

Parth Kumar

Physics PhD Candidate | parthk@arizona.edu | [Website](#)

PERSONAL

Born 1995

Indian Citizen

EDUCATION

The University of Arizona

PhD in Physics

Arizona, USA

August 2018 - Present (Expected Spring 2024)

- Advisor: Prof. Charles A. Stafford

The University of Arizona

Master of Science in Physics

Arizona, USA

August 2021

Delhi College of Engineering

Bachelor of Technology in Engineering Physics

New Delhi, India

August 2014 - May 2018

RESEARCH INTERESTS

Theoretical Condensed Matter Physics

Nonequilibrium Quantum Dynamics, Thermodynamics & Statistical Mechanics | Quantum Transport & Mesoscopics | Quantum Information Theory | Nonequilibrium Topological Quantum Matter | Quantum Stochastics

RESEARCH PROJECTS

PhD Thesis: Thermodynamics of Time-Dependent Open Quantum Systems

August 2020 – Present

- Investigating the Nonequilibrium Quantum Dynamics of driven Open Quantum systems.
- Clarifying the laws of Thermodynamics in Open Quantum systems under non-steady state conditions by investigating the consistency of partitioning the Energy and Entropy of such systems.

Quantum Information Engine

May 2020 – July 2020

- Investigating Landauer Erasure and Heat Engine operation of a two qubit machine with dipole interaction.

Density Functional Theory

June 2017 – August 2017

- Undergraduate internship at IIT-Delhi learning and implementing DFT with the aim of optimizing low-dimensional systems for Photovoltaic applications

Transition Metal Di-Chalcogenide based Heterojunction Solar cells

August 2016 – August 2018

- Undergraduate Thesis project involving theoretical design, simulation, optimization and analysis of TMD based Heterojunction Solar cells.

PREPRINTS & PUBLICATIONS

1. P. Kumar and C. A. Stafford, On the First Law of Thermodynamics in Time-Dependent Open Quantum Systems (2022), [arXiv:2208.06544 \[cond-mat\]](#).
2. P. Kumar and C. A. Stafford, Adiabatic Driving Reveals a New Term in the Thermodynamics of Open Quantum Systems (In Preparation).

AWARDS, HONORS & SERVICE

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| University of Arizona Physics Department Fanfare Domestic Travel Grant | Spring 2023, 2022 |
| University of Arizona GPSC International Travel Grant | Spring 2023 |
| Grants Reviewer for University of Arizona Graduate and Professional Council | Spring 2023 |
| University of Arizona Physics Department Excellence in Teaching Award | Spring 2020 |

SCHOOLS, CONFERENCES & TALKS

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| March Meeting 2023, American Physical Society <i>Contributed Talk</i> | March 2023 <i>Las Vegas, USA</i> |
| The Center for Simulational Physics, University of Georgia <i>Invited Seminar</i> | October 2022 <i>Georgia, USA (Virtual)</i> |
| Topological Matter School 2022, Donostia International Physics Center <i>Competitive selection for school; Poster presented</i> | August 2022 <i>San Sebastian, Spain</i> |
| QTD2022 Conference, Queen's University Belfast <i>Poster presented</i> | June 2022 <i>Belfast, UK (Virtual)</i> |
| March Meeting 2022, American Physical Society <i>Contributed Talk</i> | March 2022 <i>Chicago, USA (Virtual)</i> |
| QTD2021 Conference, University of Geneva <i>Poster presented</i> | October 2021 <i>Geneva, Switzerland (Virtual)</i> |
| Quantum Transport Workshop, Telluride Science Research Center <i>Poster presented</i> | July 2021 <i>Telluride, USA (Virtual)</i> |

TECHNICAL SKILLS

Programming Languages: C, C++, Mathematica, Python, SQL, MATLAB.
Computational Physics: Nonequilibrium Green's Functions (NEGF), Density Functional Theory (DFT).

TEACHING

Award-winning Teaching Assistant for several freshman physics undergraduate courses at The University of Arizona. 10 semesters of TA experience teaching both physics majors and non-majors. Several of these semesters have been for Honors courses.