

# 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  **$\beta$ -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  $[\text{Fe}/\text{H}] \sim -2$** , 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

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- 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

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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

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

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

## SKILLS

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*Proficient* Python,  $\LaTeX$ , bash (Unix/Linux), IRAF, MOOG, SMH

*User-level* C++, Fortran, HTML, CSS

## STUDENT SUPERVISION

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

**Tino Wells**, University of Washington (REU)

## MEMBERSHIPS

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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

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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**