Archisman Panigrahi

 $5^{\rm th}~{\rm Year}~\cdot~{\rm UG}~\cdot~{\rm Physics}~{\rm Major}$ Indian Institute of Science, Bangalore, India □ (+91) 7980591664 | **S** archismanp@iisc.ac.in

Education

Master of Science in Physics

Bangalore, India

Aug. 2021 - May 2022 (expected)

· Ongoing

Bachelor of Science (Research) in Physics

Secondary Examination (X^{th} standard)

Bangalore, India

INDIAN INSTITUTE OF SCIENCE

INDIAN INSTITUTE OF SCIENCE

Aug. 2017 - Jun. 2021

• C.G.P.A - 9.8/10

Higher Secondary Examination (XII^{th} standard)

West Bengal Council of Higher Secondary Education, India

2015 - 2017

HOOGHLY COLLEGIATE SCHOOL

- Obtained $\mathbf{1}^{\text{st}}$ rank in Board, among about 0.7 million candidates

West Bengal Board of Secondary

Education . India

HOOGHLY COLLEGIATE SCHOOL

- Obtained 2^{nd} rank in Board, among about 1 million candidates

2005 - 2015

Achievements_

2017-21	C.G.P.A 9.8/10 in B.S. (Research), highest GPA in batch	IISc, Bangalore
2017	1st rank (99.2 %) in Board in Higher Secondary Examination	West Bengal, India
2017	10th rank in National Entrance Screening Test (NEST)	India
2017	Qualified for JEE Mains (All India Rank - 381) - an all India Engineering entrance	
2017	Qualified for JEE Advanced examination (All India Rank- 543), Entrance examination of Indian Institute(s) of	
2011	Technology (IIT)	
2017	Qualified for Indian Statistical Institute, Kolkata and Chennai Mathematical Institute	
2015	Qualified for K.V.P.Y (All India Rank - 128)	
2015	2nd rank (97.57 %) in Board in Secondary Examination	West Bengal, India

Research Articles

PREPRINT(S)

- A. Panigrahi, R. Moessner, B. Roy; Non-Hermitian dislocation modes: Stability and melting across exceptional points (2021) arXiv:2105.05244
- A. Panigrahi, S. Mukerjee; Energy magnetization and transport in systems with a non-zero Berry curvature in a magnetic field (2021) arXiv:2111.08026

MANUSCRIPTS IN PREPARATION

• A. Panigrahi, V. Juričić, B. Roy; Emergence of topological properties of parent crystals in projected topological phases.

Talks_

Dislocation as a bulk probe of non-Hermitian topology

MPIPKS, Dresden, Germany

(remotely)

July 6, 2021 PRESENTATION DOWNLOAD LINK

Research Interests

Broadly interested in theoretical Condensed Matter Physics

- · Topological phases of matter and Quantum Phase transitions
- Thermo-electric transport
- Brownian motion
- · Thermalization of quantum systems and Many body localization



Mathematical skills Integral Calculus, Linear Algebra, Trigonometry, Differential Equations

Comfortable with performing long algebraic calculations in pen and paper

Programming skills

MATLAB/Octave, Mathematica, Data structures in C

Advanced Physics Courses

Condensed Matter Physics II, Advanced Statistical Physics, Quantum Field Theory I, Relativistic Q.M. (ongoing)

Languages

Fluent in English, Bengali, Hindi

Ongoing Research Projects

Many body localization and thermalization of quantum systems

IISc, Bangalore, India (Bachelor's thesis)

WITH PROF. SUBROTO MUKERJEE

September 2021 - Present

Research Experience_

Topological phases in Quasicrystals

MPIPKS, Dresden, Germany (remotely)

June 2021 - September 2021

JOINTLY WITH PROF. BITAN ROY AND PROF. VLADIMIR JURIČIĆ

Julie 2021 - September

- · Numerically studied how topological properties of parent systems emerge in projected crystals and Fibonacci quasicrystals
- · Verified the existence of dislocation modes, Weyl points, and Landau levels in projected crystals and quasicrystals

Berry curvature effects on thermoelectric transport

IISc, Bangalore, India (Bachelor's thesis)

WITH PROF. SUBROTO MUKERJEE

October 2020 - June 2021

- · Studied how Berry curvature can alter thermoelectric transport, leading to anomalous Hall and anomalous Nernst effects
- Studied the Boltzmann transport formalism
- Studied how the existence of the Onsager relation can be demonstrated from microscopic theories for a system with Berry curvature in reciprocal space
- Found a condition on the energy magnetization such that the Einstein relation holds for the transport energy current in the above type of systems
- · Found a physical interpretation of this condition, and obtained a closed expression for energy magnetization using this condition
- · Analytically solved the Boltzmann transport equation (including Berry curvature effects) for two-dimensional systems

Non-Hermitian Topological Insulators and Dislocations

MPIPKS, Dresden, Germany

May 2020 - September 2020

(remotely)

• Studied and numerically implemented SSH Model, Chern Insulators, Quantum Spin Hall Insulators

- Studied effects of dislocation in Hermitian and Non-Hermitian Chern Insulators
- Noticed similarity between plot of a quantity I analytically calculated, and a phase diagram in a paper (in a different context), from which I found a new interpretation of that phase transformation
- Proposed how dislocations can be used to probe topological phases in non-Hermitian systems, where the non-Hermitian skin effect disturbs the traditional bulk-boundary correspondence

Nano Heat Engines IISc, Bangalore, India

WITH PROF. H. R. KRISHNAMURTHY

May 2019 - July 2019

- Studied how harmonic oscillators and two state systems can be used as efficient heat engines
- Read Articles claiming they surpassed Carnot efficiency with "squeezing", and figured out the sense in which Carnot efficiency is surpassed
- Studied how one can produce such a squeezed state of a harmonic oscillator using "squeezed thermal bath"
- Studied about Brownian Motion and Langevin equation
- Solved the Langevin equation for a special kind of random force, for which a classical harmonic oscillator behaves like a squeezed state
- Created a computer simulation to verify the nature of this solution

References_

- Prof. Subroto Mukerjee, Dept. of Physics, Indian Institute of Science, Bangalore, India.
 Email Address smukerjee@iisc.ac.in
- Prof. Bitan Roy, Dept. of Physics, Lehigh University, Bethlehem, PA 18015, USA.
 Email Address bitan.roy@lehigh.edu
- Prof. Hulikal Ramaiengar Krishnamurthy, Dept. of Physics, Indian Institute of Science, Bangalore, India.
 Email Address hrkrish@iisc.ac.in