

Arvind Freedman Gupta

NOIRLab Postdoctoral Fellow
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Education

Ph.D., Astronomy & Astrophysics (dual title Astrobiology), Pennsylvania State University August 2023
Thesis: *Harnessing the Potential of Radial Velocity Exoplanet Surveys* [Advisor: Jason Wright]
M.S., Astronomy & Astrophysics, Pennsylvania State University December 2020
B.Sc., Astronomy-Physics, University of Virginia May 2018

Awards & Honors

NOIRLab Prize Postdoctoral Fellowship 2023 – Present
Zaccheus Daniel Fellowship 2022
Flatiron CCA Remote Pre-Doctoral Fellowship 2021
NSF Graduate Research Fellowship Honorable Mention (×2) 2018 & 2020
Verne A. Willaman Distinguished Graduate Fellowship 2018–2019
Virginia Space Grant Scholarship 2017 – 2018
Barry M. Goldwater Scholarship Honorable Mention 2017
Phi Beta Kappa 2018
Raven Society 2017

Talks & Seminars

Contributed Seminar, University of Arizona, Origins Seminar series Nov 2024
Searching for Snapshots of Giant Exoplanet Migration: case studies of eccentric warm Jupiters
Invited Colloquium, New Mexico State University May 2024
Searching for Snapshots of Giant Exoplanet Migration: case studies of eccentric warm Jupiters
Dissertation Talk, AAS 243 (New Orleans, LA) Jan 2024
Harnessing the Potential of Radial Velocity Exoplanet Surveys
Contributed Talk, EPRV Research Coordination Network Survey Design Meeting Dec 2023
Using Fisher Information to Assess EPRV Survey Performance in the Presence of Correlated Noise
Invited Talk, NOIRLab Flash Talks Sep 2023
Searching for Snapshots of Giant Exoplanet Migration: case studies of eccentric warm Jupiters
Contributed Talk, Emerging Researchers in Exoplanet Science VII (New Haven, CT) Jun 2023
Status of the NEID Earth Twin Survey and Early Science Results
Contributed Talk, EPRV 5 (Santa Barbara, CA) Mar 2023
Status of the NEID Earth Twin Survey and Early Science Results
Invited Seminar, Princeton University Exoplanets Seminar Oct 2022
Harnessing the Potential of Radial Velocity Exoplanet Surveys
Invited Seminar, Caltech Oct 2022
Harnessing the Potential of Radial Velocity Exoplanet Surveys
Contributed Talk, Flatiron CCA Predoctoral Symposium Jun 2022
Fishing for Planets: Analyzing the Fisher Information Content of EPRV Exoplanet Surveys
Contributed Talk, Emerging Researchers in Exoplanet Science VI (State College, PA) Jun 2022
Fishing for Planets: Analyzing the Fisher Information Content of EPRV Exoplanet Surveys
Contributed Talk, Exoplanets IV (Las Vegas, NV) May 2022
Characterization of Single-transit TESS Warm Jupiters with NEID
Invited Seminar, Yale Stars & Exoplanets Seminar Feb 2022
Subgiant Asteroseismology with NEID and TESS
Contributed Talk, Penn State Astronomy Lunch Talks Feb 2020

The NEID Earth Twin Survey: Target Selection and Survey Strategy

Contributed Talk, Emerging Researchers in Exoplanet Science V (Ithaca, NY)

Jun 2019

The NEID Earth Twin Survey: Target Selection and Survey Strategy

Conference Posters

☞ Cool Stars 22 (San Diego, CA)

Jun 2024

A hot Jupiter progenitor on a super-eccentric retrograde orbit

☞ Extreme Solar Systems V (Christchurch, New Zealand)

Mar 2024

A hot Jupiter progenitor on a super-eccentric retrograde orbit

☞ SPIE Astronomical Telescopes & Instrumentation (Montreal, Canada)

Jul 2022

Real-time Exposure Control and Instrument Operation with the NEID Spectrograph GUI

☞ Cool Stars 21 (Toulouse, France)

Jun 2022

Fishing for Planets: Analyzing the Fisher Information Content of EPRV Exoplanet Surveys

☞ TESS Science Conference II (virtual)

Jul 2021

Optimizing Radial Velocity Follow-up Strategies for Single-Transit Exoplanet Candidates

Observing Programs

Transiting Warm Jupiter Follow-up [Total 159 hours; \$47,000 awarded through NN-Explore]

– Measuring the Spin-Orbit Misalignment of the most Eccentric Transiting Exoplanet

2024A

PI: A. F. Gupta; WIYN/NEID: 10 hours

– Cornering an Eccentric Giant

2023B

PI: A. F. Gupta; WIYN/NEID: 3 hours & PI: J. Libby-Roberts; APO-3.5 m/ARCTIC: 5 hours

– Radial Velocity Observations of Long-period TESS Exoplanet Candidates with NEID

2021A – 2023B

PI: A. F. Gupta; WIYN/NEID: 130 hours; WIYN/NESSI: 11 hours

EPRV Stellar Variability Characterization [Total 54 hours]

– Coordinated Multi-Facility Observations of Supergranulation in EPRV Time Series

2024B

PI: A. F. Gupta; WIYN/NEID: 13.6 hours; Gemini-N/MAROON-X: 15.5 hours & PI: J. Luhn; Keck/KPF: 10 hours

– 2 Fingers on the Pulse: Simultaneously Resolving P-mode Oscillations with NEID and TESS

2022A

PI: J. Luhn; WIYN/NEID: 7 hours

– Simultaneous NEID and TESS Observations of p-mode Oscillations in HD 35833

2020B

PI: A. F. Gupta; WIYN/NEID: 8 hours

The NEID Earth Twin Survey [Total ~ 180 nights]

– Guaranteed Time Observations Program

2021A – 2025B

PI: S. Mahadevan, J. Wright; WIYN/NEID: 30 nights / year for 5 years, plus 2-4 institutional nights / semester

Observing Experience

NEID, WIYN-3.5 m, Kitt Peak National Observatory

November 2019 – May 2021

30 nights NEID instrument commissioning

FourStar, Baade Magellan 6.5 m, Las Campanas Observatory

2017 – 2018

7 nights

Teaching and Mentoring

Instructor of Record, Pennsylvania State University

Spring 2022

Astro 5: The Sky & Planets

Guest Lecturer, Pennsylvania State University

Fall 2019

Astro 140: Life in the Universe, Astro 401: Fundamentals of Planetary Science and Astronomy

Instructor, Upward Bound Math & Science (State College, PA)

Summer 2019 & 2020

Astronomy: The Search for Exoplanets and Life Beyond Earth

Academic Tutor, University of Virginia Department of Athletics

2016 – 2017

Calculus, Differential Equations, Introductory calculus-based Physics, Introductory Astronomy

Mentor, Carnegie Astronomy Summer Student Internship (CASSI) Program

2020 – Present

Research Advising

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|---|----------------|
| Evan Fitzmaurice , Graduate Student at Pennsylvania State University EPRV data analysis for the NEID Earth Twin Survey | 2023 – Present |
| James Ball , Undergraduate Student at Arizona State University TESS + NEID warm Jupiter characterization | 2024 – Present |
| Armand Zeibari , Undergraduate Student at Pennsylvania State University Prospects for atmospheric characterization of RV exoplanets | 2022 – 2023 |

Scientific and Professional Service

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| Task Group Lead, Habitable Worlds Observatory START: Target Stars & Systems | 2024 – Present |
| NASA ROSES Review Panelist | 2024 |
| NOIRLab Time Allocation Committee | 2024 – Present |
| Referee, AAS Journals | 2023 – Present |
| Member, EPRV Research Coordination Network | 2022 – Present |
| Science & Local Organizing Committee, Emerging Researchers in Exoplanet Science VII | Aug 2022 |
| American Astronomical Society Congressional Visits Day | Mar 2021 |

Press

Discovery of TIC 241249530 b: [CNN](#), [NOIRLab](#), [Penn State](#), [Simons Foundation](#), [MIT](#), [IAC](#), [Space.com](#), [Cosmos](#), [Popular Science](#), [365 Days of Astronomy Podcast](#)

Discovery of TOI-4127 b: [Space.com](#)

Kitt Peak celebrates 60 years of telescope tourism, [Tucson.com](#)

Outreach

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| Kitt Peak National Observatory Tours Summit and telescope tours for members of the Tohono O'odham Nation and Pascua Yaqui Tribe | 2024 – Present |
| Tucson Dark Sky Advocacy Classroom presentations at local schools, analysis of sky brightness monitoring data | 2024 – Present |
| Organizing Committee , Penn State Astronomy Grad-Undergrad Research Mentoring Program | 2021 – 2023 |
| Co-Organizer & Host , Astronomy on Tap – State College | 2019–2023 |
| Public Science Talks & Presentations , various topics, events, locations | 2019 – Present |

Refereed Publications [6 First Author, 47 Total [↗](#)]

First Author:

1. Gupta, A. F., Luhn, J., Wright, J. T., et al., *The NEID Earth Twin Survey I. Confirmation of a 31-day planet orbiting HD 86728*, accepted for publication in *The Astronomical Journal*, arXiv:2409.12315
2. Gupta, A. F., Millholland, S., Im, H., et al., *A hot Jupiter progenitor on a super-eccentric retrograde orbit*, **2024**, *Nature*, 632, 50
3. Gupta, A. F., & Bedell, M., *Fishing for Planets: A Comparative Analysis of EPRV Survey Performance in the Presence of Correlated Noise*, **2024**, *The Astronomical Journal*, 168, 29
4. Gupta, A. F., Jackson, J. M., Hébrard, G., et al., *A High-Eccentricity Warm Jupiter Orbiting TOI-4127*, **2023**, *The Astronomical Journal*, 165, 234
5. Gupta, A. F., Luhn, J., Wright, J. T., et al., *Detection of p-mode Oscillations in HD 35833 with NEID and TESS*, **2022**, *The Astronomical Journal*, 164, 254
6. Gupta, A. F., Wright, J. T., Robertson, P., et al., *Target Prioritization and Observing Strategies for the NEID Earth Twin*

Survey, 2021, *The Astronomical Journal*, 161, 130

Co-author:

7. Kanodia, S., Gupta, A. F., Cañas, C. I., et al., *Searching for GEMS: Characterizing Six Giant Planets Around Cool Dwarfs* 2024, *The Astronomical Journal*, 168, 235
8. Lam, C., Bedell, M., Zhao, L. L., et al., *Gaspary: Optimized Scheduling of Radial Velocity Follow-up Observations for Active Host Stars* 2024, *The Astronomical Journal*, 168, 200
9. Dong, J., Chontos, A., Zhou, G., et al., *Origins of Super Jupiters: TOI-2145b Has a Moderately Eccentric and Nearly Aligned Orbit* 2024, *arXiv e-prints*, arXiv:2411.01356
10. Hotnisky, A., Kanodia, S., Libby-Roberts, J., et al., *Searching for GEMS: Two Super-Jupiters around M-dwarfs – Signatures of Instability or Accretion?* 2024, *arXiv e-prints*, arXiv:2411.08159
11. Placco, V. M., Gupta, A. F., Almeida-Fernandes, F., et al., *BD+44 493: Chemo-Dynamical Analysis and Constraints on Companion Planetary Masses from WIYN/NEID Spectroscopy* 2024, *arXiv e-prints*, arXiv:2410.08943
12. Reji, V., Kanodia, S., Ninan, J., et al., *Searching for GEMS: TOI-5688 A b, a low-density giant orbiting a high-metallicity early M-dwarf* 2024, *arXiv e-prints*, arXiv:2409.01371
13. Bernabò, L. M., Kanodia, S., Canas, C. I., et al., *Searching for GEMS: TOI-6383Ab, a giant planet transiting an M3-dwarf star in a binary system* 2024, *arXiv e-prints*, arXiv:2409.16889
15. Jones, S. E., Stefánsson, G., Masuda, K., et al., *TOI-2015 b: A Warm Neptune with Transit Timing Variations Orbiting an Active Mid-type M Dwarf* 2024, *The Astronomical Journal*, 168, 93
16. Ford, E. B., Bender, C. F., Blake, C. H., et al., *Earths within Reach: Evaluation of Strategies for Mitigating Solar Variability using 3.5 years of NEID Sun-as-a-Star Observations* 2024, *arXiv e-prints*, arXiv:2408.13318
17. Peluso, D. O., Dalba, P. A., Wright, D., et al., *Confirming the Warm and Dense Sub-Saturn TIC 139270665 b with the Automated Planet Finder and Unistellar Citizen Science Network* 2024, *The Astronomical Journal*, 167, 170
18. Orell-Miquel, J., Carleo, I., Murgas, F., et al., *Revisiting the warm sub-Saturn TOI-1710b. The impact of stellar activity on the mass measurement* 2024, *Astronomy and Astrophysics*, 684, A96
19. Jones, M. I., Reinartz, Y., Brahm, R., et al., *A long-period transiting substellar companion in the super-Jupiters to brown dwarfs mass regime and a prototypical warm-Jupiter detected by TESS* 2024, *Astronomy and Astrophysics*, 683, A192
20. Delamer, M., Kanodia, S., Cañas, C. I., et al., *TOI-4201: An Early M Dwarf Hosting a Massive Transiting Jupiter Stretching Theories of Core Accretion* 2024, *The Astrophysical Journal*, 962, L22
21. Carleo, I., Malavolta, L., Desidera, S., et al., *The GAPS programme at TNG. L. TOI-4515 b: An eccentric warm Jupiter orbiting a 1.2 Gyr-old G-star* 2024, *Astronomy and Astrophysics*, 682, A135
22. Han, T., Robertson, P., Kanodia, S., et al., *TOI-5344 b: A Saturn-like Planet Orbiting a Super-solar Metallicity M0 Dwarf* 2024, *The Astronomical Journal*, 167, 4
23. Lubin, J., Wang, X.-Y., Rice, M., et al., *TOI-1670 c, a 40 day Orbital Period Warm Jupiter in a Compact System, Is Well Aligned* 2023, *The Astrophysical Journal*, 959, L5
24. Mann, C. R., Dalba, P. A., Lafrenière, D., et al., *Giant Outer Transiting Exoplanet Mass (GOT 'EM) Survey. III. Recovery and Confirmation of a Temperate, Mildly Eccentric, Single-transit Jupiter Orbiting TOI-2010* 2023, *The Astronomical Journal*, 166, 239
25. Kanodia, S., Lin, A. S. J., Lubar, E., et al., *Stable Fiber-illumination for Extremely Precise Radial Velocities with NEID* 2023, *The Astronomical Journal*, 166, 105
26. Powers, L. C., Libby-Roberts, J., Lin, A. S. J., et al., *TOI-3785 b: A Low-density Neptune Orbiting an M2-dwarf Star* 2023, *The Astronomical Journal*, 166, 44
27. Cañas, C. I., Kanodia, S., Libby-Roberts, J., et al., *TOI-3984 A b and TOI-5293 A b: Two Temperate Gas Giants Transiting Mid-M Dwarfs in Wide Binary Systems* 2023, *The Astronomical Journal*, 166, 30
28. Libby-Roberts, J. E., Schutte, M., Hebb, L., et al., *An In-depth Look at TOI-3884b: A Super-Neptune Transiting an*

M4Dwarf with Persistent Starspot Crossings 2023, **The Astronomical Journal**, 165, 249

29. Lambert, M., Bender, C. F., Kanodia, S., et al., *TOI-5375 B: A Very Low Mass Star at the Hydrogen-burning Limit Orbiting an Early M-type Star* 2023, **The Astronomical Journal**, 165, 218

30. Luhn, J. K., Ford, E. B., Guo, Z., et al., *Impact of Correlated Noise on the Mass Precision of Earth-analog Planets in Radial Velocity Surveys* 2023, **The Astronomical Journal**, 165, 98

31. Kanodia, S., Mahadevan, S., Libby-Roberts, J., et al., *TOI-5205b: A Short-period Jovian Planet Transiting a Mid-M Dwarf* 2023, **The Astronomical Journal**, 165, 120

32. Frazier, R. C., Stefánsson, G., Mahadevan, S., et al., *NEID Reveals That the Young Warm Neptune TOI-2076 b Has a Low Obliquity* 2023, **The Astrophysical Journal**, 944, L41

33. Ulmer-Moll, S., Lendl, M., Gill, S., et al., *Two long-period transiting exoplanets on eccentric orbits: NGTS-20 b (TOI-5152 b) and TOI-5153 b* 2022, **Astronomy and Astrophysics**, 666, A46

34. Kanodia, S., Libby-Roberts, J., Cañas, C. I., et al., *TOI-3757 b: A Low-density Gas Giant Orbiting a Solar-metallicity M Dwarf* 2022, **The Astronomical Journal**, 164, 81

35. Beard, C., Robertson, P., Kanodia, S., et al., *GJ 3929: High-precision Photometric and Doppler Characterization of an Exo-Venus and Its Hot, Mini-Neptune-mass Companion* 2022, **The Astrophysical Journal**, 936, 55

36. Cañas, C. I., Kanodia, S., Bender, C. F., et al., *TOI-3714 b and TOI-3629 b: Two Gas Giants Transiting M Dwarfs Confirmed with the Habitable-zone Planet Finder and NEID* 2022, **The Astronomical Journal**, 164, 50

37. Reefer, M. A., Luque, R., Gaidos, E., et al., *A Close-in Puffy Neptune with Hidden Friends: The Enigma of TOI 620* 2022, **The Astronomical Journal**, 163, 269

38. Beard, C., Robertson, P., Kanodia, S., et al., *TOI-1696 and TOI-2136: Constraining the Masses of Two Mini-Neptunes with the Habitable-Zone Planet Finder* 2022, **The Astronomical Journal**, 163, 286

39. Lin, A. S. J., Monson, A., Mahadevan, S., et al., *Observing the Sun as a Star: Design and Early Results from the NEID Solar Feed* 2022, **The Astronomical Journal**, 163, 184

40. Guo, Z., Ford, E. B., Stello, D., et al., *Modeling Stellar Oscillations and Granulation in Radial Velocity Time Series: A Fourier-based Method* 2022, **arXiv e-prints**, arXiv:2202.06094

41. Cañas, C. I., Mahadevan, S., Bender, C. F., et al., *An Eccentric Brown Dwarf Eclipsing an M dwarf* 2022, **The Astronomical Journal**, 163, 89

42. Kanodia, S., Stefánsson, G., Cañas, C. I., et al., *TOI-532b: The Habitable-zone Planet Finder confirms a Large Super Neptune in the Neptune Desert orbiting a metal-rich M-dwarf host* 2021, **The Astronomical Journal**, 162, 135

43. Burt, J. A., Dragomir, D., Mollière, P., et al., *TOI-1231 b: A Temperate, Neptune-sized Planet Transiting the Nearby M3 Dwarf NLTT 24399* 2021, **The Astronomical Journal**, 162, 87

44. Stefánsson, G., Kopparapu, R., Lin, A., et al., *A Mini-Neptune and a Radius Valley Planet Orbiting the Nearby M2 Dwarf TOI-1266 in Its Venus Zone: Validation with the Habitable-zone Planet Finder* 2020, **The Astronomical Journal**, 160, 259

45. Cañas, C. I., Stefánsson, G., Kanodia, S., et al., *A Warm Jupiter Transiting an M Dwarf: A TESS Single-transit Event Confirmed with the Habitable-zone Planet Finder* 2020, **The Astronomical Journal**, 160, 147

46. Dalba, P. A., Gupta, A. F., Rodriguez, J. E., et al., *The TESS-Keck Survey. I. A Warm Sub-Saturn-mass Planet and a Caution about Stray Light in TESS Cameras* 2020, **The Astronomical Journal**, 159, 241

47. Roy, A., Halverson, S., Mahadevan, S., et al., *Solar Contamination in Extreme-precision Radial-velocity Measurements: Deleterious Effects and Prospects for Mitigation* 2020, **The Astronomical Journal**, 159, 161