Moumita Ganguly

Curriculum Vitae

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Education

2015–2021	**Ph.D.**. *Biophysics*, School of Biosciences and Bioengineering, Indian Institute of Technology (IIT) Mandi Thesis Awarded: *5 December, 2022* Thesis Supervisor: *Dr. Aniruddha Chakraborty*, CGPA 8.2/10
2012–2014	**M.Sc.**, *Biomedical Sciences*, Dr. B.R. Ambedkar Centre for Biomedical Research, University of Delhi, Delhi, India . Majors: Advanced Pharmacology and Toxicology, Radiation Biology and Toxicology
2009–2012	**B.Sc.**, *Botany*, Presidency College, University of Calcutta, India .

Skills & Abilities

Additional courses	Data Science using Python, Tableau Training
Computational techniques	Langevin dynamics, Molecular dynamics and Simulation
Programming Languages	Python,C
Documentation	LaTeX, MS Word
Software	Wolfram Mathematica, HyperChem, Matlab, MS Office
OS	Linux and Windows
Experimental techniques	Cell Culture, Gel Electrophoresis, Western Blotting, Chromatography, Bacterial cell culture, PCR, Molecular cloning

Research Projects

November 2022 - Jan 2023	**To study the efficacy and toxicity of a novel nitrofuran small molecule that potentiates Vancomycin activity against vancomycin-intermediate Staphylococcus aureus**.
September - November 2019	**Molecular Docking and Simulations study of phytoconstituents from medicinal plant compounds against tuberculosis, an in silico analysis**.
Jan 2014 –May 2014	**Assessment of Oxidant and Antioxidant Status of Red Blood Cells In Bronchial Asthma And Alteration in Membrane Protein**.

Teaching Assistant

2020 (fall)	**Cell Biology**
2019 (fall)	**Reaction Dynamics , Kinetics and Catalysis**
2018 (fall)	**Data Science and Programming using Python**
2018 (spring)	**Computational Chemistry**

2017 (fall)	**Mathematics for Chemist and Biologists**
2016 (fall)	**Experimental Biochemistry**

Awards & Certifications

Media Outreach	**Research work in National Newspaper, Research work was covered by Several Reputed National Newspapers like India Today, NDTV, Hindustan Times etc.** , HTTPS://WWW.INDIATODAY.IN/EDUCATION-TODAY/NEWS/STORY/IIT-MANDI-RESEARCHERS-DEVELOP-SIMPLE-MODELS-TO-UNDERSTAND-POLYMER-LOOPING-1615510-2019-11-04.
Reviewer	**Invited reviewer in the journal 'Physica A' published by Elsevier**.
Travel Grants	**Full Travel grants for attending APS & ICTP-SAIFR Young Physicists Forum on Biological Physics from Molecular to Macroscopic Scale**, *Sao Paulo, Brazil*, 8-15 March, 2020.
Session Chair	**Workshop on Computer Simulation and Theory of Macromolecules**, *22 March-23 March, 2019*, Max-Planck Institute, Germany.
Youngest teacher and facilitator	**Salter's chemistry camp held at IIT Mandi**, *July 2017*, The Royal Society of Chemistry, India and the Salters Institute, UK.
Best Oral Presentation	**Research Fair, Anusandhan**, *IIT Mandi, India*, March, 2017.
Teaching Assistant	**Excellence in Teaching Assistant**, *IIT Mandi*, Mar 2016.
National Level Scholarships	**Qualified in Graduate Aptitude Test in Engineering (GATE - 2014)**, *Conducted by IIT's*, April 2014, Percentile score: 97.4.

Ph.D. Research Highlights

Thesis Title	**Theoretical investigations of looping of a long chain polymer molecule in dilute solution**
Supervisor	**Dr. Aniruddha Chakraborty**
Summary	Understanding the dynamics of polymer looping in solution, the kinetics of irreversible and reversible looping process in biopolymeric systems is useful in understanding the application of such models in a variety of other biological systems such as morphogenesis, in understanding mathematical model for studying Alzheimer's disease, protein aggregation etc.. These findings are also groundbreaking and provide a significant addition to the study of primary folding processes in proteins, DNA looping, and cellular biology, as well as the knowledge of dynamics in confined and low-dimensional systems, and mathematical biology in general. If the polymer molecule is immersed in solvent, a description of the end-to-end distribution can be obtained by using a Smoluchowski-like equation. Ensuring the occurrence of reaction between two ends is modelled in the equation by adding a sink function which can be arbitrary positioned. This sink function results in decay of the survival probability of the un-reacted population. Since many biomolecular events occurring in molecular aggregates and immunological systems, electrostatic steering in enzyme to ligand binding processes could be modelled by this type of equations, thus it is desirable to achieve a solution of this Smoluchowski-like equation with a sink of finite strength analytically in time and Laplace domain. Therefore, this thesis deals with developing different methods of solving the equation by analytical or semi-analytical approach

Publications

2020	**M. Ganguly**, *A.Chakraborty , Opening of a weak link of a closed looped polymer immersed in solution. Analytical modelling using a delta function sink*, Physica Scripta, 96. 015003, 2020

2020 **M. Ganguly**, *A.Chakraborty* , *Interpreting the looping rates of a polymer molecule in solution: Exact solution using a simple analytical method*, Chemical Physics Letters, 749. 137370, 2020

2020 **M. Ganguly**, *A.Chakraborty* , *The two-state reversible kinetics of a long polymer molecule in solution with a delocalized coupling term. An exact analytical model*, Physica Scripta, 95. 115006 2020

2019 **M. Ganguly**, *A.Chakraborty* , *Understanding the reversible looping kinetics of a long chain polymer molecule in solution with Dirac Delta coupling. An exact analytical perspective*, Physica A, 536. 122509 2019

2018 **M. Ganguly**, *A.Chakraborty* , *Exploring the role of relaxation time, bond length and length of the polymer chain in the kinetics of end-to-end looping of a long polymer chain. An exact analytically solvable model*, Chemical Physics Letters, 733. 136673, 2019

2017 **M. Ganguly**, *A.Chakraborty* , *Understanding looping kinetics of a long polymer molecule in solution. Exact solution for delta function sink model*, Physica A, 484. 163 2017

**corresponding author

Awaited Publications

2022 **M. Ganguly**, *A.Chakraborty* , *Effect of different architecture of sink function beyond Dirac delta sink model in looping kinetics of a long polymer molecule in solution*, Journal of Physics A. submitted 2022

2021 **M. Ganguly**, *A.Chakraborty* , *A time-dependent Morphogen Gradient Analysis: An Exact Analytical Method*, Chemical Physics Letters. under review 2021

2021 **M. Ganguly**, *A.Chakraborty* , *Dynamics of unlooping of a long chain polymer molecule in solution: Exact result for an asymmetric point sink model*, Chemical Physics. submitted 2021

2021 **M. Ganguly**, *A.Chakraborty* , *Analytical expression for end-to-end-auto correlation function of a long chain polymer molecule in solution*, Journal of Chemical Physics Letters. under review 2021

**Manuscript available on request

Recent Talks / Posters

March 2015 **Invited talk**, Second Discussion Meeting on Spectroscopy, Structure and Dynamics, **Understanding looping kinetics of a long Polymer chain in solution**, MNIT Jaipur. India

August 2020 **Open Seminar**, Analytical solutions to time dependent Smoluchowski- like equation for Bicoid morphogen gradient in Fruit fly patterning, IIT Mandi, India.

February 2020 **Open Seminar**, Analytical solutions to diffusion- limited reactions in biology, IIT Mandi, India.

December 2020 **Poster**, 33rd M. Smoluchowski Symposium on Statistical Physics *MS Teams Platform Online*, Self-organized criticality in polymers.

March 2019 **Poster**, Workshop on Computer Simulation and Theory of Macromolecules, Understanding reversible looping kinetics of a long polymer chain in solution with delocalised coupling." An exact analytical solution of Dirac Delta sink model, Germany.

December 2018	**Poster**, Gordon Research Seminar and Conference on Polymer Physics, Understanding reversible looping kinetics of a long chain polymer molecule in solution. Exact analytical solution for delta function coupling model, selected but couldn't attend physically.
December 2017	**Poster**, ICTP School on Biological Soft Matter: from molecular interactions to engineered materials, International Centre for Theoretical Physics, Understanding looping kinetics of a long polymer chain in solution with delocalised sink." An exact analytical solution of Dirac Delta sink model., School on Biological Soft Matter: from molecular interactions to engineered materials, International Centre for Theoretical Physics. Sao Paulo,Brazil

Coursework

- Mathematics for Biologist and Chemist
- Nanobiotechnology
- Statistical Mechanics
- Cell Biology
- Data Science with Python

- Reaction Dynamics , Kinetics and Catalysis
- Metabolomics
- Computational Chemistry
- Nanomanufacturing
- Research Methodology

Extra Interests

Hobbies	**Yoga, Dancing, Singing, Educational Vlogging (Various Biomedical Subjects), Cricket**
Language	**English, Bangla, Hindi**

Workstyle

- Detail oriented, passionate, well-organized, responsible and open-minded molecular biochemist with over seven years of research experience and with strong Willing to teach existing courses as well as introduce new ones, given an opportunity.
- I hold a keen interest in industry-academia conclave and constantly looking to make an effort by which can get more involved in lab-to-market research opportunities
- Strong independent work style and excellent teamwork skills
- I try to disseminate research via scientific publications and conferences in priority.
- Competent in written and oral English. Excellence in regional languages as needed.
- Ability to work independently as well as in team environment.
- Ability to plan tasks and complete them within the appropriate timescale and to the required quality.

References

Dr. Aniruddha Chakraborty, achakraborty@iitmandi.ac.in, *Associate professor*, School of Basic Sciences, Indian Institute of Technology Mandi, Himachal Pradesh, India.

**Additional references available on request