.: 63/044,135, filed 2020.

Conference Presentations

- 2017 **"Oil-infused Polyethylene Films"**, 70th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Denver, CO, November 19–21, 2017 (Oral).
- 2018 **"Effect of Surface Orientation on Jumping-droplet Condensation"**, 16th International Heat Transfer Conference (IHTC-16), Beijing, China, August 10–15, 2018 (Poster).
- 2018 **"Oil-infused Polyethylene Films"**, MII Technical Conference and Review, Virginia Tech, Blacksburg, April 16–18, 2018 (Poster).
- 2019 **"Effect of Surface Orientation on Jumping-Droplet Condensation"**, Micro and Nanoscale Phase Change Heat Transfer, Gordon Research Conference, Lucca, Italy, February 3–8, 2019 (Poster).
- 2019 **"Jumping Frost"**, 72nd Annual Meeting of the American Physical Society Division of Fluid Dynamics, Seattle, WA, November 23–26, 2019 (Oral).

Participation in Outreach Programs

- 2017, 2018 **Kids Tech University (KTU)**, An educational outreach program to inspire children between ages 9–12 years in STEM education, Blacksburg, Virginia.
- 2017–19 **C-Tech² Summer Camp**, Interactive activity involving recent high school graduates to help them explore the engineering and research options at Virginia Tech. Organized by the Center for the Enhancement of Engineering Diversity (CEED), Blacksburg, Virginia.
- 2020 **Virginia Tech Science Festival**, Teleconferenced Meetups between learner groups and researchers to instill a love for science. Organized by Virginia Tech and the Science Museum of Western Virginia, Blacksburg, Virginia.

References

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- 2 **Prof. Rui Qiao**, *Professor*,
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- 3 **Dr. S. Farzad Ahmadi**, *Postdoctoral Research Associate*,
Department of Mechanical and Environmental Engineering, University of California,
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