Abigail Polin, PhD

Carnegie Observatories
813 Santa Barbara Street
Pasadena, CA 91101

abigail@caltech.edu
abigailpolin.com

I am a joint postdoctoral research fellow sharing a Burke fellowship in theoretical physics at Caltech and a Carnegie fellowship at Carnegie Observatories. 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

Research Appointments

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

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

Fellowships & Awards

NERSC Early Career Award: High Impact Scientific Achievement 2021
Burke Fellowship in Theoretical Physics, Caltech 2020-Present
Carnegie Fellowship, Carnegie Observatories 2020-Present

– 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

Publication Summary

(see end of CV for complete publication history)

19 journal articles: 7 identifying supernovae belonging to a newly discovered class of transients, which matched our modeled theoretical predictions

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 (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)

Las Campanas Observatory:

Magellan: Baade 6.5m telescope
— IMACS Optical & FIRE NIR Spectrographs ..... 4 nights (2023A)
..... 4 nights (2022B)
..... 4 nights (2022A)

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

Invited Talks & Conference Proceedings:

INVITED

SuperVirtual 2022 - From Common to Exotic Transients	Nov 2022
University of Delaware, Physics and Astronomy Colloquium	Oct 2022
Chandra Workshop: Supernova Remnants and Their Progenitors	Aug 2022
NBIA Workshop Radiation Transfer in Astrophysics, Niels Bohr Institute	June 2022
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
Haverford College, Physics and Astronomy Colloquium	Sept 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
New York University, CCPP Astrophysics Seminar	May 2017
University of Wisconsin, Milwaukee, Astronomy Seminar	Mar 2013

CONTRIBUTED

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, Baltimore, MD	Mar 2013
APS March Meeting, Houston TX	Mar 2011

Mentorship: Advising Student Research

Graduate Students

Peter Scherbak (Caltech)
Margot Fitz Axen (UT Austin, DOE CSGF Fellow)

Undergraduate Students

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 graduate student at UC Berkeley)

Teaching Experience

Outstanding Graduate Student Instructor Award (UC Berkeley) 2014

Adjunct Instructor (UC Berkeley)

Astro 9: Introduction to Scientific Computing Summer 2020
Sole Instructor: in charge of syllabus 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 Talks

Carnegie Astronomy Lecture Series, Huntington Library, Pasadena CA — May 2023
AAS Journal Author Series — Jan 2023
Astronomy on Tap, Pasadena CA — Oct 2022
Wonderfest Science Series, Virtual Talk — Jan 2021
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

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. The program's participants emerge as articulate Science Envoys.

UC Berkeley Society for Women in the Physical Sciences:
Astronomy Coordinator — Fall 2015 - Spring 2019
Mentoring Coordinator — Fall 2014 - Spring 2016

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 one-on-one.

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: ApJ, ApJL & MNRAS

Publications [ADS Link]

Summary: 19 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. E. 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. E. Nugent, and D. Kasen
   The Astrophysical Journal, 873, 84 (2019).

4. *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.
   arXiv:2209.04463. *accepted/in press* The Astrophysical Journal (2023).

5. *Fast and Not-so-Furious: Case Study of the Fast and Faint Type IIb SN 2021bxu*
   Desai, D., and 38 colleagues including **A. Polin**.
   arXiv:2303.13581. *submitted to* MNRAS. (2023).

6. *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).

7. *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).

8. *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
   arXiv:2206.12437, *submitted to* The Astrophysical Journal (2022).

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

10. *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).

11. *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).

12. *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).

13. *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).

14. *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).

15. *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).

16. *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).

17. *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).

18. *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).

19. *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).