Alexander P. Ji

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RESEARCH INTERESTS: NEAR-FIELD COSMOLOGY

The first stars and galaxies: metal-free stars, first galaxy relics, reionization
The origin of the elements, especially the rapid neutron-capture process
Milky Way halo substructure and the nature of dark matter
Stellar spectroscopy

EDUCATION AND APPOINTMENTS

Hubble Fellow, Observatories of the Carnegie Institution for Science — Aug 2017 - Present

Ph. D. Physics, Massachusetts Institute of Technology — Sep 2012 - Jun 2017
Advised by Anna Frebel, Astrophysics division

M.S. Statistics, Stanford University — Jun 2012
Focus on Applied Statistics and Machine Learning

B. S. Physics, Stanford University — Jun 2011
Minor in Computer Science

HONORS AND AWARDS

Hubble Fellowship	2017-2020
APS DAP Cecilia Payne-Gaposchkin Thesis Award Finalist	Apr 2019
Martin Deutsch Award for Excellence in Experimental Physics, MIT	Sep 2016
Young Scientist at 66th Lindau Nobel Laureate Meeting, Germany	Jun 2016
Best Poster Prize, Nuclei in the Cosmos XIV, Japan	Jun 2016
Henry Kendall Teaching Award, MIT	Sep 2014
Whiteman Fellow, MIT	Sep 2012 - Aug 2013
Outstanding Learning Assistant, American Association of Physics Teachers	Jun 2012
Stanford Alumni Award of Excellence	Jun 2011

INVITED TALKS

Talk Session on Dwarf Galaxies, First Stars VI, Concepcion, Chile	Mar 2020
Colloquium "Near-field Cosmology with the Rapid Neutron-capture Process", Caltech	Oct 2019
Talk "Chemical evolution in ultra-faint dwarf galaxies", Dwarf Galaxy Cosmology, Durham	Jul 2019
Talk "Signatures of the First Stars in Relics of the First Galaxies", APS Cecilia Payne-Gaposchkin Doctoral Dissertation Award in Astrophysics Finalist	Apr 2019
Talk "r-process nucleosynthesis in the first galaxies", Stellar Archaeology, Tokyo	Dec 2018
Talk "Connecting dwarf galaxies to the stellar halo", Metal-Poor Galaxy, Ringberg	Jul 2018
Talk "r-process nucleosynthesis in dwarf galaxies", AAS Denver	Jun 2018
Colloquium U. Virginia (Joint Physics/Astronomy)	Feb 2018
Seminar "A rare and prolific r-process event in Reticulum II", CCAPP/OSU	Oct 2016
Highlight Talk "Dwarf galaxy archaeology with Reticulum II", First Stars V, Heidelberg	Aug 2016
Talk "A single prolific r-process event preserved in an ultra-faint dwarf galaxy", American Physical Society Hot Topics Session, April Meeting	Apr 2016
Colloquium "A rare and prolific r-process event in Reticulum II", University of Toledo	Jan 2016

CONTRIBUTED TALKS AND POSTERS

Talk "Chemical evolution in ultra-faint dwarf galaxies", GalFRESCA, UC Irvine — Aug 2019
Talk "Lanthanide fractions in neutron star mergers", ASU *r*-process workshop — Mar 2019
Talk "Dwarf galaxy archaeology with Reticulum II", UC Irvine — May 2018
Talk "A full abundance pattern in Reticulum II", JINA Frontiers — May 2018
Talk "Homogeneous Abundances in Ultra-faint Dwarf Galaxies", JINA Forging Connections — Jun 2017
Talk "Dwarf galaxy archaeology with Reticulum II", The Galactic Renaissance — Feb 2017
Seminars "Dwarf galaxy archaeology with Reticulum II", 7 talks — Apr-Nov 2016
At Caltech, CfA, UCSC, Yale, Carnegie, KIPAC, Tufts
Poster "Stellar Abundances in Ultra-faint Dwarf Galaxies", GMT Science Meeting — Sep 2017
Poster "A rare and prolific r-process event in Reticulum II", Nuclei in the Cosmos XIV — Jun 2016
Poster "Satellite Planes in Caterpillar", Local Group Astrostatistics Conf, U Michigan — Jun 2015
Poster "Testing early star formation", Near-Field Far-Field Conf, UC Irvine — Feb 2014

TEACHING

Professional Development Program* ISEE (as team leader, with A. Lanz, S. Uddin) — 2019
Lecturer "Cosmology and First Stars", JINA Frontiers Summer School, MSU — 2019
Professional Development Program* ISEE (with R. McGurk, D. French) — 2018
Workshop Carnegie, Scientific Writing Workshop for Undergraduates (with J. Teske) — 2017
Teaching Assistant MIT, 8.282/8.284: Intro to Astronomy/Modern Astrophysics — 2014/2016/2017
Head Teaching Assistant Stanford, Physics 25/26: Modern Physics — 2012
Teaching Assistant Stanford, Physics 63: Electricity, Magnetism, and Waves — 2012
Teaching Assistant* Stanford, Physics 62: Classical Mechanics Laboratory — 2010/2011
Instructor* Stanford, Physics 91SI: Practical Computing for Scientists — 2011
Teaching Assistant Stanford, Physics 24: Electricity and Optics Laboratory — 2011
Resident Tutor Stanford CTL, Math, science, and engineering tutoring — 2009 - 2010
Section Leader Stanford, CS 106A/B: Programming Methods/Abstractions — 2008 - 2009

* Led or assisted in curriculum development

SELECTED OUTREACH AND SERVICE

Referee for ApJ, MNRAS, A&A
Climate Survey Working Group Carnegie Institution for Science — 2019–2020
Public Talk "Glimpses of the Cosmic Dawn", Pasadena City College Lectures — Sep 2019
Program Committee for JINA First Frontiers Summer School — May 2019
Public Talk "Glimpses of the Cosmic Dawn", Huntington Library Astronomy Lectures — Mar 2019
Public Talk "Glimpses of the Cosmic Dawn", Carnegie Lunch with an Astronomer — Nov 2017
Public Talk "Searching for the First Stars", Carnegie Open House — Oct 2017
Public Talk "Glimpses of the Cosmic Dawn", Whitin Observatory at Wellesley — Apr 2017
Public Talk "The First Stars", MIT IAP — Jan 2017
Einstein in the Classroom Instructor Cambridge Science Festival — Apr 2015
Science by the Pint public outreach with Harvard Science in the News — Apr 2015
Public Talk "The First Stars", MIT IAP — Jan 2015
Public Talk "The Universe in a Box", MIT IAP — Jan 2014
Mentor for two undergraduate students and one high school student at MIT — 2013 - 2017

TELESCOPE AND COMPUTING ALLOCATIONS

Magellan/MIKE High-resolution spectroscopy, >20 nights (PI)
Magellan/M2FS Multi-object spectroscopy, 3 nights (PI)
Magellan/IMACS Multi-object spectroscopy, 2 nights (PI)
VLT/FLAMES Multi-object spectroscopy, 1.6 nights (PI)
Gemini/GRACES High-resolution spectroscopy, 3.4 nights (PI)
Keck/HIRES High-resolution spectroscopy, 1 night (Co-I)
Hubble/ACS 29 orbits (Co-I)
XSEDE/Stampede, Comet 10 million CPU hours (Co-I)

STUDENT COLLABORATORS

Graduate Students Kaley Brauer (MIT, 2017-present, stellar halo models)

Undergraduates Fernando Barcelo (Pomona, 2019, Pop III mass function); Jose Arizmendi, Allen Marquez (ELAC, 2019, metal-poor star abundances); Sergio Escobar (Caltech, 2018, stellar halo kinematics); Maude Gull, Madelyn Cain (MIT, 2016-2018, r-process star abundances; now graduate students at Berkeley and Harvard); Lizhou Sha (MIT, 2016-2017, dark matter simulations; now TESS Quick-Look Pipeline Engineer)

COLLABORATION MEMBERSHIP

The Southern Stellar Stream Spectroscopic Survey (S^5, `https://s5collab.github.io/`, Project Builder)
The *Caterpillar* Project (`https://www.caterpillarproject.org/`, Project Builder)
The R-Process Alliance (RPA)
The Magellanic Satellites Survey (MagLiteS)
DECam Local Volume Exploration Survey (DELVE, `https://delve-survey.github.io/`)
Joint Institute for Nuclear Astrophysics - Center for the Evolution of the Elements (JINA-CEE) member

PUBLICATIONS

13 refereed first and second author papers + 1 submitted, 440 total citations, h-index = 10.
30 refereed papers + 2 submitted, 968 total citations, h-index = 16. As of Oct 2019 (via NASA ADS).

FIRST AND SECOND AUTHOR PUBLICATIONS

14. **Ji, A. P.**, Li, T. S., Simon, J. D., et al., *Detailed Abundances in the Ultra-Faint Magellanic Satellites Carina II and III*, submitted to ApJ

13. **Ji, A. P.**, Drout, M. R., & Hansen, T. T., *The Lanthanide Fraction Distribution in Metal-poor Stars: a Test of Neutron Star Mergers as the Dominant r-process Site*, 2019, ApJ, 882, 1

12. Frebel, A., **Ji, A. P.**, Ezzeddine, R., Hansen, T. T., Chiti, A., Thompson, I. B., Merle, T. *Chemical abundance Signature of J0023+0307 – A Second-Generation Main-Sequence Star with [Fe/H]* < -6, 2019, ApJ, 871, 146

11. Brauer, K., **Ji, A. P.**, Frebel, A., Dooley, G. A., Gomez, F. A., O'Shea, B. W. *The Origin of r-process Enhanced Metal-Poor Halo Stars In Now-Destroyed Ultra-Faint Dwarf Galaxies*, 2019, ApJ, 871, 2

10. **Ji, A. P.**, Simon, J. D., Frebel, A., Venn, K. A., Hansen, T. T. *Chemical Abundances in the Ultra-Faint Dwarf Galaxies Grus I and Triangulum II: Neutron-Capture Elements as a Defining Feature of the Faintest Dwarfs*, 2019, ApJ, 870, 83

9. **Ji, A. P.** & Frebel, A. *From Actinides to Zinc: Using the full abundance pattern of the brightest star in Reticulum II to distinguish between different r-process sites*, 2018, ApJ, 856, 138

8. Safarzadeh, M., **Ji, A. P.**, Dooley, G., Frebel, A., Scannapieco, E., Gomez, F., O'Shea, B. W. *Selecting ultra-faint dwarf candidate progenitors in cosmological N-body simulations at high redshifts*, 2018, MNRAS, 476, 5006

7. **Ji, A. P.**, Frebel, A., Ezzeddine, R., Casey, A. R. *Chemical Diversity in the Ultra-faint Dwarf Galaxy Tucana II*, 2016, ApJL, 832, 1

6. **Ji, A. P.**, Frebel, A., Simon, J. D., Chiti, A. *Complete element abundances of nine stars in the r-process galaxy Reticulum II*, 2016, ApJ, 830, 93

5. **Ji, A. P.**, Frebel, A., Chiti, A., Simon, J. D. *R-process enrichment from a single event in an ancient dwarf galaxy*, 2016, Nature, 531, 610

4. Griffen, B. F., **Ji, A. P.**, Dooley, G. A., Gomez, F. A., Vogelsberger, M., O'Shea, B. W., Frebel, A., *The Caterpillar Project: A Large Suite of Milky Way Sized Halos*, 2016, ApJ, 818, 10

3. **Ji, A. P.**, Frebel, A., Simon, J. D., Geha, M., *High-resolution spectroscopy of extremely metal-poor stars in the least evolved galaxies: Bootes II*, 2016, ApJ, 817, 41

2. **Ji, A. P.**, Frebel, A., Bromm, V., *Preserving chemical signatures of primordial star formation in the first low-mass stars*, 2015, MNRAS, 454, 659

1. **Ji, A. P.**, Frebel, A., Bromm, V., *The chemical imprint of silicate dust on the most metal-poor stars*, 2014, ApJ, 782, 95

N-TH AUTHOR PUBLICATIONS

18. Hawkins, K., Lucey, M., Ting, Y.-S., **Ji, A. P.**, . . . , *Identical or fraternal twins? The chemical homogeneity of wide binaries from* Gaia *DR2*, accepted to MNRAS

17. Norfolk, B. J., Casey, A., . . . , **Ji, A. P.**, *Discovery of s-process enhanced stars in the LAMOST survey*, 2019, MNRAS, 490, 2219

16. Koposov, S. E., Boubert, D., Li, T. S., . . . , **Ji, A. P.** (7th/20), . . . , *Discovery of a nearby 1700 km/s star ejected from the Milky Way by Sgr A**, 2019, accepted to MNRAS (arXiv:1907.11725)

15. Li, T. S., Koposov, S. E., Zucker, D. B., . . . , **Ji, A. P.** (7th/32), . . . , *The Southern Stellar Stream Spectroscopic Survey (S^5): Overview, Target Selection, Data Reduction, Validation, and Early Science* , 2019, accepted to MNRAS (arXiv:1907.09481)

14. Kozlowski, S., Bañados, E., . . . , **Ji, A. P.**, . . . , *Discovery of two quasars at $z = 5$ from the OGLE survey*, 2019, ApJ, 878, 115

13. Placco, V., Santucci, R. M., . . . , **Ji, A. P.**, . . . , *The R-Process Alliance: Spectroscopic Follow-up of Low-metallicity Star Candidates from the Best & Brightest Survey*, 2019, ApJ, 870, 122

12. Kemp, A., Casey, A., . . . , **Ji, A. P.**, . . . , *On the discovery of K-enhanced and possibly Mg-depleted stars throughout the Milky Way*, 2018, MNRAS, 480, 1384

11. Cain, M. G., Frebel, A., Gull, M., **Ji, A. P.**, . . . , *The R-Process Alliance: Chemical Abundances for a Trio of R-Process-Enhanced Stars*, 2018, ApJ, 864, 43

10. Gull, M., Frebel, A., Cain, M. G., Placco, V., **Ji, A. P.**, . . . , *The R-Process Alliance: discovery of the first metal-poor star with a combined r- and s-process element signature*, 2018, ApJ, 862, 174

9. Chiti, A., Frebel, A., **Ji, A. P.**, Jerjen, H., Kim, D., Norris, J. E., *Chemical Abundances of New Member Stars in the Tucana II Dwarf Galaxy*, 2018, ApJ, 857, 74

8. Li, T. S., Simon, J. D., . . . , **Ji, A. P.**, . . . , *Ships Passing in the Night: Spectroscopic Analysis of Two Ultra-Faint Satellites in the Constellation Carina*, 2018, ApJ, 851, 145

7. Hartwig, T., Yoshida, N., . . . , **Ji, A. P.**, . . . , *Descendants of the first stars: the distinct chemical signature of second generation stars*, 2018, MNRAS 478, 1795

6. Griffen, B. F., Dooley, G., **Ji, A. P.**, O'Shea, B. W., Gomez, F., Frebel, A., *Tracing the origin of the first stars and galaxies within the hierarchical assembly history of the Milky Way*, 2018, MNRAS, 474, 443

5. Drout, M. R., Piro, A. L., . . . , **Ji, A. P.**, . . . , *Light Curves of the Neutron Star Merger GW170817/SSS17a: Implications for R-Process Nucleosynthesis*, 2017, Science, 358, 1570

4. Shappee, B. J., Simon, J. D., . . . , **Ji, A. P.**, . . . , *Early Spectra of the Gravitational Wave Source GW170817: Evolution of a Neutron Star Merger*, 2017, Science, 358, 1574

3. Placco, V. M., Holmbeck, E. M., . . . , **Ji, A. P.**, . . . , *RAVE J203843.2−002333: The first highly r-process enhanced star identified in the RAVE survey*, 2017, ApJ, 844, 18

2. Frebel, A., Chiti, A., **Ji, A. P.**, Jacobson, H. R., Placco, V. M., *SD 1313–0019 — another second generation star with [Fe/H] = -5.0, observed with the Magellan telescope*, 2015, ApJL, 810, 27

1. Dooley, G., Griffen, B. F., Zukin, P., **Ji, A. P.**, Vogelsberger, M., Hernquist, L., Frebel, A., *The effects of varying cosmological parameters on halo substructure*, 2014, ApJ, 786, 50

UNREFEREED MANUSCRIPTS

5. **Ji, A. P.** et al., *Local Dwarf Galaxy Archaeology*, White Paper submitted to the Astro 2020 Decadal Survey

4. Simon, J. D. et al. including **Ji, A. P.**, *Dynamical Masses for a Complete Census of Local Dwarf Galaxies*, White Paper submitted to the Astro 2020 Decadal Survey

3. Roederer, I. U. et al. including **Ji, A. P.**, *The First Stars and the Origin of the Elements*, White Paper submitted to the Astro 2020 Decadal Survey

2. Roederer, I. U. et al. including **Ji, A. P.**, *The astrophysical r-process and the origin of the heaviest elements*, White Paper submitted to the Astro 2020 Decadal Survey

1. The MSE Science Team including **Ji, A. P.**, *The Detailed Science Case for the Maunakea Spectroscopic Explorer, 2019 edition* (contributed to Chapter 4), arXiv:1904.04907