

# Patrick Armstrong

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## EDUCATION

<b>Doctor of Philosophy (Astronomy &amp; Astrophysics)</b>	Australian National University <i>February 2020 – Present</i>
<b>Bachelor of Science (Adv.) (Hon.)</b>	Australian National University <i>February 2016 – October 2019</i>

## ACADEMIC EXPERIENCE

<b>DES Builder</b> <i>Develop &amp; maintain the Pippin pipeline, Internal review of DES papers, Organise &amp; host meetings.</i>	Dark Energy Survey <i>July 2023 – Present</i>
<b>MSATT Student Mentor</b> <i>Provide guidance and mentorship for highschool students completing astronomical projects.</i>	MSATT <i>February 2020 – Present</i>
<b>Astronomical Tutor</b> <i>Sole tutor for Galaxies and Cosmology (ASTR3002).</i>	Australian National University <i>July 2019 – October 2022</i>

## OTHER EXPERIENCE

<b>Student Seminar Planning Committee Member</b> <i>[2022]: Senior planning committee member, [2021]: Planning committee member</i>	Australian National University <i>February 2021 – October 2022</i>
<b>Mt. Stromlo Outreach Officer</b> <i>Deliver high quality outreach experience for school groups and families</i>	Australian National University <i>January 2018 – December 2022</i>
<b>Astronomical Consultant</b> <i>[2020] Research for Questacon's Australia in Space exhibition</i> <i>[2019] Research for Penguin Random House's Stargazer publication</i> <i>[2018] Research and preparation for ABC's Stargazing Live 2018</i> <i>[2018] Building backend code and moderation for the SkyMapper Citizen Science Project: Supernova Sighting</i>	
<b>Questacon Staff</b> <i>[2019 – 2020] Learning Programs Presenter (APS 4)</i> <i>[2016 – 2019] Questacon Assistant (APS 2)</i> <i>[2015 – 2019] Gallery Assistant (APS 1)</i>	Questacon

## RECOGNITION & DISTINCTIONS

<b>ANU 2.3m Observing Time</b> <i>The Ultimate Low-z Supernova Sample for Cosmology</i>	Siding Spring Observatory <i>2023</i>
<b>Alex Rodgers Travelling Scholarship</b> <i>Travel to DES Collaboration Meeting 2022</i>	ANU College of Science <i>2022</i>
<b>Commendation for Excellence in Tutoring or Demonstrating</b> <i>Tutoring Galaxies and Cosmology (ASTR3002)</i>	ANU College of Science <i>2022</i>
<b>NCI ANU Merit Allocation Scheme</b> <i>Forward Modelling Supernova Cosmology</i>	GADI <i>2021 – 2022</i>
<b>Australian Government Research Training Program</b> <i>PhD Scholarship</i>	Australian National University <i>2020 – Present</i>
<b>RSAA Supplementary Scholarship</b> <i>PhD Scholarship</i>	Australian National University <i>2020 – Present</i>
<b>ANU Science, Health, and Medicine Honours Scholarship</b> <i>Honours Scholarship</i>	Australian National University <i>2019</i>
<b>ANU Summer Research Scholarship</b> <i>Develop a TNS Bulk Report API for the SkyMapper Transient Survey</i>	Australian National University <i>2016</i>
<b>Boyapti Computer Science and Mathematics prize for first year</b> <i>Top grades in mathematics and computing</i>	Australian National University <i>2016</i>

## TECHNICAL SKILLS

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### Python 3

Numpy, Scipy, Pandas, Emcee, GetDist, Ultranest

*Covariance Matrix Calculator*, *Pippin Pipeline*, *Cosmology Validator*

### Julia

Makie, PyCall, Unitful, AffineInvariantMCMC

*Fit Supernovae Lightcurve*, *Approximate Supernovae Simulations*

### HTML, CSS, & Javascript

Django, Franklin

*DEBass Survey*, *Personal Website*

### Statistics

*MCMC, ABC, and other Bayesian Inference*, *Frequentist Inference*, *Data Analysis*, *Data Visualisation*

## PUBLICATIONS

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### FIRST AUTHOR

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**Probing the consistency of cosmological contours for supernova cosmology** (doi: [10.1017/pasa.2023.40](https://doi.org/10.1017/pasa.2023.40))

P. Armstrong, H. Qu, et. al. (2023); Publications of the Astronomical Society of Australia

**SN2017jgh: a high-cadence complete shock cooling light curve of a SN IIb with the Kepler telescope** (doi: [10.1093/mnras/stab2138](https://doi.org/10.1093/mnras/stab2138))

P. Armstrong, B E. Tucker, et. al. (2022); Monthly Notices of the Royal Astronomical Society

### CO-AUTHOR

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**The Dark Energy Survey Supernova Program: Cosmological Analysis and Systematic Uncertainties** (doi: [10.48550/arXiv.2401.02945](https://doi.org/10.48550/arXiv.2401.02945))

M. Vincenzi, D. Brout, ..., P. Armstrong, et. al. (2024); arXiv e-prints

**The Dark Energy Survey: Cosmology Results With 1500 New High-redshift Type Ia Supernovae Using The Full 5-year Dataset** (doi: [10.48550/arXiv.2401.02929](https://doi.org/10.48550/arXiv.2401.02929))

DES Collaboration, T. M. C. Abbott, ..., P. Armstrong, et. al. (2024); arXiv e-prints

**Binning is Sinning: Redemption for Hubble Diagram Using Photometrically Classified Type Ia Supernovae** (doi: [10.3847/2041-8213/ace34d](https://doi.org/10.3847/2041-8213/ace34d))

R. Kessler, M. Vincenzi, ..., P. Armstrong, et. al. (2023); The Astrophysical Journal Letters

**VizieR Online Data Catalog: SN 2018agk spectra and NIR-UV light curves (Wang+, 2021)** (bibcode: 2023yCat..19230167W)

Q. Wang, A. Rest, ..., P. Armstrong, et. al. (2024); VizieR Online Data Catalog

**Revealing the Progenitor of SN 2021zby through Analysis of the TESS Shock-cooling Light Curve** (doi: [10.3847/2041-8213/acb0d0](https://doi.org/10.3847/2041-8213/acb0d0))

Q. Wang, P. Armstrong, et. al. (2023); The Astrophysical Journal Letters

**Revealing Progenitor of SN 2021zby with Shock Cooling Light Curve from TESS** (bibcode: 2023AAS...24110716W)

Q. Wang, P. Armstrong, et. al. (2024); American Astronomical Society Meeting Abstracts

**Concerning colour: The effect of environment on type Ia supernova colour in the dark energy survey** (doi: [10.1093/mnras/stac3711](https://doi.org/10.1093/mnras/stac3711))

L. Kelsey, M. Sullivan, ..., P. Armstrong, et. al. (2023); Monthly Notices of the Royal Astronomical Society

**The Dark Energy Survey supernova program: cosmological biases from supernova photometric classification** (doi: [10.1093/mnras/stac1404](https://doi.org/10.1093/mnras/stac1404))

M. Vincenzi, M. Sullivan, ..., P. Armstrong, et. al. (2022); Monthly Notices of the Royal Astronomical Society

**Measuring Cosmological Parameters with Type Ia Supernovae in redMaGiC Galaxies** (doi: [10.3847/1538-4357/ac8b82](https://doi.org/10.3847/1538-4357/ac8b82))

R. Chen, D. Scolnic, ..., P. Armstrong, et. al. (2023); The Astrophysical Journal

**The Pantheon+ Analysis: Cosmological Constraints** (doi: [10.3847/1538-4357/ac8e04](https://doi.org/10.3847/1538-4357/ac8e04))

D. Brout, D. Scolnic, ..., P. Armstrong, et. al. (2023); The Astrophysical Journal

**The dark energy survey 5-yr photometrically identified type Ia supernovae** (doi: [10.1093/mnras/stac1691](https://doi.org/10.1093/mnras/stac1691))

A. Möller, M. Smith, ..., P. Armstrong, et. al. (2023); Monthly Notices of the Royal Astronomical Society

**SN 2018agk: A Prototypical Type Ia Supernova with a Smooth Power-law Rise in Kepler (K2)** (doi: [10.3847/1538-4357/ac2c84](https://doi.org/10.3847/1538-4357/ac2c84))

Q. Wang, A. Rest, ..., P. Armstrong, et. al. (2022); The Astrophysical Journal

**Rates and delay times of Type Ia supernovae in the Dark Energy Survey** (doi: [10.1093/mnras/stab1943](https://doi.org/10.1093/mnras/stab1943))

P. Wiseman, M. Sullivan, ..., P. Armstrong, et. al. (2023); Monthly Notices of the Royal Astronomical Society

**First Results of the SkyMapper Transient Survey** (doi: [10.1017/S1743921318002077](https://doi.org/10.1017/S1743921318002077))

A. Möller, B. E. Tucker, ..., P. Armstrong, et. al. (2022); IAU Symposium

**Spectroscopic classification of SN 2018bwp as a type Ia supernova a few weeks after peak brightness** (bibcode: [2018ATel11671....1L](https://ui.adsabs.org/2018ATel11671....1L))

A. Lopez-Sanchez, L. Galbany, ..., P. Armstrong, et. al. (2022); The Astronomer's Telegram

**Spectroscopic classification of SN 2018bwq as a type Ia supernova a few days before maximum light.** (bibcode: [2018ATel11667....1L](https://ui.adsabs.org/2018ATel11667....1L))

A. Lopez-Sanchez, L. Galbany, ..., P. Armstrong, et. al. (2022); The Astronomer's Telegram

**First Confirmed Supernova with the SkyMapper/Zooniverse Supernova Sighting Project** (bibcode: [2017ATel10426....1T](https://ui.adsabs.org/2017ATel10426....1T))

B. E. Tucker, A. Moller, ..., P. Armstrong, et. al. (2022); The Astronomer's Telegram

**WiFeS Classification of SMT17kdl/SN2017edm as a Type Ia Supernova** (bibcode: [2017ATel10444....1T](https://ui.adsabs.org/2017ATel10444....1T))

B. E. Tucker, A. Moller, ..., P. Armstrong, et. al. (2022); The Astronomer's Telegram

**DEbass Transient Classification Report** (69 Reports)

C. Lidman, B. Martin, ..., P. Armstrong, et. al.; Transient Name Server Classification Report

**Transient Classification Report for 2021-10-12** (bibcode: [2021TNSCR3493....1L](https://ui.adsabs.org/2021TNSCR3493....1L))

C. Lidman, M. Dixon, ..., P. Armstrong, et. al. (2022); Transient Name Server Classification Report

**Classification of 11 supernovae by DEBass** (bibcode: [2021ATel14925....1L](https://ui.adsabs.org/2021ATel14925....1L))

C. Lidman, S. Dhaka, ..., P. Armstrong, et. al. (2022); The Astronomer's Telegram

**SkyMapper Transient Discovery Report** (15 Reports)

A. Moller, B. Tucker, ..., P. Armstrong, et. al.; Transient Name Server Discovery Report

## COMMUNICATION

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**SN2017jgh: a high-cadence complete  
shock cooling light curve of a SN IIb  
with the Kepler telescope**

Over 180 items in print, radio, and online,  
across Australia and internationally

*Highlights:*, Al Jazeera, National Geographic Indonesia, Radio Canada,  
De Morgen, ABC Science online, The Guardian, Space Australia,  
Sky News Australia, 2GB and on the AAP wires

2021

## CONFERENCE TALKS

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**CosmoPalooza**

*DES SN 5 Year Methodology & Results*

Invited Speaker

2023

**DES Collaboration Meeting**

*DES 5 year supernova analysis*

Invited Speaker

2020, 2021, 2022, 2023

**ASA Annual Science Meeting**

*DES 5 year supernova analysis*

Speaker

2020, 2021, 2022, 2023

**Kepler K2 Extragalactic Data Analysis Meeting**

*Investigating transients in Kepler's K2 survey*

Attendee

2018