ARPITA ROY

Dept. of Astronomy • California Institute of Technology • 1200 E California Blvd, Pasadena, CA 91125

EDUCATION

The Pennsylvania State University, University Park, PA
- **PhD, Astronomy & Astrophysics** — 2017
  "Connecting the Pale Blue Dots: Detection & Characterization of Exoplanets With Extreme Precision Spectroscopy"

Franklin & Marshall College (F&M), Lancaster, PA — 2009
- BA, Magna Cum Laude
- Astrophysics (honors) + English (Creative Writing)

St. Catherine's College, Oxford University, Oxford, UK — 2008
- Study Abroad, First Class Distinction in Literature

APPOINTMENTS

ROBERT A. MILLIKAN PRIZE POSTDOCTORAL FELLOW — 2017-Present
Department of Astronomy, California Institute of Technology [Mentor: Dr. Andrew Howard]

GRADUATE RESEARCH ASSISTANT — 2011-2017
Dept. of Astronomy & Astrophysics, Penn State University [Advisor: Dr. Suvrath Mahadevan]

POST-BACCALAUREATE RESEARCHER — 2009-2010
Center for Exoplanets & Habitable Worlds, Penn State University [Advisor: Dr. Suvrath Mahadevan]

RESEARCH EXPERIENCE FOR UNDERGRADUATES (REU) — 2008
Harvard-Smithsonian Center for Astrophysics [Advisor: Dr. Elizabeth Humphreys]

LUCILLE & WILLIAM HACKMAN RESEARCH SCHOLAR — 2007-2009
Dept. of Physics & Astronomy, Franklin & Marshall College [Advisor: Dr. Andrea Lommen]

GRANTS & AWARDS

AURA Future Leaders Fellow, Association of Universities for Research in Astronomy	2019
KISS Postdoctoral Affiliate W. M. Keck Institute for Space Studies	2018
Distinguished Doctoral Scholar Medal Penn State	2017
Penn State Alumni Association Dissertation Award Penn State	2017
Rodger Doxsey Dissertation Award AAS	2017
Astronomy & Astrophysics Postdoctoral Fellowship NSF (declined)	2017
Lab Bench to Commercialization Grant Penn State	2016
Zaccheus Daniel Fellowship Penn State	2011, 2014, 2016
Lewis and Clark Field Scholar in Astrobiology NASA & APS	2015
Downsbrough Graduate Fellowship Penn State	2015
Center for Exoplanets & Habitable Worlds Small Grant Penn State	2015
Stephen B. Brumbach Graduate Fellowship in Astrophysics Penn State	2013
SDSS Astronomer Travel Assistance Award SDSS	2013
Sigma Xi Grants-in-Aid of Research Sigma Xi	2013
Michael J. Mumma Senior Prize in Physics & Astronomy F&M	2009
Joseph R. Holzinger Senior Astronomy Award F&M	2009
John Kershner Physics Scholar F&M	2008, 2009
Phi Beta Kappa National Honor Society F&M	2009
William Uhler Hensel Senior Prize F&M	2009
William Uhler Hensel Junior Prize F&M	2008
Sigma Pi Sigma National Honor Society F&M	2007
Black Pyramid Honor Society F&M	2008

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INSTRUMENTATION

- KECK PLANET FINDER Project Scientist
  Next-generation optical spectrograph for the Keck-I telescope aiming at ~30cm/s radial velocity precision. I am responsible for project and instrument level science execution — including requirements flowdown & testing, leading Data Pipeline development, commissioning planning, and final performance demonstration.
- NEID Instrument & Science Team Member
  NASA-NSF extreme precision spectrograph for the WIYN telescope aiming at ~30cm/s precision. I co-led the Data Pipeline, fiber feed design, error budget assembly and management, and am part of the GTO team.
- HABITABLE ZONE PLANET FINDER Instrument & Science Team Member
  Precision near-infrared spectrograph for the Hobby-Eberly telescope searching for planets around red stars at ~1m/s. I am a key architect of the Data Pipeline and fiber feed system, including 2 patented technologies.
- PARAS & PARAS-2 Instrument & Science Team Member
  Stabilized optical spectrographs on 1.2m & new 2.5m Mt Abu telescopes aiming at <1m/s precision on sky. I wrote the data reduction pipeline for PARAS, and will oversee this effort for science verification on PARAS-2.
- SALT HIGH RESOLUTION SPECTROGRAPH Collaborator
  Existing instrument on the 10m South African Large Telescope that never successfully commissioned its high precision mode. I am leading instrument stability & simultaneous calibration RV precision measurement effort.
- PARVI Collaborator
  Diffraction limited infrared spectrograph for the Palomar Observatory aiming at <1m/s precision. I am advising the data analysis team and will be an early science user

TEACHING

Astro 011	Instructor, Introductory Astronomy Lab	2011-2012
Astro 140	Teaching Assistant & Guest Lecturer, Life in the Universe	2012
Astro 130	Teaching Assistant, Black Holes in the Universe	2011
SEECoS	Instructor, Summer program for first-generation high school students	2010
Writing Center	Tutor, academic writing across the curriculum	2006-2007
AST 121,122	Undergraduate Teaching Assistant, Introductory Astronomy	2006-2009
PHY 100-200	Undergraduate Tutor for 100 and 200 level physics classes	2008-2009

ADVISING

Elsa Palumbo	Undergraduate Student, Caltech
Qifan Wang	Schmidt Academy Post-Baccalaureate Fellow, Caltech
Marie Weisfeiler	Undergraduate Student, UC Berkeley (co-advised as part of KPF team)
Yuzo Ishikawa	Graduate Student, San Francisco State University (co-advised as part of KPF team)

ACADEMIC SERVICE

Founder:	Towards A More Inclusive Astronomy [Caltech Chapter]
Co-Chair:	NASA Extreme Precision Radial Velocity Working Group - Data Analysis Subgroup
Referee:	Publications of the Astronomical Society of the Pacific (PASP); Astrophysical Journal (ApJ)
Reviewer:	Future Investigators in NASA Earth and Space Science and Technology (FINESST) Fellowship
Organizer:	Emerging Researchers in Exoplanet Science Symposium; Extremely Precise Radial Velocities III
Member:	American Astronomical Society, SPIE

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INVITED TALKS

Frank N. Bash Symposium: Extreme Precision Exoplanet Hunting Spectrographs	2019
Haverford Distinguished Visitors Program: Witnessing the Exoplanet Revolution	2019
Extreme Precision in Radial Velocity IV: Extremely Precise RV Pipelines Plenary	2019
Extreme Precision in Radial Velocity IV: Breakout Session on Next Generation Pipeline Challenges	2019
Telluric Line Hack Week: Modern Doppler Spectrometers & Stellar Radial Velocities	2019
TESS Data Science Workshop: NEID + TESS	2019
Colloquium at California State University, Northridge: Worlds Without End	2018
Colloquium at University of California, San Diego: The Precision RV Landscape	2018
Precision Radial Velocity Landscape Review: The Challenge of Precision RV Software	2018
Sagan Exoplanet Workshop: Breaking the 1m/s Barrier	2018
High Dispersion Coronagraphy Workshop: Synergies with Radial Velocity	2018
Colloquium at University of California, Santa Cruz: Worlds Without End	2018
JPL Seminar: The Keck Planet Finder	2018
Extremely Precise RV Workshop III: The Deleterious Effects of Spectral Contamination	2017
Extremely Precise RV Workshop III: Breakout Session on The Path to 10cm/s RV Precision	2017
Extremely Precise RV Workshop III: The Keck Planet Finder	2017
American Astronomical Society Meeting: The Smallest Signatures of Other Worlds	2017
Opportunity M: The Habitable Zone Planet Finder Spectrograph	2016
Harvard Center for Astrophysics Stars & Planets Seminar: The Promise of Many Worlds	2016
Caltech-IPAC Science Talk: Building New Gold Standards in Precision Spectroscopy	2016
Carnegie Observatories Lunch Talk: Beyond Radial Velocity	2016

PATENTS

"Optical Scramblers", *Patent 20170045690,* Inventors: Suvrath Mahadevan, **Arpita Roy**, Samuel Halverson (based on technology published in Halverson & Roy et al. 2015)

A Robust Microscope for External Cell Phone Attachment" Inventors: **Arpita Roy**, Suvrath Mahadevan, Samuel Halverson (Developed under Penn State PSU Lab Bench To Commercialization Grant; Provisional Patent, Licensed by Million Concepts LLC)

OUTREACH

Caltech Women's Engagement Board, Member	2018-2019
Caltech Stargazing & Public Lecture Series, Invited Speaker	2018-2019
Caltech Women of Color in STEM Panel, Invited Speaker	2018
Astronomy on Tap , Invited Speaker	2018
Synergy Quantum Academy High School Lecture, Invited Speaker	2018
Penn State AstroFest (annual four-day event), Volunteer	2010-2016
USA Science & Engineering Festival, Washington, DC, Volunteer	2010-2014
Penn State Workshops in Astronomy for Educators, Instructor	2014
F&M Society for Physics Students Subchapter, President	2008-2009

SELECT MEDIA COVERAGE

- **Discovery Channel's "How the Universe Works" – The Secret History of the Moon** [Season 4, E6]
- Times of India "Exoplanet find that put India in select league" [June 2018]
- Discover Magazine's Top 100 Stories of 2014 [Jan 2015]
  - #59 Beneath the Moon's Two Faces
  - #100 Meet the Exoplanet Class of 2014
- **New York Times "The Moon Comes Around Again** [Sept 2014]
- Scientific American "2-Face Moon Tells How It Got That Way" [June 2014]
- **National Geographic "One of the Most Earthlike Planets Ever Found May Not Exist"** [July 2014]
- New York Times "Earthlike Planets May Be Merely An Illusion" [July 2014]

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PUBLICATIONS FIRST AUTHOR

1. *Solar Contamination in Extreme Precision Radial Velocity Measurements: Deleterious Effects, Impacts, and Prospects for Mitigation*
   Roy, A. et al. 2019 (Submitted)
2. *Precision velocimetry planet hunting with PARAS: Current performance and lessons to inform future EPRV*
   Roy, A., Chakraborty, A., Mahadevan, S., et al. 2016, Vol. 9908, SPIE, 6
3. *An Efficient, Compact, and Versatile Fiber Double Scrambler for High Precision Radial Velocity Instruments*
   Halverson, S. & Roy, A.*, Mahadevan, S., Ramsey, L., Levi, E. et al. 2015, ApJ, 806, 61 *(*joint first author)*
4. *Earthshine on a Young Moon: Explaining the Lunar Farside Highlands*
   Roy, A., Wright, J.T., & Sigurðsson, S. 2014, ApJ , 788, L42
5. *Scrambling and modal noise mitigation in the Habitable Zone Planet Finder fiber feed*
   Roy, A., Halverson, S., Mahadevan, S., & Ramsey, L. W. 2014, Vol. 9147, SPIE, 6

PUBLICATIONS ALL COAUTHOR

6. *Detection of He I 10830A absorption during the transit of a warm Neptune around the M-dwarf GJ 3470 with the Habitable-zone Planet Finder*
   Ninan, J. (including **Roy, A.**) et al. 2019, ApJ (Under Review)
7. *A Sub-Neptune Sized Planet Transiting the M2.5-dwarf G 9-40: Validation with the Habitable-zone Planet Finder*
   Stefansson, G. (including **Roy, A.**) et al. 2019, ApJ (Under Review)
8. *Radial Velocity Discovery of an Eccentric Jovian World Orbiting at 18 au*
   Blunt, S. (including **Roy, A.**) et al. 2019, AJ, 158, 181B
9. *Impact of crosshatch patterns in H2RGs on high precision radial velocity measurements*
   Ninan, J. (including **Roy, A.**) et al. 2019, JATIS, 5, 041511
10. *Extreme Precision Radial Velocity Working Group*
    Gaudi, S. (including **Roy, A.**) et al. 2019, Bulletin of the American Astronomical Society, Vol. 51, Issue 7, 232
11. *Searches for Technosignatures: The State of the Profession*
    Wright, J. (including **Roy, A.**) et al. 2019, Bulletin of the American Astronomical Society, Vol. 51, Issue 7, 39
12. *Stellar Spectroscopy in the Near-infrared with a Laser Frequency Comb*
    Metcalf, A. (including **Roy, A.**) et al. 2019, Optica, Vol 6, Issue 2, 233
13. *Ultra-Stable Environment Control for the NEID Spectrometer: Design and Performance Demonstration*
    Robertson, P. (including **Roy, A.**) et al. 2019, JATIS, Vol 5, 015003
14. *Evidence of a Sub-Saturn around EPIC 211945201*
    Chakraborty, A., **Roy, A.**, Sharma, R. et al. 2018, AJ, 156, 3C
15. *Keck Planet Finder: preliminary design*
    Gibson, S., Howard, A., **Roy, A.** et al. 2018, Vol 10709, SPIE, 5XG
16. *An optical fiber double scrambler and mechanical agitator system for the Keck planet finder*
    Sirk, M. (including **Roy, A.**) et al. 2018, Vol 10709, SPIE, 6FS
17. *PARAS-2 precision radial velocimeter: optical and mechanical design of a fiber-fed high resolution spectrograph*
    Chakraborty, A. (including **Roy, A.**) et al. 2018, Vol 10709, SPIE, 6GC
18. *The Habitable-Zone Planet Finder: improved flux image generation algorithms for H2RG data*
    Ninan, J. (including **Roy, A.**) et al. 2018, Vol 10709, SPIE, 2UN
19. *The NEID precision radial velocity spectrometer: port adapter overview, requirements, and test plan*
    Logsdon, S. (including **Roy, A.**) et al. 2018, Vol 10709, SPIE, 67L
20. *The NEID precision radial velocity spectrometer: optical design of the port adapter and ADC*
    Schwab, C. (including **Roy, A.**) et al. 2018, Vol 10709, SPIE, 71S
21. *Overview of the spectrometer optical fiber feed for the habitable-zone planet finder*
    Kanodia, S. (including **Roy, A.**) et al. 2018, Vol 10709, SPIE, 6QK

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22. *Proxima Centauri as a Benchmark for Stellar Activity Indicators in the Near Infrared*
Robertson, P., Bender, C., Mahadevan, S., **Roy, A.** & Ramsey, L. 2016, ApJ, 832, 112R

23. *A Versatile Technique To Enable Sub-milli-kelvin Instrument Stability For Precise Radial Velocity Measurements*
Stefansson, G. (including **Roy, A.**) et al. 2016, ApJ, 833, 175S

24. *Evidence for Reflected Light from the Most Eccentric Exoplanet Known*
Kane, S.R., Wittenmeyer, R.A., Hinkel, N.R., **Roy, A.**, Mahadevan, S., et al. 2016, ApJ, 821, 65

25. *Detection of a Very Low Mass Star in an Eclipsing Binary System*
Chaturvedi, P., Chakraborty, A., Anandarao, B.G., **Roy, A.**, and Mahadevan, S. 2016, MNRAS, 463, 554

26. *Design of NEID, an extreme precision Doppler spectrograph for WIYN*
Schwab, C., Rakich, A., Gong, Q.,Mahadevan, S., Halverson, S., **Roy, A.** et al. 2016, Vol. 9908, SPIE, 6

27. *A comprehensive radial velocity error budget for next generation Doppler spectrometers*
Halverson, S., Terrien, R., Mahadevan, S., **Roy, A.** et al. 2016, Vol. 9908, SPIE, 6

28. *The instrument control software package for the Habitable-Zone Planet Finder spectrometer*
Bender, C. (including **Roy, A.**) et al. 2016, Vol. 9913, SPIE, 11

29. *Ultra-stable temperature and pressure control for the Habitable-zone Planet Finder spectrograph*
Stefansson, G.K. (including **Roy, A.**) et al. 2016, Vol. 9908, SPIE, 6

30. *Stellar Activity Mimics a Habitable-Zone Planet Around Kapteyn's Star*
Robertson, P., **Roy, A.**., & Mahadevan, S., 2015, ApJL, 805, L22

31. *'Modal Noise' in Single-Mode Fibers: A Cautionary Note for High Precision Radial Velocity Instruments*
Halverson, S., **Roy, A.,** Mahadevan, S., & Schwab, C. 2015, ApJL, 814, L22

32. *The APOGEE Spectroscopic Survey of Kepler Planet Hosts: Feasibility, Efficiency, and First Results*
Fleming, S. W., Mahadevan, S., Deshpande, R., Bender, C., Terrien, **Roy, A.**, et al. 2015, AJ, 149, 143

33. *Stellar activity masquerading as planets in the habitable zone of the M dwarf Gliese 581*
Robertson, P., Mahadevan, S., Endl, M., & **Roy, A.** 2014, Science, 345, 440

34. *The PRL Stabilized High-Resolution Fiber-fed Spectrograph: Instrument Description & RV Results*
Chakraborty, A., Mahadevan, S., **Roy, A.**, et al. 2014, PASP, 126, 133

35. *Determination of mass and orbital parameters of a low-mass star HD 213597B*
Chaturvedi, P., Deshpande, R., Dixit, V., **Roy, A.**, et al. 2014, MNRAS, 442, 3737

36. *The habitable-zone planet finder calibration system*
Halverson, S., Mahadevan, S., Ramsey, L., Terrien, R., **Roy, A.**, et al. 2014, Vol. 9147, SPIE, 7

37. *The Habitable-zone Planet Finder: A status update on the development of a spectrograph for the HET*
Mahadevan, S., Ramsey, L. W., Terrien, R., Halverson, S., **Roy, A.**, et al. 2014, Vol. 9147, SPIE, 1

38. *Environmental control system for Habitable-zone Planet Finder*
Hearty, F. (including **Roy, A.**) et al. 2014, Vol. 9147, SPIE, 52

39. *The Tenth Data Release of the Sloan Digital Sky Survey*
Ahn, C. P. (including **Roy, A.**) et al. 2014, ApJS, 211, 17

40. *MARVELS-1: A Face-on Double-lined Binary Star Masquerading as a Resonant Planetary System*
Wright, J. T., **Roy, A.**, Mahadevan, S., et al. 2013, ApJ, 770, 11

41. *MARVELS Brown Dwarf Candidate Reveals Itself to be a Very Long Period, Highly Eccentric Stellar Binary*
Mack, III, C. E. (including **Roy, A.**) et al. 2013, AJ, 145, 139

42. *The SDSS-HET Survey of Kepler Eclipsing Binaries: Spectroscopic Dynamical Masses of the Kepler-16*
Bender, C. F., Mahadevan, S., Deshpande, R., Wright, J. T., **Roy, A.**, et al. 2012, ApJ, 751, L31

43. *First light results from PARAS: the PRL Echelle Spectrograph*
Chakraborty, A., Mahadevan, S., **Roy, A.**, et al. 2010, Vol. 7735, SPIE

44. *The habitable zone planet finder: a proposed high-resolution NIR spectrograph for the Hobby Eberly Telescope*
Mahadevan, S., Ramsey, L., Wright, J., Endl, M., Redman, S., Bender, C., **Roy, A.**, et al. 2010, Vol. 7735, SPIE

45. *The Pathfinder testbed: exploring techniques for achieving precision radial velocities in the NIR*
Ramsey, L. W., Mahadevan, S., Redman, S., Bender, C., **Roy, A.**, et al. 2010, Vol. 7735, SPIE

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