Alex M. Garcia

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Awards

- Virginia Space Grant Consortium Research Fellow
  2024-25, 2025-26
- Graduate Teaching Award (UF)
  2023
- Outstanding Master's Thesis (UF)
  2022

Honors

- Outstanding Research Presentation (UF)
  2022
- Distinguished Contributions by a Graduate Student (UF)
  2022
- Distinguished Service and Citizenship (UF)
  2022
- Tutor of the Year Finalist; Honorable Mention (UIUC)
  2021

Technical Skills

○○○ = Expert
●○○ = Proficient
●●○ = Working Knowledge

●○○ Python | ●○○ LaTeX | ●●○ Bash/SLURM | ●○○ Git | ●○○ C/C++ | ●●○ JavaScript/HTML/CSS

Education

University of Virginia — Doctorate of Philosophy in Astronomy
2023 – 2026 — Master of Science in Astronomy

University of Florida — Master of Science in Astronomy
2021 – 2023

University of Illinois — Bachelor's of Science in Engineering Physics (*Honors*)
2017 – 2021 — Bachelor's of Science in Astronomy (*Distinction*)

Research Experience

Post-Doctoral Fellow — Harvard College Observatory
2026 – Present — *L. Kewley*

Graduate Researcher — University of Virginia & University of Florida
2021 – 2026 — *P. Torrey*

Undergraduate Researcher — University of Illinois
2020 – 2021 — *B. Dunne & Y. Shen*

Select Publications

Complete Publication List on last page; see also **[NASA/ADS Library]**

First Author: (8 total)

- **Garcia, A.**, et al. (2025) *["The DREAMS Project: Disentangling the Impact of Halo-to-Halo Variance and Baryonic Feedback on Milky Way Dark Matter Density Profiles"]*. ApJ. Submitted.
- **Garcia, A.**, et al. (2025) *["Metallicity Gradients in Modern Cosmological Simulations II: The Role of Bursty Versus Smooth Feedback at High Redshift"]*. ApJ. Submitted.
- Qi, J., **Garcia, A.** [equal contribution] et al. (2025) *["Star Formation Rates, Metallicities, and Stellar Masses on kpc-scales in TNG50"]*. ApJ. 993, 32.
- **Garcia, A.**, et al. (2025) *["Metallicity Gradients in Modern Cosmological Simulations I: Tension Between Smooth Stellar Feedback Models and Observations"]*. ApJ. 989, 147.
- **Garcia, A.**, et al. (2025) *["Does the Fundamental Metallicity Relation Evolve with Redshift? II: The Evolution in Normalisation of the Mass-Metallicity Relation"]*. MNRAS. 536, 119.
- **Garcia, A.**, et al. (2024) *["Does the Fundamental Metallicity Relation Evolve with Redshift? I: The Correlation Between Offsets from the Mass-Metallicity Relation and Star Formation Rate"]*. MNRAS. 531, 1398.
- **Garcia, A.**, et al. (2024) *["Interplay of Stellar and Gas-Phase Metallicities: Unveiling Insights for Stellar Feedback Modeling with Illustris, IllustrisTNG, and EAGLE"]*. MNRAS. 529, 3342.
- **Garcia, A.**, et al. (2023) *["Gas-phase metallicity break radii of star-forming galaxies in IllustrisTNG"]*. MNRAS. 519, 4716.

Student Theses Supervised:

*Co-supervised with P. Torrey

- D. Western (Senior Thesis; UVA, In Progress) abc
- L. Carnevale (*Senior Thesis*; UVA 2025)
- Z. Stevens* (*Senior Thesis*; UVA, 2024)
- C. O'Brien* (Senior Thesis; Ohio State, 2023)

Student Mentoring

- D. Western
  2025 - 2026
- D. Robinson
  2025 - 2026
- M. Kulkarni
  2025 - 2026
- I. Leisher
  2024 - 2026
- L. Carnevale
  2024 - 2025
- M. Liu
  2024
- Z. Stevens
  2023 - 2024
- C. O'Brien
  2022 - 2024

Service

Student/Postdoc Leadership Council
NSF-Simons CosmicAI Institute
2025 - 2026

Referee
MNRAS
2023, 2024, 2025

Host
Journal Club (UVA)
2024 - 2026

Member
Dark Skies, Bright Kids Outreach Group (UVA)
2023 - 2026

Gradaute Student Rep.
Committee for DEI (UF)
2021 - 2023

Other Work

Planetarium Assistant
Kika Silva Pla Planetarium
Gainesville, FL
2021 - 2023

Tutor/Lead Tutor
College of Engineering (UIUC)
Urbana, IL
2018 - 2021

Contributed Talks & Presentations

Conference & Workshop Contributions:

- Confronting Simulation with the Real Universe – Napa Valley, CA *January 2026*
- NSF Summit for AI Institute Leadership – Reston, VA **[Poster]** *October 2025*
- GOALS Workshop – Charlottesville, USA *September 2025*
- Open SkAI – Chicago, USA **[Poster]** *September 2025*
- Simulation Based Inference for Galaxy Evolution – Bristol, UK *May 2025*
- DREAMS Workshop – New York, USA *May 2025*
- Student Research Conference – Hampton University, VA *April 2025*
- The Multi-phase ISM in Galaxies – Bologna, Italy **[Poster]** *September 2024*
- Connecting Simulations and Observations – Barossa, Australia *June 2024*
- Regulating Star Formation Across Time – Baltimore, MD **[Video]** *April 2024*
- Building Galaxies from Scratch – Vienna, Austria **[Poster]** *February 2024*
- Resolving Galaxy Ecosystems – Hong Kong *December 2023*

Invited Seminars

- Astronomy and Data Science Seminar – Yale *February 2026*
- Astronomy Seminar – U. Kentucky *November 2025*
- Cosmology Group – U. Maryland *October 2024*
- Astronomy Seminar – Virginia Tech *September 2024*
- Astronomy Seminar – Australian National University *June 2024*

Other Formal Presentations:

- Astronomy on Tap – Charlottesville, VA *November 2025*
- Conroy Group Meeting – CfA Harvard-Smithsonian *April 2025*
- McCormick Observatory Public Night – Charlottesville, VA *July 2024*
- Vogelsberger Group Meeting – MIT *November 2023*
- Ellison Group Meeting – U. Victoria *(virtual)* *May 2023*

Teaching

Institution				Course	Semester
Virginia	ASTR	5140	◇	Research Methods	*SP 26*
		1210	◇	Intro Sky & Solar System	*FA 25*
		2110	◇	Intro to Astrophysics	*FA 24*
		†1250	◇	Alien Worlds	*SU 24*
		4470	◇	Computational Astrophysics	*SP 24*
		3830	◇	Planetary Astronomy (+Lab)	*SP 24*
		1220	◇	Stars, Galaxies, and Universe	*SP 24*
		5110	◇	Astronomical Techniques	*FA 23*
Florida	AST	†1022	◇	Astronomy Laboratory	*SP 23*
		†1022	◇	Astronomy Laboratory	*SP 22*
		1002	◇	Discovering the Universe	*FA 21*
Illinois	ASTR	330	◇	Extraterrestrial Life	*SP 21*
		330	◇	Extraterrestrial Life	*W 21*
		100	◇	Introduction to Astronomy	*FA 20*
		150	◇	Killer Skies: Astro-Disasters	*FA 20*

†Primary instructor (UVA; Summer 2024 – UF; Spring 2023, 2022)

Complete Publication List

See also: [NASA/ADS Library]

First Author

8. **Garcia, A.**, Rose, J., Torrey, P., Caputo, A., Listanti, M., Pace, A., Liu, H., Hussein, A., Liu, H., Villaescusa-Navarro F., Barry, J., Leisher, I., Costanza, B., Kho, J., Lille, E., Jiaxuan, L., Bhowmick, A., Nguyen, T., O'Neil, S., Ou, X., Shen, X., Kallivayalil, N., Necib, L., Vogelsberger, M. *["The DREAMS Project: Disentangling the Impact of Halo-to-Halo Variance and Baryonic Feedback on Milky Way Dark Matter Density Profiles"]*. 2025. ApJ. Submitted.
7. **Garcia, A.**, Torrey, P., Bhagwat, A., Shen, X., Vogelsberger, M., McClymont, W., Nagarajan-Swenson, J., Zhu, P., Zimmerman, D., Zier, O., Biddle, S., Wright, R., Grasha, K., Keating, L., Kannan, R., Smith, A., Garaldi, E., Puchwein, E., Ciardi, B., Hernquist, L., Kewley, L. *["Metallicity Gradients in Modern Cosmological Simulations II: The Role of Bursty Versus Smooth Feedback at High Redshift."]* 2025. ApJ. Submitted.
6. Qi, J. & **Garcia, A.** (equal contribution from Qi and Garcia), Robinson, D., Torrey, P., Moreno J., Green, K., Evans, A., Hemler Z., Hernquist L., Ellison, S. *["Star Formation Rates, Metallicities, and Stellar Masses on kpc-scales in TNG50"]*. 2025. ApJ. 993 32.
5. **Garcia, A.**, Torrey, P., Bhagwat, A., Wright, R., Chen, Q., Grasha, K., Ridolfo, S., Hemler, Z., Sarkar, A., Chakraborty, P., Nelson, E., Sanders, R., Costa, T., Vogelsberger, M., Kewley, L., Ellison, S., Hernquist, L. *["Metallicity Gradients in Modern Cosmological Simulations I: Tension Between Smooth Stellar Feedback Models and Observations"]*. 2025. ApJ. 989 147.
4. **Garcia, A.**, Torrey P., Ellison S., Grasha K., Chen Q., Hemler Z., Zimmerman D., Wright R., Zovaro H., Nelson E., Sanders R., Kewley L., Hernquist L. *["Does the Fundamental Metallicity Relation Evolve with Redshift? II: The Evolution in Normalisation of the Mass-Metallicity Relation"]*. 2025. MNRAS 536, 119.
3. **Garcia, A.**, Torrey, P., Ellison, S., Grasha, K., Hernquist, L., Zovaro, H., Chen, Q., Hemler, Z., Kewley, L., Nelson, E., Wright, R. *["Does the Fundamental Metallicity Relation Evolve with Redshift? I: The Correlation Between Offsets from the Mass-Metallicity Relation and Star Formation Rate"]*. 2024. MNRAS 531, 1398.
2. **Garcia, A.**, Torrey, P., Grasha, K., Hernquist, L., Ellison, S., Zovaro, H., Hemler, Z., Nelson, E., Kewley, L.*["Interplay of Stellar and Gas-Phase Metallicities: Unveiling Insights for Stellar Feedback Modeling with Illustris, IllustrisTNG, and EAGLE"]*. 2024. MNRAS 529, 3342.
1. **Garcia, A.**, Torrey P., Hemler Z., Hernquist, L., Kewley L., Nelson E, Grasha K., Zovaro H., Chen Q., *["Gas-phase metallicity break radii of star-forming galaxies in IllustrisTNG"]*. 2023. MNRAS 519, 4716.

Co-Author

‡Undergraduate Student Led

27. ‡Barry, J., Torrey, P., Farahi, A., **Garcia, A.**, Ou, X., Rose, J., Lisanti, M., Kallivayalil, N., Villaescusa-Navarro, F., *"Preserving Correlated Physical Structure in Galaxy Profiles with Covariance-Aware Neural Networks"*. Under Collaboration Review.
26. Green, K., et al. including **Garcia, A.**. *"The Resolved Star Formation and Stellar Mass Properties of Luminous Infrared Galaxies"*. Under Collaboration Review.
25. ‡Carnevale, L., **Garcia, A.**, et al. *["The Mass Dependence of the Fundamental Metallicity Relation in Cosmological Simulations"]*. Under Collaboration Review.

Submitted to Journal

24. Khostovan, A., Sanders, R., Shapley, A., Topping M., Reedy, N., **Garcia, A.**, Berg, D., Clarke, L., Cullen, F., Ellis, R., Förester Schreiber, N. M., McLeod, D., Pahl, A., Pettini, M., Torrey, P. *["The AURORA Survey: The Mass–Metallicity and Fundamental Metallicity Relations at $z \sim 2.3$ based only on Direct T_e Constraints"]*. 2025. ApJ. Submitted.
23. Lille, E., Rose, J., Lisanti, M., **Garcia, A.**, Kollmann, K., Li, J., Mostow, O., Shen, X., Brooks, A., Farahi, A., Kallivayalil, N., Necib, L., Pace, A., Torrey, P., Vogelsberger, M. *["The DREAMS Project: Disentangling the Impact of Halo-to-Halo Variance and Baryonic Feedback on Milky Way Dark Matter Velocity Distributions"]*. 2025. ApJ. Submitted.
22. Rose, J., Lisanti, M., Torrey, P., Villaescusa-Navarro F., **Garcia, A.**, Farahi, A., Fillion, C., Brooks, A., Kallivayalil, N., Kollmann, K., Lilie, E., Li, J., Mostow, O., Cruz, A., Ngyuen, T., Pace, A., Ahvazi, N., O'Neil, S., Shen, X., Cyr-Racine, F., Caputo, A., Price-Whelan, A., Geha, M., Greene, J., Necib, L., Vogelsberger, M., Muñoz, J., Dalcanton, J. *["The DREAMS Project: Disentangling the Impact of Halo-to-Halo Variance and Baryonic Feedback on Milky Way Satellite Galaxies"]*. 2025. ApJ. Submitted
21. Rose, J., Lisanti, M., Torrey, P., Villaescusa-Navarro F., **Garcia, A.**, Farahi, A., Fillion, C., Brooks, A., Kallivayalil, N., Kollman, K., Lilie, E., Roy, S., Pace, A., Ahvazi, N., O'Neil, S., Shen, X., Greene, J., Vogelsberger, M. *["The DREAMS Project: A New Suite of 1,024 Simulations to Contextualize the Milky Way and Assess Physics Uncertainties"]*. 2025. ApJ. Submitted.

20. Ahvazi, N., Pace, A., Garling, C., Ou, X., Kallivayalil, N., Torrey, P., Benson, A., Bhowmick, A., Torres-Albà, N., **Garcia, A.**, Kho, J., Warfield, J., Atzberger, K. *["The Abundance and Properties of the lowest Luminosity Dwarf Galaxies around the Milky Way: Insights from Semi-Analytic Models"]*. 2025. ApJ. Submitted.

19. Heretz, P., Triani, P., Battisti, A., **Garcia, A.**, Torrey, P., Pope, A., Calzetti, D., Kewley, L. *"A New Metallicity Diagnostic Suitable for Low Spectral Resolution Surveys of Star-Forming Galaxies"*. 2025. ApJ. Submitted.

18. ‡Leisher, I., Torrey, P., **Garcia, A.**, Rose, J., Villaescusa-Navarro F., Lubberts, Z., Farahi, A., O'Neil, S., Shen, X., Mostow, O., Kallivayalil, N., Zimmerman, D., Narayana, D., Vogelsberger, M. *["Linking Warm Dark Matter to Merger Tree Histories via Deep Learning Networks"]*. 2025. ApJ. Submitted.

17. Garling, C., **Garcia, A.,**, Ahvazi, N., Kallivayalil, N., McQuinn, K., Feldmann, R., Cohen, R. *["A Unified Framework Connecting Chemical Enrichment with Resolved Star Formation Histories"]*. 2025. ApJ. Submitted.

16. Narayanan, D., Torrey, P., Stark, D., Chirsholm, J., Finkelstein, S., **Garcia, A.**, Marinacci, F., Kelley-Derzon, J., Sales, L., Savitch, E., Vogelsberger, M., Zimmerman, D. *["The Growth of Dust in Galaxies in the First Billion Years with Applications to Blue Monsters"]*. 2025. Submitted.

15. Jain, S., Sanders, R., Khostovan, A., Jones, T., Shapley, A., Reddy, N., **Garcia, A.**, Torrey, P., Coil, A. *["A Uniform Analysis of Gas-phase Metallicity Evolution with $1-3$ Gyr Time Sampling over the Past 12 Billion Years"]*. 2025. Submitted.

Accepted to Journal

14. Silvestrini, M., Torta, C., Busillo, V., Farahi, A., **Garcia, A.**, Kallivayalil, N., Napolitano, R., Rose, J., Torrey, P., Villaescusa-Navarro, F., Vogelsberger, M. *["CASCO: Cosmological and AStrophysical parameters from Cosmological simulations and Observations IV. Testing warm dark matter cosmologies with galaxy scaling relations: a joint simulation–observation study using DREAMS simulations"]*. 2026. A&A. Accepted. In Press.

13. Nyguen, T., Villaescusa-Navarro, F., Misha-Sharma, S., Cuesta-Lazaro, C., Torrey, P., Farahi, A., **Garcia, A.**, Rose, J., O'Neil, S., Vogelsberger, M., Shen, X., Roche, C., Anglés-Alcazar, D., Kallivayalil, N., Muñoz, J., Cyr-Racine, F., Roy, S., Necib, L., Kollmann, K. *["How DREAMS are made: Emulating subhalo populations under alternative dark matter scenarios with Diffusion Models"]*. 2026. ApJ. In Press.

12. Kewley, L., Grasha, K., **Garcia, A.**, Torrey, P., Rich, J., Hemler, Z., Zhu, P., Chen, Q., Seibert, M., Hernquist, L., Madore, B., *"Extragalactic Archaeology via Gas-Phase Oxygen Abundace Gradients"*. 2025. Nature Astronomy. Accepted. In Press.

11. Bhowmick, A., Blecha, L., Torrey, P., Kelley, L., Natarajan, P., Weinberger, R., **Garcia, A.,** Hernquist, L., Di Matteo, T., Somerville, R., Vogelsberger, M. *["Heavy seeds and the first black holes: Insights from the BRAHMA simulations"]*. 2025. ApJ. Accepted. 997, 187B.

10. Chen, Q, **Garcia, A.**, Li, Z., Wisnioski, E., Grasha, K., Torrey, P., Remus, R., Kimming, L., Battisti, A., Buder, S. *["How Mergers and Flybys Shape Azimuthal Age Patterns in Spiral Galaxies"]*. 2026. MNRAS. Accepted. 546, 2.

9. ‡Mostow, O., Torrey, P., Rose, J., **Garcia, A.**, Ahvazi, N., Lisanti, M., Kallivayalil, N. *["How Many Bursts Does it Take to Form a Core at the Center of a Galaxy?"]*. 2025. ApJ. Accepted. 995, 25.

8. Costanza, B., Wang, B., Villaescusa-Navarro, F., **Garcia, A.**, Rose, J., Vogelsberger, M., Torrey, P., Farahi, A., Shen, X., Leisher, I. *["On the Sensitivity of Different Galaxy Properties to Warm Dark Matter"]*. 2025. ApJ 994, 62.

7. Kho, J., Bhowmick, A., Torrey, P., **Garcia, A.**, Ahvazi, N., Blecha, L. *["Signatures of BH seeding on the $M_{\rm BH}-\sigma$ relation: Predictions from the BRAHMA simulations"]*. 2025. ApJ 994, 172.

6. Chakraborty, P., Sarkar, A., Smith, R., Ferland, G., McDonald, M., Forman, W., Vogelsberger M., Torrey, P., **Garcia, A.**, Bautz, M., Foster, A., Miller, E., Grant, C. *["Unveiling the Cosmic Chemistry II: "direct" T_e based metallicity of galaxies at $3<z<10$ with JWST/NIRSpec"]*. 2025. ApJ 985, 24.

5. Rose, J., Torrey, P., Villaescusa-Navarro, F., Lisanti, M., Ngyuen, T., Roy, S., Kollmann, K., Vogelsberger, M., Cyr-Racine, F., Medvedev, M., Genel, S., Anglés-Alcazar, D., Kallavayalil, N., Wang, B., Costanza, B., O'Neil, S., Cian, R., Karmakar, S., **Garcia, A.**, Low, R., Lin, S., Mostow, O., Cruz, A., Caputo, A., Farahi, A., Muñoz, J., Necib, L., Teyssier, R., Dalcanton, J., Spergel, D. *["Introducing the DREAMS project: DaRk mattEr and Astrophysics with Machine learning and Simulations"]*. 2025. ApJ. 982, 68.

4. Sarkar, A., Chakraborty, P., Vogelsberger, M., McDonald, M., Torrey, P., **Garcia, A.**, Khullar, G., Ferland, G., Forman, W., Wolk, S., Schneider, B., Bautz, M., Miller, E., Grant, C., ZuHone, J. *["Unveiling the Cosmic Chemistry: Revisiting the Mass-Metallicity Relation with JWST/NIRSpec at $4<z<10$"]*. 2025. ApJ 978 136.

3. Chen, Q., Grahsa, K., Battisti A., Wisnioski, E., Li, Z., Park, H., Groves, B., Torrey, P., Mendel, T., Madore, B., Seibert, M., Sextl, E., **Garcia, A.**, Rich, J., Beaton, R., Kewley, L. *["Quantifying azimuthal variations within the interstellar medium of spiral galaxies with the TYPHOON survey"]*. 2024. MNRAS 534, 883.

2. Shurui, L., Villascusa-Navarro, F., Rose, J., Torrey, P., Farahi, A., Kollman, K., **Garcia, A.**, Roy, S., Vogelsberger M., Kallivayalil, N., Cai, F., Luo, W. *["Can we constrain warm dark matter masses with individual galaxies?"]*. 2024. ApJ 970, 170.

1. ‡Hartley, A., Nelson, E., Suess, K., **Garcia, A.**, Park, M., Hernquist, L., Bezanson, R., Nevin, R., Pillepich, A., Schecter, A., Terrazas, B., Torrey, P., Wellons, S., Whitaker, K., Williams, C. *["The First Quiescent Galaxies in TNG300"]*. 2023. MNRAS 522, 3138.