Dr. Rana Ezzeddine

JINA-CEE Postdoctoral Fellow &
Heising-Simons Physics Research Fellow

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EMPLOYMENT

Assistant Professor — Starting Jan 2020
Department of Astronomy,
University of Florida
Gainesville, FL

Postdoctoral Fellow — 2016-present
Joint Institute for Nuclear Astrophysics –
Center for the Evolution of Elements (JINA-CEE)
Michigan State University
(residing at) Kavli Institute for Astrophysics and Space Research
Massachusetts Institute of Technology
Cambridge, MA, USA

EDUCATION

Ph.D in Physics — 2012-2015
University of Montpellier, France

Master of Sciences in Astrophysics — 2010-2012
Joint Notre Dame University, Louaize, Lebanon
& University of Saint Joseph, Beirut, Lebanon

Bachelor of Sciences in Physics — 2005-2008
Lebanese University, Beirut, Lebanon

AWARDS AND GRANTS

Heising-Simons Physics Research Fellowship — 2019
Massachusetts Institute of Technology

Co-I. NASA Hubble Space Telescope — 2019-2023
GO-15951 (P.I. Hansen): TBD

Co-I. NASA Hubble Space Telescope — 2018-2022
GO-15657 (P.I. Roederer): $66,821

Co-I., NASA Hubble Space Telescope — 2016-2019
GO-14151 (P.I. Frebel): $53,547

JINA-CEE postdoctoral fellowship — 2016-present
Massachusetts Institute of Technology

IAUS 334 best poster 1st prize award — 2017

IAU travel grant for attendance of Symposium 334 2017
$400

PHC CEDRE grant (France) 2015
Project number 32919SL: 3400 €

1M CPU hours 2014-2015
FRANCE-GRILLES/DIRAC grid , University of Montpellier, France

University of Montpellier PhD fellowship 2012-2015
Montpellier, France

CNRS-Lebanon PhD fellowship 2012-2015
Montpellier, France

Masters Graduate Fellowship 2011-2012
Notre Dame University, Louaize, Lebanon

COMPETITIVELY AWARDED OBSERVING TIME

Principal Investigator 2019
Gran Telescopio Canarias (GTC) (21 queue hours)
"Characterizing r-process nucleosynthesis models of enhanced r-process stars"

Co-Investigator 2019
McDonald Observatory 2.7 m Telescope, 7 nights

Co-Investigator 2020-2022
Hubble Space Telescope
Cycle 27 proposal GO-15951, 17 Orbits
"Testing r-process nucleosynthesis models with two r-process enhanced stars"

Co-Investigator 2019-2021
Hubble Space Telescope
Cycle 26 proposal GO-15657, 37 Orbits
"HD 222925: A unique opportunity to study the full range of nuclei produced by a single r-process event"

Principal Investigator 2016-2019
Magellan Clay Telescope (24 nights total)
"Characterizing the population of r-process stars in the Galactic Halo"

Co-Investigator 2018
Magellan Clay Telescope (2 nights total)
"J0023−0307: A rare second-generation star with [Fe/H]< -6"

Co-Investigator 2016-2017
Magellan Clay Telescope (8 nights total)
"Discovering the most metal-poor stars from the SkyMapper Survey"

Co-Investigator 2015-2018
Hubble Space Telescope
Cycle 23 proposal GO-14151, 24 Orbits
"Constraining Pop III supernova energies and the formation of the first low-mass stars with the iron-poor star HE 1327−2326"

OBSERVING EXPERIENCE

Magellan Clay Telescope (Chile), 6.5m 2016-2018
MIKE Spectrograph
(25 nights total)

Observatoire de Haute Provence (France), 1.52m Telescope 2014
Aurelie Spectrograph
(4 nights total)

University of Notre Dame (Lebanon), 0.6m Meade Telescope 2011-2012
Echelle Spectrograph
(20 nights total)

TEACHING & MENTORING

Mentoring of high school RSI student summer research Summer 2019
Subhash Kantamneni (*Suncoast Community High School/Florida*)
Final Presentation (Link)

Mentoring of undergraduate summer research Summer 2019
Xinmiao (Anna) Hu (*Imperial College London/UK*)
Ezzeddine, Hu (in prep)

Mentoring of undergraduate research 2017-present
Fouad Chahrour (*Fullbright Fellow, Germany*)

Co-Mentoring of graduate research work 2018-present
Kaitlin Rasmussen (*Notre Dame University, IN*)
Ezzeddine R., Rasmussen K. et al. ApJ in prep.

Summer School Lectures 2017
MIT Undergraduate Research Opportunities Program students (UROP) *"Introduction to Radiative Transfer in Stellar Atmospheres"*, MIT, Cambridge, MA

Undergraduate Physics Teaching Fellow 2011-2012
Astronomy 101: "Introduction to the Solar System"
Notre Dame University, Louaize, Lebanon

General Physics Lab Teaching Fellow 2011-2012
Notre Dame University, Louaize, Lebanon

Electricity and Magnetism Physics Lab Teaching Fellow 2011-2012
Notre Dame University, Louaize, Lebanon

Highschool Physics Instructor 2008-2012
Beirut Modern School, Beirut, Lebanon
Part-time teaching, 4 highschool classes

Highschool Physics Instructor 2010-2011
Amjad College, Beirut, Lebanon
Part-time teaching, 2 highschool classes

CONFERENCE PRESENTATIONS

1- CEMP stars as probes of First stars Nucleosynthesis 09/2019
contributed talk, *Geneva, Switzerland*

2- JINA-CEE 2019 Frontiers meeting, **contributed** talk 05/2019
East Lansing, MI, USA

3- Galactic Archeology as time machines to the First stars, 12/2018
contributed talk *Tokyo, Japan*

4- Eleventh International Conference on Atomic and Molecular 11/2018
Data and Their Applications, **invited** talk, *Cambridge, MA, USA*

5- Cool stars 20 (plenary session), **contributed** talk (Link) 08/2018
Boston, MA, USA

6- The Metal poor Galaxy, **invited** talk 07/2018
Ringberg, Germany

7- FRIB and the GW170817 kilonova, **invited** talk 07/2018
Lansing, MI, USA

8- JINA-CEE 2018 Frontiers meeting, (poster) 05/2018
South Bend, IN

9- IAU 334 1st prize poster award **contributed** talk 08/2017
Potsdam, Germany

11- JINA-CEE Frontiers meeting (Junior workshop) 05/2017
contributed Review on Observational Astrophysics, *Lansing, MI, USA*

12- First stars V conference (poster) , *Heidelberg, Germany* 07/2016

13- MIT Kavli Institute postdoc symposium, **contributed** talk 05/2016
MIT, Cambridge, MA, USA

14- STScI 2017 Spring Symposium: UV metals (poster) 04/2017
Baltimore, MD, USA

15- JINA-CEE Frontiers meeting, **contributed** talk 02/2016
South Bend, IN, USA

16- The Milky Way's History: 592. WE-Heraeus-Seminar 06/2015
contributed talk, *Bad Honnef, Germany*

17- Annual meeting of the French Society of Astronomy & Astrophysics 06/2013
contributed talk, *Montpellier, France*

18- New advances in Stellar Physics (poster) *Roscoff, France* 05/2013

COLLOQUIUM & SEMINAR TALKS

1- Massachusetts Institute of Technology, **invited** Astrophysics Colloquium 11/2019
Cambridge, MA, USA

2- Brandeis University, **invited** Astronomy Seminar 10/2019
Waltham, MA, USA

3- University of Texas A&M, **invited** Astronomy Seminar 09/2019
College Station, TX, USA

4- University of Notre Dame, **invited** Seminar 04/2019
South Bend, IN, USA

5- University of Florida, **invited** Astrophysics Colloquium 03/2019
Gainsville, FL, US

6- Harvard CfA, Institute for Theory & Computation (ITC), 10/2018
invited Lunch Seminar
Cambridge, MA, USA

7- Pontifical Catholic University of Chile, **invited** Seminar 07/2018
Santiago, Chile

8- American University of Beirut, **invited** Colloquium 08/2017
Beirut, Lebanon

9- University of Heidelberg, Stellar Astrophysics Seminar 07/2017
Heidelberg, Germany

10- JINA-CEE online webinar (Link) 10/2016

11- Michigan State University, **invited** Seminar 01/2016
East Lansing, MI, USA

12- Université Libre de Bruxelles, Astrophysics Seminar 06/2015
Brussells, Belgium

COLLABORATIONS
1- *R*-process Alliance (*R*PA), Core Member 2017-present
2- JINA-CEE, Fellow, Member 2016-present
3- *Gaia*-ESO − CoRoT, Working-Group member 2014-present

PROFESSIONAL ACTIVITIES
1- NASA Hubble Space Telescope Cycle 27 Time Allocation Committee 2019
Panel Member: Stellar Physics 3

2- External reviewer, Future Investigators in NASA Earth and Space Science and Technology (FINESST) proposals 2019

3- Referee, *IOP, A&A, Nature Astronomy & Springer* Journals 2017-present

4- Reviewer, Heising Simmons Physics Research Fellows, MIT 2018

5- Astrophysics seminar organizer, Brown Bag Lunch talk series, MIT 2017-present

6- LOC member, JINA 2019 frontiers meeting 2018-present

7- LOC member, Cool stars 20 2018

8- External Reviewer, CFHT TAC 2017

9- Organizer, Postdoc lunch series, MIT 2016-2017

10- LOC member, JINA 2017 frontiers meeting 2017

11- Co-organizer, MIT Kavli Institute postdoc symposium 2016

OUTREACH & SCIENCE COMMUNICATION

Leading Roles

Co-creator, organizer, Astronomy on Tap, Cambridge/Boston Series 2017-present
Co-creator, Lebanese Astronomy group 2006-present
Treasurer, Lebanese Astronomy group 2006-2012
Events organizer, Lebanese Astronomy group 2006-2012
Co-organizer, Beirut Science Days 2006-2012

Events/ Public Talks

1- MIT Museum, *Moon Shots: Apollo 11th 50th anniversary celebrations* 07/2019
invited talk, *Cambridge, MA*

2- High-school students outreach talk on *"Exciting Astronomy Questions"* 12/2018
Tokyo, Japan

3- Science Café, *"Where do elements in the Universe come from?"* 12/2017
Beirut, Lebanon

4- Astronomy on Tap 11/2017
"How is gold (and other heavy elements) made in stars?"
Boston, MA, USA

5- Astronomy on Tap *"How to find the oldest stars in the Universe?"* 04/2017
Cambridge, MA, USA

6- Potomac High school visit talk *"How to become a scientist?"* 01/2017
MIT, Cambridge, MA, USA

7- International year of Astronomy 2009, organizer, *Beirut, Lebanon* 2009

8- *100 hours of Astronomy*, organizer, *Beirut, Lebanon* 2009

9- Beirut Science Days, organizer, booth participant, *Beirut, Lebanon* 2006-2012

10- Various science festivals and sidewalk observing outreach events 2006-present
Multiple locations in Lebanon, France, USA

MEDIA & PRESS RELEASES

1- Pour La Science – 08/2019
Des jets puissants pour la mort des premières étoiles

2- Scientific American – 05/2019
The Universe's First Stars Exploded in Strange Ways

3- IPMU Press Release – 05/2019
Explosions of universes first stars spewed powerful jets

4- Newsweek – 05/2019
The Universe's First Stars Exploded, Sending Out Powerful Jets That Produced New Ones

5- TechTimes – 05/2019
First Stars In The Universe Were Short-Lived And Ejecting Giant Jets Of Matter

6- Astronomy Magazine – 05/2019
The universe's first supernovae spewed jets of material into nearby galaxies

7- MIT Press Release – 05/2019
Explosions of universes first stars spewed powerful jets

8- Interview for "Cosmic Front: Next Generation" 06/2017
documentary series, "Psyche Mission" episode
Las Campanas Observatory, Atacama, Chile

9- Multiple radio and TV interviews 2006-2012
promoting Astronomy and outreach events, *Beirut, Lebanon*

LANGUAGES

Arabic (native): read, written, spoken
English (quadrilingual): read, written, spoken
French (quadrilingual): read, written, spoken
German (quadrilingual): read, written, spoken
Spanish : read and spoken

LIST OF PUBLICATIONS

First Author

6- **Ezzeddine R.**, Rasmussen K., Chiti A., Frebel A., et al. 2019, in prep.
"The R-Process Alliance : High resolution Magellan/MIKE data release from the Southern search for r-process enhanced stars in the Galactic Halo"

5- **Ezzeddine R.**, Frebel A., Roederer I. U., Tominaga T., Tumlinson J., Ishigaki M., Nomoto K., Placco V. M., Aoki W., 2019, **ApJ**, 876, 97E
"Evidence for an aspherical Population III supernova explosion inferred from the Hyper-Metal-Poor star HE 1327−2326"

4- **Ezzeddine, R.**, Merle T., Plez, B. et al. 2018, **A&A**, 618, A141
"An empirical recipe for inelastic hydrogen-atom collisions in non-LTE calculations"

3- **Ezzeddine R.** & Frebel A., 2018, **ApJ**, 863, 168E
"Revisiting the Iron Abundance in the Hyper Iron-poor Star HE 1327−2326 with UV COS/HST Data"

2- **Ezzeddine R.**, Frebel A. and Plez B., 2017, **ApJ**, 847, 142E
"Ultra-metal-poor Stars: Spectroscopic Determination of Stellar Atmospheric Parameters Using Iron Non-LTE Line Abundances"

1- **Ezzeddine R.**, Merle T. and Plez B., 2016, **AN**, 337, 850E
"Non-LTE iron abundances in cool stars: The role of hydrogen collisions"

Co-Author

12- Rasmussen K.C., Frebel A., **Ezzeddine R.**, Ji A.P., Chiti A, Beers T., Hansen T.T., Placco V.M., Roederer I.U., Sakari C., **ApJ** submitted

The R-Process Alliance: A Uranium abundance measurement in the r-I star BD+17° 3248

11- Nordlander T., Bessell M.S., Da Costa G.S., Mackey A.D., Asplund M., Casey A.R., Chiti A, **Ezzeddine R.**, Frebel A., Lind K., Marino A.F., Murphy S.J., Norris J.E., Schmidt B.P. and Yong D., **MNRAS** accepted
"The lowest detected stellar Fe abundance: The halo star SMSS J160540.18−44323.1"

10- Sitnova T., Mashonkina L., **Ezzeddine R.**, Frebel A. 2019, **MNRAS**, 485, 3527S
"Ultra metal-poor stars: improved atmospheric parameters and NLTE abundances of magnesium and calcium"

9- Sakari C., Roederer I., Placco V., Beers T., **Ezzeddine R.** et al. 2019, **ApJ**, 874, 148S
"The R-Process Alliance : Discovery of a low α, r-process enhanced metal-poor star in the Galactic halo"

8- Frebel A., Ji, A., **Ezzeddine R.**, et al. 2019, **ApJ**, 871, 146F
"Chemical abundance Signature of J0023+0307 – A Second-Generation Main-Sequence Star with [Fe/H]< -6"

7- Placco V. M et al. including **Ezzeddine, R.** 2019, **ApJ**, 870, 122P
"The R-Process Alliance: Spectroscopic Follow-up of 857 Low-Metallicity Star Candidates from the Best & Brightest Survey"

6- Sakari C., Placco V., Farrell E., Roederer I., Wallerstein G., Beers T., **Ezzeddine R.** et al. 2018, **ApJ**, 68, 110S
"The R-Process Alliance: First Release from the Northern Search for r-Process Enhanced Metal-Poor Stars in the Galactic Halo"

5- Roederer I., Sakari C., Placco, V., Beers, T., **Ezzeddine, R.** at al. 2018, **ApJ**, 865, 129R
"The R-Process Alliance: A Comprehensive Abundance Analysis of HD 222925, a Metal-Poor Star with an Extreme R-Process Enhancement of [Eu/H]$= -0.14$"

4- Cain M., Frebel A., Gull M., Ji A., Placco V., Beers T., Meléndez J., **Ezzeddine R.**, et al. 2018, **ApJ**, 864, 43C
"The R-Process Alliance: Chemical Abundances for a Trio of r-process-enhanced StarsOne Strong, One Moderate, and One Mild"

3- Gull, M., Frebel A., Cain M., Placco V., Ji A., Abate C., **Ezzeddine R.** et al. 2018, **ApJ**, 862, 174G
"The R-Process Alliance: Discovery of the First Metal-poor Star with a Combined r- and s-process Element Signature"

2- Placco V., Holmbeck E., Frebel A., Beers T., Surman R., Ji A., **Ezzeddine R.** 2017, **ApJ**, 844, 18P
"RAVE J203843.2-002333: The First Highly R-process-enhanced Star Identified in the RAVE Survey"

1- Ji A., Frebel A., **Ezzeddine R.** & A. Casey, 2017, **ApJ**, 832L, 3J
"Chemical Diversity in the Ultra-faint Dwarf Galaxy Tucana II"

PROCEEDING PUBLICATIONS

4- Aprahamian A. et al. including **Ezzeddine R.**, 2018, Proceedings for the FRIB Theory Alliance workshop, arXiv:1809.00703

"FRIB and the GW170817 kilonova"

3- **Ezzeddine R.**, Sitnova T., Frebel A., Mashonkina L., Plez B., 2018, IAU symposium 334 Conference proceeding, 259E
"Mega (metal-poor) not so much: Non-LTE spectroscopic stellar parameters and abundance determination of Ultra metal-poor stars"

2- **Ezzeddine, R.**, Merle T. & Plez B., 2013, "New Advances in Stellar Physics: From Microscopic To Macroscopic Processes" EAS conference proceedings, 63, 407E
"NLTE Iron abundance determination in Red Giants"

1- **Ezzedine, R.**, Merle T., Plez B., 2013, Proceedings of the Annual meeting of the French Society of Astronomy and Astrophysics, 119E
"Non-LTE Iron abundance determination of a sample of Kepler Red Giants"

REFERENCES

Prof. Anna Frebel
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Prof. Bertrand Plez
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University of Notre Dame
South Bend, IN, USA
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