Archisman Panigrahi

5^{th} Year · UG · Physics Major

Indian Institute of Science, Bangalore, India

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Education

Master of Science in Physics

Bangalore, India

Indian Institute of Science

Aug. 2021 - May 2022 (expected)

- Ongoing

Bachelor of Science (Research) in Physics

Bangalore, India

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

Hooghly Collegiate School

2015 - 2017

- Obtained 1^{st} rank in Board

Secondary Examination (X^{th} standard)

West Bengal Board of Secondary Education , India

Hooghly Collegiate School

2005 - 2015

- Obtained 2^{nd} rank in Board

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 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 Fibonacci quasicrystals*

Talks

Dislocation as a bulk probe of non-Hermitian topology

MPIPKS, Dresden, Germany (remotely)

Presentation Download Link

July 6, 2021

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**

Skills

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)
September 2021 - Present

With Prof. Subroto Mukerjee

Research Experience

Topological phases in Quasicrystals

MPIPKS, Dresden, Germany
(remotely)
June 2021 - September 2021

Jointly with Prof. Bitan Roy and Prof. Vladimir Juričić

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

Berry curvature effects on thermoelectric transport

IISc, Bangalore, India
(Bachelor's thesis)
October 2020 - June 2021

With Prof. Subroto Mukerjee

- 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
(remotely)
May 2020 - September 2020

With Prof. Bitan Roy

- 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
May 2019 - July 2019

With Prof. H. R. Krishnamurthy

- 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