Praphul Kumar

Assistant Professor | Polymer Dynamics, Rheology of Complex Fluids, Computational Modeling, Soft matter

---

Department of Chemical Engineering,
Harcourt Butler Technical University,
Nawabganj, Kanpur-208002, India

Email: praphul.kr77@gmail.com
Phone: +91-8789883762
Google Scholar Link
Date of Birth: March 28, 1989

Education

- **Ph.D., Chemical Engineering** 2015–2023
  Indian Institute of Technology Kanpur
  CPI: 8.44/10
  Thesis: *Effects of Chain Model Resolution on Predictions of Polymer Dynamics in Flow Fields*
  Advisor: Prof. Indranil Saha Dalal
- **M.E., Chemical Engineering** 2011–2013
  Indian Institute of Science Bangalore
  CPI: 5.1/8
  Thesis: *Removal of Hexavalent Chromium from Wastewater Using Activated Carbon Fabric*
- **B.Tech., Chemical Engineering** 2007–2011
  BIT Sindri, Dhanbad
  CPI: 8.11/10
- **Intermediate, Bihar Intermediate Education Council** 2004–2006
  Patna Science College, Patna, Bihar
  Percentage: 68.66%
- **Matriculation, Bihar School Examination Board** 2004
  Janta High School Mansi, Khagaria, Bihar
  Percentage: 80.7%

Research Experience

- **Institute Postdoctoral Fellow, IIT Bombay** 2023–2025
  Advisor: **Prof. Jason R. Picardo**
  • Investigate stretching dynamics of elastic particles in turbulent flows to model marine bioluminescence using Direct Numerical Simulations (DNS) and stochastic models.
- **Doctoral Researcher, IIT Kanpur** 2015–2023
  Advisor: **Prof. Indranil Saha Dalal**
  Multiscale Modeling and simulations of the dynamics of large macromolecules to predict their configurations and rheology

Research Interests

• **Rheology of complex fluids**
• **Computational modeling and simulations** for polymeric liquids, soft deformable elastic particles etc.
• **Brownian Dynamics simulations**
• **Turbulent flow:** Dynamics of elastic/viscoelastic particles using a Direct Numerical Scheme (DNS) and stochastic model

Teaching & Mentoring Experience

- **Assistant Professor (Ad-hoc)**, Department of Chemical Engineering, NIT Srinagar Mar 2014–Dec 2014
- **Assistant Professor (Contractual)**, Department of Chemical Engineering, HBTU Kanpur 2026–Present

- **Tutor**, IIT Kanpur
  Numerical Methods in Engineering
- **Teaching Assistant**, IIT Kanpur
  Courses: Transport Phenomena, Fluid Mechanics, Numerical Methods, Polymer Physics, Rheology of Complex Fluids, Modeling and Simulations, Coordinator, Unit Operations & Processes Lab.
- **Teaching Assistant**, IIT Bombay
  Courses: Stochastic process and turbulent flow, CFD

Technical Skills

- **Programming Languages:** FORTRAN, C/C++, MATLAB
- **High-Performance Computing:** Parallel Programming (GPU-CUDA)
- **CFD & Software:** COMSOL Multiphysics, ANSYS Fluent, OpenFOAM
- **Platforms & Tools:** Linux, Windows, MS Office, LaTeX

Publications (Peer-Reviewed)

1. **Praphul Kumar**, & Jason R. Picardo (2026). Bioluminescence in turbulence: intermittent straining lights up dinoflagellates. *Physical Review Fluids* (Letter), 11, L012602. Link
2. Sanjay jana, S V Sivakrishna, **Praphul Kumar**, & Indranil Saha Dalal (2025). Modeling aspects of excluded volume and hydrodynamic interactions in dissipative particle dynamics simulations of highly resolved polymer chains in flow fields. *Journal of Polymer Research*, 32(9), 1-15. Link
3. S V Sivakrishna, **Praphul Kumar**, Bharatkumar Sharma, & Indranil Saha Dalal (2025). Analysis of the tumbling dynamics of highly resolved polymer chains in shear flow with hydrodynamic interactions through Brownian dynamics simulations on graphics processing units *Physics of Fluid*, 37(12). (**Equal contribution**) Link
4. S V Sivakrishna, **Praphul Kumar**, & Indranil Saha Dalal (2024). Analysis and estimation of time step sizes and stiffness parameters for efficient simulations of macromolecules with hydrodynamic interactions. *Physics of Fluids*, 36(3). (**Equal contribution**) Link
5. **Praphul Kumar**, S V Sivakrishna, Bharatkumar Sharma, & Indranil Saha Dalal (2024). Effects of chain resolution on the configurational and rheological predictions of dilute polymer solutions in flow fields with hydrodynamic interactions. *Physics of Fluids*, 36(3). Link
6. **Praphul Kumar**, & Indranil Saha Dalal (2023). Effects of chain resolution on the configurational and rheological predictions from Brownian dynamics simulations of an isolated polymer chain in flow. *Journal of Non-Newtonian Fluid Mechanics*, 315, 105017 Link
7. **Praphul Kumar**, & Indranil Saha Dalal (2022). Fraenkel Springs as an Efficient Approximation to Rods for Brownian Dynamics Simulations and Modeling of Polymer Chains. *Macromolecular Theory and Simulations*, 31(5), 2200008. Link
8. **Praphul Kumar**, Sanjay jana, Harishyam, & Indranil Saha Dalal (2023). Effectiveness of DPD Simulations to Predict the Dynamics of Polymer Chains in Solutions at Equilibrium and Steady Shear Flows. *Macromolecular Theory and Simulations*, 2300045. Link
9. Indranil Saha Dalal, **Praphul Kumar**, & Larson, R. G. (2021). Accurate Closure for the Configuration Dynamics and Rheology of Dilute Polymer Chains in Arbitrary Flows. *Macromolecules*, 54(13), 6355-6371. Link

Presentations & Workshops

- Speaker at IGM 2026 held on February 23-24, 2026 at FC Kohli Auditorium, IIT Bombay (Topic: *Bioluminescence in turbulence: intermittent straining lights up dinoflagellates*)
- Participant, NVIDIA GPU Hackathon, IISER Pune (Sep 2020).
- Poster Presentation, COMFLU-2018: "*A novel scheme towards improving the consistency of bead-spring models of polymer chains in dilute solutions.*"
- Poster Presentation, COMFLU-2017: "*Effects of model discretization levels on the configurational and rheological predictions of an isolated polymer chain in flow fields.*"

References

Prof. Indranil Saha Dalal
Department of Chemical Engineering
Indian Institute of Technology Kanpur
Kanpur, 208016, India
Phone: +91-512-2596702
Email: indrasd@iitk.ac.in

Prof. Jason R. Picardo
Department of Chemical Engineering
Indian Institute of Technology Bombay
Mumbai, 400076, India
Phone: +91-22-25767247
Email: picardo@iitb.ac.in

Prof. Goutam Deo
Department of Chemical Engineering
Indian Institute of Technology Kanpur
Kanpur, 208016, India
Phone: +91-512-2597881
Email: goutam@iitk.ac.in