

# SHRAVAN PRADEEP

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## EDUCATION & TRAINING

<b>University of Pennsylvania</b> , Philadelphia, PA Postdoctoral Research Associate, Earth & Environmental Sciences	2021-present
<b>North Carolina State University</b> , Raleigh, NC Ph.D. in Chemical Engineering    <i>Minor</i> : Materials Science & Engineering	2016-2021
<b>Birla Institute of Technology and Science (BITS) Pilani</b> , Pilani Campus, India M.Eng. in Chemical Engineering	2013-2015
<b>Amrita Vishwa Vidyapeetham</b> , Coimbatore, India B.Tech. in Chemical Engineering    First Class with Distinction	2008-2012

## RESEARCH INTERESTS

Colloids and granular materials, dense suspension rheology, structure-flow relationships, passive-active matter interactions, suspension memory, soft matter hydrodynamics, granular jamming, and additive manufacturing.

## AWARDS & HONORS

<b>Postdoctoral Poster Award</b> , Society of Rheology 93rd 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> , Chemical & Biomolecular Engg., NC State	2022
<b>Langmuir Graduate Student Oral Presentation - Phase I Awardee</b> , American Chemical Society	2021
<b>Travel Assistance Award</b> , Graduate Student Association, NC State	2019
<b>Conference Travel Award</b> , College of Engineering, NC State	2019
<b>Provost's University Graduate Fellowship</b> , College of Engineering, NC State	2016-2017
<b>Department 1<sup>st</sup> Rank</b> , Chemical Engineering Department, BITS Pilani	2015
<b>Poster Award</b> , Indian Institute of Chemical Engineers, Pilani Chapter	2015
<b>University 3<sup>rd</sup> Rank</b> , Amrita Vishwa Vidyapeetham University	2012
<b>Prime Minister's Merit Scholarship</b> , Ministry of Defense, Government of India	2008-2012

## PROFESSIONAL EXPERIENCE

### Research Experience:

<b>Postdoctoral Research Associate, University of Pennsylvania</b> , Philadelphia, PA <i>Mentor(s)</i> : Prof. Douglas J. Jerolmack & Prof. Paulo E. Arratia <i>Research Focus</i> : Flow dissipation mechanics in model earth materials	09/2021-present
<b>Graduate Research Assistant, North Carolina State University</b> , Raleigh, NC <i>Advisor</i> : Prof. Lilian C. Hsiao <i>Dissertation</i> : Flow mechanics in dense suspensions of smooth and rough colloids	01/2017-08/2021
<b>Research Assistant, Indian Institute of Technology Delhi</b> , New Delhi, India <i>Advisor</i> : Prof. Shalini Gupta & Prof. Ravikrishnan Elangovan <i>Project</i> : Immunomagnetic capture chip development for optical detection of bacteria	07/2015-05/2016
<b>Research Assistant, Birla Institute of Technology &amp; Science</b> , Pilani, India <i>Advisor</i> : Sonal Mazumder, PhD ( <i>Current Position</i> : Regulatory Scientist, US FDA) <i>Thesis</i> : Quantum dots for photocatalytic degradation of biological pollutants	01/2014-05/2015

<b>Research Assistant, Amrita School of Engineering</b> , Coimbatore, India Advisor: Prof. Kanakasabai Panchanathan Project: Titania nanoparticles-embedded polyvinyl alcohol-based membranes	01/2012-05/2012
<b>Summer Research Intern, Research &amp; Development Establishment (Eng.)</b> , Pune, India Advisor: Anoop Anand, PhD (Composite Research Center) Project: Graphene in advanced structural composites	Summer 2011
<b>Industry Experience:</b>	
<b>Management Trainee, Mangalore Chemicals &amp; Fertilizers Ltd.</b> , Mangalore, India Production Engineering, Ammonia Plant	07/2012-06/2013
<b>Summer In-Plant Trainee (Co-Op), Exide Industries</b> , Hosur, India Industrial Battery Division	Summer 2010

## JOURNAL PUBLICATIONS

<sup>†</sup>indicates equal contributions | Total Publications: 13 | First-Author: 7 | [Google Scholar](#)

- 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* (2022). (Accepted) [\[Preprint\]](#)
- 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). [\[Paper\]](#)
- 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). [\[Paper\]](#)
  - Research Highlights: Physics of disaster: How mudslides move. [Penn Today](#)
- Shravan Pradeep**, Alan Wessel, and Lilian C Hsiao, "Hydrodynamic origin for the suspension viscoelasticity in rough colloids", *Journal of Rheology*, 66: 895 (2022). [\[Paper\]](#)
  - Designated as the [Editor's Featured Article](#)
- Shravan Pradeep**, Paulo E. Arratia, "To biofilm or not to biofilm", *eLife*, 80891 (2022). [\[Paper\]](#)
- 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). [\[Paper\]](#)
- 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). [\[Paper\]](#)
  - Research Highlights: New images lead to better prediction in shear thickening. [Phys.org](#)
  - Highlighted in [NC State University News Releases](#)
- 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). [\[Paper\]](#)
- Shravan Pradeep**, Lilian C Hsiao, "Contact criterion in suspensions of smooth and rough colloids", *Soft Matter*, 16:4980-4989 (2020). [\[Paper\]](#)
- Lilian C Hsiao, **Shravan Pradeep**, "Experimental synthesis and characterization of frictional particles for colloidal and granular rheology", *Current Opinion in Colloid & Interfacial Science*, 43:94-112 (2019). [\[Paper\]](#)
- 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 & 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). [\[Paper\]](#)

## PROPOSAL EXPERIENCE

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**NSF-DMR: "Structure and Dynamics of Creep Deformation in Disordered Materials"** *Under Review*

PI(s): Prof. Paulo E. Arratia and Prof. Douglas J. Jerolmack (University of Pennsylvania)

*Contribution:* Idea generation, preliminary data collection, DEI efforts, and writing specific sections.

## PROFESSIONAL SERVICES

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### Conference Chair/Co-Chair:

- Society of Rheology Annual Meeting
  - Session: Colloids and Suspensions 2022
- American Physical Society March Meeting
  - Session: Rheology, Flow & Instabilities of Soft Materials 2022
  - Session: Interfaces and Mixing & Kadanoff Prize Talk 2022

**Reviewer:** Nature Communications, Physical Review Letters

**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)

<b>Climate, Diversity, Equity &amp; Inclusion Committee Member</b> , Penn Arts & Sciences, UPenn	2022-present
<b>Student Affairs Committee Member</b> , Division of Soft Matter, American Physical Society	2019-2022
<b>Mentor - Alumni Mentoring Program</b> , Chemical & Biomolecular Engineering, NC State	2021-2022
<b>Captain - Graduate Recruitment Event</b> , Chemical & Biomolecular Engineering, NC State	2019
<b>Student Organizer</b> , Future Leaders in Chemical Engineering, NC State	2018 & 2019
<b>Vice-President</b> , Chemical & Biomolecular Engineering Graduate Student Association, NC State	2017-2018
<b>Department Ambassador</b> (Chemical & Biomolecular), Office of International Services, NC State	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

## TEACHING EXPERIENCE

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**Guest Lecturer**, Department of Mechanical Engineering & Applied Mechanics, UPenn

- MEAM 2020 Introduction to Thermo-Fluids Engineering Fall 2022
- MEAM 225 Engineering in the Environment (+ **Course Developer**) Spring 2022

**Teaching and Communication Certificate**, The Graduate School, NC State Spring 2021

**Teaching Assistant**, Department of Chemical & Biomolecular Engineering Department, NC State

- 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, Fall 2014
- CHE F322 Chemical Engineering Lab II Spring 2014, Spring 2015

## SUPERVISING & MENTORING EXPERIENCE

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### University of Pennsylvania

**Graduate Student:** John Ruck (*Earth & Environmental Science*; 2021 - present)

**Undergraduate Students:** Eric Sigg (*Mechanical Engineering & Applied Mechanics*; 2022 - present), Philip Choi (*Earth & Environmental Science*; 2021 - 2022)

### NC State University

**Undergraduate Students** (*Chemical Engineering*): Alan Wessel (2020 - 2021), Sara Wozniak (2019 - 2020), Christine Dang (2019 - 2020), Colin Donaldson (2018 - 2019), Alexander Kramer (2017 - 2019)

## SCIENTIFIC PRESENTATIONS

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### Invited Presentations

1. "Distance to jamming dictate colloidal shear thickening", *The Plot Thickens*, Shear Thickening Seminar Series, Virtual (2021).
2. "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**, Eckart Meiburg, Paulo Arratia, Douglas Jerolmack, "Rheological flow curves for model earth suspension mixtures", *Society of Rheology Annual Meeting*, Chicago, IL (2022).
2. **Shravan Pradeep**, Robert Kostynick, Thomas Dunne, Paulo Arratia, Douglas Jerolmack, "Constraint-based approach towards debris flow rheology", *APS March Meeting*, Chicago, IL (2022).
3. **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).
4. **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).
5. **Shravan Pradeep**, Alan Wessel, Lilian Hsiao, "Elasticity in dense suspensions of geometrically frustrated colloids", *APS March Meeting*, Virtual (2021).
6. **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**
7. **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).
8. **Shravan Pradeep**, Alan Jacob, Lilian Hsiao, "Distance to jamming defines shear thickening strength in colloids", *AIChE Annual Meeting*, Virtual (2020).
9. **Shravan Pradeep**, "Engineering flow mechanics in surface-anisotropic colloidal suspensions", *Schoenborn Graduate Research Symposium*, Raleigh, NC (2020).
10. **Shravan Pradeep**, Lilian Hsiao, "Dynamics and contact microstructure of rough colloids", *APS March Meeting*, March 2-8, Denver, CO (2020).
11. **Shravan Pradeep**, Lilian Hsiao, "Contact numbers and radial distributions in suspensions of smooth and rough colloids", *APS March Meeting*, Boston, MA (2019).
12. **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**, “Towards rational design of structured soft earth materials”, *AIChE Annual Meeting*, Phoenix, AZ (2022).
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  $\text{Fe}^{3+}$  and  $\text{Mn}^{2+}$  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).