Erika M. **Holmbeck**

PH.D. · NUCLEAR ASTROPHYSICIST

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SUMMARY

My interdisciplinary research focuses on understanding heavy-element production through the astrophysical rapid neutron-capture ("*r*"-) process. I observe metal-poor stars with high-resolution spectroscopy and determine elemental abundances from stellar spectra. I also use nucleosynthesis simulations to investigate both the nuclear and astrophysical effects on heavy-element production by the *r*-process.

APPOINTMENTS

Aug 2020 – **Rochester Institute of Technology**
POSTDOCTORAL RESEARCHER (CENTER FOR COMPUTATIONAL RELATIVITY AND GRAVITATION)
Reconstructing Neutron Star Merger Properties from Metal-Poor Stars
Supervisor: Richard O'Shaughnessy

EDUCATION

Apr 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 M.S. PHYSICS (GPA: 3.94)
"The Stellar Actinide Boost and its r-Process Implications"
Advisors: Profs. Rebecca Surman and Timothy C. Beers

Jun 2014 **University of California Los Angeles**
B.S. ASTROPHYSICS (GPA: 3.81), *Cum laude*, DEPARTMENTAL HONORS, DEAN'S HONORS LIST
"New Members of Nearby Moving Groups"
Advisors: Profs. Benjamin Zuckerman and Smadar Naoz

RESEARCH AND TEACHING

2015 – 2020 **University of Notre Dame, Department of Physics**
GRADUATE RESEARCH ASSISTANT, ADVISED BY PROF. REBECCA SURMAN
r-Process Nucleosynthesis

GRADUATE RESEARCH ASSISTANT, ADVISED BY PROF. TIMOTHY C. BEERS
Identifying r-II Stars in the Milky Way Halo

2019 **Holy Cross College and Westville Correctional Facility**
TEACHING ASSISTANT FOR PROF. LARA ARIELLE PHILLIPS
Lab Technician for Westville Education Initiative

2015 – 2017 **University of Notre Dame, Department of Physics**
TEACHING ASSISTANT FOR PROF. PETER GARNAVICH
Lead Technician for the Jordan Hall of Science Observatory

2013 – 2015 **University of California Los Angeles, Department of Physics and Astronomy**
UNDERGRADUATE RESEARCH ASSISTANT
Identifying New Members of Nearby Moving Groups

PUBLICATIONS

FIRST AUTHOR (7)

2020 **Reconstructing Masses of Merging Neutron Stars from Stellar *R*-Process Abundance Signatures,** Holmbeck, E. M., Frebel, A., McLaughlin, G. C., et al. 2020, arXiv:2010.01621 (*submitted to ApJ*).

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.

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.

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.

2017 **J2038−0023: The First Bright *R*-Process Enhanced Star Identified in the RAVE Survey,** Holmbeck, E. M., Placco, V. M., Beers, T. C., et al., 2017, Proceedings of the 14th Symposium on Nuclei in the Cosmos (NIC2016), 020612.

CO-AUTHOR (12)

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, arXiv:2009.14251

The *R*-Process Alliance: The Peculiar Chemical Abundance Pattern of RAVE J183013.5−455510, Placco, V. M., Santucci, R. M., Yuan, Z., ..., Holmbeck, E. M., ..., 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.,Randrup, J., Sprouse, T. M., Mumpower, M. R., Jaffke, P. J., Shaw, D., Holmbeck, E. M., Zhu, Y., McLaughlin, G. C., 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., ..., Holmbeck, E. M., ..., 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., Vassh N., Holmbeck, E. M., Surman R., Möller P., 2018, ApJ, 869, 14.

Californium-254 and Kilonova Light Curves, Zhu, Y., Wollaeger, R. T., Vassh, N., Sprouse, T. M., Mumpower, M. R., Möller, P., McLaughlin, G. C., Korobkin, O., Kawano, T., Jaffke, P. J., Holmbeck, E. M., Fryer, C. L., Even, W. P., Couture, A. J., Barnes, J., 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., Placco, V. M., Ji, A. P., Abate, C., Ezzeddine, R., Karakas, A. I., Hansen, T. T., Sakari, C., Holmbeck, E. M., Santucci, R. M., Casey, A. R., Beers, T. C., 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., ..., Holmbeck, 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] $\sim$ $-$2, Sakari, C. M., Placco, V. M., Hansen, T., **Holmbeck, E. M.**, et al. 2018, ApJL, 854, L20.

Spectroscopic Validation of Low-metallicity Stars from RAVE, Placco, V. M., Beers, T. C., Santucci, R. M., Chanamé, J, Sepúlveda, M. P., Coronado, J., Points, S. D., Kaleida, C. C., Rossi, S., Kordopatis, G.; Lee, Y-S., Matijeviç, G., Frebel, A., Hansen, T. T., **Holmbeck, E. M.**, Rasmussen, K. C., Roederer, I. U., Sakari, C. M., Whitten, D. D., 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.

Oral Presentations

Invited (9)

2020 **Physics Colloquium** (Virtual) — *San Francisco State University, CA*
"The Astrophysical Production of the Heaviest Elements"

Physics Colloquium (Virtual) — *Gonzaga University, WA*
"The Astrophysical Production of the Heaviest Elements"

N3AS Seminar (Virtual) — *University of California Berkeley, CA*
"Properties of *r*-Process-Producing Neutron Star Mergers: What We Can Learn from Metal-Poor Stars"

Our Universe Revealed (Virtual) — *University of Notre Dame, IN*
"Cosmic Alchemy: How the Universe Made the Heaviest Elements"

Physics Colloquium — *Andrews University, MI*
"Through the Looking Glass: Understanding the *r*-Process with Stellar Actinide Signatures"

2019 **Nuclear Seminar** — *University of Notre Dame, IN*
"Constraining the *r*-Process with Actinide Production Studies"

***R*-Process Alliance Workshop: Pushing toward the Next Project Phases** — *Massachusetts Institute of Technology, MA*
"Constraining the *r*-Process with Actinide Production Studies"

Astrophysics Seminar — *University of Notre Dame, IN*
"The Stellar Actinide Boost and its *r*-Process Implications"

2018 **JINA-CEE Online Seminar** — *Michigan State University, MI*
"Actinide Production in Neutron Star Mergers: Observation and Theory"

Contributed (9)

2020 **Fall Meeting of the APS Division of Nuclear Physics** (Virtual) — *New Orleans, LA*
"Which Neutron Star Mergers Synthesized the *r*-Process Elements?"

235th Meeting of the AAS — *Honolulu, HI*
"The Actinide Boost and its *r*-Process Implications"

2019 **Fall Meeting of the APS Division of Nuclear Physics** — *Crystal City, VA*
"Actinide-Rich or Actinide-Poor, Same r-Process Progenitor"

JINA-CEE Frontiers in Nuclear Astrophysics — *Michigan State University, MI*
"Actinide-Rich or Actinide-Poor, Same r-Process Progenitor"

Notre Dame GPS Annual Conference — *University of Notre Dame, IN*
"Actinide-Boost Stars Might Not Suggest a Separate r-Process Site"

R-Process Sources in the Universe — *Arizona State University, AZ*
"Actinide-Boost Stars may not Suggest a Separate r-Process Site"

2018 **Fifth Joint Meeting of the Nuclear Physics Divisions of the APS and JPS** — *Waikoloa, HI*
"Actinide Production in Neutron Star Mergers"

2017 **Annual FIRE (Fission In R-process Elements) Meeting** — *Lawrence Livermore National Laboratory, CA*
"Impact of New LANL Fission Rates on the R-Process"

JINA-CEE Frontiers in Nuclear Astrophysics: Junior Researchers Workshop — *MSU, MI*
"The Hunt for r-II Stars: Constraining the Early r-Process through High-Resolution Spectroscopic Follow-up on the RAVE Survey"

Poster Presentations

2019 **Nuclear Physics in Astrophysics IX** — *Schloß Waldthausen, Frankfurt, Germany*
"Characterizing r-Process Sites through Actinide Production" - *Winner of the Best Poster Award*

2018 **JINA-CEE Frontiers in Nuclear Astrophysics** — *University of Notre Dame, IN*
"The R-Process Alliance Hunt for r-II Stars"

2017 **LANL FIESTA Fission School & Workshop** — *Sante Fe, NM*
"Searching for New Highly r-Process-Enhanced Stars in the Halo of the Milky Way"

2016 **Graduate Physics Students (GPS) Fall Conference** — *University of Notre Dame, IN*
"A Bright r-II Star Detected by High-Resolution Follow-up of the RAVE Survey"

Nuclei in the Cosmos XIV — *Niigata, Japan*
"A Bright r-II Star Detected by High-Resolution Follow-up of the RAVE Survey"

2014 **American Astronomical Society Meeting #224** — *Boston, MA*
"Identifying New Members of Nearby Moving Groups"

Awards and Fellowships

2019 **Best Poster Award (Nuclear Physics in Astrophysics IX)** *(500€)*

Graduate Student Union (GSU) Conference Presentation Grant *($350)*

2018 **Zahm Research Travel Grant** *($2,000)*

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

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

Skills

Proficient Python, LaTeX, bash (Unix/Linux), IRAF, MOOG, SMH
User-level C++, Fortran, HTML, CSS

Student Supervision

2018 **Phuong Hoang,** University of Hanoi (REU)

Tino Wells, University of Washington (REU)

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)**

Activities and Outreach

2019	**Lead Physics lab teaching assistant for the Moreau College Initiative at Westville Correctional Facility**
2019	**Cofounder and organizer of the JINA-CEE First Frontiers Summer School**
2017 – 2018	**Graduate Student Union (GSU) Representative for the Department of Physics**
2017 – 2019	**Private Tutor for Physics I and II**
2016	**Teaching Assistant for Sensing our World 2016: Mission to Mars**
	Exhibitor for Our Universe Revealed: Hands-On Physics and Astroblast!
	Exhibitor for JINA-CEE Art 2 Science Camp