

KISHORE C. PATRA — Curriculum Vitae

Contact Information

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Research Interests

- My current research focuses on understanding the physics of various astrophysical transients including **supernovae, tidal disruption events, fast radio bursts, and quasi-periodic eruptions** with a combination of observations and theory
- I have expertise in **polarimetry (both spectral and imaging)**, photometry, and spectroscopy
- I also work on detecting **orbital decay of hot Jupiters**, and **constraining axion-photon coupling** with polarimetry of highly magnetized white dwarfs

Education

Ph.D. Astrophysics, University of California, Berkeley 2024 (expected)

Advisor: Alexei V. Filippenko

Thesis: *Polarization of Astrophysical Transient Events*

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*

Publications Summary

ADS Link, Google Scholar Link

20 total refereed (first-author = 4); 388 total citations (first-author = 196);

h -index = 9 (first-author = 4); > 45 ATels/TNS Reports/GCN Circulars

(Complete publication list attached)

Awards, Honors & Scholarships

- Robert J. Trumpler Graduate Student Excellence Award, UC Berkeley 2023
- The Nagaraj - Noll - Otellini Graduate Fellowship, UC Berkeley 2020 – Present
- Wonderfest Science Envoy 2020 – 2021
- Outstanding Graduate Student Instructor, UC Berkeley 2020
- Carl & Betty Helmholtz 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

Observing & Instrument Experience

- Hubble Space Telescope: HST/ACS data
- 3 m Shane Telescope, Lick Observatory, Kast spectrograph & spectropolarimeter: > 12 nights
- 10 m Telescope, Keck Observatory, LRIS & LRISp: 3 nights
- 1 m Nickel Telescope, Lick Observatory: 20 nights
- 1.2 m Robotic Telescope, Fred L. Whipple Observatory: > 25 nights
- 14 and 24 inch Telescopes, MIT Wallace Observatory: > 20 nights
- Public data: Gaia, ASAS-SN, APOGEE, SDSS, ZTF, STScI MAST

Telescope Proposals

10 m Keck Telescope, LRIS, LRISp, DEIMOS, HIRES

- Co-I (Science Lead), *Polarimetry of supernovae and tidal disruption events*, 2 nights, 2023A, 2023B
- Co-I, *Powerful Diagnostics from Nebular Spectroscopy of Unique Transients*, 2 nights, 2023B
- Co-I, *(ToO) Probing Supernova Progenitors with Observations at Very Early Times*, 20 ToO interrupts, 2020B, 2021A, 2021B, 2023A, 2023B

1 m Nickel Telescope

- PI, *Orbital Decay of Hot Jupiters with Transit Timing*, 20 nights, 2022A, 2023B

3 m Shane Telescope, Kast spectrograph/spectropolarimeter

- Co-I, *Long-term monitoring of Supernovae*, > 160 nights, 2019B, 2020A, 2020B, 2021A, 2021B, 2022A, 2022B, 2023A, 2023B
- Co-I, *Polarized signatures of axions in magnetic white dwarfs*, 3 nights, 2023B

Hubble Space Telescope

- Co-I, *Early-Time UV Spectroscopy of Stripped-Envelope Supernovae: A New Window*, 34 orbits, Cycles 28 & 29

Southern Astrophysical Research Telescope, GSP¹ Collaboration

- Co-I, *A sample of infant supernovae*, > 10 nights, 2021B, 2022A, 2022B, 2023B

Las Cumbres Observatory Global Telescope Network, GSP Collaboration

- Co-I, *A sample of infant supernovae*, > 60 nights, 2020A, 2020B, 2021B, 2022A, 2023B

Very Large Telescope, European Southern Observatory, FORS2

- Co-I, *(ToO) Exploring the Pre-explosion Configuration of Supernovae by Spectropolarimetry*, 16 hours, P106
- Co-I, *Imaging Polarimetry of Thermonuclear Supernovae as a Probe of their Circumstellar Matter*, P109

¹Global Supernova Project

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

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 ~ 850 students. Led weekly discussion sections for ~ 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 ~ 70 undergraduates.

Average evaluation rating: 6.3/7

Developed 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 ~ 40 high school students

High-school Physics & Math teacher (Kolkata, India) October 2013 – April 2014

International Baccalaureate Diploma Program, Oaktree International School Kolkata

Taught ~ 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

Supervised Undergraduate Student Projects

The Search for Evidence of Tidal Orbital Decay in Hot Jupiters June 2022 – present

Students: **Efrain Alvarado III**, Kate Bostow, UC Berkeley

Paper: Alvarado, Bostow, Patra et al. (2023), in prep.

Orbital evolution of the white dwarf-hot Jupiter system WD 1856+534 June 2022 – present

Students: **Kate Bostow**, Eli Gendreau-Distler, UC Berkeley

Astronomy Honors Thesis: Statistical analysis of Si II line velocities of SNe Ia Aug 2022 – present

Student: **Edgar Vidal**, UC Berkeley

Paper: Vidal, Patra et al., in prep.

Modeling infrared dust echoes from tidal disruption events May 2022 – present
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 – present
Student: **Sophia Risin**, UC Berkeley undergraduate
Paper: Risin, Jacobus, ..., Patra et al., (2023) in prep.

Skills

Astronomy techniques: Spectropolarimetry, imaging polarimetry, photometry, spectroscopy, big data management, numerical computation
Programming: Python, L^AT_EX, MATLAB, Mathematica, SQL
Software: SAOImage DS9, Cloudy, KastShiv, IRAF, AstroImageJ
High performance computing: National Energy Research Scientific Computing Center (NERSC), UC Berkeley Savio Supercluster
Languages (highest proficiency first): English, Hindi, Punjabi, Telugu, Oriya, Spanish, Korean

Selected Talks

Scientific

- *Constraints on narrow-line region of the QPE GSN 069*, UC Berkeley Lunch Talks Aug 2023
- *Optical emission from tidal disruption events*, UC Berkeley Compass Lecture Oct 2022
- *Spectropolarimetry of the TDE AT2019qiz*, 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 CIPS² Talk Sep 2019
- *The search for orbital decay of hot Jupiters*, UC Berkeley GSPS³ Apr 2019
- *The apparently decaying orbit of WASP-12b*, UMass Lowell, BAESM⁴ May 2018
- *The dynamical state of brightest cluster galaxies*, Lowell Observatory, Flagstaff AZ Jan 2018

General Audience

- *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

²Center for Integrative Planetary Science

³Graduate Student & Postdoc Seminar

⁴Boston Area Exoplanet Science Meeting

Selected Service & Outreach

- Research mentor for Cal-NERDS⁵ Program for under-represented STEM students 2022 – present
- 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 (undergraduate research journal) 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 AT2019qiz: (Patra et al. 2022)
-UC Berkeley News, Science Daily, The Debrief, Universe Today, Space.com

Refereed Publications

Submitted

4. Vasylyev, S., Yang, Y., Filippenko, A., **Patra, K.**, Brink, T., et al., 2023, *Early-time Spectropolarimetry of the Asymmetric Type II Supernova SN 2023ixf*, submitted, arXiv: 2307.01268, [PDF](#)
3. 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*, submitted, arXiv: 2304.06147, [PDF](#)
2. Vasylyev, S., Yang, Y., **Patra, K.**, Filippenko, A., Baade, D., et al., 2023, *Spectropolarimetry of the type IIP supernova 2021yja: an unusually high continuum polarization during the photospheric phase*, submitted, arXiv: 2303.06497, [PDF](#)
1. Irani, I., Chen, P., Morag, J., Schulze, S., Gal-Yam, A., et al. (**Patra, K.**), 2022, *SN 2022oqm – a Ca-rich explosion of a compact progenitor embedded in C/O circumstellar material*, submitted, arXiv: 2210.02554, [PDF](#)

Significant Contribution

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. **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](#)
5. **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](#)
4. **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](#)
3. Yee, S., Winn, J., Knutson, H., **Patra, K.**, Vissapragada, S., et al., 2020, *The Orbit of WASP-12b Is Decaying*, ApJL, 888, 1, [PDF](#)

⁵New Experiences for Research and Diversity in Science

2. 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](#)
1. **Patra, K.**, Winn, J., Holman, M., Yu, L., Deming, D., et al., 2017, *The Apparently Decaying Orbit of WASP-12b*, AJ, 154, 1, [PDF](#)

Other Collaborations

9. 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](#)
8. Hoefflich, 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](#)
7. 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](#)
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 Propriis, 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](#)