BHAGYA M. SUBRAYAN

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Citizenship : Indian

RESEARCH INTERESTS

- Multi-wavelength observations of astrophysical transients in time-domain astronomy
- Electromagnetic counterparts of gravitational wave (GW) events
- Maximizing scientific return from all-sky surveys with state-of-the-art technologies
- Dust reservoirs and mass-loss mechanisms in massive stars
- Early photometric and spectroscopic observations of young transients

CURRENT POSITION

Postdoctoral Research Associate **Sept. 2024 – Present**
Steward Observatory, University of Arizona, Tucson, AZ , USA
Advisor: Prof. David J. Sand

EDUCATION

Ph. D. Physics and Astronomy **Aug. 2018 – 2024**
Purdue University, West Lafayette, Indiana, USA
Thesis Title: Constraining Explosion Physics and Progenitors of Transients via Statistical Inferencing of All Sky Survey Data Streams **Advisor**: Prof. Danny Milisavljevic

M. S. Physics, Major in Physics and Minor in Chemistry **Aug. 2013 – May 2018**
Indian Institute of Science Education and Research (IISER), India
Integrated B. S - M. S Program, CGPA: 8.59 / 10

HONORS AND AWARDS

- George W. Tautfest Award for Outstanding Graduate Student in High Energy, Nuclear or Astrophysics, Purdue — April 2024
- Karl Lark-Horvitz Award for Outstanding Research Accomplishments, Purdue — April 2024
- Charlotte Ida Litman Tubis Award for Excellence in Scientific Communication, Purdue — April 2024
- Lijuan Wang Memorial Award, Physics and Astronomy, Purdue — April 2021, April 2023
- Women in Science Program (WISP) Travel Grant, Purdue — Fall 2022
- Summer Research Grant, Physics and Astronomy, Purdue — July 2020 – August 2020

TIME-DOMAIN ASTRONOMY COLLABORATIONS

- Distance less than 40 Mpc (DLT40)
- SHADOW (DECam Shadowing of LSST to Discover the Youngest Transients in the Nearby Universe)
- The Public AEON Spectroscopic Survey for Transient Astronomy (PASSTA)
- Arizona Transient Exploration and Characterization (AZTEC)
- LSST Discovery Alliance Transient and Variable Stars Science (TVS), TVS-LVK Coordination
- Searches After Gravitational waves Using Arizona Observatories (SAGUARO)
- Tool for Rapid Object Vetting and Examination (TROVE)
- University of Arizona new 90" instrument on Bok Telescope (Instrumentation and Commissioning)
- ULTRASAT Collaboration
- Global Supernova Project (GSP)
- Recommender Engine For Intelligent Transient Tracking (REFITT)

TECHNICAL EXPERIENCE

Technical Expertise: Reduction pipeline development (Imaging/Spectroscopy), Statistical Data Analysis, Machine Learning, High Performance Computing, Integrated Field Unit, Optical Image Processing, Optical Spectroscopy, Data Mining and Wrangling, Python, C , C++, SQL, HTML, IDL

Software: JWST Reduction Pipelines, Django-DB, spacephot, JHAT, PyRAF, IRAF, ds9, LaTeX, TensorFlow, PyTorch, ccdproc, scikit-learn, GitHub, emcee, dynesty, Astropy, MOSFiT, SuperBol, Jupyter Lab, Matplotlib, Seaborn, Microsoft Applications

PUBLICATIONS

Authored 31 publications (398 citations), including 3 first-author papers (60 citations), 2 (*in prep)*

First-author:

5. **Subrayan, B.**, Sand, D., Culbert, O., 2026. A JWST/MIRI Study of Dust in a Sample of Normal Core Collapse Supernovae (*in prep*)
4. **Subrayan, B.**, Milisavljevic, D., Garretson, B. et al 2026. Insights from Late Time and HST Observations of the Extreme Nuclear Transient AT2021lwx (*in prep*)
3. **Subrayan, B.**, Sand, D., Bostroem, K. A., et al. 2025. Early Shock Cooling Observations and Progenitor Constraints of Type IIb Supernova SN 2024uwq, ApJL, 990, L68
2. **Subrayan, B.**, Milisavljevic, D., Chornock, R., et al., 2023. Scary Barbie: An Extremely Energetic, Long-duration Tidal Disruption Event Candidate without a Detected Host Galaxy at z = 0.995, ApJL, 914, L9
1. **Subrayan, B.**, Milisavljevic, D., Moriya, T. J., et al. 2023. Inferencing Progenitor and Explosion Properties of Evolving Core-collapse Supernovae from Zwicky Transient Facility Light Curves, ApJ, 945, 4

Major Contributions as Co-author:

5. Ransome, C., **Subrayan, B.**, Sand, D. J., 2026. First Results from the LSST Shadow Survey: The Restless Luminous Blue Variable AT2017des in the Virgo-Cluster Galaxy, NGC4532, arXiv:2606.23784
4. Vieira, N., Franz, N., **Subrayan, B.** et al. 2026. Search For a Counterpart to the Subsolar Mass Gravitational Wave Candidate S251112cm, arXiv:2603.17009
3. Franz, N., **Subrayan, B.**, Kilpatrick, C. D., et al. 2025. Optimizing Kilonova Searches: A Case Study of the Type IIb SN 2025ulz in the Localization Volume of the Low-significance Gravitational Wave Event S250818k, ApJL, 994, L45
2. Pearson, J., **Subrayan, B.**, Sand, D., et al. 2025. Mid-infrared Dust Evolution and Late-time Circumstellar Medium Interaction in SN 2017eaw, ApJ, 993, 213
1. Moriya, T. J., **Subrayan, B.**, Milisavljevic, D., Blinnikov, S., I. 2023. Synthetic red supergiant explosion model grid for systematic characterization of Type II supernovae, PASJ, psad024

16 additional contributions as co-author. 80 Transient Name Server (TNS) reports, Astronotes, and circulars in total.

TELESCOPE PROPOSALS AND SUPPORT GRANTS

James Webb Space Telescope (JWST) - 20.8 hours over 3 programs

- *Resolving the Host Galaxy of AT 2021lwx with JWST: Testing SMBH Host Galaxy Scaling Relations with an Extreme Nuclear Transient (ENT)*: GO-11424 , 7.6 hours, $**114,455**, Cycle 5 (**PI**)
- *Watching Dust Formation in Real Time in Two Very Nearby Core Collapse Supernovae*: GO-7881/GO-12572, 10.3 hours, Cycle 4 / Cycle 5 (**CoI**)

- *NIR+MIR Spectroscopy of the Nearby Broad Line Type Ic SN 2024abup: r-process, Dust and Explosion Physics*: DD-06803, 2.9 hours, Cycle 3 (**CoI**)

Hubble Space Telescope (HST) - 3 orbits

- *HST Observations of the Most Energetic and Luminous Optical Transient AT 2021lwx aka Scary Barbie*: GO-17748, 3 orbits, $**53,283**, Cycle 32 (**PI**)

W. M. Keck Observatory - 5 nights over 3 programs

- *Search for Late-Time Signatures of Circumstellar Medium Interaction and Dust Formation in Normal Core-Collapse Supernovae with Keck*, 0.5 night, 2026B-N172 through NASA/Keck time, $ **13,365** (**PI**)
- (**CoI**) to 2024B-N017 through NASA/Keck, 2026B-U289 through UCDavis (DLT40 Collaboration)

Gemini Observatory - >200 hours across all programs

- *Search for Late-Time Signatures of Circumstellar Medium Interaction and Dust Formation in Normal Core-Collapse Supernovae with Gemini*, 8.25 hours, 2026A (**PI**)
- **CoI** on 22 competitive Gemini observing programs (2023–2026), including large, queue, fast-turnaround, and Director's Discretionary programs on time-domain astrophysics.

Magellan Telescopes - 4 nights

- *Follow-up of Electromagnetic Counterparts to Gravitational Wave Events in O4-IR1* (**PI**) through Steward/University of Arizona, 2026B, 2 nights
- *Follow-up of Electromagnetic Counterparts to Gravitational Wave Events in O4* (**PI**) through Steward/University of Arizona, 2025B, 2 nights

MMT Observatory - >10 nights across all programs

- *Follow-up of Electromagnetic Counterparts to Gravitational Wave Events in O4-IR1* (**PI**) through Steward/University of Arizona, 2026B, 2 nights
- *Follow-up of Electromagnetic Counterparts to Gravitational Wave Events in O4* (**PI**) through Steward/University of Arizona, 2025B, 2 nights
- (**CoI**) to 17 competitive observing programs from 2025-2026 through AZTEC collaboration, time awarded through Steward/University of Arizona

Bok Telescope - 15 nights through Steward/University of Arizona

- *Chasing Young Supernovae: A Bok/90prime + ZTF Pilot to Pre- pare for LSST's Early Transient Science*, (**PI**), 2025B, 6 nights
- *Bok Telescope Pre-Surveys for ULTRASAT: Laying the Ground- work for UV Transient Science*, (**PI**), 2025A, 9 nights

Cerro Tololo Inter-American Observatory (CTIO/DECam) - 77.1 nights

- *DECam Shadowing of LSST to Discover the Youngest Transients in the Nearby Universe*, (**CoI**) - (2025B-2028A), 77.1 nights

Southern Astrophysical Research Telescope (SOAR) - > 60 nights

- *DECam Shadowing of LSST to Discover the Youngest Transients in the Nearby Universe*, (**CoI**) - (2025B-2028A), 3.7 nights
- *The Public AEON Spectroscopic Survey for Transient Astronomy (PASSTA)*, (**CoI**) - (2025B-2028A), 60 nights
- *Spectroscopic Follow-up of Faint Transients from the ZTF Public Survey using REFITT*, (**CoI**), 2021B, 40 hours

Las Cumbres Observatory (LCO) - > 100 nights

- *Testing Science-driven Prioritization of Transients with LCO for Large-Scale Surveys*, (**PI**), 2021A, 5 hours
- (**CoI**) to LCO Key Project through GSP collaboration from 2025-2026, and 2 DDT programs through REFITT collaboration

CONFERENCE/ MEETING TALKS

· ASU Spring 2026 Workshop on MMA, ASU (***Invited***) May 2026
· RAPID: Hot-wiring Conference, Caltech (***Awarded Travel Support***) March 2026
· MMA in the Dynamic Universe, Kyoto University (***Awarded Travel Support***) February 2026
· 247 American Astronomical Society (AAS) Winter Meeting Phoenix, January 2026
· Talk to Steward Observatory stakeholders, UoA (***Invited***) November 2025
· Transients from Space, STScI Baltimore, March 2025
· Rise_Time Conference, Purdue University Indiana, August 2024
· Rare Gems in Big Data Conference, NOIRLab Arizona, May 2024
· Observational Astronomy Meetings, CIERA, Northwestern University Illinois, January 2024
· 243 American Astronomical Society (AAS) Winter Meeting New Orleans, January 2024
· The High-Energy Astrophysics Department (HEAD) Frontier Seminar Series Online, December 2023
· Transient Science @ Space Telescope (TSST) Talk, STScI Maryland, November 2023
· AstroCoffee @ John Hopkins University Maryland, November 2023
· Transient Group Meeting, Harvard CfA MA, November 2023
· Monday Afternoon Talk (MAT), MIT Kavli Institute MA, November 2023
· BigBoom Talk Series, University of Arizona Online, October 2023
· BOOM! An LSST Workshop Illinois, July 2022
· Spoken-WERRD Symposium Online, November 2021

TEACHING AND MENTORING

· Pima Spring School Guest Lecturer, Pima School, AZ Spring 2025
· Guest Lecture: AST 567 - Observational Techniques in Astronomy, Purdue, IN Fall 2023
· Guest Lecture: AST 364 - Stars and Galaxies, Purdue, IN Spring 2023

· Olivia Culbert (UG), University of Arizona 2024-2026
Project: Dust in Normal Core-collapse Supernovae (Incoming Master's Student at San Diego State University) - Finalist at Chambliss Competition at 247 AAS Meeting, Phoenix, AZ, 2026
· Danielle Dickinson (G), Purdue University 2021 - 2024
Project: Analyzing JWST MIR IFU Cubes of Supernova Remnant Cassiopeia A.
· Braden Garretson (UG), Purdue University 2020 - 2024
Project: Machine Learning Frameworks for Rapid Inference of Light Curves from All-Sky Surveys.

· Moira Andrews (UG) (current graduate student at University of California, Santa Barbara) 2022
Provided guidance to revise application materials for graduate school.

Leadership, Academic Service and Outreach

Leadership

· **Women in Science Program (WISP), College of Science, Purdue University** Summer 2020–2023
  - Designed and organized a monthly seminar series featuring invited speakers on professional development and scientific topics. Supported women and non-binary STEM graduate students through community-building and career development initiatives.

· **Spoken-WERDD Symposium Scientific Organizing Committee (SOC)** 2022
  - Served on the Scientific Organizing Committee. Coordinated abstract collection, talk scheduling, and development of the symposium code of conduct.

Academic Service

· **Journal Referee** 2024-2026
  - Referee for *Nature Astronomy*, *Monthly Notices of the Royal Astronomical Society (MNRAS)*, and *Astronomy & Astrophysics (A&A)*.

· **Proposal Reviewer**
  - Panel reviewer for *HST* (Cycles 33–34), *JWST* Director's Discretionary Time (DDT), NASA FINNEST 2025, and NASA ROSES 2024 proposal programs.

Outreach and Community Engagement

· **National Public Radio (NPR) 1A Show – Guest Speaker** 2023
  - Invited to discuss the discovery and scientific significance of AT 2021lwx ("Scary Barbie") for a broad public audience.

Selected Media

· Why does a leap year have 366 days?, 2024, Curious Kids, The Conversation
· Scientific Method: When a supermassive black hole devours a star, 2023, NPR 1A Podcast
· Astronomers detect "Scary Barbie" supermassive black hole ripping apart huge star in "terrifying" spaghettification event, 2023, CBS
· 'Terrifying': Why the universe's largest cosmic explosion is called 'Scary Barbie', 2023, USA Today
· Uncovering a star's demise: Supermassive black hole tears apart a giant star in a display brighter, more energetic and longer lasting than any observed before, 2023, Purdue News
· Master of Ceremony - First Light: A Discussion of the first images returned from the JWST, 2022, YouTube
· Master of Ceremony - JWST Launch Party, 2021, YouTube
· Saturday Morning Astrophysics Outreach, 2021, YouTube
· Stellarium Lesson Intro, 2021, YouTube

References

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