Shubham Kanodia

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APPOINTMENTS

Carnegie Institution for Science **Washington, DC, USA**
Carnegie Postdoctoral Fellow, Earth and Planets Laboratory July 2022 - July 2025
From Pixels to Population: Understanding Gas Giants around M dwarfs

Pennsylvania State University **Pennsylvania, USA**
Research Technologist February 2017 - July 2017

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: $>$ 30 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

- DAA Seminar, Tata Institute for Fundamental Research, Mumbai, March 2022
- EPL Astronomy Seminar, Carnegie EPL, October 2021
- PSU Center for Exoplanets and Habitable Worlds Seminar, PSU, September 2021
- NASA Goddard Extrasolar Planets Seminar, NASA Goddard, September 2021
- Order of the Octopus, PSU, July 2021
- PSETI Seminar, PSU, October 2020
- NASA Technosignatures Workshop, USRA, September 2018
- Emerging Researchers in Exoplanet Science Symposium, PSU, 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

RESEARCH PROJECTS

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)

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**
Pennsylvania State University 2021 and 2022
I developed and taught a 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 – 2022) - Undergraduate and Master's thesis. Now a graduate student at University of Arizona

FIRST AUTHOR PUBLICATIONS

Total: 38; First Author (Refereed): 9 (6); Significant Contributions: 11
Total Citations: 497 ; 20th June, 2022. [ADS]

REFEREED

1. **Shubham Kanodia**, J. Libby-Roberts, C. Canas, and others, *TOI-3757 b: A low density gas giant orbiting a solar-metallicity M dwarf*, ApJ submitted (2022) [ADS]
2. **Shubham Kanodia**, L. Ramsey, M. Maney, and others, *High resolution near-infrared spectroscopy of a flare around the ultracool dwarf - vB 10*, ApJ, 925, 2 (2022) [ADS].
3. **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].
4. **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].
5. **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].
6. **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

1. **Shubham Kanodia**, J. Ninan, A. Monson, Suvrath Mahadevan, and others, *Ghosts of NEID's Past*, SPIE, 11447, 1144740 (2020). [ADS].
2. **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].
3. **Shubham Kanodia**, and J. Wright, *Python Leap Second Management and Implementation of Precise Barycentric Correction (barycorrpy)*, RNAAS, 2, 1 (2018). [ADS].

CO-AUTHOR PUBLICATIONS

Significant Contributions

1. C. Cañas, **Shubham Kanodia**, et al., *TOI-3714 b and TOI-3629 b: Two gas giants transiting M dwarfs confirmed with HPF and NEID*, Submitted to AAS journals. [ADS].

2. A.S.J. Lin et al., *Observing the Sun as a star: Design and early results from the NEID solar feed* , AJ, 163, 4, 184, (2022) [ADS].
3. J. Wright, and **Shubham Kanodia**, *Barycentric Corrections for Precise Radial Velocity Measurements of Sunlight*, The Planetary Science Journal, 1, 2, 38, (2020). [ADS].
4. 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].
5. C. Schwab, A. Monson, **Shubham Kanodia**, *The NEID spectrometer: fibre injection system design*, SPIE, 11447, 114474L (2020). [ADS].
6. 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].
7. A. Roy, et al., *Solar Contamination in Extreme-precision Radial-velocity Measurements: Deleterious Effects and Prospects for Mitigation*, AJ, 159, 4, 161, (2020). [ADS].
8. 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].
9. A. Metcalf, et al., *Stellar Spectroscopy in the Near-infrared with a Laser Frequency Comb*, Optica, 6, 2, 233, (2019). [ADS].
10. 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].
11. G. Stefansson, et al., *Toward Space-like Photometric Precision from the Ground with Beam-shaping Diffusers*, ApJ, 848, 1, (2017). [ADS].

Other Publications

1. M. Reefe et al., *A Close-in Puffy Neptune with Hidden Friends: The Enigma of TOI 620*, AJ, 163, 269, (2022) [ADS].
2. J. Dong et al., *NEID Rossiter-McLaughlin Measurement of TOI-1268b: A Young Warm Saturn Aligned with Its Cool Host Star*, ApJL, 926, 2, (2022) [ADS].
3. R. Terrien et al., *Rotational modulation of spectroscopic Zeeman signatures in low-mass stars* , ApJL, 927, 1, (2022) [ADS].
4. G. Stefansson et al., *The Warm Neptune GJ 3470b has a Polar Orbit* , ApJL, 931, 2, 16, (2022). [ADS].
5. A. Ghosh, et al., *Gaia 20eae: A newly discovered episodically accreting young star* , ApJ, 926, 1, 68 (2022) [ADS].
6. C. Canas, et al., *A Hot Mars-sized Exoplanet Transiting an M Dwarf* , AJ, 163, 15, (2022). [ADS].
7. C. Canas, et al., *An eccentric Brown Dwarf Eclipsing an M dwarf* , AJ, 163, 2, 89, (2022). [ADS].

8. V. Krishnamurthy, et al., *Nondetection of Helium in the Upper Atmospheres of TRAPPIST-1b, e, and f*, ApJ, 162, 82 (2021). [ADS].
9. S. Vissapragada, et al., *A Search for Planetary Metastable Helium Absorption in the V1298 Tau System*, ApJ, 162, 5 (2021). [ADS].
10. A. Gupta, et al., *Target Prioritization and Observing Strategies for the NEID Earth Twin Survey*, AJ, 161, 30, (2021). [ADS].
11. J. Lubin, et al., *Stellar Activity Manifesting at a One Year Alias Explains Barnard b as a False Positive*, ApJ, 162, 61 (2021). [ADS].
12. 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].
13. 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].
14. 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].
15. 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].
16. 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].
17. 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].
18. Edited by Dawn Gelino and Jason Wright; Chapter Leads incl.**Shubham Kanodia** *NASA and the Search for Technosignatures: A Report from the NASA Technosignatures Workshop*, NASA Technosignatures Workshop Participants (2018) [ADS].