Prashant PATHAK

RESEARCH INTEREST

- Astronomical instrumentation
- High-contrast imaging of Exoplanets
- Adaptive Optics

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EDUCATION

PhD, Astronomy (Instrumentation) — September 2017
The Graduate University for Advance Studies [SOKENDAI], Japan

Integrated Bachelor & Master of Science (BS-MS) — April-2013
Indian Institute of Science Education and Research -Thiruvananthapuram, India

RESEARCH EXPERIENCE

OCT 2014-SEPT 2017

PhD Research: On-sky closed-loop correction of atmospheric dispersion for high-contrast coronagraphy and astrometry
Supervisor: **Prof. Olivier Guyon**
ABSTRACT: *For direct detection of habitable exoplanets, located at a small angular separation from the host star, it is crucial to employ small inner working angle (IWA) coronagraphs that efficiently suppress starlight. For ground-based telescopes, atmospheric refraction is also an important factor, since it results in a smearing of the PSF, that can no longer be efficiently suppressed by the coronagraph. For a high-contrast instrument like SCExAO system, which employs very small IWA coronagraphs, refraction-induced smearing of the PSF has to be less than 1 mas in the science band for optimum performance. By using an adaptive speckle grid generated using a deformable mirror with sufficiently large number of actuators, I was able to accurately measure the residual atmospheric dispersion and subsequently correct it in a closed-loop manner to < 1 mas in the H-band.* *[Link to PhD thesis]*

AUG 2012-APR 2013

Masters Thesis: Optoelectronic studies of ZnO nanostructures
Supervisor: **Prof. Joy Mitra**
ABSTRACT: *Major part of the project involved designing and building a custom-made room temperature optoelectronic characterization setup, capable of performing optical as well as electrical characterization, and in combination such as Photoluminescence (PL), Electroluminescence. It was crucial to choose the design and optics carefully, as luminescence from the studied material was low for the detection. Building the setup involved assembling, optically matched spectrometer, detector, lasers, optical components. Subsequently, the setup was optimized such that its excitation/detection performance was at par with any commercial instrument, and standardized using common fluorescent dyes.*
[Link to Masters thesis]

MAY-JUL 2011

Summer Project at Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India
Supervisor: **Prof. A.N. Ramaprakash**
Title: Development of Near Infrared Picnic Imager (NIPI)
ABSTRACT: *The project involved the development of the Near Infra detector to be used at the IUCAA Girawali observatory, which included writing code for acquiring the image through the detector, and optical alignment of the optics, the electronics for image acquisition being already developed. My project was writing code to read the buffer data from each pixel, convert the analog signal to digital values, and arrange the assimilated data to form the image. After successful development of the software, I focused my attention on the optical alignment of the detector. It was intriguing to work on such a project as everything was developed in the lab except the detector chip. This gave me an experience on making things from scratch in a research environment.*

MAY-JUL 2010 | **Summer Project** at Saha Institute of Nuclear Physics (SINP), Kolkata, India
Supervisor: **Prof. P.M.G. Nambissan**
Title: Gamma-Gamma Coincidence Spectroscopy Using HPGe (High Pure Germanium) Detectors
ABSTRACT: *The main purpose of the project was to familiarize with the performance of two newly procured HPGe detectors in detecting and measuring the characteristics of gamma radiation emitted from radioactive sources. Particularly, the use of such a device for accurate measurements of the energies of gamma rays emitted in a number of nuclear de-excitations and particle-antiparticle annihilation was explored.*

MAY-JUL 2009 | **Summer Project** at Jawaharlal Nehru Centre for Advanced Scientific Research (JNCARS), Bangalore, India
Supervisor: **Prof. Swapan K Pati**
Title: Computational Quantum Magnetism and Related Phenomena
ABSTRACT: *The project involved the computational study of density states of 1-D, 2-D and 3-D nanostructures.*

WORK EXPERIENCE

April-Sept 2014 | ***Instrument Developer***
Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India
The project involves development of new type of Photo-Polarimeter for high observing efficiency and automated operation as the prime goal, which performs better than its existing counterparts. I was responsible for the theoretical calculations, optical design and performance analysis.

May-Nov 2013 | ***Project Assistant***
Indian Institute of Science Education and Research -Thiruvananthapuram, India
The project involved understanding the origin of color pattern in butterfly wings and trying to mimic it using nano lithography.

SOFTWARE/PROGRAMMING SKILLS

Languages	Developed extensively in Python, MATLAB and Bash, and intermediate knowledge of Mathematica, C, C++, HTML, CSS
Packages	AutoCAD, Origin, IRAF, LabView and Circuit Design, Latex

OBSERVING EXPERIENCE

31 Engineering and Science nights with Subaru adaptive optics AO188, SCExAO and high contrast instrument for next generation adaptive optics (HICIAO).

SUMMER SCHOOLS ATTENDED

- 17^{th} Annual International Summer School on Adaptive Optics — Aug-2017
  Center for Adaptive Optics, University of California, Santa Cruz, USA
- Summer School on Introduction to Astronomical Instrumentation — Aug-2016
  Dunlap Institute for Astronomy, University of Toronto, Canada
- NExSS Arizona Winter School on Consequences of Internal Planet Evolution for the Habitability and Detectability of Life on Extrasolar Planets. — Feb-2016
  Arizona State University, USA
- Winter school on Ultracold Atoms for fundamental science and enabling technologies — Dec-2012
  IISER-Pune, India and *University of Nottinghum*, UK
- IndIGO school on Gravitational Waves — Dec-2010
  University of Delhi, *Inter University Centre for Astronomy and Astrophysics (IUCAA)*, and *Tata Institute of Fundamental Research (TIFR)*, India

- Summer school on Astrophysics May-2010
  Indian Institute of Astrophysics (IIA) Bangalore, India
- Winter school on Radio Astronomy Dec-2009
  National Centre for Radio Astronomy (NCRA) Pune, India

Awards and Fellowship

INSPIRE (Innovation in Science Pursuit for Inspired Research) fellow from DST (Department of Science and Technology) India. (http://www.inspire-dst.gov.in)

Presentations

Invited Talk	Closed-loop correction of residual atmospheric dispersion in high-contrast imaging systems. *Institute for Astronomy (IFA), Hilo, Hawaii, USA.* Oct-2016
Poster	Closed-loop atmospheric dispersion compensation: on-sky demonstration of sub-milliarcsecond residual dispersion across H-band. *AO4ELT5, Tenerife, Spain* Jun-2017
	First on-sky closed loop measurement and correction of atmospheric dispersion. *SPIE Astronomical Telescopes & Instrumentation, Edinburgh, UK.* Jun-2016

Astronomy Outreach

Journey through the Universe educator, a public education program held annually by GEMINI Observatory in Hilo, Hawaii.

Extracurricular activities and Hobbies

I have participated in organizing various cultural and technical events at my institute and was the leading member of the Photography and the Astronomy club. I have an inherent fascination towards nature and have been part of various bird watching clubs and have gone to several field trips.

References

Prof. Hideki Takami
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Assoc. Prof. Olivier Guyon
Subaru Telescope, NAOJ, Hawaii/
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Dr. Nemanja Jovanovic
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