

Arpan Dey

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Physics master's student at Montpellier University, working across statistical physics, nonlinear dynamics, and biophysical modeling.

EDUCATION

- University of Montpellier**, France, 2025–Present. M1 grade: 16.9/20
M.Sc. in Fundamental Physics and Applications, IDIL Graduate Program (Modeling Biological and Environmental Systems)
- St. Xavier's College, Kolkata**, India, 2022–2025. CGPA: 8.02/10 (A+)
B.Sc. (Honors) in Physics, dissertation on path integral formulation of quantum mechanics (Supervisor: Tanaya Bhattacharyya)

RESEARCH EXPERIENCE

- M1 internship, Laboratoire Charles Coulomb, Montpellier**, France, Jan–Jul 2026
Supervisor: Jean-Charles Walter; investigated variational mean-field approaches to construct a phase diagram of the semiflexible magnetic polymer, also investigated structural competition in lattice polymer ground states.
- Summer research intern, The Institute of Mathematical Sciences, Chennai**, India, Jun 2025
Supervisor: Sitabhra Sinha; investigated networks of Kuramoto oscillators with nonlinear feedback.
- Summer research fellow, Physical Research Laboratory, Ahmedabad**, India, Jun–Jul 2024
Supervisor: Ketan Patel; investigated modular symmetry and the fundamental domain of the modular group, received fellowship from the Indian Academy of Sciences.

SELECTED ARTICLES

- Collective drift and pinning in active rotator networks with Kuramoto coupling and mixed-sign feedback disorder.** 2026. arXiv: 2606.10032.
- Mobility heterogeneity in a 2D Gaussian lattice polymer: a dynamic Monte Carlo study.** 2026. arXiv: 2606.04002.
Accepted for publication in *Polymer Science, Series A*.
- Is statistical mechanics just a tool?.** 2026. PhilSci-Archive. <https://philsci-archive.pitt.edu/id/eprint/30878>.
- Path integral formulation of quantum mechanics.** B.Sc. dissertation, 2025. Zenodo: 10.5281/zenodo.15564781.
- Investigations on the fundamental domain of the modular group.** Summer research project, 2024. Zenodo: 10.5281/zenodo.15737745.

SELECTED PRESENTATIONS

- Collective drift and pinning in active rotator networks with Kuramoto coupling and mixed-sign feedback disorder.** WE-Heraeus Seminar: Half a Century of the Kuramoto Model, Physikzentrum, Bad Honnef, 2026.
- How stiffness and interactions shape the structure of magnetic polymers (with Linda Delimi).** ANR project meeting on bacterial DNA segregation, Laboratoire Charles Coulomb, Montpellier, 2026.
- Phase diagram and ground states of the semiflexible magnetic polymer (with Linda Delimi and Jean-Charles Walter).** GDR ADN-G meeting, ENS de Lyon, Lyon, 2026.
- Dyadic emotional modeling: a nonlinear dynamics approach.** International School on Urban Physics for Environmental Research (iSUPER), Montpellier, 2026.
- Path integrals, uncertainty, entropy and information.** Quantum Foundations Summer School, Bhaktivedanta Institute and CDAC, Kolkata, 2025.
- Exploring synchronized oscillations in Kuramoto-type oscillators with nonlinear feedback.** The Institute of Mathematical Sciences, Chennai, 2025.
- Complexity: the next big thing in physics.** Spectrum, St. Xavier's College, Kolkata, 2024.

EXTRACURRICULARS

- Founder and reviewer**, The Journal of Young Physicists, 2020–Present.
- Senior physics editor**, Young Scientists Journal, 2020–2026.
- Mentor**, Young Scientists Journal Research Program, 2026.
- Associate student editor-in-chief**, Pebbles 2025, St. Xavier's College Science Association, 2025.
- Research mentor**, Xaverian Astronomical Society, St. Xavier's College, Kolkata, 2024–2025.
- Young member**, Junior Academy, New York Academy of Sciences, 2020–2022.

BOOKS AND BOOK CHAPTERS

- The city of equilibrium: a scientific allegory and selected essays on physics.** 2026. ISBN: 979-8906064868.
- Our physics so far: a journey through spacetime, consciousness and the fundamental nature of reality.** 2021. ISBN: 978-1685090234.
- Properties and Biomedical Applications of Graphene-based Nanotechnologies (with Fabeha Shafaat, Roberto Parisi, Nipun Gorantla, and Fahad Hassan Shah).** In *Nanotherapeutic Strategies and New Pharmaceuticals (Part 1)*, Bentham Science Publishers. 2021. DOI: 10.2174/9789815036694121010007.

SKILLS

- Research areas:** Statistical mechanics, stochastic processes, nonlinear dynamics, complex systems, polymer physics, biological systems, quantum mechanics.
- Methods:** Monte Carlo simulations, mean-field theory, nonlinear differential equations, lattice models.
- Computational tools:** Python, NumPy, SciPy, Matplotlib, GitHub, LaTeX.
- Other:** Academic writing, editing, science communication, leadership, mentoring.