Benjamin M. Rose

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Employment

Assistant Professor — **2023–present**
Department of Physics
Baylor University, Waco, Texas

Research Scientist — **2020–2023**
Department of Physics, Cosmology Research Group
Duke University, Durham, North Carolina
Supervisor: Assistant Professor Dan Scolnic

Postdoctoral Fellow — **2018–2020**
Space Telescope Science Institute, Baltimore, Maryland
Supervisors: Drs. Susana Deustua and Andrew Fruchter

Education

Doctor of Philosophy in Physics — **2018**
Master of Science in Physics — **2016**
University of Notre Dame, Notre Dame, Indiana
Advisor: Professor Peter Garnavich

Bachelor of Science in Physics, *cum laude* — **2012**
Whitworth University, Spokane, Washington
Minor: Mathematics

Awards & Grants

Astrophysics Research and Analysis Proposal, NASA — **2022–2026**
Collaborator, *CANDLE: Calibration using an Artificial star with NIST-traceable Distribution of Luminous Energy*
$1.5 million

Astronomy and Astrophysics Research Grants, NSF — **2022–2024**
Co-Investigator, *Are Hubble Residuals a Product of Poor Mass Estimates? Improving Supernova Ia Host Galaxy Characterizations*
$355,000

HST-GO Grant, Cycle 30, Space Telescope Science Institute — **2022–2023**
Program Administer Principal Investigator, *Local Environment of Low-redshift Type Ia Supernova Siblings*
$28,000

Lennox Graduate Fellowship, Notre Dame — **2017**
Recognizes achievements and promise as a graduate student in physics

Notebaert Professional Development Award, Notre Dame — **2015 & 2016**

Observational Programs

Principal Investigator, NASA Infrared Telescope Facility 2023A — **2022**
Constraining a Redshift Dependent Type Ia Supernova Mass Step with Improved Stellar Mass Measurements
Two nights of NIR photometry

Principal Investigator, Gemini 2022B **2022**
Constraining a Redshift Dependent Type Ia Supernova Mass Step with Improved Stellar Mass Measurements
Gemini South (GS-2022B-Q-306), 18.0 hours of NIR photometry with F2
Gemini South (GS-2022B-Q-408), 4.1 hours of NIR photometry with F2
Gemini North (GN-2022B-Q-404), 10.8 hours of NIR photometry with NIRI

Co-Investigator, HST Cycle 30 & 31 **2022-2023**
Reducing Type Ia Supernova Distance Biases by Separating Reddening and Intrinsic Color
Awarded 135 orbits

Program Administer PI, HST Cycle 30 Snapshot **2022**
Local Environments of Low-redshift Type Ia Supernova Siblings
Awarded 32 targets

Co-Investigator, HST Cycle 29 Snapshot **2021**
UV Spectroscopy of Astronomical Transients through Rolling Snapshots
Awarded 100 targets

Co-Investigator, Spitzer DDT Program **2019**
IRAC Photometry for the Cosmic Flux Standards - A Network of Faint Absolute Calibrators

Principal Investigator, SDSS-IV MaNGA Ancillary Program **2017**
Exploring a Possible Correlation Between Hubble Residuals and SN Ia Local Environments
Awarded 40 ancillary targets

Vatican Advanced Technology Telescope (VATT) **2014**
Mount Graham International Observatory, Safford, Arizona
4 nights

Activities & Service

Cosmic Structure Science Interest Group, member **May 2023–present**
Group is a part of NASA's Physics of the Cosmos

The Future of Transient Science With the Roman Space Telescope **January 2023**
Splinter meeting at 241th AAS session
Member of the organizing committee

Cosmology with the Nancy Grace Roman Space Telescope **January 2022**
A virtual seminar from a canceled 239th AAS session
Chair of the organizing committee

Roman RCS Under-performance Mitigation Task Force, member **September 2020**

Accurate Flux Calibration, organizing committee, *canceled* **March 2020**

WFIRST Science Jamboree, organizing committee **July 2019**

WFIRST Simulated Data Hack Day, organizing committee **March 2019**

Mentoring

Kevin Wang, Duke University **2021–2023**
Ph.D. student working on measuring the effect of weak gravitational lensing on supernovae cosmology, with a specific focus the on Roman Space Telescope.

Kayla Perkinson, Space Telescope Science Institute **2019**
High school intern working on a project to understand the capabilities of the Romans Space Telescope prism.

Teaching Experience

Baylor University

PHY 2455 - Foundations of Astronomy **Fall 2023**

University of Notre Dame

Introduction to Scientific Computing with Python **Summer 2017 & 2018**
Lead instructor and supervisor of teaching assistants for the Notre Dame REU program

Physics GRE Preparation Course **Summer 2017 & 2018**
Instructor for an exam review course for the Notre Dame REU program

Introduction to Scientific Computing with Python **Spring 2016**
Organized help session and graded assignments

Reviewer

The Astrophysical Journal, Letters
Hubble Space Telescope, External Review
Journal of Open Source Software
Monthly Notices of the Royal Astronomical Society, Letters
NASA Guest Investigator
NASA Research Opportunities in Space and Earth Sciences (ROSES)
National Research, Development and Innovation Office, Hungary

Science Collaborations

Nancy Grace Roman Space Telescope (formerly WFIRST)
Foley Supernova Science Investigation Team **2020–2022**
Perlmutter Supernova Science Investigation Team **2018–2022**
LSST Dark Energy Science Collaboration, Member **2018–present**
Dark Energy Survey, Member **2020–present**
Sloan Digital Sky Survey (SDSS) V, Member **2019–2020**
Sloan Digital Sky Survey IV, Member **2014–2018**

Open Source

Co-maintainer: SNCosmo
Source Code: corner.py, `kde_corner`, SNANA, `extinction`, UNITY
Documentation: `emcee`, `scipy`, `seaborn`, `sep`

Technical Skills

Daily Use: `bash`, `click`, Python, `numpy`, `scipy`, macOS, LaTeX, `git`, GitHub, GitHub Actions, Astropy, Markdown, matplotlib, Overleaf, `pandas`, `seaborn`, SNANA, `SNCosmo`, UNITY, `zsh`
Proficient: `codcov`, Confluence, `emcee`, Jekyll, Jupyter Notebook, JupyterLab, `pytest`, `pymc3`, reStructuredText, sep, `stan`, `scikit-learn`, TravisCI
Competent: HTML, CSS, Linux, `george`, Windows, Wordpress

Refereed Publications
1,879 total citations

Peterson E. R., Jones D. O., Scolnic D., **et al.**, 2023, *The DEHVILS Survey Overview and Initial Data Release: High-Quality Near-Infrared Type Ia Supernova Light Curves at Low Redshift* MNRAS, 522 2478

Kelsey L., Sullivan M., Wiseman P., **et al.**, 2023, *Concerning Colour: The Effect of Environment on Type Ia Supernova Colour in the Dark Energy Survey* MNRAS, 519, 3046

Meldorf, C., Palmese, A., Brout, D., **et al.** 2022, *The Dark Energy Survey Supernova Program results: Type Ia Supernova brightness correlates with host galaxy dust*, MNRAS, 518, 1985

Joshi, B., Strolger, L., Ryan, R., **et al.** 2022, *High-Precision Redshifts for Type Ia Supernovae with the Nancy Grace Roman Space Telescope P127 Prism*, ApJ, 941, 14

Rose, B. M., Popovic, B., Scolnic, D., Brout, D. *Constraining R_V Variation Using Highly Reddened Type Ia Supernovae from the Pantheon+ Sample*, MNRAS, 516, 4822

Scolnic, D., Brout, D., Carr, A., **et al.** 2022, *The Pantheon+ Type Ia Supernova Sample: The Full Dataset and Light-Curve Release*, ApJ, 938, 113

Peterson, E. R., Kenworthy, W. D., Scolnic, D., **et al.** 2022, *The Pantheon+ Analysis: Evaluating Peculiar Velocity Corrections in Cosmological Analyses with Nearby Type Ia Super-*

novae, ApJ, 938, 112

Brout, D., Taylor G., Scolnic D., Wood, C. M., **Rose, B. M.**, et al. 2022, *The Pantheon+ Analysis: SuperCal-Fragilistic Cross Calibration, Retrained SALT2 Light Curve Model, and Calibration Systematic Uncertainty*, ApJ, 938, 111

Brout, D., Scolnic D., Popovic, B., **et al.** 2022, *The Pantheon+ Analysis: Cosmological Constraints*, ApJ, 938, 110

Chen, R., Scolnic, D., Rozo, E., **et al.** 2022, *Measuring Cosmological Parameters with Type Ia Supernovae in redMaGiC galaxies*, ApJ, 938, 62

Wiseman P., Vincenzi M., Sullivan M., **et al.**, 2022, *A galaxy-driven Model of Type Ia Supernova Luminosity Variations* MNRAS, 515, 4587.

Rubin D., Aldering G., Astraatmadja T. L., **et al.**, 2022, *Evaluating and Optimizing a Slitless Prism for Nancy Grace Roman Space Telescope SN Cosmology* submitted to ApJ, arXiv.2206.10632.

Wang, K., Scolnic, D., Troxel, M., **et al.** 2022, *A Synthetic Roman Space Telescope High-Latitude Time-Domain Survey: Supernovae in the Deep Field*, submitted to MNRAS, arXiv:2204.13553

Garnavich, P., Wood, C. M., Milne, P., **et al.** 2022, *Connecting Infrared Surface Brightness Fluctuation Distances to Type Ia Supernova Hosts: Testing the Top Rung of the Distance Ladder*, submitted to ApJ, arXiv:2204.12060

The SDSS Collaboration 2021, *The Seventeenth Data Release Of The Sloan Digital Sky Surveys*, ApJSS, 259, 35

Wiseman, P., Sullivan, M., Smith, M., **et al.** 2021, *Rates and Delay Times of Type Ia Supernovae in the Dark Energy Survey*, MNRAS, 506, 3330

Rose, B. M., Rubin, D., Strolger, L., Garnavich P. M. 2021, *Combined, Host Galaxy Mass and Local Stellar Age Improves Type Ia Supernovae Distances*, ApJ, 909, 28

Rose, B. M., Rubin, D., Cikota, A., et al. 2020, *Evidence for Cosmic Acceleration is Robust to Observed Correlations Between Type Ia Supernova Luminosity and Stellar Age*, ApJL, 896, L4

The SDSS Collaboration 2020, *The Sixteenth Data Release Of The Sloan Digital Sky Surveys*, ApJSS, 249, 3

Rose, B. M., Dixon, S., Rubin, D., et al. 2020, *Initial Evaluation of SNEMO2 and SNEMO7 Standardization Derived From Current Light Curves of Type Ia Supernovae*, ApJ, 890, 60

Rose, B. M., Garnavich, P. M., Berg, M. A. 2019, *Think Global, Act Local: The Effect of Environment on Hubble Residuals of Type Ia Supernovae*, ApJ, 874, 32

The SDSS Collaboration 2019, *The Fifteenth Data Release Of The Sloan Digital Sky Surveys*, ApJSS, 240, 23

Mathews, G. J., **Rose, B. M.**, Garnavich, P. M., et al. 2016, *Detectability of Cosmic Dark Flow in the Type Ia Supernova Redshift-Distance Relation*, ApJ, 827, 60

Kennedy, M. R., Callanan, P., Garnavich, P. M., **et al.** 2016, *The New Eclipsing CV MASTER OTJ192328.22+612413.5: A Possible SW Sextantis Star*, AJ, 152, 27

Mathews, G. J., Gangopadhyay, M. R., Garnavich, P., **Rose, B. M.**, et al. 2015, *Constraints on the Birth of the Universe and Origin of Cosmic Dark Flow*, International Journal of Modern Physics A, 30, 1545022

Littlefield, C., Garnavich, P., Magno, K., **et al.** 2015, *High-Amplitude, Rapid Photometric Variation of the New Polar MASTER OT J1321*, Information Bulletin on Variable Stars, 6129, 1

Roman Technical Reports

Rose, B. M., et al. 2021 *A Reference Survey for Supernova Cosmology with the Nancy Grace Roman Space Telescope*, Report to Roman Project, arXiv:2111.03081

Rose, B. M., R. Hounsell, S. Deustua, et al. 2021, *Prioritization of RCS LED Lenses: Impacts on the Supernova Key Project*, Memo for Roman Calibration Working Group, March 11, 2021

Deustua, S., **et al.** 2021, *The Roman Space Telescope Relative Calibration System and the Dark Energy Figure of Merit*, Res. Notes AAS 5 66

Rose, B. M., Rubin, D., Deustua, S., et al. 2020, *The Limit of Pre-flight Unusable Pixels on the Roman Space Telescope Supernova Survey Science*, Roman Detector Working Group, August 28, 2020

Ryan, R. E., Crawford, S., **et al.** 2020, *Anticipated Data Processing and Algorithm Descriptions for SIT-Contributed Software.* A WFIRST operations concept document

Non-refereed Works

Rose, B. M., et al. 2021, *Synergies between Vera C. Rubin Observatory, Nancy Grace Roman Space Telescope, and Euclid Mission: Constraining Dark Energy with Type Ia Supernovae*, Response to DOE/NASA request for information on January 21, 2021. arXiv:2104.01199

Endorsed Astro2020 Science Whitepapers:

Keith, B., et al. *Dark Matter Science in the Era of LSST* arXiv:1903.04425

Green, D., et al. *Messengers from the Early Universe: Cosmic Neutrinos and Other Light Relics* arXiv:1903.04763

Foley, R., et al. *WFIRST: Enhancing Transient Science and Multi-Messenger Astronomy* arXiv:1903.04582

Mantz, A., et al. *The Future Landscape of High-Redshift Galaxy Cluster Science* arXiv:1903.05606

Williams, B., et al. *Far Reaching Science with Resolved Stellar Populations in the 2020s* BAAS51c.301W

Sehgal, N., et al. *Science from an Ultra-Deep, High-Resolution Millimeter-Wave Survey* arXiv:1903.03263

Dore, O., et al. *WFIRST: The Essential Cosmology Space Observatory for the Coming Decade* arXiv:1904.01174

Garnavich, P. & **Rose, B. M.** 2014, *GRB140629A: VATT optical observations*, GRB Coordinates Network, Circular Service, No. 16492, #1

Invited Presentations

Understand Highly Reddened Type Ia Supernova, December 13, 2022, Lawrence Berkeley National Lab Cosmology Seminar, Berkeley, California

The Golden Age of Supernova Cosmology, November 30, 2022, Baylor U. Physics Department Colloquium, Waco, Texas

Preparing for Supernova Cosmology With the Nancy Grace Roman Space Telescope, November 3, 2022, APS Southeastern Section Meeting, Oxford, Mississippi

Taking Supernova Cosmology from DES to Roman, April 20, 2022, U. Pennsylvania Astrophysics Seminar, Philadelphia, Pennsylvania

Synergies of the Roman Space Telescope with Other Missions and Facilities, February 8, 2022, co-led a panel discussion at Exploring the Transient Universe with the Nancy Grace Roman Space Telescope, Pasadena, California

Updates from Roman Supernova Science Investigation Team, May 19, 2021, LSST DESC Seminar, virtual

Systematics Limited Cosmology with the Nancy Grace Roman Space Telescope, September 22, 2020, Notre Dame Astrophysics Seminar, virtual

WFRIST and Type Ia Supernova Systematic Uncertainties, April 21, 2020 (*Postponed*), Notre Dame Astrophysics Seminar, South Bend, Indiana

Understaning Type Ia Supernova Systematic Uncertainties, April 9, 2020 (*Canceled*), Duke Astrophysics Seminar, Durham, North Carolina

Oral Presentations

A Forecast of Extragalactic Transient Light Curves for the Roman Time Domain Core Community Survey, August 2022, Time Domain and Multi-Messenger Astrophysics NASA Workshop, Annapolis, Maryland

Constraining R_V Variation Using Highly Reddened Type Ia Supernovae from the Pantheon+ Sample, June 16, 2022, 240th AAS Meeting, Pasadena, California

A High-Latitude Time Domain Reference Survey, November 18, 2021, Roman Science Team Community Briefing, virtual

Improving SN Ia Standardization with Host Galaxy Mass and Local Stellar Age, January 11, 2021, 237th AAS Meeting, virtual

Potential Systemics from Standardizing Our Standard Candles, March 2, 2020, WFIRST Science Jamboree, New York, New York

Initial Evaluation of SNEMO2 and SNEMO7 Standardization, October 3, 2019, SNIa Cosmology Analysis Meeting, Chicago, Illinois

Tools for Supernova Standardization: Bayesian Hierarchical Models, July 30th, 2019, WFIRST Science Jamboree, Greenbelt, Maryland

Dissertation Talk. *Think Local, Act Global: The Influence of Host Galaxy Properties on Type Ia Light Curves*, January 9th, 2019, 233rd AAS Meeting, Seattle, Washington

Searching For a Cosmic-scale Dark Flow, November 20, 2015, 2015 APS Prairie Section Meeting, Notre Dame, Indiana

Finding A Cosmic Bulk Flow, April 28, 2014, 2014 GPS Spring Conference, Notre Dame, Indiana

Determining the Location of a Radioactive Source in Majorana Demonstrator, August 2, 2011, REU Culminating Talks, Duke University, Durham, North Carolina

Poster Presentations

Forecasting Extragalactic Transient Light Curves From the Roman High Latitude Time Domain Core Community Survey, January 2023, 241th AAS Meeting, Seattle, Washington

Constraining R_V Variation Using Highly Reddened Type Ia Supernovae from the Pantheon+ Sample, January 2022, 239th AAS Meeting, Salt Lake City, Utah, *canceled*

Testing Linear Standardization of Type Ia Supernovae using Gaussian Processes, June 2020, 236th AAS Meeting, virtual

Can Type Ia Supernovae Systematics Resolve the Current Hubble Tension?, January 2020, 235th AAS Meeting, Honolulu, Hawaii

Estimating the Average Age of Stellar Populations to Understand Type Ia Supernova Systematics, November 18, 2019, The Art Of Measuring Galaxy Physical Properties, Milan, Italy

Can Type Ia Supernovae Systematics Resolve the Current Hubble Tension?, October 5, 2019, Cosmic Controversies, Chicago, Illinois

Correlations Between Hubble Residuals and MCMC Estimated Local Stellar Ages of Type Ia Supernovae, January 10, 2018, 231th AAS Meeting, Washington, DC

Correlations Between Hubble Residuals and Local Stellar Populations of Type Ia Supernovae, January 7, 2017, 229th AAS Meeting, Grapevine, Texas

Correlating Type Ia Supernova Properties With Their Local Environment Using HST Snapshots of Host Galaxies, January 6, 2016, 227th AAS Meeting, Kissimmee, Florida

Prospects for Detecting a Cosmic Bulk Flow, January 6, 2015, 225th AAS Meeting, Seattle, Washington

Finding A Cosmic Bulk Flow, February 27, 2014, GSU 6th Annual Research Symposium, Notre Dame, Indiana

Determining the Location of a Radioactive Source in Majorana Demonstrator, *October 27, 2011, APS, Division of Nuclear Physics, Michigan State University*