Shubham Kanodia

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EDUCATION

Pennsylvania State University **Pennsylvania, USA**
Doctor of Philosophy (Ph.D.) Astrophysics May 2019 - May 2022
Developing new tools and techniques to probe the M dwarf planet population

Pennsylvania State University **Pennsylvania, USA**
Master of Science (M.Sc.) Astrophysics Sept 2017 - May 2019
Combining the Next Generation of Exoplanet Instrumentation & Astrostatistics

Brown University **Rhode Island, USA**
Master of Science (Sc.M.) Physics Sept 2015 - Dec 2016
Optical Design of the Exoplanet Climate Infrared Telescope Spectrometer

St. Xavier's College **Mumbai, India**
Bachelor of Science (B.Sc.) Physics June 2012 - Apr 2015

AWARDS

- Downsbrough Graduate Fellowship in Astrophysics, Penn State, 2021
- Zaccheus Daniel Fellowship, Penn State, 2018, 2020, 2021
- Homer F. Braddock / Nellie H. and Oscar L. Roberts Fellowship, Penn State, 2017
- J.N. Tata Endowment Fund for Higher Education, Mumbai, 2015
- INSPIRE Scholarship - Government of India, Mumbai, 2013

TELESCOPE TIME ALLOCATION

- HET 10 m HPF: $>$ 30 nights
- ARC 3.5 m: $>$ 25 half nights
- WIYN 3.5 m NEID: $>$ 10 nights
- Davey 0.4 m: $>$ 5 nights

SOFTWARE

- `barycorrpy` - Python package for barycentric corrections at the cm/s level for precise radial velocity measurements. Used for HPF, NEID, SPIROU, EXPRES, CARMENES (Kanodia and Wright, 2018; Wright and Kanodia, 2020).
- `MRExo` - Nonparametric tool used to fit mass-radius relationships using beta density functions. It is currently being expanded to simultaneously fit 5 dimensions to model additional planetary parameters (Kanodia et al. 2019).

PROFESSIONAL TALKS

- Carnegie EPL Astronomy Seminar, October 2021
- PSU Center for Exoplanets and Habitable Worlds Seminar, September 2021

- NASA Goddard Extrasolar Planets Seminar, September 2021
- Order of the Octopus, July 2021
- PSETI Seminar, October 2020
- NASA Technosignatures Workshop, USRA, September 2018
- Emerging Researchers in Exoplanet Science Symposium, June 2018

POSTER PRESENTATIONS

- Emerging Researchers in Exoplanet Science, May 2021
- STScI Symposium, April 2021
- Cool Stars 20.5, March 2021
- SPIE Astronomical Telescopes and Instrumentation 2020, December 2020
- Extreme Precision Radial Velocity IV, March 2019
- SPIE Astronomical Telescopes and Instrumentation 2018, June 2018

Outreach

- **Public Talks** -
  - Astronomy on Tap: State College, USA, *Digging through the Cosmic Haystack*, 2019
  - Nerd Nite: Webster's Cafe, State College, USA, *Searching for other worlds, other life*, 2019
  - Nehru Planetarium, Mumbai, India, *Finding Earth 2.0*, 2018
- **Volunteering** -
  - Volunteered for Astrofest - Penn State Department of Astronomy Annual outreach event (2017, 2018, 2019)
  - Volunteered with Brown Cubesat Educational Outreach Saturday STEM program at West Broadway Middle School to communicate Science and Physics to students. (2015 - 2016)
  - Volunteered at Umang Foundation, Mumbai - teaching underprivileged children basic Mathematics and English. (2012 - 2014)

ACADEMIC SERVICE

Referee
International Journal of Astrobiology

Science Organizing Committee
Emerging Researchers in Exoplanet Sciences IV June 2018

CO-CURRICULAR RESEARCH PROJECTS

HPF and NEID spectrograph design and instrument assembly **Pennsylvania, USA**
Pennsylvania State University Jan 2017 - Aug 2019
The Habitable Planet Finder (HPF) and NEID are high precision spectrographs for Radial Velocity measurements of exoplanets in NIR and optical respectively. My work involves optical design, simulation and analysis, along with assistance in the assembly and testing of the instrument.(Prof. Suvrath Mahadevan)

Optical design for exoplanet telescope (EXCITE) in Zemax **Rhode Island, USA**

Brown University April 2016 - Dec 2016

Master's Thesis - Optical Design and Simulation for EXoplanet Climate Infrared Telescope (EXCITE). Zemax designing includes non-sequential ray tracing to optimize positions, specifications and design of the various optical components of the setup. (Prof. Gregory Tucker)

Muon detection and rate measurement **Mumbai, India**

St. Xavier's College Jan 2015

(Undergraduate Semester Project) Performed using a plastic scintillator coupled to photomultiplier tubes, discriminator and then counted using coincidence logic. (Prof. Kajari Mazumdar and Mrs. Mandakini Patil, TIFR, India)

Optical Simulation of Quantum logic **Mumbai, India**

St. Xavier's College Sept 2014

(Undergraduate Semester Project) Polarizing photons using a sugar solution in order to simulate qubits and their superposition. (Prof. J.B. Mistry)

Diffuse UV background radiation **Bangalore, India**

Indian Institute of Astrophysics (IIA) Apr 2014 - May 2014

Worked on Galex spacecraft data to analyze diffuse background UV radiation scattering due to interstellar dust, particularly at high northern galactic latitudes. (Prof. Jayant Murthy)

FPGA programming **Mumbai, India**

Tata Institute of Fundamental Research (TIFR) Oct 2013 - Nov 2013

Worked on FPGA programming in a Altera FPGA board using VHDL for basic digital logic functions for use in detectors in High Energy Particle Physics. (Prof. Kajari Mazumdar and Mandakini Patil)

Alpha tagged Calibration for CZT-I in ASTROSAT **Mumbai, India**

Tata Institute of Fundamental Research (TIFR) May 2013 - June 2013

Analyzing timing parameters for efficient calibration of CZT-I hard X-ray detector using Alpha particle source for the space telescope ASTROSAT. (Prof. A.R.Rao)

Starting the Physics Circle **Mumbai, India**

St. Xavier's College Nov 2012 - Dec 2014

The Physics Circle was started as a forum for students to discuss concepts and new ideas. Students gave presentations, apart from which there were public lectures by distinguished speakers.

TEACHING

Teaching probabilistic programming **State College, USA**

Pennsylvania State University July 2021 - Aug 2021

Spread across 5 weeks, I developed and taught an informal course on probabilistic programming, and statistical inference using the Hamiltonian Monte Carlo Python code - `PyMC3` and package `exoplanet`.

Teaching Assistant for Astronomy lab **Providence, USA**

Brown University Jan 2016 - Apr 2016

Lab assistant for basic astronomy labs, eg. measuring blue shift of Andromeda, CCD imaging etc. (Prof. Ian Dell'Antonio)

MENTORING

- Helen Baran (2019 – 2020) - Now a graduate student at Paris Observatory
- Marissa Maney (2019 – 2021) - Now a graduate student at Harvard University
- Brody McElwain (2020 –) - Undergraduate/Master's student in Engineering Science at Pennsylvania State University

FIRST AUTHOR PUBLICATIONS

REFEREED

- **Shubham Kanodia**, L. Ramsey, M. Maney, and others, *High resolution near-infrared spectroscopy of a flare around the ultracool dwarf - vB 10*, ApJ, Submitted, (2021).
- **Shubham Kanodia**, G. Stefansson, C. Canas, and others, *TOI-532b: The Habitable-zone Planet Finder confirms a Large Super Neptune in the Neptune Desert orbiting a metal-rich M dwarf host*, AJ, 162, 135, (2021). [ADS].
- **Shubham Kanodia**, S. Halverson, J. Ninan, and others, *A Harsh Test of Far-field Scrambling with the Habitable-zone Planet Finder and the Hobby-Eberly Telescope*, ApJ, 912, 1, 11, (2021). [ADS].
- **Shubham Kanodia**, C. Canas, G. Stefansson, and others, *TOI-1728b: The Habitable-zone Planet Finder confirms a warm super Neptune orbiting an M dwarf host*, ApJ, 899, 1, 29, (2020). [ADS].
- **Shubham Kanodia**, A. Wolfgang, G. Stefansson, Bo Ning, S. Mahadevan, *Mass-Radius relationship for M dwarf exoplanets: Comparing nonparametric and parametric methods*, ApJ, 882, 1, 38, (2019). [ADS].

UN-REFEREED

- **Shubham Kanodia**, J. Ninan, A. Monson, Suvrath Mahadevan, and others, *Ghosts of NEID's Past*, SPIE, 11447, 1144740 (2020). [ADS].
- **Shubham Kanodia**, S. Mahadevan, L. W. Ramsey, and others, *Overview of the spectrometer optical fiber feed for the Habitable-zone Planet Finder*, SPIE, 10702, 107026Q (2018). [ADS].
- **Shubham Kanodia**, and J. Wright, *Python Leap Second Management and Implementation of Precise Barycentric Correction (barycorrpy)*, Research Notes of the AAS, 2, 1 (2018). [ADS].

CO-AUTHOR PUBLICATIONS

CO-AUTHOR

REFEREED

- V. Krishnamurthy, et al., *Nondetection of Helium in the Upper Atmospheres of TRAPPIST-1b, e, and f*, ApJ, 162, 82 (2021). [ADS].
- S. Vissapragada, et al., *A Search for Planetary Metastable Helium Absorption in the V1298 Tau System*, ApJ - Accepted (2021). [ADS].
- J. Lubin, et al., *Stellar Activity Manifesting at a One Year Alias Explains Barnard b as a False Positive*, ApJ, 162, 61 (2021). [ADS].
- S. Mahadevan, et al., *The Habitable-zone Planet Finder Detects a Terrestrial-mass Planet Candidate Closely Orbiting Gliese 1151: The Likely Source of Coherent Low-frequency Radio Emission from an Inactive Star*, ApJ Letters, 919, L9, (2021). [ADS].

- J. Wright, and **Shubham Kanodia**, *Barycentric Corrections for Precise Radial Velocity Measurements of Sunlight*, The Planetary Science Journal, 1, 2, 38, (2020). [ADS].
- C. Cañas, G. Stefansson, **Shubham Kanodia**, *A warm Jupiter transiting an M dwarf: A TESS single transit event confirmed with the Habitable-zone Planet Finder*, AJ, 160, 3, 147, (2020). [ADS].
- A. Gupta, et al., *Target Prioritization and Observing Strategies for the NEID Earth Twin Survey*, AJ, 161, 30, (2021). [ADS].
- G Stefansson, et al., *A Mini-Neptune and a Venus-Zone Planet in the Radius Valley Orbiting the Nearby M2-dwarf TOI-1266: Validation with the Habitable-zone Planet Finder*, AJ, 160, 6, 259, (2020). [ADS].
- G. Stefansson, et al., *The Habitable-zone Planet Finder Reveals A High Mass and a Low Obliquity for the Young Neptune K2-25b*, AJ, 160, 4, 192, (2020). [ADS].
- P. Robertson, et al., *Persistent starspot signals on M dwarfs: multi-wavelength Doppler observations with the Habitable-zone Planet Finder and Keck/HIRES*, ApJ, 897, 2, 125, (2020). [ADS].
- J.P. Ninan, et al., *Evidence for He I 10830 Å Absorption during the Transit of a Warm Neptune around the M-dwarf GJ 3470 with the Habitable-zone Planet Finder*, ApJ, 894, 2, 97, (2020). [ADS].
- A. Roy, et al., *Solar Contamination in Extreme-precision Radial-velocity Measurements: Deleterious Effects and Prospects for Mitigation*, AJ, 159, 4, 161, (2020). [ADS].
- G. Stefansson, et al., *A Sub-Neptune-sized Planet Transiting the M2.5 Dwarf G 9-40: Validation with the Habitable-zone Planet Finder*, AJ, 159, 3, 100, (2020). [ADS].
- P. Robertson, et al., *Ultra-Stable Environment Control for the NEID Spectrometer: Design and Performance Demonstration*, Journal of Astronomical Telescopes, Instruments, and Systems, 5, 015003, (2019). [ADS].
- A. Metcalf, et al., *Stellar Spectroscopy in the Near-infrared with a Laser Frequency Comb*, Optica, 6, 2, 233, (2019). [ADS].
- J. Wright, **Shubham Kanodia** and E. Lubar, *How Much SETI Has Been Done? Finding Needles in the n-dimensional Cosmic Haystack*, AJ, 156, 6, 260, (2018). [ADS].
- G. Stefansson, et al., *Toward Space-like Photometric Precision from the Ground with Beam-shaping Diffusers*, ApJ, 848, 1, (2017). [ADS].

UN-REFEREED

- C. Schwab, A. Monson, **Shubham Kanodia**, *The NEID spectrometer: fibre injection system design*, SPIE, 11447, 114474L (2020). [ADS].
- J.P. Ninan, et al., *The Habitable-Zone Planet Finder: improved flux image generation algorithms for H2RG up-the-ramp data*, SPIE, 10709, 107092U (2018). [ADS].
- Edited by Dawn Gelino and Jason Wright; Chapter Leads: Natalie Batalha, Svetlana Berdyugina, Emilio Enriquez, **Shubham Kanodia**, Andrew Siemion, Jason Wright, Shelley Wright, *NASA and the Search for Technosignatures: A Report from the NASA Technosignatures Workshop*, NASA Technosignatures Workshop Participants (2018) [ADS].