Erika M. **Holmbeck**

Nuclear Astrophysicist · PhD Candidate

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Summary

My 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 run nucleosynthesis simulations to investigate both the nuclear and astrophysical effects on heavy-element production.

Education

anticipated **University of Notre Dame**

2020 Ph.D. Physics

"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, *Cum laude*, Departmental Honors, Dean's Honors List

"New Members of Nearby Moving Groups"

Advisors: Profs. Benjamin Zuckerman and Smadar Naoz

Research and Teaching Experience

2015 – **University of Notre Dame, Department of Physics**

Graduate Research Assistant, Advised by Prof. Rebecca Surman

r-Process Nucleosynthesis

- Theoretical modeling of nucleosynthesis in *r*-process events
- Utilize nucleosynthesis network code to study *r*-process element formation
- Investigate actinide production and correlate with measurements in metal-poor stars

Graduate Research Assistant, Advised by Prof. Timothy C. Beers

Identifying r-II Stars in the Milky Way Halo

- Spectroscopic observational astronomy; high-resolution follow-up search for *r*-II stars
- Elemental abundance measurements of *r*-II stars
- Classifying and identifying new *r*-process-enhanced stars

2019 **Holy Cross College and Westville Correctional Facility**

Teaching Assistant for Prof. Lara Arielle Phillips

Lab Technician for Westville Education Initiative

- Design, prepare, and lead Physics labs for the Moreau College Initiative at Westville Correctional Facility

2015 – 2017 **University of Notre Dame, Department of Physics**

Teaching Assistant for Prof. Peter Garnavich

Lead Technician for the Jordan Hall of Science Observatory

- Set up telescopes nightly for and guide undergraduate student projects
- Lead biweekly public observing events

2013 – 2015 **University of California Los Angeles, Department of Physics and Astronomy**

Undergraduate Research Assistant

Identifying New Members of Nearby Moving Groups

- Remote observational astronomy
- High-resolution spectroscopy to measure lithium in young stars

Publications

Main Author

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.

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.

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.

Co-Author

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.

2018 **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 Pattern of a Bright, Highly *r*-Process-Enhanced, Metal-Poor Halo Star at [Fe/H] ~ -2, Sakari, C. M., Placco, V. M., Hansen, T., **Holmbeck, E. M.**, et al. 2018, ApJL, 854, L20.

Unrefereed and Conference Proceedings

2019 **FRIB and the GW170817 Kilonova,** Aprahamian, A., Surman, R., Frebel, A., ..., **Holmbeck, E. M.**, ..., et al., 2018, arXiv e-prints, *arXiv:1809.00703*.

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.

Oral Presentations

2019 **Astrophysics Seminar**
"The Stellar Actinide Boost and its *r*-Process Implications" (invited)
University of Notre Dame, Notre Dame, IN

JINA-CEE Frontiers in Nuclear Astrophysics
"Actinide-Rich or Actinide-Poor, Same r-Process Progenitor" (contributed)
Michigan State University, East Lansing, MI

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

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

2018 **Fifth Joint Meeting of the Nuclear Physics Divisions of the APS and JPS**
"Actinide Production in Neutron Star Mergers" (contributed)
Hilton Waikoloa Village, Waikoloa, HI

JINA-CEE Online Seminar
"Actinide Production in Neutron Star Mergers: Observation and Theory" (invited)
Michigan State University, East Lansing, MI

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

JINA-CEE Frontiers in Nuclear Astrophysics: Junior Researchers Workshop
"The Hunt for *r*-II Stars: Constraining the Early *r*-Process through High-Resolution Spectroscopic Follow-up on the RAVE Survey" (contributed)
Michigan State University, East Lansing, MI

Posters

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

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

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

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

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

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

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

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

2015 – **Member of the 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**

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