

EDUCATION

University of North Carolina at Chapel Hill

Ph.D. in Chemistry, Advisor: Dr. Zhiyue Lu

Chapel Hill, USA

2021–Current

Indian Institute of Science

M.Sc. in Chemistry

Bangalore, India

2019–2020

Indian Institute of Science

B.S.(Research) in Chemistry

Bangalore, India

2015–2019

RESEARCH APPOINTMENTS

Graduate Research Assistant at the University of North Carolina at Chapel Hill

Lu Group, Department of Chemistry

2021–Current

- Sensitivity of a sensor to time-dependent environment
- Theoretical upper bound of multiplexing in biological sensory receptors [1]
- Shown that biological receptors are capable of simultaneously sensing multiple environmental information i.e perform multiplexing.
- Derived a theoretical upper bound of multiplexing in biological receptors.
- Developed a rank-deficient maximum likelihood technique to obtain the upper bound for a receptor and identify it's accuracy and sensitivity in sensing different environmental variables.

Undergraduate Researcher at the Indian Institute of Science

BS Thesis, Cherayil Group, Department of Inorganic and Physical Chemistry

Bangalore, India

2018-2019

- Stochastic thermodynamics of a harmonically trapped colloid in linear mixed flow[2]
- A system of a harmonically trapped colloid subjected to linear mixed flow was successfully shown to satisfy various fluctuation theorems like the integral fluctuation theorem, Jarzynski relation, Bochkov-Kuzovlev relation and the detailed fluctuation theorem.

Intern at the University at Buffalo

Errington Group, Department of Chemical and Biological Engineering

Buffalo, USA

May-July, 2018

- Introduction to Monte Carlo Simulations and Molecular Dynamics simulations and their application to compute phase coexistence properties of an ionic liquid
- Monte Carlo and Molecular simulations were used to calculate properties of a Room Temperature Ionic Liquid (RTIL) called 1,3-dimethylimidazolium tetrafluoroborate ($[C_1mim][BF_4]$) at a temperature higher than its thermal degradation temperature. The phase behaviour of this liquid was obtained for a constant temperature of 1000K and varying densities.

Intern at the Indian Institute of Science

Cherayil Group, Department of Inorganic and Physical Chemistry

Bangalore, India

May-July, 2017

- Thermodynamics and work fluctuations of a closed quantum system with applications to interacting spin-1/2 particles
- Characteristic function and work distribution of a system of spin 1/2 particles interacting via J coupling were derived. Local violations of the second law caused by the considerable thermal and quantum fluctuations were clearly observed.

- The different dimensions of dimensional analysis[3]
- Dimensional analysis and scaling properties were used to show scaling behaviour in the phenomenon of slowing down of magnets when dropped through a metallic pipe.

PUBLICATIONS

- [1] **A. Pagare**, S. H. Min, and Z. Lu, “Theoretical upper bound of multiplexing in biological sensory receptors”, *Physical Review Research*, vol. 5, no. 2, p. 023 032, 2023.
- [2] **A. Pagare** and B. J. Cherayil, “Stochastic thermodynamics of a harmonically trapped colloid in linear mixed flow”, *Physical Review E*, vol. 100, no. 5, p. 052 124, 2019.
- [3] **A. Pagare** and B. J. Cherayil, “The different dimensions of dimensional analysis”, *Resonance*, vol. 23, no. 6, pp. 641–661, 2018.

TECHNICAL SKILLS

- **Coding:** Python, Julia, C
- **Softwares:** Matlab, Mathematica, LAMMPS
- **Applied mathematical skills:** Information theory, Probability theory, Stochastic thermodynamics, Calculus, Complex Analysis, Differential Equations, Linear Algebra

SCHOLARSHIPS AND AWARDS

- Kishore Vigyanik Prothsahan Yojana 2015–2020

EXTRACURRICULARS

- Teaching Assistant at University of North Carolina at Chapel Hill Spring 2022
Quantitative Chemistry lab II (102L)
- Teaching Assistant at University of North Carolina at Chapel Hill Fall 2021
Physical Chemistry lab (481L)
- Oral presentation on ‘**Can a single ligand-receptor sense multiple channels of information?**’ April 2023
TriMolS Symposium 2023, Raleigh, NC
- Poster presentation on ‘**Theoretical upper bound of multiplexing in biological sensory receptors**’ May 2022
The Workshop on Stochastic Thermodynamics III, WOST III 2022
- Oral presentation on ‘**Can a single ligand-receptor sense multiple channels of information?**’ March 2022
APS March Meeting 2022, Chicago, Illinois
- Poster presentation on ‘**Stochastic thermodynamics of a harmonically trapped colloid in linear mixed flow**’ Feb 2020
7th Indian Statistical Physics Community Meeting (ISPCM), International Centre for Theoretical Sciences (ICTS), Bangalore.
- Oral presentation on ‘**Measuring irreversibility in small systems: entropy production and the integral fluctuation theorem**’ March 2019
In house symposium of the Department of Inorganic and Physical Chemistry, IISc.