Abigail Polin, PhD

Purdue University
Physics & Astronomy
525 Northwestern Ave #255
West Lafayette, IN, 47905

abigail@purdue.edu
abigailpolin.com

As a theoretical astrophysicist I employ a combination of analytic, numerical and high-performance computing techniques to study the physics driving astrophysical explosions and I specialize in connecting that theory to observed transient phenomena.

Education

Ph.D. in Physics May 2020
University of California, Berkeley
Advisors: Peter Nugent & Daniel Kasen
Thesis: *Pushing the Helium Envelope: Signatures of Normal and Unusual Supernovae from Sub-Chandrasekhar Mass White Dwarf Explosions*

M.S. in Physics May 2015
University of California, Berkeley

B.S. in Physics December 2012
New York University

Appointments

Assistant Professor 2024-Present
Purdue University
Department of Physics and Astronomy

Joint Postdoctoral Research Fellow 2020-2024
Carnegie Fellowship, Carnegie Observatories
Burke Fellowship in Theoretical Physics, Caltech

NSF Graduate Research Fellow 2015-2020
University of California, Berkeley

Fellowships & Awards

Scialog Fellow: Early Science with the LSST 2024
NERSC Early Career Award: High Impact Scientific Achievement 2021
Burke Fellowship in Theoretical Physics, Caltech 2020-2024
Carnegie Fellowship, Carnegie Observatories 2020-2024

– GRAD –

NSF Graduate Research Fellowship 2015-2020
Wonderfest Science Envoy 2019-2020
Berkeley Connect Fellowship 2014-2016
Outstanding Graduate Student Instructor Award, UC Berkeley 2014

Grant Funding

Royal Society International Exchange Grant 2022
Co-PIed with Chris Frohmier, PhD – University of Southampton
"Helium-shell white dwarf explosions leading to unusual transient phenomena"
Awarded £5,707.37

Computing Grants (PI-ed)

National Energy Research Scientific Computing Center (NERSC):

ERCAP 2022:
Perlmutter GPUs ..... 15,000 node-hours
Cori KNL CPUs ..... 1,156,000 core-hours

NERSC Early Career Award 2021: Early Access to the Perlmutter GPU Supercomputer

NSF Extreme Science and Engineering Discovery Environment (XSEDE):

XRAC 2021: Stampede2 CPUs ..... 3,060,000 core-hours
Startup Allocation: Stampede2 CPUs ..... 108,800 core-hours

DOE INCITE Leadership Computing Award 2023-2025 (co-PI):

Oak Ridge National Laboratory, Summit GPUs ..... 400,000 node-hours
Oak Ridge National Laboratory, Frontier CPUs ..... 300,000 node-hours
Argonne National Laboratory, Polaris GPUs ..... 100,000 node-hours

Awarded Telescope Time (PI-ed)

Gemini Observatory – Gemini/Subaru Exchange:

Subaru telescope
— FOCUS Spectrograph ..... 0.5 hours ToO (2025A)

W. M. Keck Observatory:

Keck II: 10m telescope
— KCWI Integral Field Spectrographs ..... 4 half nights (2024B)

Las Campanas Observatory:

Magellan: Baade 6.5m telescope
— IMACS Optical & FIRE NIR Spectrographs ..... 28 nights (2022A-2024B)

Magellan: Clay 6.5m telescope
— LDSS3 Optical Spectrograph ..... 2 nights (2021B)

Invited Talks & Conference Proceedings:

COLLOQUIA	University of Minnesota, Institute for Astrophysics Colloquium	Feb 2025
	Indiana University, Department of Astronomy Colloquium	Jan 2025
	University of Chicago Astronomy Colloquium	Nov 2024
	Purdue University Physics & Astronomy Colloquium	Oct 2024
	Carnegie Observatories Astronomy Colloquium	May 2024
	University of Virginia & NRAO Joint Colloquium	May 2024
	University of Hawai'i Institute for Astronomy Colloquium	Feb 2023
	University of Delaware, Physics and Astronomy Colloquium	Oct 2022
	Haverford College, Physics and Astronomy Colloquium	Sept 2019
SEMINARS	Institute for Advanced Study Astrophysics Seminar	Apr 2024
	Michigan State University Astronomy Seminar	Nov 2023
	Lawrence Berkeley National Lab, NERSC Awards Seminar Series	Nov 2021
	UC Davis, Physics & Astronomy Seminar	Apr 2021
	Purdue University, Astronomy Seminar	Feb 2021
	Florida State University, Astronomy Seminar	Nov 2020
	Stony Brook University, Astronomy Seminar	Oct 2020
	Harvard University, Galaxy and Cosmology Seminar	Dec 2019
	Northwestern University, Observational Astronomy Seminar	Nov 2019
	UC Santa Barbara, Astronomy Lunch Talk	Nov 2019
	UC Santa Cruz, Astronomy FLASH Talk	Oct 2019
	Caltech, Astronomy Tea Talk	Oct 2019
	Carnegie Observatories, Lunch Talk	Oct 2019
	New York University, CCPP Astrophysics Seminar	May 2017
	University of Wisconsin, Milwaukee, Astronomy Seminar	Mar 2013
INVITED	Stars With Lars: Bildsten's 60th Conference	Feb 2024
	SNEX: Supernova Explosions Conference - Technion	Aug 2023
	SuperVirtual 2022 - From Common to Exotic Transients	Nov 2022
	Chandra Workshop: Supernova Remnants and Their Progenitors	Aug 2022
	NBIA Workshop Radiation Transfer in Astrophysics, Niels Bohr Institute	June 2022
	Texas A&M, Cook's Branch Supernova Workshop	Mar 2019
	UC Santa Cruz, Pre-Filippenkopalooza Supernovae Meeting	Aug 2018
	KITP, UC Santa Barbara, ZTF Theory Network Summer Meeting	Aug 2018
	Weizmann Institute of Science, Particle Physics and Astrophysics Workshop	Dec 2017
CONTRIBUTED	Transients Down Under, Melbourne, Australia	Feb 2024
	Cosmic Streams in the Era of Rubin, Puerto Varas, Chile	Dec 2023
	KITP White Dwarfs Conference, Santa Barbara, CA	Nov 2022
	NASA TDAMM Workshop, Anapolis, MD	Aug 2022
	AAS Dissertation Talk, Winter Meeting, Honolulu, HI	Jan 2020
	Midwest Workshop on Supernovae and Transients, Ohio State	Sept 2019
	The Beginnings and Ends of Double White Dwarfs, DARK, Copenhagen	July 2019
	UC Berkeley, Theoretical Astrophysics Seminar	Jan 2018
	Supernovae: The LSST Revolution Workshop, Northwestern	May 2017
	APS March Meeting, Houston TX	Mar 2011

Mentorship: Advising Student Research

* denotes students for whom A. Polin was the primary advisor

Graduate Students

Tess Hoover* (Purdue, Current Grad Student)
Miranda Pikus* (Purdue, Current Grad Student)
Soham Mandal (Purdue Grad Student now UVA Postdoc)
Peter Scherbak (Caltech, Current Grad Student)
Margot Fitz Axen (UT Austin, DOE CSGF Fellow)

Undergraduate Students

Roy Galazka* (Current Purdue Undergraduate)
Akshith Karri* (Current Purdue Undergraduate)
Owen Odney* (Current Purdue Undergraduate)
Desiree Harvell* (CASSI Summer Student: California State University, San Bernardino)
Siddharth Boyeneni* (Caltech SURF: Caltech)
Hayden Campos* (CASSI Summer Student: Dartmouth)
Wynn Jacobson-Galán (UCSC, now Caltech Postdoc)

Teaching Experience

Outstanding Graduate Student Instructor Award (UC Berkeley) 2014

Professor of Record (Purdue University)

Physics 560: Stellar Evolution — Spring 2025
Physics 567: Observational Astronomy — Fall 2024

Adjunct Instructor (UC Berkeley)

Astro 9: Introduction to Scientific Computing — Summer 2020
Sole Instructor: in charge of syllabus, course design and instruction

Head Graduate Student Instructor (UC Berkeley)

Physics 7A: Introductory Mechanics — Spring 2014

Graduate Student Instructor (UC Berkeley)

Astro C10: Introduction to General Astronomy — Fall 2019
Astro 7A: Introduction to Astrophysics — Fall 2017
Astro 250: Introduction to High Performance Computing — Spring 2017
Physics 7A: Introductory Mechanics — Fall 2013

Adjunct Instructor (New York University)

Observational Astronomy — Spring 2013

UC Berkeley Teaching Conference

Developer and instructor of a mandatory workshop for first time graduate student instructors — Fall 2014

Coursework in Teaching Development (UC Berkeley)

Physics 198: Progressive Physics Education — Spring 2015
Physics 198: Physics Pedagogy Seminar — Spring 2014
Physics 375: Professional Preparation in Teaching Physics — Fall 2013

Leadership, Outreach & Service

Public & Outreach Talks

The Astrophysics Podcast – Guest host — Jan 2025
Astronomy on Tap, Cradle of Astronauts, Lafayette IN — Dec 2024
The Astrophysics Podcast — Jan 2024
Carnegie Astronomy Lecture Series, Huntington Library, Pasadena CA — May 2023
AAS Journal Author Series — Jan 2023
Astronomy on Tap, Pasadena CA — Oct 2022
Radio Interview: Women in STEM w/ KPOO-FM — Mar 2020
Wonderfest Science Envoy Speaks at the Verdi Club, San Francisco, CA — Feb 2020
Berkeley Art Museum and Pacific Film Archive, Berkeley, CA — Nov 2018

Leadership & Service Positions

Faculty Advisor to Undergraduate Gender Minorities in Physics — 2024-present
Purdue University

Faculty organizer, panelist, and Member of the LOC — Jan 2025
APS Conference for Undergraduate Gender Minorities in Physics (CU*iP)
Purdue University, West Lafayette, IN

Conference Scientific Organizing Committee:

Rise Time: Explosive Astrophysics in the Era of High-Cadence Astronomy — Aug 2024
Purdue University, West Lafayette, IN

SNEX: Supernova Explosions Conference — Aug 2023
Technion, Haifa, Israel

Instructor: Physics Inside Out, Purdue University — 2024
A program designed work with local 7th and 8th grade students
to get them excited about STEM.

Carnegie Postdoc Representative — 2021-2023

Caltech TAPIR Seminar Organizer — 2021-2023

CASSI Science Mentor — 2021-2022
CASSI is a 10 week internship and educational program at Carnegie designed to improve undergraduate students' fluency with research and communication.

Wonderfest Science Envoy — 2019-2020
A program funded by the Gordon and Betty Moore Foundation that identifies PhD students who show particular science-popularization promise. The program helps us to develop the subtle art and science of public outreach.

UC Berkeley Society for Women in the Physical Sciences:

Astronomy Coordinator Fall 2015 - Spring 2019
Mentoring Coordinator Fall 2014 - Spring 2016
Individually in charge of running our multi-tiered mentorship program which included over 200 students, postdocs and faculty members in Physics, Astronomy, Earth and Planetary Sciences and Biophysics at UC Berkeley.

Berkeley Connect Fellow Fall 2014 - Spring 2017
Berkeley Connect is a teaching and mentorship program intended to strengthen the relationship between undergraduate students and the Physics Department. As a Fellow, I contributed to curriculum design, led class meetings, and mentored students.

Respect is Part of Research: Founding Member and Peer Facilitator 2014 - 2016
RPR is a graduate student group that runs annual peer-led sexual assault and sexual harassment prevention workshops for incoming first-year graduate students. RPR's primary mission is to create a respectful, positive working environment where everyone can do their best science.

Compass Program Organizer/Instructor/Research Mentor Summer 2014
The Berkeley Compass Project is a Physics graduate student-run organization that aims to improve the experiences of undergraduate students from under-represented groups interested in STEM.

Anonymous Peer Reviewer for: Nature Astronomy, ApJ, ApJL & MNRAS

Publications [ADS Link]

Summary: 37 journal articles, 3 as first author, 7 identifying supernovae belonging to a newly discovered class of transients, which matched our modeled theoretical predictions.

1. *Using Anisotropies as a Forensic Tool for Decoding Supernova Remnants*
Polin, A., P. Duffell, and D. Milisavljevic
The Astrophysical Journal Letters, 940, L28, (2022).

2. *Nebular Models of Sub-Chandrasekhar Mass Type Ia Supernovae: Clues to the Origin of Ca-rich Transients*
Polin, A., P. Nugent, and D. Kasen
The Astrophysical Journal, 906, 65 (2021).

3. *Observational Predictions for Sub-Chandrasekhar Mass Explosions: Further Evidence for Multiple Progenitor Systems for Type Ia Supernovae*
Polin, A., P. Nugent, and D. Kasen
The Astrophysical Journal, 873, 84 (2019).

4. *SN 2023xwi: Forbidden line emission in the peak spectrum of a Ca-strong transient*
Touchard-Paxton, C.G., C.Frohmaier, M. Pursiainen, M. Sullivan, **A.Polin** and 4 colleagues.
Monthly Notices of the Royal Astronomical Society, *accepted and in press* (2025).

5. *Near-infrared spectroscopy of the LMC recurrent nova LMCN 1968-12a*
Evans, A., Banerjee, D. P. K., Geballe, T. R., **Polin, A**., and 4 colleagues
Monthly Notices of the Royal Astronomical Society, 536, 2 (2025).

6. *Expansion Properties of the Young Supernova Type Iax Remnant Pa 30 Revealed*
   Cunningham, T. and 16 colleagues including **A. Polin**
   The Astrophysical Journal Letters, 975, 1 (2024).

7. *Characterizing the Rapid Hydrogen Disappearance in SN 2022crv: Evidence of a Continuum between Type Ib and IIb Supernova Properties*
   Dong, Y., and 54 colleagues including **A. Polin**
   The Astrophysical Journal, 974, 2, (2024).

8. *Measurement of Anisotropies in Supernova Remnant Observations and Their Interpretation Using Numerical Models* Mandal, S., P. Duffell. **A. Polin** and D. Milisavljevic.
   The Astrophysical Journal, 972, 1, (2024).

9. *1991T-like Supernovae*
   Phillips, M. and 25 colleagues including **A. Polin**
   The Astrophysical Journal Supplement Series, 273, 1 (2024).

10. *Discovery and follow-up of ASASSN-23bd (AT 2023clx): the lowest redshift and luminosity optically selected tidal disruption event*
    Hoogendam, W. B. and 25 colleagues including **A. Polin**
    Monthly Notices of the Royal Astronomical Society, 530, 4 (2024).

11. *Sensitivity of Simulations of Double Detonation Type Ia Supernova to Integration Methodology*
    Zingale, M., Z. Chen, M. Rasmussen, **A. Polin**, M. Katz, A. Smith Clark, and E. Johnson.
    The Astrophysical Journal, 966, 2 (2024).

12. *Ground-based and JWST Observations of SN 2022pul: II. Evidence from Nebular Spectroscopy for a Violent Merger in a Peculiar Type-Ia Supernova*
    Kwok, L., and 80 colleagues including **A. Polin**.
    The Astrophysical Journal, 966, 1 (2024).

13. *Ground-based and JWST Observations of SN 2022pul: I. Unusual Signatures of Carbon, Oxygen, and Circumstellar Interaction in a Peculiar Type Ia Supernova*
    Siebert, M. and 81 colleagues including **A. Polin**.
    The Astrophysical Journal, 960, 1, (2024).

14. *Flight of the Bumblebee: the Early Excess Flux of Type Ia Supernova 2023bee revealed by TESS, Swift and Young Supernova Experiment Observations*
    Wang, Q. and 43 colleagues including **A. Polin**.
    The Astrophysical Journal, 962, 1 (2024).

15. *Strong Carbon Features and a Red Early Color in the Underluminous Type Ia SN 2022xkq*
    Pearson J., and 87 colleagues including **A. Polin**.
    The Astrophysical Journal, 960, 1 (2024).

16. *Extreme Nuclear Transients Resulting from the Tidal Disruption of Intermediate Mass Stars*
    Hinkle, J., B. Shappee, K. Auchettl, C. Kochanek, J. Neustadt, **A. Polin** and 9 colleagues.
    arXiv:2405.08855. *submitted to* Science Advances (2024).

17. *The Host Galaxies of High Velocity Type Ia Supernovae*
    Nugent, A., **A. Polin**, and P. Nugent.
    arXiv:2304.10601 (2024).

18. *Sculpting the Morphology of Supernova Remnant Pa 30 via Efficient Ejecta Cooling*
Duffell, P., **A. Polin**, and S. Mandal
arXiv:2403.13641. (2024).

19. *Probing the Low-mass End of Core-collapse Supernovae Using a Sample of Strongly-stripped Calcium-rich Type IIb Supernovae from the Zwicky Transient Facility*.
Das, K. and 28 colleagues including **A. Polin**.
The Astrophysical Journal, 959, 1, (2023).

20. *A 3D Numerical Study of Anisotropies in Supernova Remnants*
Mandal, S., P. Duffell. **A. Polin** and D. Milisavljevic.
The Astrophysical Journal, 956, 2, (2023).

21. *SN 2021gno: a calcium-rich transient with double-peaked light curves*
Ertini, K. and 54 colleagues including **A. Polin**.
MNRAS, 526, 279, (2023).

22. *SN 2020jgb: A Peculiar Type Ia Supernova Triggered by a Massive Helium-Shell Detonation in a Star-Forming Galaxy*
Liu, C., A. Miller, **A. Polin**, and 25 colleagues.
The Astrophysical Journal, 946, 83, (2023).

23. *Fast and Not-so-Furious: Case Study of the Fast and Faint Type IIb SN 2021bxu*
Desai, D., and 38 colleagues including **A. Polin**.
MNRAS, 524, 767 (2023).

24. *SN 2021zny: an early flux excess combined with late-time oxygen emission suggests a double white dwarf merger event*
Dimitriadis, G., and 30 colleagues including **A. Polin**.
MNRAS, 521, 1. (2023).

25. *The origin and evolution of the normal Type Ia SN 2018aoz with infant-phase reddening and excess emission*
Qi Ni, Y., D. Moon, M. Drout, **A. Polin**, and 40 colleagues
The Astrophysical Journal, 946, 7 (2023).

26. *SN 2016dsg: A Thermonuclear Explosion Involving a Thick Helium Shell*
Dong, Y., S. Valenti, **A. Polin**, and 29 colleagues.
The Astrophysical Journal, 934, 2, (2022).

27. *The Absolute Magnitudes of 1991T-like Supernovae*
Phillips, M., and 22 colleagues including **A. Polin**.
The Astrophysical Journal, 938, 47, (2022).

28. *Physical Properties of the Host Galaxies of Ca-rich Transients*
Dong, Y., D. Milisavljevic, and 9 colleagues, including **A. Polin**
The Astrophysical Journal, 927, 2, (2022).

29. *Infant-phase Reddening by Surface Fe-peak Elements in a Normal Type Ia Supernova*
Qi Ni, Y., D. Moon, M. Drout, **A. Polin**, and 40 colleagues
Nature Astronomy, cover article February, (2022).

30. *The Zwicky Transient Facility Census of the Local Universe I: Systematic search for Calcium rich gap transients reveal three related spectroscopic sub-classes*
De, Kishalay, and 49 colleagues including **A. Polin**
The Astrophysical Journal, 905, 58 (2020).

31. *ZTF Early Observations of Type Ia Supernovae. III. Early-time Colors As a Test for Explosion Models and Multiple Populations*
Bulla, M. and 24 colleagues including **A. Polin**
The Astrophysical Journal, 902, 1, 48 (2020).

32. *Strong Calcium Emission Indicates that the Ultraviolet-flashing SN Ia 2019yvq Was the Result of a Sub-Chandrasekhar Mass Double-detonation Explosion*
Siebert, M. R.; G. Dimitriadis, **A. Polin**, and R. J. Foley
The Astrophysical Journal Letters, 900, 2, L27, (2020).

33. *The Spectacular Ultraviolet Flash from the Peculiar Type Ia Supernova 2019yvq*
Miller, A. A., M. R. Magee, **A. Polin**, and 42 colleagues
The Astrophysical Journal, 898, 1, 56 (2020).

34. *Ca hnk: The Calcium-rich Transient Supernova 2016hnk from a Helium Shell Detonation of a Sub-Chandrasekhar White Dwarf*
Jacobson-Galán, W., **A. Polin**, R. J. Foley, and 11 colleagues
The Astrophysical Journal, 896, 2, 165 (2020).

35. *ZTF 18aaqeasu (SN 2018byg): A Massive Helium-shell Double Detonation on a Sub-Chandrasekhar Mass White Dwarf*
De, K., M. Kasliwal, **A. Polin**, and 27 colleagues
The Astrophysical Journal Letters, 873, L18 (2019).

36. *K2 Observations of SN 2018oh Reveal a Two-Component Rising Light Curve for a Type Ia Supernova*
Dimitriadis G., R. J. Foley, A. Rest, D. Kasen, A. L. Piro, **A. Polin**, and 144 colleagues
The Astrophysical Journal Letters, 870L, 1D (2019).

37. *Gravitational Wave Hotspots: Ranking Potential Locations of Single-Source Gravitational Wave Emission*
Simon J., **A. Polin**, A. Lommen, B. Stappers, L.S. Finn, F. Jenet and B. Christy
The Astrophysical Journal, 784, 60 (2014).