PANKAJ ROHILLA

Drug Delivery | Medical Devices | Biological Fluid Dynamics

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EDUCATION

Ph.D., Chemical Engineering, Texas Tech University *Aug 2017- Aug 2022*
M.Tech, Chemical Engineering, Indian Institute of Technology Kharagpur *Aug 2014- May 2016*
B.Tech, Chemical Engineering, Kurukshetra University *Aug 2009- May 2013*

EMPLOYMENT

Eckert Postdoc Fellow, Chemical and Biomolecular Engineering, **Georgia Tech** *Aug 2022-Present*
Adviser: Saad Bhamla and Mark Prausnitz

- Low-cost hardware for intradermal delivery of nucleic acid therapeutics and vaccines.
- Human tolerance of electroporation in human subjects.
- Studied in vivo protein and gene expression, humoral immune response, serum biomarkers, reticulocyte counts, and hematocrit levels for Erythropoietin encoding mRNA and SARS-CoV-2 antigens.
- Fluid ejection in nature and interfacial fluid dynamics in water-walking insects to inform bioinspired designs for applications in drug delivery and additive manufacturing.

Graduate Research Assistant, Chemical Engineering, **Texas Tech University** *Aug 2017- May 2022*
Adviser: Jeremy Marston

- Optimized drug delivery efficiency of spring-powered needle-free jet injectors to nearly 100% by analyzing and leveraging the underlying injection hydrodynamics.
- Developed and assessed the feasibility of novel intradermal drug delivery methods, including tattooing, laser-induced jetting, and spark-induced jetting.
- Studied how eye medication droplets spread on an eye replica to reduce drug wastage.
- Studied fluid driven cracking in hydrogels for applications in drug delivery and hydraulic fracturing.

Project Officer, Chemical Engineering, **IIT Madras** *Dec 2016- Jun 2017*
Advisers: MG Basavaraj, S Thampi, and M Manivannan

Detection of critical micelle concentration via spreading oil drops on surfactant solutions.

Junior Research Fellow, Chemical Engineering, **IIT Bombay** *Jun 2016- Dec 2016*
Adviser: Jyoti Seth

Stochastic modeling of particle aggregation using Stokesian Dynamics.

Graduate Assistant, Chemical Engineering, **IIT Kharagpur** *Mar 2015- June 2016*
Adviser: Somenath Ganguly

Charge transport in carbon electrodes for supercapacitors.

AWARDS AND HONORS

Top 20 Scientific Contributions, *Controlled Release Society Meeting*, Bologna, Italy *2024*
Robert M. Nerem Travel Award, Georgia Tech *2023*
Eckert Postdoctoral Fellowship Award, Georgia Tech (ChBE) *2022*

Horn Distinguished Professors Graduate Achievement Award, Texas Tech University *2022*
Best Poster Award, Annual Chemical Engineering Research Fair, Texas Tech University *2022*
APS March FGSA Travel Award, Texas Tech University *2022*
Poster Award Winner, AICHE Fall Meeting (FP & BE Division) *2021*
Study Abroad Competitive Scholarship (SACS), Texas Tech University *Fall 2021*
Graduate School Travel Award, Texas Tech University *Fall 2019, 2021*
Best Judge, 3 minute presentation, Society of Plastics Engineers, Texas Tech *Spring 2021*
Mark Demark Scholarship, Texas Tech University *Spring 2021*
NSF I-Corps (Regional), Texas Tech University *Fall 2020*
Graduate Student Research Support Award, Texas Tech University *Spring 2020*
MHRD Scholarship, Indian Institute of Technology, Kharagpur *2014-2016*

PATENTS

1. Azizoglu, E., **Rohilla, P.**, Bhamla, S., and Prausnitz, M. S. "Multiple pulse generator", U.S. Provisional Patent Application No. 63/398,123, filed July 3, 2025.

PUBLICATIONS

Google Scholar

[*] *indicates equal contribution.*

18. Ortega, V.M., Yee, T., **Rohilla, P.**, Seleb, B.R., Belair, J., and Bhamla, M. S. "Flamingos use L-shaped beak and morphing feet to induce vortical traps for prey capture", PNAS, 122 (21), e2503495122 (2025).
    : ScienceDaily | SciTechDaily | Greek Reporter

17. **Rohilla, P.***, Choi, D.*, Wallace, H., Yung, K., Deora, J., Lele, A. and Bhamla, M. S. "Mastering the Manu – How humans create large splashes", Royal Society - Interface Focus, 15: 20240056 (2025).
    : The Conversation | WSJ | ScienceNews | New Scientist | USA Today | CBC Radio | Newswise

16. Lawal, I.*, **Rohilla, P.***, Rodriguez, E., Pham, P. and Marston, J. O. "Delivery of viscous drops and jets to eyeball replicas", International Journal of Pharmaceutics, 674 (125400), (2025).

15. **Rohilla, P.*** O'Neil, J.*, Jimenez, V. O., Choi, D., and Bhamla, M. S., "Interfacial vortex recapture enhances thrust in tiny water skaters", bioRxiv (2025).

14. Lu, C*, **Rohilla, P.***, Felner, E. I., Byagathvalli, G., Azizoglu, E., Bhamla,, M. S. and Prausnitz, M R. "Tolerability of a piezoelectric microneedle electroporator in human subjects", Bioengineering and Translational Medicine, 9 (4), e10662 (2024).

13. O'Neil, J., Yung, K. L., Difini, G., **Rohilla, P.**, and Bhamla, M. S. "Limb loss and specialized leg dynamics in tiny water-walking insects", Integrative and Comparative Biology, 64 (3), 1034-1043 (2024)

12. Challita, E. J., **Rohilla, P.**, and Bhamla, M. Saad. "Fluid ejections in nature", Annual Review of Chemical and Biomolecular Engineering, *15* (2024).
    : ARS Technica

11. **Rohilla, P.**, and Marston, J. O. "Focused high-speed liquid jets induced via low-voltage sparks in capillary tubes", Experiments in Fluids, 64 (5), 90 (2023).

10. **Rohilla, P.**, Khusnatdinov, E., and Marston, J. O. "Effect of air pockets in drug delivery via jet injections", International Journal of Pharmaceutics, 602, 120547 (2021).

9. Lawal, I., **Rohilla, P.**, and Marston, J. O. “Visualization of drug delivery via tattooing: effect of needle reciprocating frequency and fluid properties”, Journal of Visualization, 1-9 (2022).

8. Shahriar, M.*, Rewanwar, A.*, **Rohilla, P.***, and Marston, J. O. “Understanding the effect of counterpressure buildup during syringe injections”, International Journal of Pharmaceutics, 602, 120530 (2021).

7. **Rohilla, P.**, and Marston, J. O. “Feasibility of laser induced jets in needle-free jet injections”, International Journal of Pharmaceutics, 589, 119714 (2020).
: New Scientist

6. **Rohilla, P.**, Lawal, I., Blanc, A.L., O’Brien, V., Weeks, C., Tran, W., Rane, Y.S., Khusnatdinov, E., and Marston, J.O. “Loading effects on the performance of needle-free jet injections in different skin models”, Journal of Drug Delivery Science and Technology, 60, 102043 (2020).

5. Deodhar, S., **Rohilla, P.**, Manivannan, M., Thampi, S.P., and Basavaraj, M.G. “Robust method to determine critical micelle concentration via spreading oil drops on surfactant solutions”, Langmuir, 36 (28): 8100-8110 (2020).

4. **Rohilla, P.**, Rane, Y.S., Lawal, I., Blanc, A.L., Davis, J., Thomas, J.B., Weeks, C., Tran, W., Fisher, P., Broderick, K.E., Simmons, J.A. and Marston J.O., “Characterization of jets for impulsively-started needle-free jet injectors: Influence of fluid properties”, Journal of Drug Delivery Science and Technology, 53, 101167 (2019).

3. **Rohilla, P.** and Marston, J. O. “In-vitro studies of jet injections”, International Journal of Pharmaceutics, 568, 118503 (2019).

2. **Pankaj**, Chavhan, M.P. and Ganguly, S., “Charge transport in activated carbon electrodes: the behaviour of three electrolytes vis-à-vis their specific conductance”, Ionics, 23, 2037 (2017).

1. Chavhan, M.P., **Pankaj** and Ganguly, S. “Charge transport in carbon electrodes made by electrospray of precursor sol and subsequent carbonization in situ”, Journal of Solid State Electrochemistry, 22, 7 : 2149-2157 (2018).

WORK IN PROGRESS

* *indicates equal contribution.*

5. **Rohilla, P.**, Azizoglu, E., Lele, A., Park, S., Bhamla, M.S., and Prausnitz, M.R., “Rotopatch - A novel piezoelectric microneedle electroporator for mRNA delivery”, *In submission, Bioengineering & Translational Medicine* (2025).

4. **Rohilla, P.**, Bhamla, M.S., and Prausnitz, M.R., “An ultra-low-cost electroporator for mRNA delivery”, *In progress* (2025).

3. Challita, E., Harrison, J., **Rohilla, P.**, and Bhamla, M. S., “Viscoelastic jets from ultrasmall nozzles in termites”, *In Preparation*,(2025).

2. **Rohilla, P.**, Lawal, I., Williams, N., and Marston, J. O., “Early-time dynamics of fluid driven cracks”, *In submission* (2025).

1. **Rohilla, P.**, Williams, N., and Marston, J.O., “Fluid driven cracking in multilayered hydrogels with high-speed liquid jets”, *In submission* (2025).

FUNDING

Total Funds Raised: > **$ 210,000**

1. Eckert Postdoctoral Fellowship Award: $110,000
Won the competitive fellowship to obtain funding for 2 years towards monthly salary and travel funds.

2. Georgia Research Alliance Grants - Phase I & II (PIs: *Saad Bhamla & Mark R. Prausnitz*): >$100,000
Drafted grant proposal and reports.

PRESENTATIONS

Invited

4. Keynote Lecture - 4th International Conference on Future Technologies in Manufacturing, Automation, Design & Energy (NIT Trichy, India), *Fluid ejections in nature* (Dec 2024)

3. University of Alabama (Tuscaloosa, AL), Chemical and Biological Engineering *Addressing global health challenges using high-speed liquid jets and ultra-low-cost tools* (Jan 2024)

2. Georgia Institute of Technology (Atlanta, US), Quantitative Biosciences, *Principles of locomotion - Water walkers* (Nov 2023)

1. Karolinska Institutet (Stockholm, Sweden), April 2023. *Ultra-low-cost electroporator for intradermal delivery of nucleic acids.* (Apr 2023)

Contributed

23. Microneedles Conference, Brisbane, Australia, 2025, *A piezoelectic low-cost electroporator for mRNA delivery* (Oral)

22. Global Physics Summit, Anaheim, CA, 2025, *Fluid ejection via micron-scale soft nozzles enables Marangoni propulsion in tiny water skaters* (Oral)

21. The Society for Integrative and Comparative Biology - Annual Meeting, Atlanta, GA, 2025, *Mastering the manu: how humans create large splashes.* (Oral)

20. American Institute of Chemical Engineers - Annual Fall Meeting, San Diego, CA, 2024. *Epatch: An Ultra-Low-Cost Handheld Electroporator for Intradermal Delivery of mRNA.* (Oral)

19. American Institute of Chemical Engineers - Annual Fall Meeting, San Diego, CA, 2024. *Vortical Interactions in nature.* (Oral)

18. American Physical Society - March Meeting, Minneapolis, MN, 2024, *Vortical interactions in nature.* (Oral)

17. American Physical Society - March Meeting, Minneapolis, MN, 2024, *Vortex interactions in Water-walking insects.* (Poster)

16. The Society for Integrative and Comparative Biology - Annual Meeting, Seattle, WA, 2023, *Small yet fast water-walkers: vortex interactions during water locomotion in Microvelia.* (Oral)

15. American Physical Society - Division of Fluid Dynamics Meeting, Washington DC, 2023. *Studying vortex interactions in water walking insects using physical and computational fluid dynamics.* (Oral)

14. American Institute of Chemical Engineers - Annual Fall Meeting, Orlando, FL, 2023. *Electroporation-Mediated Delivery of mRNA in the Skin Using a Low-Cost Handheld Electroporator.* (Oral)

13. American Physical Society - March Meeting, Las Vegas, NV, 2023. *Impact of vortex recapture in water-walking Microvelia using a physical model and computational fluid dynamics.* (Oral)

12. The Society for Integrative and Comparative Biology - Annual Meeting, Austin, TX, 2023, *Physical and computational models of vortex recapture during Microvelia's walking on water.* (Oral)

11. American Physical Society - March Meeting, Chicago, IL, 2022, *Spark-induced drops and jets.* (Oral)

10. CHEGSA Symposium - Tech University, Lubbock, TX, 2022, *Optimizing needle-free jet injections for intradermal drug delivery.* (Poster). **First Prize.**

9. Graduate School Symposium - Tech University, Lubbock, TX, 2022, *Optimizing needle-free jet injections for intradermal drug delivery.* (Poster)

8. American Physical Society - Division of Fluid Dynamics Meeting, Phoenix, AR, 2022. *Early-time dynamics of fluid-driven cracks.* (Oral)

7. American Institute of Chemical Engineers - Annual Fall Meeting, Boston, MA, 2021. *Optimizing needle-free jet injections for intradermal drug delivery.* (Poster). **Best Poster Award.**

6. American Institute of Chemical Engineers - Annual Fall Meeting, Boston, MA, 2021. *Early-time dynamics of fluid-driven cracks.* (Oral)

5. Graduate School Symposium - Texas Tech University, Lubbock, TX, 2021, *Laser-induced jets for drug delivery.* (Poster)

4. American Physical Society - Division of Fluid Dynamics Meeting, Seattle, WA, 2019. *Effect of applied load and jet dispersion on efficiency of needle-free injections.* (Oral)

3. American Physical Society - Division of Fluid Dynamics Meeting, Atlanta, GA, 2018. *In-vitro studies of jet injection dynamics.* (Oral)

2. International Conference on Material Science and Engineering, Kottayam, India, 2016. *Impedance Spectroscopy Studies for Supercapacitors based on different electrolytes.* (Poster).

1. Annual Session of Indian Institute of Chemical Engineers, IIT Guwahati, India, 2015. *Modeling of Electric Double layer Capacitors.* (Poster).

TEACHING EXPERIENCE

3.	Advanced Chemical Engineering Techniques, CHE 5310 (Teaching Assistant)	*Fall 2018*
2.	Engineering Materials Science, CHE 3330 - (Teaching Assistant)	*Spring 2018*
1.	Chemical Engineering Thermodynamics II, CHE 3322 - (Teaching Assistant)	*Fall 2017*

MENTORSHIP

– Individually supervised **24** high school$^{\alpha}$, undergraduate$^{\beta}$ and graduate students$^{\gamma}$ in summer and semester-long research projects.
– †Co-authors in peer-reviewed publications.
– ‡Won the President's Undergraduate Research Award (Georgia Tech) or the Undergraduate Research Award (Texas Tech) in my mentorship.

24.	Sion Park$^{\beta,\ddagger}$	Georgia Tech	*Fall 2024- Present*
23.	Jace Holmes$^{\beta}$	Georgia Tech	*Fall 2024*
22.	Sarah Bender$^{\beta}$	Georgia Tech	*Fall 2024- Present*

21. Atharva Lele[β,‡]	Georgia Tech	*Fall 2023- Present*
20. Annika Joshi[α]	Johns Creek High School	*Fall 2023- Summer 2024*
19. Johnathan O'Neil[†]	Georgia Tech	*2022-2024*
18. Holden Walker[β,†,‡]	Georgia Tech	*Fall 2022-Spring 2023*
17. Nihanth Pinakka[β]	Georgia Tech	*2022-2023*
16. Breanna Carruth[β]	Texas Tech University	*2021-2022*
15. Eliana Rodriguez[β]	Texas Tech University	*Spring 2022*
14. Elina Khusnatdinov[β]	Texas Tech University	*2021- 2022*
13. Emil Khusnatdinov[β,†]	Texas Tech University	*2020- 2022*
12. Noah Williams[β]	Texas Tech University	*2020- 2022*
11. Md. Shahriar[†]	Texas Tech University	*2019- 2020*
10. Ankit Rewanwar[†]	Texas Tech University	*2019- 2020*
9. Cormak Weeks[β,†,‡]	Texas Tech University	*2019- 2022*
8. Whitney Tran[β,†]	Texas Tech University	*2019- 2022*
7. Veronica O'Brien[α,†]	Margaret Talkington School	*Summer 2019*
6. Pedro Mallet	Fed. Flum. University, Brazil	*Summer 2019*
5. Andrew Le-Blanc[β,†]	Texas Tech University	*Spring 2019*
4. Justin Davis[β,†]	Texas Tech University	*2019*
3. Idera Lawal[†]	Texas Tech University	*2018-2019*
2. James B. Thomas[β,†]	Texas Tech University	*2018*
1. Haley Slook[β]	Texas Tech University	*Fall 2018*

SERVICE

SESSION CHAIR of the following:
- American Physical Society March Meeting (2023)
- American Physical Society - Division of Fluid Dynamics Meeting (2023)
- Society of Integrative and Comparative Biology Annual Meeting (2024, 2025)

LEADERSHIP in the following positions:
- Vice-President, Chemical Engg. Graduate Student Association, Texas Tech (2018-2019)
- Graduate Student Rep., Chemical Engg. Student Advisory Council, Texas Tech (2018-2019)

REVIEWER in the following peer-reviewed journals:
- Bioengineering and Translational Medicine
- Journal of Drug Delivery Science and Technology
- Journal of Heat and Mass Transfer
- Scientific Reports
- Royal Society Proceedings B
- HardwareX.

VOLUNTEER in the following outreach activities:
- Zoo Biomechanics Day, Atlanta (2023, 2024)
- Atlanta Science Festival (2024)
- Workshops in Peru (Rural and Local Girls' Primary Schools, Porto Maldonaldo and Lima) (2022)
- Annual Science Fair, Lubbock, TX (2019)

PROFESSIONAL MEMBERSHIPS

MEMBER of the following societies:
American Institute of Chemical Engineers (AICHE) | American Physical Society (APS) | Controlled Release Society (CRS) | The Society of Integrative and Comparative Biology (SICB) | Society of Plastic Engineers

REFERENCES

Saad Bhamla, Assoc. Professor, Georgia Institute of Technology saadb@chbe.gatech.edu
Mark R. Prausnitz, Professor, Georgia Institute of Technology prausnitz@gatech.edu
Jeremy O. Marston, Assoc. Professor, Texas Tech University jeremy.marston@ttu.edu