

# Isabel Rosa Marie Medlock

Email : isabel.medlock@yale.edu

Website: <https://isamedlock.github.io>

## EDUCATION

### **Yale University**

*Astronomy PhD Candidate, Thesis Advisor: Prof. Daisuke Nagai*

New Haven, CT

Aug 2021 – present

### **Princeton University**

*B.A. in Astrophysics; Certificates in Applications of Computing and Russian Language*

Princeton, NJ

Sep 2017 – Jun 2021

## RESEARCH EXPERIENCE

### **PhD Dissertation (advised by Daisuke Nagai)**

Aug 2021 - present

- **Probing the Physics of the CGM & Cosmological Tension with FRBs: Insights from CAMELS:**

First-year theory project - 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:**

Co-mentoring (with Daisuke Nagai) Theory Project with Chloe Neufeld

- **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.

### **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.

## PRESENTATIONS

### **33rd Texas Symposium: FRB Parallel Session** in Tempe, Arizona (Invited Talk)

Dec 8th, 2025

### **Hernquist Group Meeting** at Center for Astrophysics, Harvard-Smithsonian (Talk)

Oct 10th, 2025

### **ITC Luncheon** at Center for Astrophysics, Harvard-Smithsonian (Invited Talk)

Oct 9th, 2025

### **Radio Lunch** at Caltech (Talk)

Oct 7th, 2025

### **Monday Tea Talk** at Caltech (Talk)

Oct 6th, 2025

### **Borthakur Group Meeting** at Arizona State University (Invited Virtual Talk)

Oct 3rd, 2025

### **Astro Seminar** at Kavli IPMU, Kashiwa, Japan (Talk)

Sept 22nd, 2025

### **2025 Santa Cruz Galaxy Workshop** at University of California Santa Cruz (Talk)

Aug 7th, 2025

### **Cosmic Ecosystems** at Perimeter Institute, Waterloo, Canada (Talk)

Aug 1st, 2025

### **Fast Radio Burst 2025** in Montreal, Canada (Talk)

Jul 7th, 2025

### **Cosmology at Home 2025** (Virtual Talk)

June 17th, 2025

### **FRB Journal Club** at Max Planck Institute for Radio Astronomy (Invited Virtual 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	(Virtual Talk)	Apr 19th, 2020

## FELLOWSHIPS & AWARDS

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NSF ACCESS Computing Grant (Co-PI): 312.5k Stampede3 node hours (equivalent of \$68.5k)	2025
NSF ACCESS Computing Grant (Co-PI): 300k Stampede3 node hours (equivalent of \$62k)	2024
Yale Dean's Fund for Colloquia and Symposia - for Yale Cosmology Seminar (\$1800)	2024,2025
Yale Graduate Student Assembly Conference Travel Fellowship (\$1600)	2023,2024
American Astronomical Society Travel Grant (\$2000)	2023,2024
APS Division of Astrophysics April Meeting Travel Grant (\$300)	2023
Dean's Emerging Scholars Research Award, Yale University (\$2000)	2022
SACNAS NDiSTEM Conference Travel Fellowship (\$1000)	2022

## ACTIVITIES & OUTREACH

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First-Year Astronomy Buddy (FAB) Mentorship Program Mentor	Aug 2024 - ongoing
Yale SACNAS Chapter (YSACNAS) Co-President, Secretary, and Treasurer	Jan 2023 - ongoing
Yale Cosmology Seminar Co-Organizer	Sep 2023 - ongoing
Leitner Family Observatory and Planetarium Spanish Night Creator and Organizer	Feb 2023 - ongoing
Science in the News Presenter	Oct 2022 - May 2023
Yale Astronomy Siblings Mentor	Sep 2022 - present
Astronomy Climate and Diversity Committee Member	Sep 2022 - present

## TEACHING EXPERIENCE

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Yale Pathways Workshop Instructor for Local High School Students	July 2025
Eduexplora Yale Summer Session Instructor	July 2023
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

## SKILLS

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**Technical:** High Performace Computing, AREPO hydrodynamical cosmological simulations, Java, Python, Javascript, C, MATLAB, HTML, Paraview, Machine Learning  
**Language:** Native English and Spanish speaker; Intermediate Russian

## REFERENCES

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Daisuke Nagai (PhD Advisor): Professor of Physics and of Astronomy, Yale University
Email: daisuke.nagai@yale.edu, Phone: +1 203-909-4266
Frank van den Bosch (Collaborator): Professor of Astronomy and Physics, Yale University
Email: frank.vandenbosch@yale.edu, Phone: +1 203-432-0196
Volker Springel (Collaborator): Director - Computational Astrophysics, Max Planck Institute for Astrophysics
Email: vspringel@mpa-garching.mpg.de, Phone: +49 89 30000 2195

# Publications

Isabel Medlock

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Website: <https://isamedlock.github.io>

## First Author

- [5] **Medlock, I.**, Nagai, D., Mandelker, N., Springel, V., van den Bosch, F., and Zinger, E., “Statistical Properties of Cold Streams in Massive Star Forming Halos in the IllustrisTNG-50 Simulations”, to be submitted to *ApJ* in October
- [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, *ApJ*, 983(1) 46
- [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) 61
- [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

- [5] Gebhardt, M., Anglés-Alcázar, D., Genel, S., Nagai, D., Kiat Oh, B., **Medlock, I.**, Mercedes-Feliz, J., Sutherland, S., Lee, M., Sims, X., Lovell, C., Spergel, D., Davé, R., Schaller, M., Schaye, J., Villaescusa-Navarro, F., “Cosmological back-reaction of baryons on dark matter in the CAMELS simulations”, submitted to *MNRAS*
- [4] Leung, C., Simha, S., **Medlock, I.**, Nagai, D., Masui, K., Kahinga, L., Lanman, A., Andrew, S., Bandura, K., Curtin, A., Gaensler, B., Gusinskaia, N., Joseph, R., Lazda, M., Mas-Ribas, L., Meyers, B., Nimmo, K., Pearlman, A., Prochaska, X., Sammons, M., Shin, K., Smith, K., Wang, H., “Stellar Mass-Dispersion Measure Correlations Constrain Baryonic Feedback in Fast Radio Burst Host Galaxies”, accepted to *ApJL* (10.48550/arXiv.2507.16816)
- [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”, accepted to *MNRAS* (astro-ph/2505.14782)
- [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 CROCODYLE simulation”, accepted 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”, 2025, *ApJ*, 984, 190

## 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, P., “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*.