Erika M. Holmbeck

PhD Physics · Staff Scientist
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Appointments

2023 – **Lawrence Livermore National Laboratory**
Staff Scientist
Nuclear Theory and Data

2021 – 2023 **The Observatories of the Carnegie Institution for Science**
NASA Hubble Fellowship Program (NHFP) Hubble Fellow
Distilling Stellar Signatures to Characterize the Astrophysical Production Site of the Heavy Elements
Supervisor: Joshua Simon

2020 – 2021 **Rochester Institute of Technology**
Postdoctoral Researcher
Reconstructing Neutron Star Merger Properties from Metal-Poor Stars
Supervisor: Richard O'Shaughnessy

Education

Aug 2020 **University of Notre Dame**
Ph.D. Physics
"The Looking Glass and Beyond: Using Observations and Modeling of Stellar Actinide Abundances as a Window into r-Process Events"
Advisors: Profs. Rebecca Surman and Timothy C. Beers

Feb 2019 **University of Notre Dame**
M.S. Physics
"The Stellar Actinide Boost and its r-Process Implications"

Jun 2014 **University of California Los Angeles**
B.S. Astrophysics, *Cum laude*, Departmental Honors, Dean's Honors List
"New Members of Nearby Moving Groups"
Advisors: Profs. Benjamin Zuckerman and Smadar Naoz

Publication Summary Last updated: 19 Feb 23

A full list of publications can be found on ADS.

- **Journal publications:** 10 first-author, 24 co-author
- **Other papers:** 2 first-author conference proceedings, 2 co-author white papers
- ***h*-index:** 18
- **Total citations:** 1021

Honors, Grants & Fellowships

2023 **Grant Award: Astronomy Mentorship Program for Upcoming Postdocs (AMP-UP) Camp — $50,000,** Heising Simons Foundation

- **Executive Committee Early Career Member-at-Large (declined),** American Physics Society - Division of Nuclear Physics

2022 **Dissertation Award in Nuclear Physics,** American Physics Society - Division of Nuclear Physics

2021 **NHFP Hubble Fellow,** Space Telescope Science Institute

2020 **Graduate Research and Dissertation Award,** Physics Department, University of Notre Dame

2019 **Grant Award: "Astronomy for Physicists and Physics for Astronomers Summer School,"** JINA-CEE

- **Award: Best Poster,** Nuclear Physics in Astrophysics Conference IX
- **Grant Award: Graduate Student Union (GSU) Conference Presentation,** University of Notre Dame

2018 **Grant Award: Zahm Research Travel,** University of Notre Dame

2017 – 2019 **Eartly-Lennox Graduate Student Fellow,** University of Notre Dame

2015 – 2020 **Arthur J. Schmitt Leadership Fellow,** University of Notre Dame

Awarded Telescope Time

2024 **Magellan 6.5-m Baade** (PI) — 2 nights

- **Magellan 6.5-m Clay** (PI) — 4 nights

2023 **Magellan 6.5-m Clay** (PI) — 5 nights

- **Facility for Rare Isotope Beams (No. 21080)** (Co-author) — 128 beam on target hours

2022 **Magellan 6.5-m Clay** (PI) — 10 nights

- **Hubble Space Telescope Cycle 30** (Co-I) — 60 orbits

2021 **Facility for Rare Isotope Beams (No. 23078)** (Co-author) — 156 beam on target hours

2019 **Hubble Space Telescope Cycle 27** (Co-I) — 17 orbits

2018 **Hubble Space Telescope Cycle 26** (Co-I) — 47 orbits

2017 – 2023 ***Additional time awarded as Co-I***

- 45+ nights on the du Pont 100-in telescope, Las Campanas Observatory, Chile
- 70+ nights on the Harlan J. Smith 107-in telescope, McDonald Observatory, Texas, USA
- 30+ nights on the Magellan 6.5-m (Clay) telescope, Las Campanas Observatory, Chile

Teaching

2023 – 2024 **Mentor,** AMP-UP

2023 **Lecturer,** Nuclei in the Cosmos XVII Summer School

2022 – 2023 **Mentor,** Carnegie Observatories: Carnegie Astrophysics Summer Student Internship Program (CASSI)

2019 **Teaching Assistant and Lab Technician,** Holy Cross College and Westville Correctional Facility

- **Co-organizer and Lecturer,** JINA-CEE First Frontiers Summer School

2015 – 2017 **Teaching Assistant and Lead Technician,** University of Notre Dame, Jordan Hall of Science Observatory

Student Supervision

2023 **Ian Johnson,** California Institute of Technology (CASSI and Summer Undergraduate Research Fellow)

- **Audrey Dunn,** University of California Los Angeles (Research Course Credit)

2022 **Rafael Cottom,** Santa Barbara City College (Carnegie Astrophysics Summer Student Internship Intern)

2021 – **Audrey Lund,** University of Michigan (undergraduate research)

2018 **Phuong Hoang,** University of Hanoi (University of Notre Dame REU Student)

- **Tino Wells,** University of Washington (University of Notre Dame REU Student)

Memberships

2020 – **Core member of the *R*-Process Alliance**

2016 – **Joint Institute for Nuclear Astrophysics - Center for the Evolution of the Elements (JINA-CEE)**

2015 – 2020 **Society of Schmitt Fellows**

2015 – **American Astronomical Society (AAS)**

2015 – **American Physical Society (APS)**

Service & Outreach

2023 – **AMP-UP Co-Lead,** NHFP Anti-Racism Initiative

2023 – **Referee,** Physical Review Journals

2023 **JWST Cycle 2 Panelist,** Stellar Populations 2

- **HST Cycle 31,** External Reviewer

2022 – **Member,** NHFP Anti-Racism Initiative

- **Referee,** The Astrophysical Journal
- **Referee,** Monthly Notices of the Royal Astronomical Society

2022 **Committee Member,** Carnegie Fellowship Committee

- **Committee Member,** NHFP Symposium Organizing Committee
- **Mentor,** Carnegie Observatories: Carnegie Astrophysics Summer Student Internship Program (CASSI)
- **Volunteer/Exhibitor,** STEM Savvy outreach event

2021 **Secretary,** *R*-Process Alliance

2019 **Cofounder and Organizer,** JINA-CEE First Frontiers Summer School

2018 – 2019 **Committee Member,** Graduate Qualification Exam Committee

2018 **Volunteer/Exhibitor,** Carnegie Observatories 16th Annual Open House

2017 – 2018 **Representative,** Graduate Student Union (GSU) for the Department of Physics

2016 **Teaching Assistant.** Sensing our World 2016: Mission to Mars

- **Volunteer/Exhibitor,** Our Universe Revealed: Hands-On Physics and Astroblast!
- **Volunteer/Exhibitor,** JINA-CEE Art 2 Science Camp

Invited Presentations (38)

2024 **American Physical Society April Meeting** (Sacrameto, CA)

- **University of California Berkeley** (Berkeley, CA)
- **Looking AHEAD to Soft Gamma-Ray Astrophysics** (Ferrara, Italy)
- **University of California Davis Cosmology Seminar** (Davis, CA)
- **Goddard Scientific Colloquium** (Greenbelt, MD)
- **XLV Symposium on Nuclear Physics** (Cocoyoc, Mexico)

2023 **Nuclei in the Cosmos XVII School** (Daejeon, Korea)

- **The 1st IReNA-UKAKUREN Joint Workshop** (Mitaka, Tokyo, Japan)
- **MIAPbP: Stellar Astrophysics** (Garching bei München, Germany)

- **Institute for Nuclear Theory 23-2: Astrophysical neutrinos and the origin of the elements** (Seattle, WA)
- **Carnegie Observatories Colloquium** (Pasadena, CA)
- **CeNAM Frontiers in Nuclear Astrophysics 2023** (East Lansing, MI)
- **UC Santa Cruz Astro Colloquium** (Santa Cruz, CA)
- **Pasadena City College Carnegie Observatories Lecture Series** (Pasadena, CA)
- **Santa Barbara City College Special Seminar** (Santa Barbara, CA)

2022 **Texas A&M University Astronomy Seminar** (College Station, TX)

- **Michigan State University Astronomy Seminar** (East Lansing, MI)
- **2022 JINA-CEE Frontiers in Nuclear Astrophysics** (South Bend, IN)
- **Anton Pannekoek Institute for Astronomy Colloquium** (University of Amsterdam, Amsterdam)
- **NDT-NPP Seminar** (Lawrence Livermore National Laboratory, CA)

2021 **APS Dissertation Award in Nuclear Physics Talk** (Massachusetts Institute of Technology, MA)

- **Institute for Nuclear and Particle Physics** (Ohio University, OH)
- **Origins of the Isotopes Workshop** (IReNA Virtual Workshop)
- **Yale Astronomy Virtual Colloquium** (Yale University, CT)
- **LANL Astrophysics Seminar** (Los Alamos National Lab, NM)
- **TCAN Meeting 2021: BNS/BH-NS Merger Workshop** (Rochester Institute of Technology, NY)
- **Star Talks Seminar Series** (University of Victoria, B.C., Canada)
- **Virtual Joint Nuclear and Astrophysics Seminar** (Texas A&M University, TX)
- **CCRG Lunch Talks** (Rochester Institute of Technology, NY)
- **FLASH Seminar** (University of California Santa Cruz, CA)

2020 **Physics Colloquium** (San Francisco State University, CA)

- **Physics Colloquium** (Gonzaga University, WA)
- **N3AS Seminar** (University of California Berkeley, CA)
- **Our Universe Revealed** Public Outreach Series (University of Notre Dame, IN)
- **Physics Colloquium** (Andrews University, MI)

2019 **Nuclear Seminar** (University of Notre Dame, IN)

- **Astrophysics Seminar** (University of Notre Dame, IN)

2018 **JINA-CEE Online Seminar** (Michigan State University, MI)

First-author Publications

Refereed (10)

2024 **Total *r*-process Yields of Milky Way Neutron Star Mergers,** **Holmbeck, E. M.** and Andrews, J. J., 2023, arXiv:2310.03847 (*in press, ApJL*).

2023 **Superheavy Elements in Kilonovae,** **Holmbeck, E. M.**, Barnes, J., Lund, K. A., et al. 2023, ApJL, 951, L13.

- **HD 222925: a New Opportunity to Explore the Astrophysical and Nuclear Conditions of *r*-process Sites,** **Holmbeck, E. M.**, Surman, R., Roederer, I. U., et al. 2023, ApJ, 951, 30.

- **Nucleosynthesis and observation of the heaviest elements,** **Holmbeck, E. M.**, Sprouse, T. M., Mumpower, M. R. 2023, Eur. Phys. J. A. 59, 28.

2022 **A Nuclear Equation of State Inferred from Stellar *r*-process Abundances,** **Holmbeck, E. M.**, O'Shaughnessy, R., Delfavero, V., Belczynski, K. 2022, ApJ, 926, 196.

2021 **Reconstructing Masses of Merging Neutron Stars from Stellar *R*-Process Abundance Signatures,** **Holmbeck, E. M.**, Frebel, A., McLaughlin, G. C., et al. 2021, ApJ, 909, 21.

2020 **The *R*-Process Alliance: Fourth Data Release from the Search for *r*-Process-Enhanced Stars in the Galactic Halo,** **Holmbeck, E. M.**, Hansen, T. T., Beers, T. C., et al. 2020, ApJS, 249, 30.

2019 **Actinide-rich and Actinide-poor *r*-Process Enhanced Metal-Poor Stars do not Require Separate *r*-Process Progenitors,** **Holmbeck, E. M.**, Frebel, A., McLaughlin, G. C., et al. 2019, ApJ, 881, 5.

- **Actinide Production in the Neutron-Rich Ejecta of a Neutron Star Merger,** **Holmbeck, E. M.**, Sprouse, T. M., Mumpower, M. R., et al. 2019, ApJ, 870, 23.

2018 **The *R*-Process Alliance: 2MASS J09544277+5246414, the Most Actinide-Enhanced *R*-II Star Known,** **Holmbeck, E. M.**, Beers, T. C., Roederer, I. U., et al. 2018, ApJL, 859, L24.

Conference Proceedings (2)

2020 **Characterizing *r*-Process Sites through Actinide Production,** **Holmbeck, E. M.**, Surman, R., Frebel, A., et al. 2020, JPCS: Nuclear Physics in Astrophysics IX (NPA-IX), 1668, 15.

2017 **J2038−0023: The First Bright *R*-Process Enhanced Star Identified in the RAVE Survey,** 14th International Symposium on Nuclei in the Cosmos (NIC2016), 020612.

Co-authored Publications

Refereed (24)

2024 **Spectacular Nucleosynthesis from Early Massive Stars,** Ji, A. P., Curtis, S., Storm, N., et al. 2024, ApJL, 961, L41.

- **The R-Process Alliance: Detailed Chemical Composition of an R-Process Enhanced Star with UV and Optical Spectroscopy,** Shah, S. P., Ezzeddine, R., Roederer, I. U., 2024, MNRAS,

2023 **Element abundance patterns in stars indicate fission of nuclei heavier than uranium,** Roederer, I. U., Vassh, N., **Holmbeck, E. M.**, et al. 2023, Science, 382, 1177.

- **SPLUS J142445.34-254247.1: An R-Process Enhanced, Actinide-Boost, Extremely Metal-Poor star observed with GHOST,** Placco, V. M., Almeida-Fernandes, F., **Holmbeck, E. M.**, et al. 2023, arXiv:2310.17024.
- **Constraining inputs to realistic kilonova simulations through comparison to observed *r*-process abundances,** Ristic, M., **Holmbeck, E. M.**, Wollager, R., et al. 2023, ApJ, 956, 64.
- **Uranium Abundances and Ages of r-process Enhanced Stars with Novel U II Lines,** Shah, S. P., Ezzeddine, R., Ji, A. P., et al. 2023, ApJ, 948, 122.
- **The *R*-Process Alliance: Chemo-Dynamically Tagged Groups II. An Extended Sample of Halo *r*-Process-Enhanced Stars,** Shank, D., Beers, T. C., Placco, V. M., et al. 2023, ApJ, 943, 23.

2022 **Discovery of an Ultra Lithium-rich Metal-Poor Red Giant star,** Kowkabany, J., Ezzeddine, R., Charbonnel, C., et al. 2022, arXiv:2209.02184 (ApJ, *under review*).

- **The R-Process Alliance: Abundance Universality among Some Elements at and between the First and Second R-Process Peaks,** Roederer, I. U., Cowan, J. J., Pignatari, M., et al. 2022, ApJ, 936, 84.

- **The *R*-process Alliance: A Nearly Complete *R*-process Abundance Template Derived from Ultraviolet Spectroscopy of the *R*-process-enhanced Metal-poor Star HD 222925,** Roederer, I. U., Lawler, J. E., Den Hartog, E. A., et al. 2022, ApJS, 260, 27.
- **Investigation of the ^{10}B(p, α)^{7}Be reaction from 0.8 to 2.0 MeV,** Kolk, B. V., Macon, K. T., deBoer, R. J., et al. 2022, Phys. Rev. C., 105, 055802.

2021 **The *R*-Process Alliance: Chemodynamically Tagged Groups of Halo *r*-process-enhanced Stars Reveal a Shared Chemical-evolution History,** Gudin, D., Shank, D., Beers, T. C., et al. 2021, ApJ, 908, 79.

2020 **Detection of Pb II in the Ultraviolet Spectra of Three Metal-Poor Stars,** Roederer, I. U., Lawler, J. E., **Holmbeck, E. M.**, et al. 2020, ApJL, 902, L24.

- **The *R*-Process Alliance: The Peculiar Chemical Abundance Pattern of RAVE J183013.5−455510,** Placco, V. M., Santucci, R. M., Yuan, Z., et al. 2020, ApJ, 897, 78.

2019 **Using excitation-energy dependent fission yields to identify key fissioning nuclei in *r*-process nucleosynthesis,** Vassh, N., Vogt, R., Surman, R., et al. 2019, Journal of Physics G Nuclear Physics, 46, 065202.

- **The R-Process Alliance: Spectroscopic Follow-up of Low-metallicity Star Candidates from the Best & Brightest Survey,** Placco, V. M., Santucci, R. M., Beers, T. C., et al. 2019, ApJ, 870, 122.

2018 **The *R*-Process Alliance: First Release from the Southern Search for *r*-Process Enhanced Stars in the Galactic Halo,** Hansen, T. T., **Holmbeck, E. M.**, Beers, T. C., et al. 2018, ApJ, 858, 92.

- **β-Delayed Fission in *R*-Process Nucleosynthesis,** Mumpower M. R., Kawano T., Sprouse T. M., et al., 2018, ApJ, 869, 14.
- **Californium-254 and Kilonova Light Curves,** Zhu, Y., Wollaeger, R. T., Vassh, N., Sprouse, T. M., et al. 2018, ApJL, 863, L23.
- **The *R*-Process Alliance: Discovery of the First Metal-poor Star with a Combined *r*- and *s*-process Element Signature,** Gull, M., Frebel, A., Cain, M. G., et al. 2018, ApJ, 862, 174.
- **The *R*-Process Alliance: First Release from the Northern Search for *r*-process-enhanced Metal-poor Stars in the Galactic Halo,** Sakari, C. M., Placco, V. M., Farrell, E. M., et al. 2018, ApJ, 868, 110.
- **The *R*-Process Pattern of a Bright, Highly *r*-Process-Enhanced, Metal-Poor Halo Star at [Fe/H] ~ -2,** Sakari, C. M., Placco, V. M., Hansen, T., et al. 2018, ApJL, 854, L20.
- **Spectroscopic Validation of Low-metallicity Stars from RAVE,** Placco, V. M., Beers, T. C., Santucci, R. M., et al. 2018, AJ, 155, 256.

2017 **RAVE J203843.2−002333: The First Highly *r*-Process-Enhanced Star Identified in the RAVE Survey,** Placco, V. M., **Holmbeck, E. M.**, Frebel, A., et al. 2017, ApJ, 844, 18.

White Papers (2)

2022 **Horizons: Nuclear Astrophysics in the 2020s and Beyond,** Schatz, H., Becerril Reyes, A. D., Best, A., et al. 2022, arXiv:2205.07996.

2018 **FRIB and the GW170817 Kilonova,** Aprahamian, A., Surman, R., Frebel, A., et al. 2018, arXiv:1809.00703.