Pranjal **Panwar**

BS-MS STUDENT · FIFTH-YEAR

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"I am delighted to admit that my passion for understanding the complexities of the natural world is boundless."

Education

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH, Pune (IISER-Pune) — *Pune,India*

BS-MS, INTERDISCIPLINARY PHYSICS — *Aug. 2020 - Expected May. 2025*

Research Experience

Understanding the local electronic properties of $ZrTe_2$ — *IISER-Pune, India*

SUPERVISOR: DR. APARNA DESHPANDE — *May 2024 - Ongoing*

- **Objective** Investigation of Electronic and Topological Properties of $ZrSe_xTe_{2-x}(0\leq x\leq 1)$.Also, We are trying to tune the bandgap by substitution from semimetal to 0.8 eV.

Designed and Developed a Low-Temperature Transport Setup — *IISER-Pune, India*

SUPERVISOR: DR. APARNA DESHPANDE — *Jan 2024 - April 2024*

- **Objective** I developed a custom-built setup for optoelectronic transport measurements at temperatures as low as 5 Kelvin.

Modulating Electronic Properties via Intercalation in Transition Metal Dichalcogenides — *IISER-Pune, India*

SUPERVISOR: DR. APARNA DESHPANDE — *Aug 2023 - Dec 2024*

- **Objective** Investigation of Transition Metal Dichalcogenide Intercalation and Associated Electronic Property Modulations via STM, Raman Spectroscopy and AFM.

Build a PRISM-TIRF Microscopy, High-Resolution UV Spectroscopy, and Investigating Excitonic Coupling through Nanoparticle Interactions (MITACS) — *Concordia University, Montreal, Canada*

SUPERVISOR: PROF. VALTER ZAZUBOVITS — *May 2023 - Aug 2023*

- **Objective:** Designed and constructed PRISM-TIRF (Total Internal Reflection Fluorescence) microscopy system, including a UV spectrograph incorporating a UV laser, was developed to investigate energy propagation resulting from excitonic coupling.

Understanding The correlated electronic properties of $NbSe_2$ (Niobium diselenide) Intercalation of bulk $NbSe_2$ — *IISER-Pune, India*

SUPERVISOR: DR. APARNA DESHPANDE — *Jan 2023 - April 2023*

- **Objective:** Through the intercalation process, electronic properties were successfully achieved in the $NbSe_2$ material, resulting in a critical temperature comparable to that of non-intercalated bulk crystals. Additionally, the intercalated $NbSe_2$ exhibited enhanced stability in comparison to monolayer flakes.

Experimental Unevaluated Nuclear Data List file Making (XUNDL) — *HBCSE-TIFR Mumbai, India*

SUPERVISOR: PROF. P.K JOSHI — *May 2022 - Expected Oct 2023*

- **Objective** Proficiently evaluate research papers and conduct nuclear experiments, employing advanced data analysis techniques and contemporary theories to unravel complex datasets. Demonstrated expertise in creating precise Evaluated Nuclear Structure Data Files (ENSDF) from Experimental Unevaluated Nuclear Data Lists (XUNDL). Skilled in preparing and presenting ENSDF files for review and dissemination, with regular reporting to mentor and the International Atomic Energy Agency (IAEA).

Fourier Analysis: An Introduction Book by Elias M. Stein Reading — *IIT-Mandi, India*

SUPERVISOR: DR. QAISER JAHAN — *Feb. 2022, May 2022*

- In this project, I acquired valuable expertise in Fourier Analysis, Fourier Series, and Harmonic Analysis, demonstrating a dedicated commitment to expanding my knowledge and skills in these critical areas of study

Honors & Awards

INTERNATIONAL HONORS & AWARDS

2023 **MITACS GRI**, *CANADA*

2021 **ESCAPE Summer School on Data Science for Astronomy, Astro-particle and Particle Physics**, *France*

NATIONAL HONORS & AWARDS

2021	**National Initiative on Undergraduate Science (NIUS),** The National Initiative on Undergraduate Science (NIUS), a major HBCSE (TIFR) effort for tertiary science education in India, aims to instill universal scientific skills in diverse disciplines through ongoing mentorship.	*India*
2022	**Graduate Aptitude Test in Engineering (GATE),** Secure 220+ All India Rank	*India*
2020	**JEE Advanced,** I secure 2k+ All India Rank in JEE.	*INDIA*

Technical Skills and Instrumentation

Instrumentation

Hands-On Experience

- Laser Writer (Lithography)
- Spectral-Analysis
- UV-Spectrograph
- Atomic force microscopy (EFM & MFM)
- Scanning tunneling microscope
- Powder XRD
- Raman spectroscopy
- XPS spectroscopy
- HR-TEM
- LT Single-Crystal XRD

Technical Skills

For Lab

- 2-D Heterostructure
- Flake Transfer Using PC-Flim and PDMS
- Transport Measurement
- Data Analysis
- STM tip and Sample Change
- Wire Bonding
- Plasma Sputtering
- Thermal Depositions/ Sputtering

Computational Skills

- Matlab (Intermediate)
- Python (Intermediate)
- Lab-View (Intermediate)
- C (Basic)
- Quantum Lattice by Jose Lado (Basic)
- DFT using Quantum Espresso (Basic)

Publications , Workshops & Conferences

Publications

- Oxidation Dynamics and Structural Evolution of $ZrTe_2$: A Pathway to Enhanced Oxygen Sensor Applications. (Submitted to ACS)
- Understanding the Effects of Selenium Substitution on $ZrTe_2$. (Under Preparation)

Camp & Workshops

NIUS Physics 18. 1 Camp *HBCSE (TIFR), Mumbai*

2021

- Completed an online exposure and enrichment camp
- Participated in short courses led by scientists and educators in Physics and Astronomy, covering core and advanced topics.
- Engaged in enrichment activities and project-based sessions.

Conferences

Asia-Pacific Conference on Condensed Matter Physics *India*

Poster Presentation *2024*

- Understanding of Se Substitution Effects on the Electronic Structure of $ZrTe_2$.
- Exploring the Impact of Oxidation on the Properties of $ZrTe_2$

International Diabetes Summit 2023 *India*

I gave Oral presentation *2023*

- Mathematical Model For optical biosensor for non-invasive blood glucose tracking that uses the visible-near-infrared spectrum

Language & Extracurricular Activities

Language

- Hindi (Fluent)
- English (Intermediate)
- French(débutante)

Extracurricular Activities

- Photography (Nature)
- National Level 10m Air rifle Player (Shooter)
- **Hindi Club Co-Ordinator** (Organising Event, Promoting Hindi Club, Collaboration with Other Clubs)
- **AIC Seed StEP fellow** This was an entrepreneurship competition that was organized by Atal Incubation Mission(AIM). It is a program launched by the Government Of India to promote and entrepreneurship and innovation in students. I receive the monthly fellowship
- **Astha Nistha Foundation Volunteer (non-profitable NGO)**Aastha Nishtha Foundation is a five years old organization, founded in the year 2015, helping street children for their development. Our mission is to encourage practices of Quality Education and Good Health by transferring knowledge to these children.

Reference

- **Dr. Aparna Deshpande (Supervisor)**
  Assistant Professor,
  Department of Physics, Indian Institute of Science Education and Research, Pune
  aparna.d@iiserpune.ac.in
- **Dr. Harnagea Luminita (Collaborator)**
  WOS-A DST Scientist, Department of Physics, Indian Institute of Science Education and Research, Pune.
  Guest Researcher (Leibniz Institute for Solid State and Materials Research: Dresden, DE)
  luminita@iiserpune.ac.in
- **Dr. Shouvik Datta (Expert)**
  Associate Professor
  Department of Physics, Indian Institute of Science Education and Research, Pune
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