

# Alex M. Garcia

## Contacts

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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   ●●● L<sup>A</sup>T<sub>E</sub>X  
●●● Bash/SLURM   ●●● Git  
●●● C/C++  
●●● JavaScript/HTML/CSS

## Education

University of Virginia 2023 – Present	Doctorate of Philosophy in Astronomy Master of Science in Astronomy ( <i>Awarded 2025</i> )
University of Florida 2021 – 2023	Master of Science in Astronomy
University of Illinois 2017 – 2021	Bachelor's of Science in Engineering Physics ( <i>Honors</i> ) Bachelor's of Science in Astronomy ( <i>Distinction</i> )

## Select Publications

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

### First Author: (8 total)

- ◇ **Garcia, A.**, et al. (In Prep; 2025) “*The Relative Impact of Astrophysics and Halo-to-Halo Variation on the Dark Matter Density Profiles of Milky Way-Mass Halos*”. Under Collaboration Review. [Document Available].
- ◇ **Garcia, A.**, et al. (In Prep; 2025) “*Metallicity Gradients in Modern Cosmological Simulations II: The Role of Bursty Versus Smooth Feedback at High Redshift*”. Under Collaboration Review. [Document Available]
- ◇ 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 Papers Supervised:

- ◇ Carnevale, L., **Garcia, A.**, et al. (2025) “*The Mass Dependence of the Fundamental Metallicity Relation in Cosmological Simulations*”. Under Collaboration Review. [Document Available]
- ◇ Leisher, I., Torrey, P., **Garcia, A.**, et al. (2025) “*Linking Warm Dark Matter to Merger Tree Histories via Deep Learning Networks*”. Under Collaboration Review. [Document Available]

### Student Theses Supervised: (Available upon request)

\*Co-supervised with P. Torrey

- ◇ D. Western (Senior Thesis; UVA, In Progress)
- ◇ 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
- ◇ D. Robinson  
2025
- ◇ M. Kulkarni  
2025
- ◇ L. Carnevale  
2024 - 2025
- ◇ I. Leisher  
2024 - 2025
- ◇ M. Liu  
2024
- ◇ Z. Stevens  
2023 - 2024
- ◇ C. O'Brien  
2022 - 2024

—Service—

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

Referee  
MNRAS  
2023, 2024, 2025

Host  
Journal Club (UVA)  
2024 - Present

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

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:

- ◇ 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, USA 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, USA [Video] April 2024
- ◇ Building Galaxies from Scratch – Vienna, Austria [Poster] February 2024
- ◇ Resolving Galaxy Ecosystems – Hong Kong December 2023

Invited Seminars

- ◇ 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:

- ◇ ANR Dark Meeting – U. Lyon (virtual) July 2025
- ◇ Conroy Group Meeting – CfA Harvard-Smithsonian April 2025
- ◇ McCormick Observatory Public Night – U. Virginia July 2024
- ◇ Ellison Group Meeting – U. Victoria (virtual) February 2024
- ◇ Vogelsberger Group Meeting – MIT November 2023
- ◇ Kewley Group Meeting – CfA Harvard-Smithsonian November 2023
- ◇ Ellison Group Meeting – U. Victoria (virtual) May 2023

—Teaching—

Institution		Course		Semester
Virginia	ASTR	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)

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## Complete Publication List

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See also: [\[NASA/ADS Library\]](#)

Summary: **26** total papers, **10** *h*-index, **10** *i10*-index, **14** *g*-index

### 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 Relative Impact of Astrophysics and Halo-to-Halo Variation on the Dark Matter Density Profiles of Milky Way-Mass Halos"*]. 2025. Under Collaboration Review.
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. Under Collaboration Review.
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

18. ‡Carnevale, L., **Garcia, A.**, et al. [*"The Mass Dependence of the Fundamental Metallicity Relation in Cosmological Simulations"*]. 2025. Under Collaboration Review.
17. ‡Leisher, I., Torrey, P., **Garcia, A.**, Rose, J., Narayanan, D., Zimmerman, D., Vogelsberger, M., et al. [*"Linking Warm Dark Matter to Merger Tree Histories via Deep Learning Networks"*]. 2025. Under Collaboration Review.
16. 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. Submitted.
15. 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.
14. 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.
13. 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". 2025. A&A. Submitted (Second Review).
12. 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" 2025. MNRAS. Submitted (Second Review).

11. 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”*]. 2024. MNRAS. Submitted.
10. 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 Abundance Gradients”*. 2025. Nature Astronomy. Accepted. In Press.
9. 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. Accepted. In Press.
8. ‡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. In Press.
7. Kho, J., Bhowmick, A., Torrey, P., **Garcia, A.**, Ahvazi, N., Blecha, L. [*“Signatures of BH seeding on the  $M_{\text{BH}} - \sigma$  relation: Predictions from the BRAHMA simulations”*]. 2025. ApJ. Accepted. In Press.
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., Nyguen, T., Roy, S., Kollmann, K., Vogelsberger, M., Cyr-Racine, F., Medvedev, M., Genel, S., Anglés-Alcazar, D., Kallivayalil, N., Wang, B., Costanza, B., O’Neil, S., Cui, 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., Grasha, 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., Schechter, A., Terrazas, B., Torrey, P., Wellons, S., Whitaker, K., Williams, C. [*“The First Quiescent Galaxies in TNG300”*]. 2023. MNRAS 522, 3138.