Anirudh Chiti

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Education & Appointments

Kavli Institute for Cosmological Physics, University of Chicago Sep 2021 – Present
Brinson Prize Fellow in Observational Astrophysics

Massachusetts Institute of Technology May 2021
Ph.D. in Physics
Thesis: *Mapping the Ancient Milky Way and its Relic Dwarf Galaxies*
Advised by Anna Frebel

Cornell University May 2014
B.A. in Physics *Magna Cum Laude* and B.A. in Mathematics *with Distinction*
Minor in Astronomy

Awards & Honors

IAU Division H PhD Prize, Thesis award from the International Astronomical Union 2022
Henry Kendall Teaching Award, Graduate teaching award in Physics 2016
Honorable Mention, NSF Graduate Research Fellowship Program 2016
Whiteman Fellow, First-year fellowship at MIT 2014 – 2015
Cranston and Edna Shelley Award, Undergraduate research award in Astronomy 2014
Dean's List, Cornell University, GPA-based award Fall 2010 – Fall 2013

Competitively Obtained Telescope Time

PI, 10.5 nights on Magellan/IMACS – Imaging (2020A, 2020B, 2021A, 2021B, 2022A)
PI, 8 nights on Magellan/IMACS – Multi-slit spectroscopy (2015B, 2016A, 2016B, 2018A)
PI, 12 nights on Magellan/MagE – Single-slit spectroscopy, (2016B, 2018A, 2018B, 2019A, 2019B)
PI, 1 night on Magellan/M2FS – Multi-fiber spectroscopy, (2016A)
PI, 3.5 nights on Magellan/MIKE – Single-slit spectroscopy, (2020B, 2021A, 2021B)
Co-I, 2 nights on Magellan/M2FS – Multi-fiber spectroscopy, (2015A)
Co-I, 6 nights on Magellan/MIKE – Single-slit spectroscopy, (2016B, 2019A, 2022A)
Co-I, 30 hours on SkyMapper – Imaging, (2017B, 2018A)

Professional Service

Co-organizer, UChicago/KICP Gaia DR3 Sprint Jun 2022
Co-organizer, UChicago/KICP Friday astro-ph discussions Sep 2021 – Jun 2022
External Reviewer for Gemini Telescope Proposal Nov 2021
Referee for ApJ, MNRAS, PASJ 2019 – Present
Organizing Committee, JINA-CEE Frontiers in Nuclear Astrophysics Meeting May 2018

Leadership, Mentoring, and Outreach Experience

Primary Research Advisor for MIT undergraduates:
Kylie Hansen (Chemical abundances of stars in classical dwarf galaxies) May 2019 – May 2020
Tatsuya Daniel (Developing a low-metallicity map of the Milky Way) Aug 2019 – May 2020

Co-director & Founding member, MIT Sidewalk Astronomy Club Fall 2017 – Aug 2020
Organized 10+ sidewalk stargazing sessions, serving over 400 members of the public

Guest presenter, STEAM Ahead Learning Academy Summer 2019
Helped organize a hands-on spectroscopy demonstration and a solar observing session for rising 5th graders in the STEAM Ahead summer camp, affiliated with Boston Public Schools.

Volunteer, Cambridge Science Festival Spring 2019
Helped organize a hands-on telescope exhibit and solar observing booth as part of the "Science Carnival & Robot Zoo" event of the Cambridge Science Festival.

Volunteer, Latino STEM Alliance Science Festival Spring 2019

Online Project Course Instructor, MIT MOSTEC Summers 2015 – 2018
Instructed an online astrophysics course for rising high school seniors, largely from under-represented or under-resourced communities. Responsibilities included running the course (e.g., curriculum development, administration, developing interactive online teaching sessions), and mentoring students to build toward a final presentation of their independent research projects at MIT. I have taught and mentored over 60 high school students over my four summers in this program.

Conference Workshop Co-Instructor, MIT MOSTEC August 2015, 2017, 2018
Helped design and lead astrophysics workshops in which rising high school seniors analyzed images of a star to derive properties (e.g., orbit, size) of its transiting exoplanet. I held six of these sessions over three summers for groups of 10 to 30 students.

Public Talk: "Searching for the First Stars", MIT IAP January 2018

Selected Media Coverage

An Extended Halo around an Ancient Dwarf Galaxy (Chiti et al. 2021), featured on CNN, the Guardian, Sky & Telescope, MIT News, German National Radio, Gizmodo, and 35 other outlets.

Discovery of 18 stars with $-3.10 <$ [Fe/H] < -1.45 in the Sagittarius dwarf galaxy (Chiti, Hansen & Frebel 2020), featured on phys.org.

Teaching Experience

Graduate Teaching Assistant, MIT, 8.02: Physics II – Electricity & Magnetism Spring 2020

Graduate Teaching Assistant, MIT, 8.287: Techniques of Optical Astronomy Fall 2018
Student rating: **7.0/7.0**

Graduate Teaching Assistant, MIT, 8.287: Techniques of Optical Astronomy Fall 2017
Student rating: **6.7/7.0**

Graduate Teaching Assistant, MIT, 8.01: Physics I – Mechanics Fall 2016
Student rating: **6.6/7.0**

Graduate Teaching Assistant, MIT, 8.01: Physics I – Mechanics Fall 2015
Student rating: **6.4/7.0**

Grader, MIT, 8.902: Astrophysics II Fall 2015

Undergraduate TA, Cornell University, Fundamentals of Physics II Spring 2012

Seminars & Colloquiua (* = invited)

13. *Mapping the ancient stellar populations of the Milky Way and its relic dwarf galaxies.* University of Chicago Astronomy Tuesday Seminar, Sep 2021.

12. ***An extended halo around an ancient dwarf galaxy.* IAS astro-coffee, Dec 2020.

11. *A halo of chemically primitive stars around an ancient dwarf galaxy.* University of Chicago Astronomy Tuesday Seminar, Nov 2020.

10. *An extended halo around an ancient dwarf galaxy.* UCSC Friday Lunchtime Astrophysics Seminar, Oct 2020.

9. *An extended halo around an ancient dwarf galaxy.* Yale Galaxy Lunch Talk, Oct 2020.

8. ***Discovering the most metal-poor stars in the Milky Way's dwarf galaxies.* SFSU Physics & Astronomy Colloquium, Oct 2020.

7. ***A halo of chemically primitive stars around an ancient dwarf galaxy.* University of Michigan Galaxy Group Talk, Oct 2020.

6. *An extended halo around an ancient dwarf galaxy.* Steward/NOAO Galaxy Group Lunch Talk, Sep 2020.

5. *A halo of chemically primitive stars around an ancient dwarf galaxy.* IReNA Online Seminar, Jun 2020.

4. *What did the first galaxies look like?* MIT Physics Department Talk Series, Apr 2020.

3. *Finding the most metal-poor stars in the Milky Way's dwarf galaxies.* STScI Galaxy Journal Club Talk, Nov 2019.

2. *Finding the most metal-poor stars in the Milky Way's dwarf galaxies.* Caltech Astronomy Tea Talk, Oct 2019.

1. *Finding the most metal-poor stars in the Milky Way's dwarf galaxies.* Carnegie Lunch Talk, Oct 2019.

Conference Talks & Posters

**No conferences April 2020 to Winter 2021 due to covid-19*

14. **Talk**. *A halo of chemically primitive stars around an ancient dwarf galaxy.* JINA-CEE Frontiers in Nuclear Astrophysics Meeting, USA, May 2022.

13. **Talk**. *Detection of a spatially extended population of extremely metal-poor stars in the Tucana II ultrafaint dwarf galaxy.* First Stars VI, Chile, March 2020.

12. **Talk**. *Chemical characterization of dwarf galaxies using SkyMapper photometry.* Stellar Archaeology as a Time Machine to the First Stars Meeting, Japan, Dec 2018.

11. **Talk**. *Overview talk – Measuring stellar chemical abundances to trace the origin of elements.* JINA-CEE Frontiers in Nuclear Astrophysics Junior Workshop, USA, May 2018.

10. **Talk**. *Detection of a Population of Carbon-enhanced metal-poor stars in the Sculptor dwarf galaxy.* IAU Symposium 334: Rediscovering the Milky Way, Germany, Jul 2017.

9. **Poster**. *Chemical characterization of the Tucana II and Tucana III dwarf galaxies using SkyMapper photometry.* JINA-CEE Frontiers in Nuclear Astrophysics Meeting, USA, May 2018.

8. **Poster**. *Chemical characterization of dwarf galaxies using SkyMapper photometry.* Small Galaxies, Cosmic Questions Conference, UK, Aug 2019.

7. **Poster**. *Photometric searches for metal-poor stars in the Sculptor and Tucana II dwarf galaxies.* JINA Forging Connections Meeting, USA, Jun 2017.

6. **Poster**. *Chemical Abundances of Stars in the Sculptor Dwarf Spheroidal Galaxy.* First Stars V Meeting, Germany, Aug 2016.

5. **Poster**. *Chemical Abundances of Stars in the Sculptor Dwarf Spheroidal Galaxy.* Joint Institute for Nuclear Astrophysics Frontiers Meeting, USA, Apr 2016.

4. **Poster**. *Chemical Abundances of Stars in the Sculptor Dwarf Spheroidal Galaxy.* 3rd Annual GMT Community Science Meeting, USA, Oct 2015.

3. **Poster**. *Transient Events in Archival VLA Observations of the Galactic Center.* 223rd American Astronomical Society Meeting, USA, Jan 2014.

2. **Poster**. *Volcanic Effects in the Upper Atmosphere.* American Geophysical Union Fall Meeting, USA, Dec 2013.

1. **Poster**. *Infrared Properties of Single-Walled Carbon Nanotubes.* Mid-InfraRed Technologies for Health and the Environment Summer Workshop, USA, Aug 2010.

10+ additional internal journal club & graduate student lunch talks at MIT

Publication Record

Summary: 24 total publications; 11 first author papers; 3 second or third author papers; 10 nth author papers. $>$ 880 total citations (ref: google scholar).

First-author publications:

11. **Chiti, A.**, Mardini, M. K., Frebel, A., Daniel, T., *Magellan/IMACS Spectroscopy of Grus I: A low metallicity ultra-faint dwarf galaxy.* 2022, arXiv:2206.04580.

10. **Chiti, A.**, Frebel, A., Ji, A. P., Mardini, M. K., Ou, X., Simon, J. D., Jerjen, H., Kim, D., Norris, J. E., *Detailed Chemical Abundances of Stars in the Outskirts of the Tucana II ultra-faint dwarf galaxy.* 2022, arXiv:2205.01740.

9. **Chiti, A.**, Mardini, M. K., Frebel, A., Daniel, T., *The Metal-Poor Metallicity Distribution of the Ancient Milky Way.* 2021, **ApJL**, 911, L23.

8. **Chiti, A.**, Frebel, A., Mardini, M. K., Daniel, T., Ou, X., Uvarova, A. V. *Stellar metallicities from SkyMapper photometry II: Precise Photometric metallicities of $\sim$280,000 giant stars with [Fe/H] $<$ -0.75 in the Milky Way from SkyMapper DR2.* 2021, **ApJS**, 254, 31.

7. **Chiti, A.**, Frebel, A., Simon, J. D., Erkal, D., Chang, L. J., Necib, L., Ji, A. P., Jerjen, H., Kim, D., Norris, J., *An extended halo around an ancient dwarf galaxy.* 2021, **Nat Astron**, `https://doi.org/10.1038/s41550-020-01285-w`.

6. **Chiti, A.**, Hansen, K. Y., Frebel, A., *Discovery of 18 stars with -3.10 $<$ [Fe/H] $<$ -1.45 in the Sagittarius dwarf galaxy.* 2020, **ApJ**, 901, 164.

5. **Chiti, A.**, Frebel, A. L., Jerjen, H., Kim, D., Norris, J., *Stellar metallicities from SkyMapper photometry I: A study of the Tucana II ultra-faint dwarf galaxy.* 2020, **ApJ**, 891, 8.

4. **Chiti, A.** & Frebel, A. L., *Four Metal-poor Stars in the Sagittarius Dwarf Spheroidal Galaxy.* 2019, **ApJ**, 875, 112.

3. **Chiti, A.**, Frebel, A. L., Ji, A. P., Jerjen, H., Kim, D., Norris, J., *Chemical Abundances of new member stars in the Tucana II dwarf galaxy.* 2018, **ApJ**, 857, 74.

2. **Chiti, A.**, Simon, J. D., Frebel, A. L., Mateo, M., Bailey, J. I., Crane, J., Shectman, S., Thompson, I., Walker, M., *Detection of a Population of Carbon-enhanced Metal-poor stars in the Sculptor dwarf galaxy.* 2018, **ApJ**, 856, 142.

1. **Chiti, A.**, Chatterjee, S., Wharton, R. S., Cordes, J., Lazio, T. J. W., Kaplan, D. L., Bower G. C., Croft, S., *Transient Events in Archival Very Large Array Observations of the Galactic Center*, 2016, **ApJ**, 833, 11.

Second or third-author publications:

3. Mardini, M. K., Frebel, A., **Chiti, A.**, Meiron, Y., Brauer, K. V., Ou, X. *The Atari Disk, a Metal-Poor Stellar Population in the Disk System of the Milky Way*, 2022, arXiv:2206.08459.

2. Ji, A. P., Frebel, A. L., **Chiti, A.**, Simon, J. D., *R-process enrichment from a single event in an ancient dwarf galaxy*, 2016, **Nature**, 10.1038, 1476-4687.

1. Frebel, A. L., **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, L27.

Nth-author publications:

10. Sand, D. J., Mutlu-Pakdil, B., Jones, M. G., Karunakaran, A., Wang, F., Yang, J., **Chiti, A.**, Bennet, P., Crnojevic, D., Spekkens, K., *Tucana B: An Isolated and Quenched Ultra-faint Dwarf Galaxy at D=1.4 Mpc.* 2022, arxiv:2205.09129.

9. Yong, D., Da Costa, G. S., Bessell, M. S., **Chiti, A.**, Frebel, A., Gao, X., Lind, K., Mackey, A. D., Marino, A. F., Murphy, S. J., Nordlander, T., Asplund, M., Casey, A. R., Kobayashi, C., Norris, J. E., Schmidt, B. P., *High resolution spectroscopic follow-up of the most metal-poor candidates from SkyMapper DR1.1.* 2021, **MNRAS**, `https://doi.org/10.1093/mnras/stab2001`.

8. Yong, D., Kobayashi, C., Da Costa, G. S., Bessell, M. S., **Chiti, A.**, Frebel, A., Lind, K., Mackey, A. D., Nordlander, T., Asplund, M., Casey, A. R., Marino, A. F., Murphy, S. J., Schmidt, B. P., *r-Process elements from magnetorotational hypernovae.* 2021, **Nature**, `https://doi.org/10.1038/s41586-021-03611-2`.

7. Wevers, T., Pasham, D. R., van Velzen, S., Miller-Jones, J. C. A, Uttley, P., Gendreau, K. C., Remillard, R., Arzoumanian, Z., Löwenstein, M., **Chiti, A.**, *Rapid state transitions in a supermassive black hole's accretion flow.* 2021, **ApJ**, 912, 151.

6. Ezzeddine, R., Rasmussen, K., Frebel, A., **Chiti, A.**, Hinojosa, K., Placco, V. M., Beers, T. C., Hansen, T. T., Roederer, I. U., Sakari, C. M., Ji, A. P., Melendez, J., *The R-process Alliance: First Magellan/MIKE Release from the Southern Search for R-Process-enhanced Stars.* 2020, **ApJ**, 898, 150.

5. 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., Yong, D., *The lowest detected stellar Fe abundance: The halo star SMSS J160540.18-144323.1.* 2019, **MNRAS**, 488, 1.

4. Frebel, A. L., 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.

3. Placco, V. M., Frebel, A. L., Beers, T. C., Yoon, J., **Chiti, A.**, Heger, A., Chan, C., Casey, A. R., Christlieb, N., *Observational Constraints on First-Star Nucleosynthesis. II. Spectroscopy of an Ultra metal-poor CEMP-no Star,* 2016, **ApJ**, 833, 21.

2. Kim, D., Jerjen, H., Geha, M., **Chiti, A.**, Milone, A. P., Da Costa, G., Mackey, D., Frebel, A. L., Conn, B.,*Portrait of a Dark Horse: a Photometric and Spectroscopic Study of the Ultra-faint Milky Way Satellite Pegasus III*, 2016, **ApJ**, 833, 16.

1. Ji, A. P., Frebel, A. L., Simon, J. D., **Chiti, A.**, *Complete Element Abundances of Nine Stars in the r-process Galaxy Reticulum II*, 2016, **ApJ**, 830, 93.