

# 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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- 09/2021-Present      **University of Pennsylvania**, Philadelphia, PA || Postdoctoral Researcher  
Earth and Environmental Sciences, Mechanical Engineering and Applied Mechanics
- 08/2016-08/2021      **North Carolina State University**, Raleigh, NC  
Ph.D. in Chemical Engineering || *Minor*: Materials Science and Engineering
- 08/2013-05/2015      **Birla Institute of Technology and Science (BITS) Pilani**, Pilani Campus, India  
M.S. in Chemical Engineering
- 07/2008-05/2012      **Amrita Vishwa Vidyapeetham University**, Coimbatore, India  
B.S. in Chemical Engineering || First Class with Distinction

## RESEARCH INTERESTS

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Nano- and micro-structured soft materials, dense suspension mechanics, structure-property relationships, materials “geomimicry”, architected material memory, human-earth interface, and additive manufacturing.

## PROFESSIONAL EXPERIENCE

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### Research Experience:

- 09/2021-Present      **Postdoctoral Research Associate, University of Pennsylvania**, Philadelphia, PA  
*Mentor(s)*: Prof. Douglas J. Jerolmack & Prof. Paulo E. Arratia  
*Research Focus*: Dynamics and rheophysics of soft earth materials
- 01/2017-08/2021      **Graduate Research Assistant, North Carolina State University**, Raleigh, NC  
*Advisor*: Prof. Lilian C. Hsiao  
*Dissertation*: Flow mechanics in dense suspensions of smooth and rough colloids
- 07/2015-05/2016      **Research Assistant, Indian Institute of Technology Delhi**, New Delhi, India  
*Advisor(s)*: Prof. Shalini Gupta & Prof. Ravikrishnan Elangovan  
*Project*: Immunomagnetic capture chip development for optical detection of bacteria
- 01/2014-05/2015      **Research Assistant, Birla Institute of Technology & Science**, Pilani, India  
*Advisor*: Sonal Mazumder, PhD (*Current Position*: Regulatory Scientist, US FDA)  
*Thesis*: Quantum dots for photocatalytic degradation of biological pollutants
- 01/2012-05/2012      **Research Assistant, Amrita School of Engineering**, Coimbatore, India  
*Advisor*: Prof. Kanakasabai Panchanathan  
*Project*: Titania nanoparticles-embedded polyvinyl alcohol-based membranes
- Summer 2011      **Summer Research Intern, Research & Development Establishment (Eng.)**, Pune, India  
*Advisor*: Anoop Anand, PhD (Composite Research Center)  
*Project*: Graphene in advanced structural composites

### Industry Experience:

- 07/2012-06/2013      **Management Trainee, Mangalore Chemicals & Fertilizers Ltd.**, Mangalore, India  
Production Engineering, Ammonia Plant
- Summer 2010      **Summer In-Plant Trainee (Co-Op), Exide Industries**, Hosur, India  
Industrial Battery Division

## AWARDS & HONORS

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2023	<b>Victor K. LaMer Award</b> (Finalist), ACS Colloids & Surface Science Division
2023	<b>Poster Award</b> (Honorable Mention), APS Forum for Early Career Scientists
2022	<b>Postdoctoral Poster Award</b> (Third Place), 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
2021	<b>Langmuir Graduate Student Award</b> (Honorable Mention), ACS Colloids & Surface Science Division
2019	<b>Travel Assistance Award</b> , Graduate Student Association, NCSU
2019	<b>Conference Travel Award</b> , College of Engineering, NCSU
2016	<b>Provost's University Graduate Fellowship</b> , College of Engineering, NCSU
2015	<b>Department 1<sup>st</sup> Rank</b> , Chemical Engineering Department, BITS Pilani
2015	<b>Poster Award</b> (Second Place), Indian Institute of Chemical Engineers, Pilani Chapter
2012	<b>University 3<sup>rd</sup> Rank</b> , Amrita Vishwa Vidyapeetham University
2009	<b>School of Engineering Merit Award</b> , Amrita Vishwa Vidyapeetham
2008	<b>Prime Minister's Merit Scholarship</b> , Ministry of Defence, Government of India

## JOURNAL PUBLICATIONS

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† 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 (& DEI) SERVICES

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### 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

**Proposal Reviewer:** NASA MUREP Space Technology Artemis Research (M-STAR) [Online Reviewer + Panelist]

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

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

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

## TEACHING EXPERIENCE & CERTIFICATIONS

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**Teaching Assistant & Guest Lecturer**, University of Pennsylvania

Department of Earth & Environmental Sciences | Department of Mechanical Engineering & Applied Mechanics

- EESC 6720 Landslides | Lecture Focus: Subaqueous Granular Matter Failure Modes Spring 2023
- MEAM 2020 Introduction to Thermo-Fluids Engineering Fall 2022
- MEAM 225 Engineering in the Environment 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). (**Victor K. 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 Student Oral Award Presentation**)

### Oral Presentations

1. Shravan Pradeep, Paulo Arratia, Douglas Jerolmack, “Rheological state diagrams for model earth suspensions under shear flow”, *APS March Meeting*, Las Vegas, NV (2023).
2. Shravan Pradeep, Robert Kostynick, Hadis Matinpour, Sarah Haber, Alban Sauret, Eckart Meiburg, Thomas Dunne, Paulo Arratia, Douglas Jerolmack, “Dense suspension rheology approach towards debris flows” *New England Complex Fluids Workshop*, Harvard University, Cambridge, MA (2022).
3. Shravan Pradeep, Eckart Meiburg, Paulo Arratia, Douglas Jerolmack, “Rheological flow curves for model earth suspension mixtures”, *Society of Rheology Annual Meeting*, Chicago, IL (2022).
4. Shravan Pradeep, Robert Kostynick, Thomas Dunne, Paulo Arratia, Douglas Jerolmack, “Constraint-based approach towards debris flow rheology”, *APS March Meeting*, Chicago, IL (2022).
5. Shravan Pradeep, Alan Wessel, Lilian Hsiao, “Elucidating the effect of surface roughness-induced geometric frustration on linear viscoelasticity in colloids suspensions”, *APS March Meeting*, Chicago, IL (2022).
6. Shravan Pradeep, Alan Wessel, Lilian Hsiao, “Effect of geometric frustration on the linear viscoelasticity in dense colloidal suspensions”, *Society of Rheology Annual Meeting*, Bangor, ME (2021).
7. Shravan Pradeep, Alan Wessel, Lilian Hsiao, “Elasticity in dense suspensions of geometrically frustrated colloids”, *APS March Meeting*, Virtual (2021).
8. Shravan Pradeep, Alan Jacob, Lilian Hsiao, “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. Shravan Pradeep, Alan Jacob, Lilian Hsiao, “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. Shravan Pradeep, “Engineering flow mechanics in surface-anisotropic colloidal suspensions”, *Schoenborn Graduate Research Symposium*, Raleigh, NC (2020).
11. Shravan Pradeep, Alan Jacob, Lilian Hsiao, “Distance to jamming defines shear thickening strength in colloids”, *AIChE Annual Meeting*, Virtual (2020).
12. Shravan Pradeep, Lilian Hsiao, “Dynamics and contact microstructure of rough colloids”, *APS March Meeting*, Denver, CO (2020).
13. Shravan Pradeep, Lilian Hsiao, “Contact numbers and radial distributions in suspensions of smooth and rough colloids”, *APS March Meeting*, Boston, MA (2019).
14. Shravan Pradeep, Sai Raghuram, Sonal Mazumder, “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. Shravan Pradeep, Lilian Hsiao, Paulo Arratia, Douglas Jerolmack, “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)**
2. Shravan Pradeep, Robert Kostynick, Hadis Matinpour, Sarah Haber, Alban Sauret, Eckart Meiburg, Thomas Dunne, Paulo Arratia, Douglas Jerolmack, “Jamming distance controls rheology of debris flows”, *KITP Conference: Multiphase Flows Atmospheres, Oceans, Earths*, Santa Barbara, CA (2022).
3. Shravan Pradeep, Lilian Hsiao, “Engineering flow mechanics in dense suspensions of surface-anisotropic colloids”, *Society of Rheology Annual Meeting*, Chicago, IL (2022). **(Poster Award - Third Place)**
4. Shravan Pradeep, Robert Kostynick, Hadis Matinpour, Sarah Haber, Alban Sauret, Eckart Meiburg, Thomas Dunne, Paulo Arratia, Douglas Jerolmack, “Yield, jam, and flow: Unpacking physics of debris flows”, *Gordon Research Seminar: Granular Matter*, Boston, MA (2022).
5. Shravan Pradeep, Lilian Hsiao, “Towards designing flow mechanics in dense suspensions”, *Triangle Soft Matter Workshop*, Virtual (2021).
6. Shravan Pradeep, Lilian Hsiao, “Geometric frustration-induced phase behavior in spherically symmetric colloids”, *AIChE Annual Meeting*, Virtual (2020).
7. Shravan Pradeep, Yunhu Peng, Lilian Hsiao, “Connecting frictional dissipation to rheology of confined suspensions”, *Society of Rheology Annual Meeting*, Raleigh, NC (2020).
8. Shravan Pradeep, Alex Kramer, Lilian Hsiao, “Programmable self-assembly and suspension rheology in light-responsive colloidal systems”, *ACS Colloids & Surface Science Symposium*, State College, PA (2018).
9. Shravan Pradeep, Alex Kramer, Lilian Hsiao, “Programmable self-assembly in photoresponsive colloids”, *Schoenborn Graduate Research Symposium*, Raleigh, NC (2018).
10. Shravan Pradeep, Sai Raghuram, Sonal Mazumder, “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)**
11. Shravan Pradeep, A. K. Ashwath, Smita Raghuvanshi, “Synthesis and characterisation of Graphene oxide nanoparticles using Modified Hummer’s Method”, *National Conference on Nano-and Functional Materials*, Pilani, India (2014).