Shwetha Prakash

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Research Interests

Cosmology; CMB and mm-wave instrumentation; mKID detector simulations; radio interferometry; astronomical data analysis; numerical astrophysics.

Education

Cornell University — *Ithaca, NY*
Ph.D Physics (Year 2) — *2024–Present*

Ashoka University — *Sonipat, India*
Postgraduate Diploma (Advanced Major: Physics, Minor: Astronomy), GPA: 3.73/4.0 — *2024*
B.Sc.(Honors) Physics, GPA: 3.53/4.0 — *2023*

Current Research

Advisors: Dr. Abigail Crites, Dr. Michael Niemack

TIME (Tomographic Ionized Carbon Mapping Experiment)

- Optimizing the pipeline that performs calibration, reduction, and analysis of data collected by TIME.
- Instrumentation of the cryo system, TES detectors and on site commissioning runs at Kitt Peak.

CCAT - PrimeCAM

- Developing software tools for data acquisition from mKID detectors on PrimeCAM.
- Exploring characterisation and data analysis of large mKID arrays.

Technical Skills

Programming: Python (NumPy, SciPy, Matplotlib, AstroPy, GWpy), LaTeX
Data Analysis: sotodlib (Simons Observatory), CASA, IRAF, HEASoft, DS9, Siril, friendlyVRI
Scientific Computing: PLUTO MHD code, General Particle Tracer (GPT), Jupyter, Docker
Version Control: Git, GitHub
Instrumentation: GSO StarTracker, Celestron NexStar 7SE telescope, STC-7 CMOS camera
Operating Systems: Linux, macOS, Windows

Teaching Experience

Cornell University

- PHYS 2207: Fundamentals of Physics I - Teaching Assistant — *Fall 2024, Fall 2025*
- PHYS 2208: Fundamentals of Physics II - Teaching Assistant — *Spring 2024*

Ashoka University

- Observing the Cosmos (Astronomy Lab) - Teaching Assistant — *Spring 2023*
- Classical Mechanics and Electromagnetism Lab - Teaching Assistant — *Fall 2023*

Past Research Experience

Senior Thesis - Ashoka University *Aug 2023–May 2024*
Mentors: Dr. Bikram Phookun, Dr. Nissim Kanekar

- Performed radio interferometric analysis of Damped Lyman-Alpha systems using VLA HI emission data.
- Developed CASA-based workflows for calibration and imaging.

CLASSE REU - Cornell University *Jun 2023–Aug 2023*
Mentor: Dr. Jared Maxson

- Simulated and built a vacuum-compatible solenoid for electron-beam focusing in UED experiments.
- Conducted COMSOL and GPT simulations for beam transport optimization.
- Featured in Cornell media: Project Summary, REU Interview.

Advanced Independent Lab (Soft Matter Physics) *Jan 2023–May 2023*
Mentor: Dr. Pramoda Kumar

- Fabricated a liquid crystal cell and studied its birefringence experimentally.

Selected Projects

Monte Carlo Simulations of Lennard-Jones Systems *Aug 2022–Dec 2022*

- Implemented Monte Carlo algorithms in Python to explore thermodynamics of lattice systems.

Earth's Mass and J_2 Perturbation via Orbital Simulation *Jun 2022–Aug 2022*

- Modeled satellite precession using RK4 methods and AstroSAT data to estimate Earth's J_2.

Solar Temperature from Spectral Analysis *Nov 2021–May 2022*

- Designed a spectrometer and analyzed solar spectra using Wien's displacement law.

Modeling Chladni Figures via Finite Difference Methods *Jan 2022–May 2022*

- Simulated 2D wave equations in Python to reproduce vibrational modes of plates.

Leadership and Service

Vice President - Physics Graduate Society, Cornell University *2025–Present*

- Coordinating academic, social, and mentorship events for the Cornell physics graduate community.

Founding President - Astronomy Society, Ashoka University *2023–Present*

- Organized India's first Undergraduate Radio Astronomy Conference.
- Led workshops on optical data reduction and telescope operation.

Core Team - Ashoka University Women in STEM (AUWS) *2023–Present*

- Advocated for integrating women's STEM engagement into the LGP curriculum.

Head - Astronomy Club, Ashoka University *2022–2023*

- Organized a three-day astronomy fest and hands-on instrumentation sessions.

Founder and Head of Design - Samatvam India *2020–Present*

- Co-founded an NGO promoting gender and social equality through science outreach.