# Arun Kumar Varanasi

*Curriculum Vitae*

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## Education

Aug'2015–Aug'2022 **Ph.D.**, *Jawaharlal Nehru Center for Advanced Scientific Research*, Bangalore, India

- Thesis: **Fluid drift and spheroid rotation in viscous density stratified fluids**
- Recipient of **Prof. Roddam Narasimha and Family medal for Best Ph.D. thesis** '2022
- Thesis Supervisor: **Prof. Ganesh Subramanian**

Aug'2005–Jul'2007 **M.E. in Chemical Engineering**, *Indian Institute of Science, Bangalore*, India

- M.E. Project: "**Multiscale simulations of surfactant mesophases using molecular dynamics**,"
- Masters supervisor: **Prof. K. Ganapathy Ayappa**

2001–2005 **B.Tech. in Chemical Engineering**, *RVR & JC College of Engineering*, Acharya Nagarjuna University, Guntur, India

## Research Interests

- **Stratified flows, Environmental Fluid dynamics, Turbulence, Applied Mathematics, Machine learning in Fluid Mechanics**

## Research and Work Experience

Aug'2025-Present **Assistant Professor (Special)**, Department of Chemical Engineering, Saintgits College of Engineering, Kottayam, Kerala

Aug'2022–Aug'2025w **Postdoctoral Fellow**, Tata Institute of Fundamental Research -International Center for Theoretical Sciences, Fluid dynamics and turbulence group

- Faculty Mentors: **Prof. Rama Govindarajan and Prof. Samriddhi Sankar Ray**

Oct'2014–Jul'2015 **Research Assistant**, JNCASR, EMU, under supervision of **Prof. Ganesh Subramanian**

Feb'2009–Jul'2013 **Senior Research Engineer**, Center for Study of Science, Technology and Policy, **Solar Energy and Battery Materials group**

Jan'2008–Jan'2009 **Senior Research Fellow**, Central Electrochemical Research Institute, Fuel Cells group

Aug'2007–Jan'2008 **Project Assistant**, Department of Chemical Engineering, Indian Institute of Science

## Honors & Awards

1. **Prof. Roddam Narasimha & Family Best PhD Thesis award '2022**, JNCASR, Bangalore
2. Best poster presentation award at Annual Faculty Meeting'2017 at JNCASR, Bangalore
3. All India 7th rank in Chemical Engineering at GATE'2005

## Publications

1. Lagrangian intermittency and vertical confinement in stably stratified turbulence

   **Varanasi, A. K.**

   **arXiv:2503.22445** (2025), (under *consideration* for **Physics of Fluids**)

2. Motion of a sphere in a viscous density stratified fluid

   **Varanasi, A. K.** & Subramanian, G.

   **Journal of Fluid Mechanics**, 949, A29 (2022)

3. The rotation of a sedimenting spheroidal particle in a linearly stratified fluid

   **Varanasi, A. K.**, Marath, N. K. & Subramanian, G

   **Journal of Fluid Mechanics**, 933, A17 (2022)

4. Tuning electrochemical potential of LiCoO2 with cation substitution: first-principles predictions and electronic origin

   **Varanasi, A. K.**, Bhowmik, A., Sarkar, T., Waghmare, U. V. & Bharadwaj, M. D.

   **Ionics**, 20, 315–321 (2014)

5. Origins of electrochemical performance of olivine phosphate as cathodes in Li-ion batteries: Charge transfer, spin-state, and structural distortion

   Bhowmik, A., Sarkar, T.,**Varanasi, A. K.**, Waghmare, U. V. & Dixit Bharadwaj, M.

   **Journal of Renewable and Sustainable Energy**, 5,053130 (2013).

6. Electrochemical potentials of layered oxide and olivine phosphate with aluminum substitution: A first principles study

   **Varanasi, A. K.** et al

   **Bulletin of Material Science**, 36, 1331–1337 (2013).

7. Computer simulation of liquid crystals

   Maiti, P. K.,**Varanasi, A. K.** & Ayappa, K. G.

   **Journal of Indian Institute of Science**, 89, 229–241 (2009).

*Following are under preparation:*

i) Far-field inertial effects on the rotation of a sedimenting spheroid in linearly stratified fluid

   **Varanasi, A. K.** & Subramanian, G.

   (under preparation for **Journal of Fluid Mechanics** Rapids)

ii) Fluid drift in a viscous density stratified fluid

   **Varanasi, A. K.**, Patibandla, R., Roy A. & Subramanian, G.

   (In draft stage)

iii) Heavy inertial particles in stably stratified turbulence

   **Varanasi, A. K.** & Ray, S. S.

   (In draft stage)

## Peer Review Experience

1. **Proceedings of National Academy of Sciences (PNAS)**
2. **Journal of Fluid Mechanics (JFM)**
3. **Ionics**

## Contributions at conferences

1. Flash talk/Poster on Lagrangian intermittency and vertical confinement in stably stratified turbulence, *CompFlu-2024*, IIT, Hyderabad, India, Dec 2024
2. Fluid drift due to a sphere settling in stratified medium, *IUTAM conference on particles, drops and bubbles in stratified environments*, IMFT, Toulouse, France, July 2022
3. Talk on Particle settling in a density stratified fluid, *16th Asian Congress of Fluid Mechanics,JNCASR-IISc,*, 2019
4. Talk on Particle motion in stratified fluids *Fluids day,JNCASR,* 2019
5. Poster on 'The potential and Stokes flow translations revisited: Asymmetric streaklines', *Fluids day,IISc,* 2017
6. Poster on 'Does viscosity enhance biogenic mixing of Oceans?' *Annual Faculty Meeting, JNCASR,* 2017

## Schools/Symposiums/Discussion meetings attended

- Waves, Instabilities and Mixing in Rotating and Stratified Flows, TIFR-ICTS Discussion meeting, Bangalore, India, Apr,2022
- Complex Lagrangian problems of particles in flows, TIFR-ICTS Discussion meeting, Bangalore, India, Mar,2022
- "Bangalore School of Statistical Physics - XI/XIII ", TIFR-ICTS , Bangalore, India, Jun' 2020 & Jul' 2022
- 16th Asian Congress of Fluid Mechanics, JNCASR-IISc, Bangalore, India, Dec' 2019
- "Turbulence from Angstroms to Light years", TIFR-ICTS Discussion meeting, Bangalore, India, Jan' 2018
- "Dynamics of complex systems", a summer school by TIFR-ICTS, Bangalore, India, Jun'2016
- International Conference on Nano Science and Technology(ICONSAT), Hyderabad, 2012

## Teaching

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| UG Courses | **Transport Phenomena**, **Corrosion Engineering**, **Engineering Biology** @ Saintgits College of Engineering, Kottayam |
| UG Labs | **Heat Transfer**, **Fluid and Particle Mechanics**, **Python and MATLAB** laboratories @ Saintgits College of Engineering, Kottayam |
| UG Tutorials | **Heat Transfer**, **Chemical Engineering Thermodynamics** @ Saintgits College of Engineering |
| Teaching assistance | **Fluid Mechanics** (Graduate level), two semesters — JNCASR, **Applied Mathematical Methods** — TIFR–ICTS / TIFR–CAM |
| Informal Teaching | Six lectures on **Fluids, Waves and Instabilities** (Geophysical Fluid Dynamics), TIFR–ICTS, Bangalore, Four **journal club** talks, TIFR–ICTS |

## Mentoring

- Mrinal Jyoti Powdel (Ph.D.), ICTS Bangalore
- Tanmay Sarkar, Research Engineer, CSTEP, Bangalore
- Vinay Kandagal, Research Engineer, CSTEP, Bangalore
- Romeo Mallik, B.Tech., IIT Kharagpur — Short-term intern, CSTEP Bangalore
- Pre-university students — Student Mentoring Program, JNCASR Bangalore
- Ramana Patibandla, Ph.D., IIT Madras — Mentored during final year of my Ph.D. at JNCASR

## Outreach

**JNCASR** As part of JNCASR's 'Student Mentoring Program', I taught mathematics and physics to pre-university students during the summers of 2017, 2018, and 2019. In 2019, I guided students in exploring soap film experiments and assisted them in investigating the 'Motorway problem.'

**ICTS** For the ICTS Open Day Festival (2025), I took part in developing and demonstrating fluid dynamics experiments, including hydrodynamic instabilities, surface tension effects, and non-Newtonian fluids.