Isabel Rosa Marie Medlock

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Education

Yale University — New Haven, CT
Astronomy PhD Candidate, Thesis Advisor: Prof. Daisuke Nagai — *Aug. 2021 – present*

Princeton University — Princeton, NJ
B.A. in Astrophysics; Certificates in Applications of Computing and Russian Language — *Sep. 2017 – Jun. 2021*

Publications

First author:

5. **Medlock, I.**, Nagai, D., et al., "Properties of Cold Streams in the IllustrisTNG-50 Simulations", in preparation

4. **Medlock, I.**, Nagai, D., Anglés-Alcázar, D., and Gebhardt. M., "Constraining the Effect of Baryonic Feedback on the Matter Power Spectrum with Fast Radio Bursts", 2025, accepted to ApJ (10.48550/arXiv.2501.17922)

3. **Medlock, I.**, Neufeld, C., Nagai, D., Anglés-Alcázar, D., Genel, S., Oppenheimer, B., Singh, P., and Villaescusa-Navarro, F., "Quantifying Baryonic Feedback on Warm-Hot Circumgalactic Medium in CAMELS Simulations", 2025, *ApJ*, 980(1) 22

2. **Medlock, I.**, Nagai, D., Singh, P., Oppenheimer, B., Anglés-Alcázar, D., and Villaescusa-Navarro, F., "Probing the Physics of the Circum-galactic Medium using Fast Radio Bursts: Insights from CAMELS", 2024, *ApJ*, 967(1) 32

1. **Medlock, I.**, and Cen, R., "Dispersion Measure Distributions of Fast Radio Bursts Due to the Intergalactic Medium", 2021, *MNRAS*, 502(3), 3664-3669.

Refereed Co-author:

3. Oppenheimer, B., Voit, M., Bahé, Y., Battaglia, N., Bregman, J., Burchett, J., Eckert, D., Faerman, Y., Gibson, J., Hummels, C., **Medlock, I.**, Nagai, D., Putnam, M., Qu, Z., Sun, M., Werk, J., and Zhang, Y., "The Descriptive Parametric Model I: Gaseous Profiles for Galaxies, Groups, and Clusters", in preparation

2. Zhang, Z., Nagamine, K., Oku, Y., Lee, K.G., Fukushima, K., Tomaru, K., Zhang, B., **Medlock, I.**, and Nagai, D., "Probing the cosmic baryon distribution and the impact of AGN feedback with FRBs in CROCODILE simulation", submitted to ApJ (10.48550/arXiv.2503.12741)

1. Lau, E., Nagai, D., Bodgan, A., **Medlock, I.**, Oppenheimer, B., Battaglia, N., Anglés-Alcázar, D., Genel, S., Ni, Y., and Villaescusa-Navarro, F., "X-raying CAMELS: Constraining Baryonic Feedback in the Circum-Galactic Medium with the CAMEL Simulation and eRASS X-ray Observations", accepted to ApJ (10.48550/arXiv.2412.04559)

Non-refereed Co-author:

2. Oppenheimer, B., Nagai, D., Lau, E., Singh, P., Butler Contreras, A., Gluck, N., Dorigo Jones, J., **Medlock, I.**, and Villaescusa-Navarro, F., "A Multi-Wavelength, Multi-Model Exploration of How Feedback Disrupts Gaseous Atmospheres", 2022, *Bulletin of the AAS, 54*(1).

1. Singh, P., Nagai, D., Oppenheimer, B., Lau, E., Gluck, N., and **Medlock, I.**, "Galactic Gaseous Halos: Mini-Clusters Disrupted by Feedback", 2022, *Galactic Atmospheres*.

Presentations

Astro Seminar at Kavli IPMU, Kashiwa, Japan (Talk) — *Sept 23rd, 2025*
FRB Journal Club at Max Planck Institute for Radio Astronomy (Invited Remote Talk) — *April 11th, 2025*
Galaxy Evolution Coffee at European Southern Observatory - Garching, Germany (Talk) — *March 27th, 2025*
Galaxy Formation Club at Max Planck Institute for Astrophysics in Garching, Germany (Talk) — *March 26th, 2025*
CGM Meeting at European Southern Observatory - Garching, Germany (Talk) — *March 21st, 2025*
Astro Lunch at Astronomy Department, University of Washington (Invited Talk) — *Feb 25th, 2025*

Cosmology and galaxy astrophysics with simulations and machine learning at CCA (Talk) *Dec 8th 2024*
Fast Radio Burst 2024 in Khao Lak Pang Nga, Thailand (Talk) *Nov 7th, 2024*
2024 Santa Cruz Galaxy Workshop at University of California Santa Cruz (Talk) *Aug 1st, 2024*
European Astronomical Society Annual Meeting (Virtual Poster) *July 2nd, 2024*
Baryons in the Universe 2024 at Kavli IPMU, Kashiwa, Japan (Talk) *Apr 11th, 2024*
Fast Radio Burst 2023 at IISER Bhopal, Indore, India (Remote Talk) *Nov 9th, 2023*
SACNAS National Diversity in STEM Conference in Portland, Oregon (Poster) *Oct 27th, 2023*
American Physical Society April Meeting in Minneapolis, Minnesota (Poster) *Apr 17th, 2023*
American Astronomical Society Winter Meeting 241 in Seattle, Washington (Poster) *Jan 12th, 2023*
CAMELS Workshop at the Center for Computational Astrophysics (Talk) *Nov 30th 2022*
SACNAS National Diversity in STEM Conference in San Juan, Puerto Rico (Talk) *Oct 28th, 2022*
Princeton Physics Junior Paper Symposium (Remote Talk) *Apr 19th, 2020*

Research Experience

PhD Dissertation (advised by Daisuke Nagai) *Aug 2023 - present*

- **Probing the Physics of the CGM & Cosmological Tension with FRBs: Insights from CAMELS**: Exploring the potential of using fast radio bursts to constrain astrophysical feedback effects on galaxy evolution and cosmology with the CAMELS project.
- **Quantifying Baryonic Feedback on Warm-Hot Circumgalactic Medium in CAMELS Simulations**: Quantifying the energetics of AGN and SNe feedback and the effect on halo properties such as the CGM gas fraction. Co-mentoring Theory Project by Chloe Neufeld with Daisuke Nagai
- **Cold Streams: The Umbilical of High-z Galaxies (co-supervised by Frank van den Bosch)**: Developing high-resolution zoom-in simulations to study the interaction of cold streams feeding star-forming high-z galaxies with the circumgalactic medium.

AGN Classification with Modulos *Aug 2022 - Sep 2023*

- **Observational Project with Meg Urry**: Used Modulos (machine learning software) along with AGNDB to develop algorithms to classify AGN.

Electron Acceleration in Simulations of Collisionless Shocks *Jun 2020 - May 2021*

- **Senior Thesis with Anatoly Spitkovsky**: Studied electron acceleration in simulations of collisionless shocks. Developed methods for visualizing particle reflection and acceleration using Paraview and Python. Participated in the Princeton Astrophysics Undergraduate Summer Research Program.

Analysis of Vertical Structures of Edge-On Galaxies Using HSC-SSP *Feb 2020 - May 2020*

- **Junior Paper with Jenny Greene**: Identified sample of edge on nearby galaxies. Using imaging techniques and model fitting, investigated the diversity of vertical structures and connection to galaxy formation and evolution.

Dispersion Measure Distributions of Fast Radio Bursts *Oct 2019 - Jan 2020*

- **Junior Paper with Renyue Cen**: Used simulation data to calculate the dispersion measure of FRBs, considering redshift, phases of gas, and contribution of the IGM.

Fellowships and Awards

American Astronomical Society International Travel Grant ($1000) *2024*
NSF ACCESS Computing Grant (Co-PI) with Daisuke Nagai (PI) *2024*

- **Title:**: Simulating Cold Gas Streams Feeding High-Redshift Galaxies
- **Allocation**: 300k Stampede3 node hours (equivalent of $62k)

Yale Graduate Student Assembly Conference Travel Fellowship ($800) *2024*
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APS Division of Astrophysics April Meeting Travel Grant ($300) *2023*
American Astronomical Society FAMOUS Travel Grant ($1000) *2023*
Dean's Emerging Scholars Research Award, Yale University ($2000) *2022*
SACNAS NDiSTEM Conference Travel Fellowship ($1000) *2022*

Activities and Outreach

First-Year Astronomy Buddy (FAB) Mentorship Program *Aug 2024 - ongoing*

- **Mentor**: I am a mentor to a first year graduate student in the Yale FAB program, serving as a contact point for help with transitioning into the program and an advocate in the case of any issues.

Yale SACNAS Chapter (YSACNAS) *Jan 2023 - ongoing*

- **Co-President, Secretary and Treasurer**: In charge of communications, and managing funding. Assist in event planning.
- **SACNAS New England Community Gathering Organizing Comittee Member**: I am a member of the organizing committee for the upcoming SACNAS regional one day conference that YSACNAS will lead and host in April 2025.
- **Recruiter**: Recruiter for Yale Astro at NDiSTEM, 2022 and 2023

Yale Cosmology Seminar *Sep 2023 - ongoing*

- **Co-Organizer**: Invite and host weekly speakers. Facilitate seminar.

Leitner Family Observatory and Planetarium at Yale *Feb 2023 - ongoing*

- **Presenter**: Present to and assist in monitoring school visits to the Planetarium.
- **Leitner Planetarium Spanish Night**: Creator and organizer of Spanish Public Nights at Leitner Planetarium (including Planetarium shows and telescope viewing), targeted towards the Spanish-speaking community in New Haven.

Science in the News *Oct 2022 - May 2023*

- **Presenter**: Present short talks on exciting science topics at local libraries and schools.

Yale Astronomy Siblings *Sep 2022 - present*

- **Graduate Student Mentor**: Paired with undergraduate astronomy student as a mentor for advice including on research experiences and graduate school applications.

Astronomy Climate and Diversity Committee *Sep 2022 - present*

- **Member**: Working on putting together report of best practices for graduate school admissions interviews

Professional Societies

Society for the Advancement of Chicanos/Hispanics & Native Americans in Science *Sep 2021 - present*
American Astronomical Society (AAS) *Sep 2021 - present*
Yale Women in Physics (WiP) *Sep 2021 - present*
Princeton Undergraduate Women in Physics (PUWiP) *Apr 2018 - May 2021*

- **Co-President (2020)**: Planned Junior Paper Symposium and spearheaded formation of mentorship program for local high schools

Teaching Experience

Eduexplora Yale Summer Session *July 2023*

- **Instructor**: Developed and taught two-week intro to astronomy course to two groups of Latin American middle school and high school students, visiting Yale through the Eduexplora program.

Teaching Fellow - ASTR 120: Galaxies and the Universe, Yale *Jan - May 2023*
Teaching Fellow - ASTR 160: Frontiers and Controversies in Astrophysics, Yale *Sep - Dec 2022*
Teaching Fellow - ASTR 180: Introduction to Relativity and Black Holes, Yale *Jan - May 2022*
Teaching Fellow - ASTR 110: Planet and Stars, Yale *Sep - Dec 2021*
Integrated Science Curriculum Tutor, Princeton *Sep 2018 - May 2019*

Skills

Technical: Java, Python, Javascript, C, MATLAB, HTML, Paraview
Language: Native Spanish speaker; Intermediate Russian