Shravan Pradeep

Penn Soft Earth Dynamics (PennSED) Lab & Penn Complex Fluids Group, University of Pennsylvania
251 Hayden Hall, 240 South 33rd Street, Philadelphia, PA 19104-6316, United States
e-mail: spradeep@sas.upenn.edu || Personal Webpage || LinkedIn || Twitter

EDUCATION & TRAINING

Postdoctoral Researcher, University of Pennsylvania, Philadelphia, PA — 2021-Present
Earth and Environmental Sciences || Mechanical Engineering and Applied Mechanics

Ph.D. in Chemical Engineering || *Minor*: Materials Science and Engineering — 2016-2021
North Carolina State University, Raleigh, NC

M.S. in Chemical Engineering — 2013-2015
Birla Institute of Technology and Science (BITS) Pilani, Pilani Campus, India

B.S. in Chemical Engineering || First Class with Distinction (*Summa Cum Laude*) — 2008-2012
Amrita Vishwa Vidyapeetham University, Coimbatore, India

RESEARCH INTERESTS

Nano- and micro-structured soft materials, dense structured fluids, suspension rheo-tribology, structure-property relationships, soft matter instrumentation, active-passive matter interactions, and 3D printing.

PROFESSIONAL EXPERIENCE

Postdoctoral Researcher, University of Pennsylvania, Philadelphia, PA — 2021-Present
Mentor(s): Prof. Douglas J. Jerolmack & Prof. Paulo E. Arratia
Research Focus: Rheophysics of soft-earth materials and bacterial suspensions

Visiting Researcher, Kavli Institute of Theoretical Physics, Santa Barbara, CA — Fall 2022
Research Program: Multiphase Flows in Geophysics and the Environment

Graduate Research Assistant, North Carolina State University, Raleigh, NC — 2017-2021
Advisor: Prof. Lilian C. Hsiao (Hsiao SMART Lab)
Dissertation: Flow mechanics in dense suspensions of smooth and rough colloids

Research Assistant, Indian Institute of Technology Delhi, New Delhi, India — 2015-2016
Advisor(s): Prof. Shalini Gupta & Prof. Ravikrishnan Elangovan
Project: Immunomagnetic capture chip development for optical detection of bacteria

Research Assistant, Birla Institute of Technology & Science, Pilani, India — 2014-2015
Advisor: Sonal Mazumder, PhD (*Current Position:* US-FDA, Silver Springs, MD)
Thesis: Quantum dots for photocatalytic degradation of biological pollutants

Management Trainee, Mangalore Chemicals & Fertilizers Ltd., Mangalore, India — 2012-2013
Production Engineering, Ammonia Production Plant

Research Assistant, Amrita School of Engineering, Coimbatore, India — 2011-2012
Advisor: Prof. Kanakasabai Panchanathan
Project: Titania nanoparticles-embedded polyvinyl alcohol-based membranes

Summer Research Intern, Research & Development Establishment (Eng.), Pune, India — Summer 2011
Advisor: Anoop Anand, PhD (Composite Research Center)
Project: Graphene in advanced structural composites

Summer In-Plant Trainee (Co-Op), Exide Industries, Hosur, India — Summer 2010
Industrial Battery Division

AWARDS & HONORS

Victor K. LaMer Award Finalist, Colloids and Surface Science Division, American Chemical Society	2023
APS Early Career Scientist Poster Award - Honorable Mention, American Physical Society	2023
Postdoctoral Poster Award - Third Place, Society of Rheology 93rd Annual Meeting	2022
Diverse Leaders for the Future, Future Faculty Workshop, University of Delaware	2022
James K. Ferrell Outstanding Ph.D. Graduate Award, NCSU	2022
Langmuir Student Award Finalist, Colloids & Surface Science Division, American Chemical Society	2021
Travel Assistance Award, Graduate Student Association, NCSU	2019
Conference Travel Award, College of Engineering, NCSU	2019
Provost's University Graduate Fellowship, College of Engineering, NCSU	2016-2017
Department 1st Rank, Chemical Engineering Department, BITS Pilani	2015
Poster Award - Second Place, Indian Institute of Chemical Engineers, Pilani Chapter	2015
University 3rd Rank, Amrita Vishwa Vidyapeetham University	2012
School of Engineering Merit Award, Amrita Vishwa Vidyapeetham	2009-2011
Prime Minister's Merit Scholarship, Ministry of Defence, Government of India	2008-2012

JOURNAL PUBLICATIONS

†indicates equal contribution || Total Publications: 13 || First-Author: 7 || Google Scholar

1. Ranjiangshang Ran, Shravan Pradeep, Sebastien Kosgodagan Acharige, Brendan C Blackwell, Christoph Kammer, Douglas J. Jerolmack, and Paulo E. Arratia, "Understanding the rheology of kaolinite clay suspensions using Bayesian inference", **Journal of Rheology** 67:241-252 (2023). [Paper]
   - *Highlight:* Editor's Featured Article
2. Bryan O. Torres Maldonado, Ranjiangshang Ran, K. L. Galloway, Quentin Brosseau, Shravan Pradeep, and Paulo E. Arratia, "Phase-separation during sedimentation of dilute bacterial suspensions", **Physics of Fluids**, 34: 113305 (2022). [Paper]
3. Robert Kostynick†, Hadis Matinpour †, Shravan Pradeep†, Thomas Dunne, Sarah Haber, Alban Sauret, Eckart Meiburg, Paulo E Arratia, and Douglas J Jerolmack, "Rheology of debris flows controlled by the distance from jamming", **Proceedings of the National Academy of Sciences**, 119:44 (2022). [Paper]
   - *Highlights:* Physics of disaster: How mudslides move. NSF News | Penn News | AAAS EurekAlert!
4. Shravan Pradeep, Alan Wessel, and Lilian C Hsiao, "Hydrodynamic origin for the suspension viscoelasticity in rough colloids", **Journal of Rheology**, 66: 895 (2022). [Paper]
   - *Highlight:* Editor's Featured Article
5. Shravan Pradeep, Paulo E. Arratia, "To biofilm or not to biofilm", **eLife**, 80891 (2022). [Paper]
6. Zijian Dai, Shravan Pradeep, Jie Zhu, Wenyi Xie, Heather F Barton, Yang Si, Bin Ding, Jianyoung Yu, and Gregory Parsons,"Freestanding metal organic framework-based microfiltration membranes fabricated *via* pseudomorphic replication toward liquid- and gas hazards abatement", **Advanced Materials Interfaces**, 2101178 (2021). [Paper]
7. Shravan Pradeep, Mohammad Nabizadeh, Alan R. Jacob, Safa Jamali, and Lilian C. Hsiao, "Jamming distance dictates colloidal shear thickening", **Physical Review Letters**, 127: 158002 (2021). [Paper]
   - *Highlights:* New images lead to better prediction in shear thickening. Phys.Org | NC State News
8. Jie Zhu, Weiwang Qiu, Hua Han, Chengjian Yao, Chun Wang, Dequn Wu, Shravan Pradeep, and Zijian Dai, "Water stable UiO-66-NH_2 metal organic frameworks armed poly(vinyl) alcohol nanofibrous wound dressing with anti-infective therapy", **Journal of Colloid and Interface Science**, 603: 243-251 (2021). [Paper]
9. Shravan Pradeep, Lilian C. Hsiao,"Contact criterion in suspensions of smooth and rough colloids", **Soft Matter**, 16:4980-4989 (2020). [Paper]

10. Lilian C. Hsiao, Shravan Pradeep, "Experimental synthesis and characterization of frictional particles for colloidal and granular rheology", **Current Opinion in Colloid and Interface Science**, 43:94-112 (2019). [Paper]
11. Shravan Pradeep, Sai Raghuram, and Sonal Mazumder, "Rapid synthesis of pure and doped ZnS quantum dots for photocatalytic degradation of biological dye pollutants", **Materials Focus**, 6:657-667 (2017). [Paper]
12. Shravan Pradeep†, Sai Raghuram†, Mahua Ghosh Chaudhury, and Sonal Mazumder, "Synthesis and characterization of Fe^{3+} and Mn^{2+} doped ZnS quantum dots for photocatalytic application: Effect of mercaptoethanol and chitosan as capping agent", **Journal of Nanoscience and Nanotechnology**, 17:1125-1132 (2017). [Paper]
13. Sai Raghuram, Shravan Pradeep, Subhra Dash, Rajdeep Chowdhury, and Sonal Mazumder, "Chitosan encapsulated ZnS:M (M: Fe^{3+} and Mn^{2+}) quantum dots for fluorescent labelling of sulphate reducing bacteria", **Bulletin of Materials Science**, 39:405-413 (2016). [Paper]

PROFESSIONAL SERVICES

Proposal Reviewer: NASA MUREP Space Technology Artemis Research (M-STAR), *Ad-hoc* Reviewer & Panelist

Journal Referee: Nature Communications, Physical Review Letters, Journal of Colloid and Interface Science, Physics of Fluids, Scientific Reports

Conference Chair/Co-Chair:

- American Physical Society March Meeting
  - *Session*: Functionality through Nonlinearity in Metamaterials 2023
  - *Session*: Rheology, Flow & Instabilities of Soft Materials 2022
  - *Session*: Interfaces and Mixing & Kandanoff Prize Talk 2022
- Society of Rheology Annual Meeting
  - *Session*: Colloids and Suspensions 2022

Primary Member, Climate, Diversity, Equity & Inclusion Committee (CDEIC), UPenn 2022-Present
Volunteer Staff, Diversity Equity Engagement at Penn in STEM (DEEPenn STEM), UPenn 2022-Present
Student Affairs Committee Member, Division of Soft Matter, American Physical Society 2019-2022
Mentor, Alumni Mentoring Program, Chemical & Biomolecular Engineering, NCSU 2021-2022
Captain, Graduate Recruitment Event, Chemical & Biomolecular Engineering, NCSU 2019
Student Organizer, Future Leaders in Chemical Engineering, NCSU 2018-2019
Vice-President, Chemical & Biomolecular Engineering Graduate Student Association, NCSU 2017-2018
Department Ambassador (Chemical & Biomolecular), Office of International Services, NCSU 2016-2018
Department Representative (Master's Student Body), Chemical Engineering, BITS Pilani 2014-2015
Student Senate Member, Academic Counselling Cell, BITS Pilani 2014-2015

Professional Member: American Institute of Chemical Engineers (*AIChE*), American Society of Mechanical Engineers (ASME), Society of Rheology (*SOR*), American Chemical Society (*ACS*), American Physical Society (*APS*), and American Geophysical Union (*AGU*).

External Course: Boulder Summer School, University of Colorado, Boulder, CO Summer 2022
Topic: Hydrodynamics Across Scales

TEACHING EXPERIENCE & CERTIFICATIONS

Teaching Assistant & Guest Lecturer, University of Pennsylvania
Department of Mechanical Engineering & Applied Mechanics | Department of Earth & Environmental Sciences

- EESC 6720 Landslides | Lecture Focus: Subaqueous Granular Matter Failure Modes Spring 2023
- MEAM 2020 Introduction to Thermo-Fluids Engineering Fall 2022
- MEAM 225 Environmental Engineering Spring 2022

Teaching and Communication Certificate, The Graduate School, NCSU Spring 2021

Teaching Assistant, Department of Chemical & Biomolecular Engineering Department, NCSU

- CHE 713 Chemical Engineering Thermodynamics — Fall 2019
- CHE 205 Chemical Process Calculations — Fall 2017
- CHE 312 Transport Processes II — Spring 2017

Teaching Assistant, Chemical Engineering Department, BITS Pilani

- CHE F312 Chemical Engineering Lab I — Fall 2013-14
- CHE F322 Chemical Engineering Lab II — Spring 2014-15

MENTORING EXPERIENCE

University of Pennsylvania

- *Graduate Student*: John Ruck (Environmental Sciences)
- *Undergraduate Students*: Eric Sigg (Mechanical Engineering), Philiph Choi (Environmental Sciences)

North Carolina State University

- *Undergraduate Students*: Alan Wessel, Sara Wozniak, Christine Dang, Colin Donaldson, Alexander Kramer (Chemical Engineering).

SCIENTIFIC PRESENTATIONS

Invited Talks

1. "Frictional interactions anneal yielding dynamics in model earth suspensions", *ACS Colloids and Surface Science Symposium*, Raleigh, NC (2023). LaMer Keynote Speaker
2. "Material constraints dictate flow mechanics in dense suspensions", Session: Frontiers in Soft Matter, *APS March Meeting*, Las Vegas, NV (2023).
3. "Distance to jamming dictate colloidal shear thickening", *The Plot Thickens*, Shear Thickening Seminar Series, Virtual (2021).
4. "Probing contact microstructure in shear thickening colloidal suspensions", *ACS Colloids and Surface Science Symposium*, Virtual (2021). Langmuir Graduate Student Speaker

Oral Presentations

1. "Rheological state diagrams for model earth suspensions under shear flow", *APS March Meeting*, Las Vegas, NV (2023).
2. "Dense suspension rheology approach towards debris flows" *New England Complex Fluids Workshop*, Harvard University, Cambridge, MA (2022).
3. "Rheological flow curves for model earth suspension mixtures", *Society of Rheology Annual Meeting*, Chicago, IL (2022).
4. "Constraint-based approach towards debris flow rheology", *APS March Meeting*, Chicago, IL (2022).
5. "Elucidating the effect of surface roughness-induced geometric frustration on linear viscoelasticity in colloids suspensions", *APS March Meeting*, Chicago, IL (2022).
6. "Effect of geometric frustration on the linear viscoelasticity in dense colloidal suspensions", *Society of Rheology Annual Meeting*, Bangor, ME (2021).
7. "Elasticity in dense suspensions of geometrically frustrated colloids", *APS March Meeting*, Virtual (2021).
8. "Distance to jamming dictates onset stress and strength of shear thickening", *International Congress on Rheology*, Virtual (2020). Keynote Speaker - Colloids, Suspensions, and Granular Media Session

9. "Universal correlation between jamming distance and shear thickening strength in dense colloidal suspensions", *Annual Meeting of the APS Division of Fluid Dynamics*, Virtual (2020).
10. "Engineering flow mechanics in surface-anisotropic colloidal suspensions", *Schoenborn Graduate Research Symposium*, Raleigh, NC (2020).
11. "Distance to jamming defines shear thickening strength in colloids", *AIChE Annual Meeting*, Virtual (2020).
12. "Dynamics and contact microstructure of rough colloids", *APS March Meeting*, Denver, CO (2020).
13. "Contact numbers and radial distributions in suspensions of smooth and rough colloids", *APS March Meeting*, Boston, MA (2019).
14. "Synthesis and characterisation of Fe^{3+} doped ZnS based colloidal quantum dots in aqueous media", *2nd International Conference on Nanotechnology*, Haldia, India (2015).

Poster Presentations

1. "Model complex fluids reveal rheological fingerprints of debris flows", *Colloids and Interface Symposium*, University of Pennsylvania, Philadelphia, PA (2023).
2. "Jamming distance: physics-informed design parameter for dense suspension rheology", *APS March Meeting*, Las Vegas, NV (2023). APS Forum for Early Career Scientists Poster Award - Honorable Mention
3. "Jamming distance controls rheology of debris flows", *KITP Conference: Multiphase Flows Atmospheres, Oceans, Earths*, Santa Barbara, CA (2022).
4. "Engineering flow mechanics in dense suspensions of surface-anisotropic colloids", *Society of Rheology Annual Meeting*, Chicago, IL (2022). Poster Award - Third Place
5. "Yield, jam, and flow: Unpacking physics of debris flows", *Gordon Research Seminar: Granular Matter*, Boston, MA (2022).
6. "Towards designing flow mechanics in dense suspensions", *Triangle Soft Matter Workshop*, Virtual (2021).
7. "Geometric frustration-induced phase behavior in spherically symmetric colloids", *AIChE Annual Meeting*, Virtual (2020).
8. "Connecting frictional dissipation to rheology of confined suspensions", *Society of Rheology Annual Meeting*, Raleigh, NC (2020).
9. "Programmable self-assembly and suspension rheology in light-responsive colloidal systems", *ACS Colloids & Surface Science Symposium*, State College, PA (2018).
10. "Programmable self-assembly in photoresponsive colloids", *Schoenborn Graduate Research Symposium*, Raleigh, NC (2018).
11. "Effect of TiO_2 nano-fillers on properties of PVA/Sulfopthalic acid membranes", *Symposium on Sustainable Technology Development in Polymer*, Pilani, India (2016).
12. "Synthesis and characterization of Fe^{3+} and Mn^{2+} doped ZnS nanocrystals", *Workshop on Analytical Instruments for Chemical & Environmental Engineers*, Pilani, India (2015). Poster Award - Second Place
13. "Synthesis and characterisation of Graphene oxide nanoparticles using Modified Hummer's Method", *National Conference on Nano-and Functional Materials*, Pilani, India (2014).