

Akash Gupta

CONTACT INFORMATION	Peyton Hall, 110 Princeton University Princeton, NJ 08544	<i>Email:</i> akashgpt@princeton.edu <i>Website:</i> www.akashgpt.com
RESEARCH INTERESTS	My research lies at the intersection of physics, chemistry and machine learning, specifically, astrophysics and planetary geosciences, and explores the origin of Earth- & Neptune-like planets across our galaxy. In particular, I am interested in understanding the fundamental physical and chemical processes that dictate a planet's formation and subsequent evolution, and how this ultimately leads to an environment and ingredients suitable for life.	
APPOINTMENTS	51 Pegasi b Fellow, Harry H. Hess Postdoctoral Fellow, and Future Faculty in Physical Sciences Fellow <i>Princeton University</i> Department of Astrophysical Sciences & Department of Geosciences	2023 -
	NASA Future Investigator (FINESST grantee) Graduate Student Researcher <i>University of California, Los Angeles</i> Department of Earth, Planetary, and Space Sciences (EPSS)	2020-23 2017-23
	Research Associate Undergraduate Researcher <i>Indian Institute of Technology, Kanpur</i> Mechanics & Applied Mathematics Group & Dept. of Aerospace Engineering	2016-17 2013-16
EDUCATION	University of California, Los Angeles (UCLA) Ph.D., M.S., Planetary Science <i>Thesis:</i> Unraveling the evolution of super-Earths and sub-Neptunes <i>Advisors:</i> Prof. Hilke E. Schlichting	2017-23
	Indian Institute of Technology, Kanpur (IIT-K) B.Tech. - M.Tech. Dual degree, Aerospace Engineering <i>Thesis:</i> Dynamics of rings around minor planets <i>Advisors:</i> Prof. Ishan Sharma & Prof. Sharvari Nadkarni-Ghosh	2011-16
SELECT AWARDS & HONORS	Summary: Awarded several international, national and university-level awards and fellowships by organizations such as NASA, Heising-Simons Foundation and Princeton University, with the total award prize amounting to over USD 0.8 million [†] .	
	• 51 Pegasi b Fellowship , Heising-Simons Foundation	2023 -
	• Future Faculty in Physical Sciences Fellowship , Princeton University	2023 -

[†]including awarded fellowships that are to disbursed in the future

- **Harry H. Hess Postdoctoral Fellowship**, Princeton University 2023 -
- *American Astronomical Society (AAS) International Travel Grant* (declined) 2024
- **Future Investigators in NASA Earth & Space Science & Technology (FINESST) grant** 2020-23
- *Exoplanet Summer Program Mini Grant* by Heising-Simons Foundation & UC Santa Cruz 2023
- *AAS Rodger Doxsey Travel Prize* awarded annually to 10 early-career researchers for presenting their PhD dissertation at the AAS meeting 2023
- *UCLA EPSS Outreach Award* in recognition of DEI initiatives 2022
- Travel grant awarded by the Munich Institute for Astro-, Particle and BioPhysics (MIAPbP) to attend and present at the *Planet Formation Workshop 2022* in Garching, DE 2022
- *Harold and Mayla Sullwold Scholarship* by EPSS, UCLA for excellence in research 2020
- *Constantine and Perina Panunzio Scholarship* by EPSS, UCLA for excellence in research 2019
- **UCLA's University Fellowship** 2017-19
- *EPSS Scholarship Award*, UCLA 2017
- Travel grant from IIT - Finnish Consortium of Higher Education program to conduct research with Prof. Heikki Salo, University of Oulu, Finland 2015
- Placed in the top ~ 1% in the Indian national exam GATE[‡] (Aerospace Engineering) 2015
- **Secured 99.6+ percentile among ~ 0.5 million candidates** in the national exam IIT-JEE[§] 2011

PEER-REVIEWED PUBLICATIONS Summary: 10 papers, incl. 8 published and 7 conference proceedings.
738 total citations and 617 citations on first-author papers.
 Source: Google Scholar, Sep 2024

JOURNAL PUBLICATIONS (*students directly mentored: **)

1. Fernandes et al. (including **Gupta, A.**). In review. *AAS journals*.
Signatures of atmospheric mass loss and planet migration in the time evolution of short-period transiting exoplanets
2. **Gupta, A.**, Stixrude, L. and Schlichting, H.E. 2024. In review. arXiv:2407.04685
The miscibility of hydrogen and water in planetary atmospheres and interiors
3. Owen, J. E., Murray-Clay, R. A., Schreyer, E., Schlichting, H. E., David, A., **Gupta, A.**, Loyd, R. O. P., Shkolnik, E. L., Sing, D. K., Swain, M. R., 2023. *MNRAS*. 518, 4357-4371.
The fundamentals of Lyman-alpha exoplanet transits
4. **Gupta, A.**, *Nicholson, L. and Schlichting, H. E. 2022. *MNRAS*, 516, 4585-4593.
Properties of the radius valley around low mass stars: Predictions from the core-powered ...
5. Rogers, J. G., **Gupta, A.**, Owen, J. E. and Schlichting, H. E. 2021. *MNRAS*, 508, 5886-5902.
Photoevaporation vs. core-powered mass-loss: Model comparison with the 3D radius gap
6. **Gupta, A.** and Schlichting, H. E. 2021. *MNRAS*, 504, 4634-4648.
Caught in the act: Core-powered mass-loss predictions for observing atmospheric escape

[‡]Graduate Aptitude Test in Engineering

[§]Indian Institute of Technology - Joint Entrance Examination (for admission to science & engineering colleges in India)

7. **Gupta, A.** and Schlichting, H. E. 2020. *MNRAS* 493, 792-806.
Signatures of the core-powered mass-loss mechanism in the exoplanet population: Dependence on stellar properties and observational predictions
8. Estrada, R. Swain, M., **Gupta, A.**, Sotin, C. and Valio, A.. 2020. *ApJ*. 898, 104-109.
Evolutionary tracks of H/He envelopes of the observed pop. of sub-Neptunes and super-Earths
9. **Gupta, A.** and Schlichting, H.E. 2019. *MNRAS* 487, 24-33.
Sculpting the valley in the radius distribution of small exoplanets as a by-product of planet formation: The core-powered mass-loss mechanism
10. **Gupta, A.**, Nadkarni-Ghosh, S. and Sharma, I. 2018. *Icarus* 299, 97-116.
Rings of non-spherical, axisymmetric bodies

SELECT CONFERENCE PROCEEDINGS

1. Tang, H., **Gupta, A.**, Schlichting, H.E. and Young E.D., 2020., 51st Annual Lunar and Planetary Science Conference, 1481
Escape from a Transient Rock Vapor Atmosphere as the Mechanism for Fractionation of the Moon's Moderately Volatile Elements

OBSERVING PROGRAMS AWARDED

Summary: **6 observing proposals awarded, including the largest Exoplanet Science proposal ever awarded by NASA's Hubble Space Telescope to-date**

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| 1. Hubble Space Telescope Cycle 32/33/34 Treasury Program
600+ primary orbits
Co-I [¶] (PI [¶] : R. O. Loyd, Eureka Scientific Inc. & Shreyas Vissapragada, Harvard U.)
<i>STELα: Survey of Transiting Exoplanets in Lyman-alpha</i> | 2024 |
| 2. W.M. Keck Observatory
<i>3 nights</i>
Co-I (PI: Erik Petigura, UCLA)
<i>The KPF Disordered Multis Survey II</i> | 2024 |
| 3. James Webb Space Telescope, Cycle 3
<i>Archival proposal</i>
Co-I (PI: Shreyas Vissapragada, Harvard U.)
<i>TUNES: The Unintentional NIRISS Escape Survey</i> | 2024 |
| 4. W.M. Keck Observatory
<i>3 nights</i>
Co-I (PI: Erik Petigura, UCLA)
<i>The KPF Disordered Multis Survey I</i> | 2023 |
| 5. Gemini MAROON-X
<i>25.7 hrs</i>
Co-I (PI: Erik Petigura, UCLA) | 2022 |

[¶]Co-Investigator

^{¶¶}Principal Investigator

*Probing the Role of Mass Loss in the Formation of Super-Earths and Sub-Neptunes
with MAROON-X*

6. Hubble Space Telescope Cycle 28 2020
15 primary orbits
Co-I (PI: Paul Cauley, UC Boulder)
Measuring mass loss via metal lines from the very young planet AU Mic b

SEMINARS

Summary: 17 talks at universities and research institutes

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| Princeton University, <i>Chemistry in Solution and at Interfaces (CSI) Seminar</i> | 2024 |
| Penn State, <i>Center for Exoplanets and Habitable Worlds (CEHW) Seminar</i> | 2024 |
| NSF Center for Matter at Atomic Pressures (CMAP) <i>Seminar</i> | 2024 |
| MIT Kavli Institute, <i>Brown Bag Lunch Seminar</i> | 2022 |
| NASA Jet Propulsion Laboratory, <i>Exoplanet Journal Club Seminar</i> | 2022 |
| University of Arizona, <i>Origins Seminar</i> | 2022 |
| University of Texas, <i>Austin Stars and Planets Seminar</i> | 2022 |
| Caltech, <i>Dix Planetary Science Seminar</i> | 2022 |
| Yale, <i>Exoplanets and Stars Seminar</i> | 2022 |
| Cornell, <i>Planetary Lunch Seminar</i> | 2022 |
| UC Berkeley, <i>Center for Integrative Planetary Science Seminar</i> | 2022 |
| Princeton, <i>Exoplanet Discussion Group Seminar</i> | 2022 |
| Carnegie Earth & Planets Laboratory, <i>Astronomy Seminar</i> | 2021 |
| University of Arizona, <i>Disks and Exoplanets Group Seminar</i> | 2020 |
| McMaster University, <i>Astronomy Seminar</i> | 2020 |
| MIT, <i>Planetary Lunch Seminar</i> | 2020 |
| UCLA, <i>Planetary Science Seminar</i> | 2018, '19, '21 |

CONFERENCES

Summary: 18 conference presentations (10 talks and 8 posters)

TALKS

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|---|------|
| <i>Future Faculty in Physical Sciences Symposium</i> , Princeton University, NJ | 2024 |
| 241 st AAS Meeting, Seattle, WA | 2023 |
| <i>Planet Formation Workshop</i> by MIAPbP [‡] , Munich, Germany | 2022 |
| 240 th AAS Meeting, Pasadena, CA, US | 2022 |
| <i>Exoplanets IV</i> , Las Vegas, NV, US | 2022 |
| <i>Stars and Planets in the Ultraviolet</i> , online conference | 2021 |
| <i>Exoplanet Demographics</i> , online conference | 2020 |
| <i>Exoplanets III</i> , online conference | 2020 |
| <i>Bay Area Exoplanet Meeting</i> , online conference | 2020 |

	<i>New Horizons in Planetary Systems</i> , Victoria, BC, Canada	2019
	POSTERS	
	<i>Extreme Solar Systems V</i> , Christchurch, New Zealand	2024
	<i>TESS Science Conference II (NASA/MIT)</i> , online conference	2021
	<i>ExSoCal 2020</i> , virtual conference	2020
	<i>Extreme Solar Systems IV</i> . Reykjavik, Iceland	2019
	<i>NASA Sagan Summer Workshop</i> , Pasadena, CA, US	2019
	<i>Kepler & K2 Science Conference V</i> , Pasadena, CA, US	2019
	<i>11th Annual EPSS Student Research Symposium</i> , UCLA, Los Angeles, CA, US	2018
	<i>48th DPS Meeting and 11th EPSC</i> , Pasadena, CA, US	2016
TECHNICAL SKILLS	<p><i>Programming languages</i>: Python, C, MATLAB, FORTRAN, IDL, Bash.</p> <p><i>Select softwares/codes</i>: VASP, DeePMD, REBOUND, MESA, emcee, dynesty.</p>	
TECHNICAL WORKSHOPS	<p><i>OWL Exoplanet Summer workshop</i> by UC Santa Cruz and Heising-Simons</p> <p><i>Planet Formation workshop</i> by MIAPbP in Garching, Germany</p> <p><i>Sagan Exoplanet Workshop: Astrobiology for Astronomers</i> by NExSci at Caltech</p> <p><i>Communicating Science Effectively in Today's World</i> by UCLA and EPSS</p> <p><i>XSEDE HPC Workshop: Summer Boot Camp</i> by XSEDE & PSC at UCLA</p> <p><i>High Performance Computing Workshop</i> by Intel at IIT Kanpur</p>	<p>2022</p> <p>2022</p> <p>2019</p> <p>2019</p> <p>2018</p> <p>2015</p>
MENTORING & TEACHING	<p><u>Summary</u>: (1) Research advisor to 4 undergraduate and 1 PhD student to-date, and mentor to 10+ students, and (2) teaching assistant for courses and guest lecturer for 1.</p> <p>MENTORING (RESEARCH):</p> <ul style="list-style-type: none"> - Roberto Tejada Arevalo (Princeton University, PhD student) 2024 - Present Project: <i>Evolution of water-worlds with hydrogen-rich atmospheres</i> - Mariana Ordonez (Princeton U., Undergrad; co-mentor: Dr. Yubo Su) 2024 - Present Project: <i>Exoplanet atmospheres X dynamics</i> - Malik Booker (Delaware State U. UG, Princeton USRP Program; with PhD student Caleb Lammers) 2024 - Present Project: <i>Applying ML techniques to AIMD derived data on material interactions</i> - Lorraine Nicholson (UCLA Undergrad and UC LEADS fellow → NSF GRFP** fellow and Ph.D. student at U. of Florida) 2020-22 Project: <i>Planet evolution under core-powered mass-loss around ultra-cool M-dwarfs</i> - Sohanjit Ghosh (IIT Kanpur/IEST UG → Ph.D. student at Johns Hopkins U.) 2017-18 	
	**National Science Foundation – Graduate Research Fellowship Program	

Project: *Understanding the dynamics of rings around non-spherical minor planets*

MENTORING (OTHER):

- Mentor, *EPSS Family Mentorship Program (EFMP)*, UCLA 2021-23
- Mentor, *Counseling Service*, IIT Kanpur 2012-13

TEACHING:

- Guest Lecturer, Planetary & Orbital Dynamics (EPS SCI 219), UCLA Spring 2019
- Teaching Assistant, Solar System and Planets (EPS SCI 9), UCLA Winter 2019
- Teaching Assistant, Solar System and Planets (EPS SCI 9), UCLA Winter 2018
- Teaching Assistant, Experiments in Aerospace Engineering III (AE451A), IIT Spring 2016
- Teaching Assistant, Experiments in Aerospace Engineering II (AE351A), IIT Fall 2015

**PROFESSIONAL
SERVICES &
OUTREACH**

Summary: (1) **Judged/reviewed 12 proposals for funding up to 1.5 million USD for the US and European government organizations such as NASA and the European Research Council**, (2) **refereed 8 publications for journals from Nature, the American Astronomical Society and the Royal Astronomical Society**, and judge for 1 national student competition, (3) founder, member, and representative of various professional and student organizations, and (4) speaker and volunteer for several outreach events.

REVIEWS:

- Reviewer for the following organizations and programs: *NASA, European Research Council (ERC), Hubble Space Telescope (HST), and Future Investigators in NASA Space Science & Technology Program (FINESST)* 2022 -
- Referee for the following journals: *Nature* [×1], *Proceedings of the National Academy of Sciences* [×2], *Monthly Notices of the Royal Astronomical Society* [×2], *Astrophysical Journal* [×2]
- Judge, AAS Chambliss Astronomy Achievement Student Awards 2023

OTHER DIVERSITY, EQUITY & INCLUSION ACTIVITIES

- Founder & Organizing Committee Member, *EPSS Family Mentorship Program* 2021-23
- Department Representative, *Mathematics & Physical Sciences Council*, UCLA 2017-19
- Departmental Undergraduate Committee, Aerospace Engr., IIT Kanpur 2012-13

OTHER PROFESSIONAL SERVICES AND ACTIVITIES

- Member, *NSF Physics Frontiers Center: Center for Matter at Atomic Pressures (CMAP)* 2023 -
- Member, *American Geophysical Union* 2024-
- Member, *American Astronomical Society (AAS)* 2022-
- Member, *Division for Planetary Sciences* of the AAS 2022-
- Founder & Organizer, *Planets & Exoplanets Journal Club*, UCLA 2020-22
- Global Organizing Committee member, *Exoplanets III* conference 2020

OTHER SELECT OUTREACH ACTIVITIES

- *Astronomy on Tap*, Trenton, NJ 2024
- Invited speaker, *Planning for Graduate School*, IIT Bombay, India 2021
- Invited speaker, Wildwood Institute for STEM Research and Development Poster Presentation and Lecture Series, Wildwood School, Los Angeles, CA 2019
- Volunteer, International Observe the Moon Night, UCLA 2019
- Participant, *Exploring Your Universe* - UCLA's Annual Science Outreach Festival 2017-20
- Panelist, Key to Success: Life and Physical Sciences. Grad Student Orientation, UCLA 2018

OTHER SELECT ACHIEVEMENTS Technical Member of the first IIT Kanpur team (*IITK Motorsports*) to ‘conceive, design and fabricate a small, Formula-style racing car to compete’ at the *Formula SAE*, Italy’13, a European-leg of the international competition organized by SAE^{††} International.

‘*Sangeet Bhushan*’ (equiv. to Diploma in Music) in playing Harmonium, an Indian classical instrument, from *Pracheen Kala Kendra*, India; 9-10 years of training in playing the instrument.

‘*Sangeet Bhushan/Visharad II*’ (equiv. to Diploma in Music) in playing Tabla, an Indian classical instrument, from *Pracheen Kala Kendra*, India; 6-7 years of training in playing the instrument.

^{††}Society of Automotive Engineers