

## EDUCATION

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- **Freie Universität Berlin** Berlin, Germany  
*Incoming PhD candidate*  
Funded by the [Marie Skłodowska-Curie Actions](#) Doctoral Network, [Track the Twin](#).  
Guide: [Prof. Cecilia Clementi](#) Sept 2025-ongoing
- **Indian Institute Of Science Education and Research Mohali** Punjab, India  
*Bachelors and Masters in Physics done together in 5 years*  
GPA: [8.9](#)/10 2020-2025

## PUBLICATIONS

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### Mass-Zero constrained molecular dynamics for electrostatic interactions | Submitted, JCP (May 2025)

The Master's thesis work done under the guidance of Prof. Sara Bonella has been submitted to JCP, with me as the third author. [arXiv](#)

### Turbulence inference from Synthetic Observations | Submitted, MNRAS (May 2025)

The Summer Internship work done under the guidance of Prof. Christoph Federrath has the potential to be published. We have submitted the manuscript to MNRAS with me as the first author.

### Can Close-In Exoplanets form by Pebble Accretion?

Jayashree Narayan, Joanna Drażkowska, Vignesh Vaikundaraman, Monthly Notices of the Royal Astronomical Society, Volume 540, Issue 1, June 2025, Pages 165174, [url](#)

## EXPERIENCE

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### Computing Electrostatic Forces in MD | Master's Thesis Project

Lausanne, Switzerland

*École polytechnique fédérale de Lausanne | NCCR-MARVEL Inspire Scholarship*

Aug 24 - Apr 25

- Guide: [Prof. Sara Bonella](#)
- Working with Prof. Sara and her team to optimize (using MPI and OpenMP) a recently developed constrained extended Lagrangian approach for computing electrostatic forces.
- I worked toward performing several tests on the code and also optimizing it in order to convert it into a library for public use.
- We have obtained a 97% speedup of the code through this optimization.
- This project is developing into a paper in which I am a third author.

### Turbulence Inference from Synthetic Observations

Canberra, Australia

*The Australian National University | FRT Scholarship*

May 24-Aug 24

- Guide: [Prof. Christoph Federrath](#)
- In his [paper](#) about measuring turbulence, his team performed calculations on turbulent clouds in the optically thin medium. My project is an extension of his work, but in the optically thick medium.
- The results show the expected differences between the optically thick and thin media.
- We have submitted a publication for this project in the MNRAS journal, where I am lead author.

### Planet Formation through Pebble Accretion

Göttingen, Germany

*Max Planck Institute for Solar System Research | DAAD Scholarship*

May 23-Aug 23

- Guide: [Dr Joanna Drażkowska](#)
- Using her [pebble predictor](#), and the analytical fits to numerical simulations from [Ormel & Liu \(2018\)](#) and [Liu & Ormel \(2018\)](#), I studied the influence of disk turbulence, pebble fragmentation and stellar metallicity on planet growth by pebble accretion.
- The results fortify the theory that the likelihood of planet formation (for close-in planets) is high when there is high pebble fragmentation, low disk turbulence, or even a very metallic star.
- The work has been published in MNRAS.

## Metropolis Monte Carlo Algorithm

IISER Mohali

Punjab, India

Jun 22-Jul 22

- Guide: [Prof. Anosh Joseph](#)
- Studied the concepts in different Monte Carlo Simulation techniques, designed and implemented in C++, Python programs.
- Developed a code that performs numerical analysis to verify the results [Multi-matrix Models and Emergent Geometry, David Berenstein et. al.](#) in the strong field regime.

## Condensed Matter Physics

IISER Mohali

Punjab, India

May 22-Jul 22

- Guide: [Prof. Ananth Venkatesan](#)
- Fabricated a laterally excited Galium Arsenide biosensor.
- Theoretically analysed the vibrations in piezoelectric materials to calculate the approximate frequency for harvesting electricity and further established the theoretical results

## Quantum Physics

Penn State University, Remote

Chennai, Tamil Nadu

Aug 21-Dec 21

- Guide: [Prof. Venkatraman Gopalan](#)
- Used concepts in Quantum Mechanics to find the approximate size range of particles that can be better understood using Quantum level principles
- Computationally analyzed the sizes of sub-atomic particles that are better characterized using Quantum mechanics treatment.

## Cosmology

IISER Mohali

Punjab, India

May 21-Aug 21

- Guide: [Prof. Jasjeet Singh Bagla](#)
- Studied the behaviour of light around a black hole
- Used classical Mechanics and GR to calculate the trajectory taken by light as it nears a black hole
- Analysed the trajectories obtained between the two approaches

## CONFERENCES ATTENDED

- **CECAM 55** Sept 2024  
*During my thesis at EPFL with CECAM, I had the opportunity to attend the [55th birthday of CECAM](#) from Sept. 2nd to Sept 4th, 2024. [Certificate link](#)*

## AWARDS AND CERTIFICATES

- **MSCA Doctoral Fellowship Awardee** 2025 - 2028  
*My Doctoral degree is funded by the [Marie Skłodowska-Curie Actions](#) Doctoral Network [Track the Twin](#).*
- **MARVEL Scholar** 2024 - 2025  
*I was a recipient of the [INSPIRE Potentials MARVEL Master's Fellowships](#). It is a 6-month fellowship for a Master's thesis project for women in the field of nanomaterial science at EPFL. It is granted to 8 women per year*
- **FRT Scholar** 2024  
*I was a recipient of the [FRT scholarship](#) for the summer of 2024.*
- **DAAD Scholar** 2023  
*I was a recipient of the DAAD-WISE scholarship for the summer of 2023.*
- **From Quantum Matter to Quantum Computers: Masters School** 2022  
*I was selected for a 4 day virtual masters school organized by the Max Planck Institute for the Physics of Complex Systems between October 4th 2022 and October 6th 2022*
- **Mimamsa, Zonal Topper Award** 2021  
*My Team won the Zonal Topper award for the states of Punjab and Haryana in the Mimamsa online written test encompassing questions from biology, physics, maths and chemistry.*
- **TOEFL Score**  
*I took the TOEFL iBT test on May 4th, 2024.*  
Score: [112](#)/120 2024

## EXTRACURRICULAR ACTIVITIES

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- **Chegg Expert** 2023  
*I work part-time as a Chegg expert in Advanced Physics. [Chegg](#). Through this I am able to hone my problem solving skills whilst understanding how an MNC operates.*
- **Chief Editor of Manthan IISER Mohali** 2023  
*As Chief editor, I managed a team of over 65 members at [Manthan magazine](#). So far, we have published 2 magazine editions and 3 newspaper editions.*
- **Website Developer, DAE-HEP 2022** 2022  
*A partner and I developed the website from scratch for the [DAE-HEP Symposium 2022](#).*
- **Active Member - Turing IISER Mohali** 2022  
*As an active member, I helped organize events like [Code Golf](#) (a coding competition), developed a [video game](#), and I also managed the club's Twitter account.*
- **Convener - WiPMA IISER Mohali** 2022-Current  
*As a convener, I was part of the group that organized talks and interactive sessions between female students interested in Physics, Mathematics and Astronomy.*
- **Managing Editor of Inventa Science Magazine** 2022  
*As the Managing Editor of Inventa Science Magazine for IISER Mohali, I hire and run an editorial team from IISER Mohali. I am also part of the operational committee of Inventa. Through this role, I manage and run the entire magazine.*
- **Volunteer Work** 2016  
*During high school, I volunteered to teach underprivileged middle school children. I was able to teach them subjects like Mathematics and English.*

## COMPUTATIONAL SKILLS

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- Skills: Bash scripting, MPI parallelization, OpenMP parallelization, starmaps parallelization, code optimization, Monte Carlo Algorithm, extensive HPC usage
- Languages: Python, C, C++, HTML, CSS, Julia

## REFERENCES

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### Dr Joanna Drażkowska

Planetary Science Department,  
Max Planck Institute for Solar System Research,  
Göttingen, Germany.

✉ [email](#)

### Prof. Jasjeet Singh Bagla

Department of Physical Sciences, IISER Mohali

✉ [email](#)

### Prof. Anosh Joseph

School of Physics  
University of the Witwatersrand Johannesburg,  
South Africa

✉ [email](#)

### Prof. Venkatraman Gopalan

Physics, and Engineering Science and Mechanics  
Pennsylvania State University

✉ [email](#)

### Prof. Christoph Federrath

Research School of Astronomy and Astrophysics,  
The Australian National University

✉ [email](#)

### Dr. Sara Bonella

The Centre Européen de Calcul  
Atomique et Moléculaire  
(CECAM, EPFL)

✉ [email](#)