# KISHORE CHANDRA PATRA

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## Research Interests

**Time-domain astronomy** — black hole astrophysics, tidal disruption events (TDEs), quasi-periodic X-ray eruptions (QPEs), and supernovae; **Exoplanets** — tidal orbital decay of hot Jupiters; **Instrumentation**

## Academic Positions

**Postdoctoral Researcher**, University of California Observatories, UC Santa Cruz, CA Sep 2024 – Present
**Postdoctoral Researcher**, Department of Astronomy, UC Berkeley June 2024 – Aug 2024
*(Parental leave)*
**Nagaraj-Noll-Otellini Graduate Fellow**, Department of Astronomy UC Berkeley Sep 2020 – May 2024

## Education

**Ph.D. Astrophysics, University of California, Berkeley** 2024
Advisor: Alexei V. Filippenko
Thesis: *An Explosive Party: Supernovae, Tidal Disruption Events, and Quasi-Periodic Eruptions*
**M.A. Astrophysics, University of California, Berkeley** 2020
**B.S. Physics, Massachusetts Institute of Technology** 2018
Advisors: Joshua N. Winn & Nevin N. Weinberg
Thesis: *The Search for Orbital Decay of hot Jupiters*

## Awards, Honors & Scholarships

- Robert J. Trumpler Graduate Student Excellence Award, UC Berkeley 2023
- Nagaraj - Noll - Otellini Graduate Fellowship, UC Berkeley 2020 – 2024
- Wonderfest Science Envoy 2020 – 2021
- Outstanding Graduate Student Instructor, UC Berkeley 2020
- Carl & Betty Helmholz Fellowship, International-House at UC Berkeley 2018 – 2019
- Alan H. Barrett Prize in Astrophysics, MIT 2018
- Phi Beta Kappa, MIT 2018
- Ilona Karmel Writing Prize, MIT 2017
- Pestalozzi International Village Trust Scholarship, United Kingdom 2011 – 2013

## Telescope Proposals as Principal Investigator

***14 proposals; Total PI funding:*** $\$88,000$

**Hubble Space Telescope (2 GO programs)**
- *Are 3XMM J2150 and EP240222a really off-nuclear tidal disruption events?*, 3 orbits, GO-18054 Cycle 33
- *The UV-Optical-IR Spectral Energy Distribution of Quasi-Periodic Eruptions*, 10 orbits, GO-17914, Cycle 32

**James Webb Space Telescope (1 DDT program)**
- *JWST observations of the off-nuclear TDE AT 2024tvd*, 6.1 hours, DDT-9249 Cycle 3

***Swift* (multiple ToO)**
- *UV and X-ray emission from tidal disruption events*, $>16$ ks

**10 m Keck Telescope (6 classical proposals)**
- *Polarimetry of supernovae and tidal disruption events*[1], 4 nights, 2023A, 2023B, 2024A, 2024B

[1] Graduate students cannot be PIs on University of California Keck proposals; A.V. Filippenko served as the acting PI

- *Searching for Polarized Signatures of Axions in Magnetic White Dwarf Stars*[2], 1.5 nights, 2024A, 2024B

**1 m Nickel Telescope (5 classical proposals)**

- *Orbital Decay of Hot Jupiters with Transit Timing*, > 60 nights, 2022A, 2023B, 2024A, 2024B, 2025A

# Refereed Publications

ADS Link, Google Scholar Link

37 **total refereed (first-author = 6);** 917 **total citations (first-author = 302);** $h$**-index = 14;**
88 **ATels/TNS Reports/GCN Circulars**

† *indicates papers by supervised students*

## Major Author

37. **Patra, K.**, Foley, R., Earl, N., Davis, K.W., Ramirez-Ruiz, E., et al., 2025, *JWST and Keck Observations of the Off-Nuclear TDE AT 2024tvd: A Massive Nuclear Star Cluster1 and Minor-Merger Origin for its Black Hole*, submitted, arXiv:2510.12572, PDF

36. **Patra, K.**, Lu, W., Ma, Y., Quataert, E., Miniutti, G., et al., 2024, *Constraints on the narrow-line region of the X-ray quasi-periodic eruption source GSN 069*, MNRAS, 530, 4, PDF

35. **Patra, K.**, Lu, W., Brink, T., Yang, Y., Filippenko, A., et al., 2022, *Spectropolarimetry of the tidal disruption event AT 2019qiz: a quasi-spherical reprocessing layer*, MNRAS, 515, 1, PDF

34. **Patra, K.**, Yang, Y., Brink, T., Höflich, P., Wang, L., et al., 2022, *Spectropolarimetry of the Type Ia SN 2019ein rules out significant global asphericity of the ejecta*, MNRAS, 509, 3, PDF

33. **Patra, K.**, Winn, J., Holman, M., Gillon, M., Burdanov, A., et al., 2020, *The Continuing Search for Evidence of Tidal Orbital Decay of Hot Jupiters*, AJ, 159, 4, PDF

32. **Patra, K.**, Winn, J., Holman, M., Yu, L., Deming, D., et al., 2017, *The Apparently Decaying Orbit of WASP-12b*, AJ, 154, 1, PDF

31. Benabou, J., Dessert, C., **Patra, K.**, Brink, T., Zheng, W., et al., 2025, *Search for Axions in Magnetic White Dwarf Polarization at Lick and Keck Observatories*, submitted, arXiv: 2504.12377, PDF

†30. Alvarado, E., Bostow, K., **Patra, K.**, Jacobus, C., Baer-Way, R., et al., 2024, *Searching for tidal orbital decay in hot Jupiters*, MNRAS, 534, 1, PDF

29. Vasylyev, S., Yang, Y., **Patra, K.**, Filippenko, A., Baade, D., et al., 2024, *Spectropolarimetry of the Type IIP supernova 2021yja: an unusually high continuum polarization during the photospheric phase*, MNRAS, 527, 2, PDF

28. Vasylyev, S., Yang, Y., Filippenko, A., **Patra, K.**, Brink, T., et al., 2023, *Early Time Spectropolarimetry of the Aspherical Type II Supernova SN 2023ixf*, ApJL, 955, 2, PDF

27. Kosiarek, M., Nisley, I., **Patra, K.**, Hatano, R., Bates, H., et al., 2017, *Rotation Period of Asteroid 3494 Purple Mountain*, Minor Planet Bulletin, 44, 3, PDF

26. Yee, S., Winn, J., Knutson, H., **Patra, K.**, Vissapragada, S., et al., 2020, *The Orbit of WASP-12b Is Decaying*, ApJL, 888, 1, PDF

## Contributing Author

25. LeBaron, N., Margutti, R., Chornock, R., Nayana, A., Aspegren, O., et al. **(Patra, K.)**, 2025, *The Most Luminous Known Fast Blue Optical Transient AT 2024wpp: Unprecedented Evolution and Properties in the Ultraviolet to the Near-Infrared*, submitted, arXiv: 2509.00951, PDF

24. Jacobson-Galán, W., Dessart, L., Kilpatrick, C., Patel, P., Auchettl, K., et al. **(Patra, K.)**, 2025, *A Panchromatic View of Late-time Shock Power in the Type II Supernova 2023ixf*, submitted, arXiv: 2508.11747, PDF

23. Vasylyev, S., Dessart, L., Yang, Y., Filippenko, A., **Patra, K.**, et al., 2025, *Spectropolarimetric Evolution of SN 2023ixf: an Asymmetric Explosion in a Confined Aspherical Circumstellar Medium*, submitted, arXiv: 2505.03975, PDF

22. Singh, M., Kwok, L., Jha, S., Dastidar, R., Larison, C., et al. **(Patra, K.)**, 2025, *Photometry and Spectroscopy of SN 2024pxl: A Luminosity Link Among Type Iax Supernovae*, submitted, arXiv: 2505.02943, PDF

[2]Experimental design, observation planning, execution and data analysis; Faculty PI B.R. Safdi

21. Hoogendam, W., Jones, D., Ashall, C., Shappee, B., Foley, R., et al. **(Patra, K.)**, 2025, *Seeing the Outer Edge of the Infant Type Ia Supernova 2024epr in the Optical and Near Infrared*, The Open Journal of Astrophysics, 8, PDF

20. Kwok, L., Singh, M., Jha, S., Blondin, S., Dastidar, R., et al. **(Patra, K.)**, 2025, *JWST and Ground-based Observations of the Type Iax Supernovae SN 2024pxl and SN 2024vjm: Evidence for Weak Deflagration Explosions*, ApJL, 989, 2, PDF

19. Gagliano, A., Villar, V., Matsumoto, T., Jones, D., Ransome, C., et al. **(Patra, K.)**, 2025, *Evidence for an Instability-induced Binary Merger in the Double-peaked, Helium-rich Type IIn Supernova 2023zkd*, ApJ, 989, 2, PDF

18. Zheng, W., Dessart, L., Filippenko, A., Yang, Y., Brink, T., et al. **(Patra, K.)**, 2025, *SN 2023ixf in the Pinwheel Galaxy M101: From Shock Breakout to the Nebular Phase*, ApJ, 988, 1, PDF

17. Das, K., Kasliwal, M., Fremling, C., Sollerman, J., Perley, D., et al. **(Patra, K.)**, 2025, *Low-luminosity Type IIP Supernovae from the Zwicky Transient Facility Census of the Local Universe. I. Luminosity Function, Volumetric Rate*, pasp, 137, 4, PDF

16. Nicholl, M., Pasham, D., Mummery, A., Guolo, M., Gendreau, K., et al. **(Patra, K.)**, "Quasi-periodicX-rayeruptionsyearsafteranearbytidaldisruptionevent", *Quasi-periodic X-ray eruptions years after a nearby tidal disruption event*, nat, 634, 8035, PDF

15. Liu, Q., Lin, J., Wang, X., Dai, Z., Sun, Y., et al. **(Patra, K.)**, 2024, *Minute-Cadence Observations of the LAMOST Fields with the TMTS: IV—Catalog of Cataclysmic Variables from the First 3-yr Survey*, Universe, 10, 9, PDF

14. Hu, X., Yu, Y., Zhang, J., Wang, X., **Patra, K.**, et al., 2024, *Multiwavelength Polarization Observations of Mrk 501*, ApJL, 970, 1, PDF

13. Irani, I., Chen, P., Morag, J., Schulze, S., Gal-Yam, A., et al. **(Patra, K.)**, 2024, *SN 2022oqm–A Ca-rich Explosion of a Compact Progenitor Embedded in C/O Circumstellar Material*, ApJ, 962, 2, PDF

12. Vasylyev, S., Vogl, C., Yang, Y., Filippenko, A., Brink, T., et al. **(Patra, K.)**, 2023, *Early-time Ultraviolet and Optical Hubble Space Telescope Spectroscopy of the Type II Supernova 2022wsp*, ApJL, 959, 2, PDF

†11. Risin, S., Jacobus, C., Altunin, I., Brink, T., **Patra, K.**, et al., 2023, *Optical Observations of the Type Ia Supernova 2022hrs*, Research Notes of the American Astronomical Society, 7, 10, PDF

10. Karambelkar, V., Kasliwal, M., Blagorodnova, N., Sollerman, J., Aloisi, R., et al. **(Patra, K.)**, 2023, *Volumetric Rates of Luminous Red Novae and Intermediate-luminosity Red Transients with the Zwicky Transient Facility*, ApJ, 948, 2, PDF

9. Hoeflich, P., Yang, Y., Baade, D., Cikota, A., Maund, J., et al. **(Patra, K.)**, 2023, *The core normal Type Ia supernova 2019np - an overall spherical explosion with an aspherical surface layer and an aspherical $^{56}Ni$ core*, MNRAS, 520, 1, PDF

8. Yang, Y., Yan, H., Wang, L., Wheeler, J., Baade, D., et al. **(Patra, K.)**, 2022, *Spectropolarimetry of the Thermonuclear Supernova SN 2021rhu: High Calcium Polarization 79 Days after Peak Luminosity*, ApJ, 939, 1, PDF

7. Cai, Y., Pastorello, A., Fraser, M., Wang, X., Filippenko, A., et al. **(Patra, K.)**, 2022, *Forbidden hugs in pandemic times. III. Observations of the luminous red nova AT 2021biy in the nearby galaxy NGC 4631*, A&A, 667, PDF

6. Vasylyev, S., Filippenko, A., Vogl, C., Brink, T., Brown, P., et al. **(Patra, K.)**, 2022, *Early-time Ultraviolet Spectroscopy and Optical Follow-up Observations of the Type IIP Supernova 2021yja*, ApJ, 934, 2, PDF

5. Kilpatrick, C., Coulter, D., Arcavi, I., Brink, T., Dimitriadis, G., et al. **(Patra, K.)**, 2021, *The Gravity Collective: A Search for the Electromagnetic Counterpart to the Neutron Star-Black Hole Merger GW190814*, ApJ, 923, 2, PDF

4. Sollerman, J., Yang, S., Schulze, S., Strotjohann, N., Jerkstrand, A., et al. **(Patra, K.)**, 2021, *The Type II supernova SN 2020jfo in M 61, implications for progenitor system, and explosion dynamics*, A&A, 655, PDF

3. Murakami, Y., Stahl, B., Zhang, K., Chu, M., McGinness, E., et al. **(Patra, K.)**, 2021, *On the relationship between Type Ia supernova luminosity and host-galaxy properties*, MNRAS, 504, 1, PDF

2. Zhang, K., Murakami, Y., Stahl, B., **Patra, K.**, Filippenko, A., et al., 2021, *Improving bayesian posterior correlation analysis on type Ia supernova luminosity evolution*, MNRAS, 503, 1, PDF

1. De Propris, R., West, M., Andrade-Santos, F., Ragone-Figueroa, C., Rasia, E., et al. **(Patra, K.)**, 2021, *Brightest cluster galaxies: the centre can(not?) hold*, MNRAS, 500, 1, PDF

## Astronomical Instrumentation

- Science Team, Software Lead - Dual-channel Automatic Rapid Transient Spectrograph (DARTS)

## Observing & Instrument Experience

- Hubble Space Telescope: ACS, WFC3, STIS
- James Webb Space Telescope: NIRCam, NIRSpec IFU
- 3 m Shane Telescope, Lick Observatory, Kast spectrograph & spectropolarimeter: $> 25$ nights
- 10 m Telescope, Keck Observatory, LRIS, LRISp, KCWI, NIRES: 10 nights
- 1.2 m Telescope, Fred L. Whipple Observatory: $> 25$ nights
- 14- and 24-inch Telescopes, MIT Wallace Observatory: $> 20$ nights
- Public data: Pan-STARRS, Gaia, ASAS-SN, ATLAS, APOGEE, SDSS, ZTF, HST

## Selected Talks

**Invited**

- *Polarimetry of supernovae and tidal disruption events*, Carnegie Observatories Lunch Seminar — Jan 2024
- *Nuclear transients: Quasi-periodic eruptions and tidal disruption events*, Stanford KIPAC — Dec 2023
- *Polarimetry of supernovae and tidal disruption events*, STScI Transient Group Seminar — Dec 2023
- *Polarimetry of supernovae and tidal disruption events*, Princeton Thursday Lunch Talks — Nov 2023
- *Optical emission from tidal disruption events*, UC Berkeley Compass Lecture — Oct 2022
- *The search for orbital decay of hot Jupiters*, UC Berkeley CIPS[3] Talk — Sep 2019
- *The apparently decaying orbit of WASP-12b*, UMass Lowell, BAESM[4] — May 2018

**Contributed**

- *Polarimetry of tidal disruption events*, Winter AAS Meeting Dissertation Talk — Jan 2024
- *Polarimetry of supernovae and tidal disruption events*, SuperVirtual Conference — Nov 2023
- *Constraints on the QPEs in GSN 069*, UC Berkeley Lunch Talks — Sep 2023
- *Spectropolarimetry of the TDE AT 2019qiz*, UC Berkeley Explosive Astro Seminar — Sep 2022
- *The remarkably unremarkable SN 2019ein*, UC Berkeley Astro Lunch Talks — Oct 2021
- *Spectropolarimetry of SN 2019ein*, UC Berkeley Explosive Astro seminar — Sep 2021
- *Spectropolarimetry of supernovae*, UC Berkeley Astro Lunch Talks — Oct 2019
- *The search for orbital decay of hot Jupiters*, UC Berkeley GSPS[5] — Apr 2019
- *The dynamical state of brightest cluster galaxies*, Lowell Observatory, Flagstaff AZ — Jan 2018

**General Audience**

- *Disruption of stars by supermassive black holes*, "Evening With Stars" Fundraising Event — May 2024
- *The incredible life and work of Subrahmanyan Chandrasekhar*, Asha Berkeley Annual Forum — Nov 2023
- *Exploding Stars*, Wonderfest Bay Area Double Play — Mar 2021
- *Exoplanets and Exploding Stars*, The Nueva School Intersession — Jan 2021
- *Exploding Stars*, UC Berkeley Astronomy Night — June 2020
- *The physics of airplanes*, MIT SPARK Program — Mar 2017

## Teaching

**Math & Physical Sciences (MPS) Department Facilitator, (UC Berkeley)** — Fall 2023
MPS 375: Professional Preparation - Supervised Teaching in Math and the Physical Sciences
Provided specialized knowledge, support, and mentorship for new Graduate Student Instructors in astronomy, and assisted in the curation of course material

**Graduate Student Instructor, Dept. of Astronomy, (UC Berkeley)** — Fall 2022
MPS 375: Professional Preparation - Supervised Teaching in Math and the Physical Sciences
Led weekly discussion sections for new Graduate Student Instructors in astronomy
*Average evaluation rating: 6.8/7*

[3] Center for Integrative Planetary Science
[4] Boston Area Exoplanet Science Meeting
[5] Graduate Student & Postdoc Seminar

**Head Graduate Student Instructor, Dept. of Astronomy (UC Berkeley)** Fall 2019
Astron C10: Introduction to General Astronomy
Led a team of 36 (20 instructors + 16 graders) to run a class with enrollment $\sim$ 850 students. Led weekly discussion sections for $\sim$ 60 undergraduates.
*Average evaluation rating: 6.8/7*

**Guest Lecturer, Dept. of Astronomy (UC Berkeley)** Fall 2019
Astron C10: Introduction to General Astronomy
Covered 2 lectures for course instructor Alex Filippenko

**Graduate Student Instructor, Dept. of Astronomy (UC Berkeley)** Fall 2018
Astron C10: Introduction to General Astronomy
Led weekly discussion sections for $\sim$ 70 undergraduates.
*Average evaluation rating: 6.3/7*

**Developer of Sophomore-Level Experimental Physics Course (MIT)** Fall 2017
8.S12: Introduction to Experimental Physics
Designed and built apparatus for lab experiments, wrote lab manuals, readings and quizzes

**Lecturer, MIT High-School Summer Program** August 2017
Exoplanets: What we know so far. What's in the future?
Designed and led the class for $\sim$ 40 high school students

**High-school Physics & Math teacher (Kolkata, India)** 2013 – 2014
International Baccalaureate Diploma Program, Oaktree International School Kolkata
Taught $\sim$ 20 high- & middle-school students, managed school library, served as residential advisor

# Mentoring

- Leader of UC Berkeley astronomy graduate student peer-mentoring program 2020 – 2022
- Mentor for UC Berkeley Compass Mentoring Program 2021
- Research mentor for ULAB undergraduate research program, UC Berkeley 2020 – 2021
- Research mentor for Cal-NERDS[6] Program for under-represented STEM students 2022 – present

**Supervised Undergraduate Student Projects**

The Search for Evidence of Tidal Orbital Decay in Hot Jupiters June 2022 – Sep 2024
Students: **Efrain Alvarado III**, Kate Bostow, UC Berkeley
Paper: Alvarado, Bostow, Patra et al. (2024), MNRAS, 534, 800

Orbital evolution of the white dwarf-hot Jupiter system WD 1856+534 June 2022 – present
Students: **Eli Gendreau-Distler**, Kate Bostow, UC Berkeley
Papers: Gendreau-Distler, Bostow, Patra et al. (2025), in prep.

*Astronomy Honors Thesis:* Statistical analysis of Si II line velocities of SNe Ia Aug 2022 – May 2023
Student: **Edgar Vidal**, UC Berkeley

Modeling infrared dust echoes from tidal disruption events May 2022 – April 2023
Student: **Ducheng Lu**, SUSTech, Shenzhen China, UC Berkeley exchange student
Paper: Lu, Patra et al., in prep.

Optical Observations of Type Ia Supernova 2022hrs Feb 2023 – May 2024
Student: **Sophia Risin**, UC Berkeley undergraduate
Paper: Risin, Jacobus, including Patra et al., (2023), RNAAS, 7, 229

# Selected Service & Outreach

- Referee for ApJ, ApJL, MNRAS, A&A
- Organizer and member of Q/A panel for new graduate student instructors 2022-2023

[6] New Experiences for Research and Diversity in Science

- KPOO-FM 89.5 Poor People's Radio interview — Aug 2021
- Panelist on the graduate diversity fair, UC Berkeley — Oct 2021
- Leader of journal club and research-skills workshops for new undergraduate researchers, Filippenko research group, UC Berkeley — 2021-2022
- Volunteer tutor for Astro Scholars Program for under-represented students, UC Berkeley — 2020
- Referee for Berkeley Scientific Journal for undergraduate research — 2019
- Volunteer for UC Berkeley Cal Day & Bay Area Science Festival — 2018, 2019, 2021
- Repaired and repurposed lab equipment for under-funded schools, Boston MA — 2017-2018

## Selected Press

- The Decaying Orbit of WASP-12b: (Patra et al. 2017), (Yee et al. 2022)
  -AAS Nova, Princeton News, CNN, Sky & Telescope
- Quasi-spherical reprocessing layer in TDE AT 2019qiz: (Patra et al. 2022)
  -UC Berkeley News, Science Daily, The Debrief, Universe Today, Space.com