

# Parth Kumar

Physics PhD Candidate | [parthk@arizona.edu](mailto:parthk@arizona.edu)

## PERSONAL

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**Born 1995**

*Indian Citizen*

## EDUCATION

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**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

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### Theoretical Condensed Matter Physics

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

## RESEARCH PROJECTS

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**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

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1. P. Kumar and C. A. Stafford, On the First Law of Thermodynamics in Time-Dependent Open Quantum Systems (2022), [arXiv:2208.06544 \[cond-mat\]](https://arxiv.org/abs/2208.06544).
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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<b>March Meeting 2023, American Physical Society</b> <i>Contributed Talk</i>	March 2023 <i>Las Vegas, USA</i>
<b>The Center for Simulational Physics, University of Georgia</b> <i>Invited Seminar</i>	October 2022 <i>Georgia, USA (Virtual)</i>
<b>Topological Matter School 2022, Donostia International Physics Center</b> <i>Competitive selection for school; Poster presented</i>	August 2022 <i>San Sebastian, Spain</i>
<b>QTD2022 Conference, Queen's University Belfast</b> <i>Poster presented</i>	June 2022 <i>Belfast, UK (Virtual)</i>
<b>March Meeting 2022, American Physical Society</b> <i>Contributed Talk</i>	March 2022 <i>Chicago, USA (Virtual)</i>
<b>QTD2021 Conference, University of Geneva</b> <i>Poster presented</i>	October 2021 <i>Geneva, Switzerland (Virtual)</i>
<b>Quantum Transport Workshop, Telluride Science Research Center</b> <i>Poster presented</i>	July 2021 <i>Telluride, USA (Virtual)</i>

## TECHNICAL SKILLS

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

## TEACHING

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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.