

# Shravan Pradeep

Penn Soft Earth Dynamics (PennSED) Lab & Penn Complex Fluids Group, University of Pennsylvania  
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## EDUCATION & TRAINING

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<b>Postdoctoral Researcher</b> University of Pennsylvania, Philadelphia, PA Earth and Environmental Sciences    Mechanical Engineering and Applied Mechanics	2021-Present
<b>Ph.D. in Chemical Engineering</b>    <i>Minor: Materials Science and Engineering</i> North Carolina State University, Raleigh, NC	2016-2021
<b>M.S. in Chemical Engineering</b> Birla Institute of Technology and Science (BITS) Pilani, Pilani Campus, India	2013-2015
<b>B.S. in Chemical Engineering</b>    First Class with Distinction ( <i>Summa Cum Laude</i> ) Amrita Vishwa Vidyapeetham University, Coimbatore, India	2008-2012

## RESEARCH INTERESTS

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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

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<b>Postdoctoral Researcher, University of Pennsylvania</b> , Philadelphia, PA <i>Mentor(s)</i> : Prof. Douglas J. Jerolmack & Prof. Paulo E. Arratia <i>Research Focus</i> : Rheophysics of soft-earth materials and bacterial suspensions	2021-Present
<b>Visiting Researcher, Kavli Institute of Theoretical Physics</b> , Santa Barbara, CA <i>Research Program</i> : Multiphase Flows in Geophysics and the Environment	Fall 2022
<b>Graduate Research Assistant, North Carolina State University</b> , Raleigh, NC <i>Advisor</i> : Prof. Lilian C. Hsiao (Hsiao SMART Lab) <i>Dissertation</i> : Flow mechanics in dense suspensions of smooth and rough colloids	2017-2021
<b>Research Assistant, Indian Institute of Technology Delhi</b> , New Delhi, India <i>Advisor(s)</i> : Prof. Shalini Gupta & Prof. Ravikrishnan Elangovan <i>Project</i> : Immunomagnetic capture chip development for optical detection of bacteria	2015-2016
<b>Research Assistant, Birla Institute of Technology &amp; Science</b> , Pilani, India <i>Advisor</i> : Sonal Mazumder, PhD ( <i>Current Position</i> : US-FDA, Silver Springs, MD) <i>Thesis</i> : Quantum dots for photocatalytic degradation of biological pollutants	2014-2015
<b>Management Trainee, Mangalore Chemicals &amp; Fertilizers Ltd.</b> , Mangalore, India Production Engineering, Ammonia Production Plant	2012-2013
<b>Research Assistant, Amrita School of Engineering</b> , Coimbatore, India <i>Advisor</i> : Prof. Kanakasabai Panchanathan <i>Project</i> : Titania nanoparticles-embedded polyvinyl alcohol-based membranes	2011-2012
<b>Research Intern, Research &amp; Development Establishment (Eng.)</b> , Pune, India <i>Advisor</i> : Anoop Anand, PhD (Composite Research Center) <i>Project</i> : Graphene in advanced structural composites	Summer 2011

## AWARDS & HONORS

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

## JOURNAL PUBLICATIONS

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<sup>†</sup> 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<sup>†</sup>, Hadis Matinpour<sup>†</sup>, [Shravan Pradeep](#)<sup>†</sup>, 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<sub>2</sub> 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<sup>†</sup>, Sai Raghuram<sup>†</sup>, Mahua Ghosh Chaudhury, and Sonal Mazumder, “Synthesis and characterization of Fe<sup>3+</sup> and Mn<sup>2+</sup> 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<sup>3+</sup> and Mn<sup>2+</sup>) quantum dots for fluorescent labelling of sulphate reducing bacteria”, **Bulletin of Materials Science**, 39:405-413 (2016). [[Paper](#)]

## PROFESSIONAL SERVICES

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**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

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**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

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### University of Pennsylvania

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

### North Carolina State University

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

## SCIENTIFIC PRESENTATIONS

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### 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<sup>3+</sup> doped ZnS based colloidal quantum dots in aqueous media", *2<sup>nd</sup> 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<sub>2</sub> nano-fillers on properties of PVA/Sulfophthalic acid membranes", *Symposium on Sustainable Technology Development in Polymer*, Pilani, India (2016).
12. "Synthesis and characterization of Fe<sup>3+</sup> and Mn<sup>2+</sup> 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).