Alex M. Garcia

Contacts

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Awards

- Virginia Space Grant Consortium Research Fellow (UVA)
  2024
- Outstanding Master's Thesis (UF)
  Fall 2022

Honors

- Graduate Student Teaching Award (UF)
  Spring 2023
- Outstanding Research Presentation (UF)
  Fall 2022
- Distinguished Contributions by a Graduate Student (UF)
  Fall 2022
- Distinguished Service and Citizenship (UF)
  Fall 2022
- Tutor of the Year Finalist; Honorable Mention (UIUC)
  Spring 2021
- Eagle Scout, Boy Scouts of America
  April 2015

Student Mentoring

- L. Carnevale (UVA)
  2024 - 2025
- I. Leisher (Grinnell College)
  2024 - 2025

Education

University of Virginia
2023 – Present
Doctorate of Philosophy in Astronomy
Master of Science in Astronomy

University of Florida
2021 – 2023
Master of Science in Astronomy

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

Select Publications

Complete Publication List on last page; see also [NASA/ADS Library]
Summary: **17** total papers, **5** h-index, **79** total citations

First & Corresponding Author: (6 total)

†Corresponding Author

- *The Evolution of Metallicity Gradients in Modern Cosmological Box Simulations to $z = 8$*
- †*Star Formation Rates, Metallicities, and Stellar Masses on kpc-scales in TNG50* [arXiv] **Submitted**
- *Does the Fundamental Metallicity Relation Evolve with Redshift? II: The Evolution in Normalisation of the Mass-Metallicity Relation* [arXiv] [MNRAS]
- *Does the Fundamental Metallicity Relation Evolve with Redshift? I: The Correlation Between Offsets from the Mass-Metallicity Relation and Star Formation Rate* [arXiv] [MNRAS]
- *Interplay of Stellar and Gas-Phase Metallicities: Unveiling Insights for Stellar Feedback Modeling with Illustris, IllustrisTNG, and EAGLE* [arXiv] [MNRAS]
- *Gas-phase metallicity break radii of star-forming galaxies in IllustrisTNG* [arXiv] [MNRAS]

Student Supervised Theses:

- L. Carnevale (Senior Thesis, UVA 2025) – *"Does the Fundamental Metallicity Relation Evolve with Mass?"*
- Z. Stevens (Senior Thesis, UVA 2024) – *"Constraining the Splashback Radius in IllustrisTNG"*
- C. O'Brien (Senior Thesis, Ohio State 2023) – *"Parameterizing Splashback Radius-Mass Relations of Galaxy Clusters with IllustrisTNG Simulations"*

Research Experience

Graduate Researcher
2021 – Present
University of Virginia
University of Florida
Paul Torrey

Undergraduate Researcher
2020 – 2021
University of Illinois
Bryan Dunne & Yue Shen

Contributed Talks & Presentations

Conference Contributions:

- Student Research Conference – Hampton University *April 2025*

- ◇ M. Liu (UVA)
  2024
- ◇ Z. Stevens (UVA)
  2023 - 2024
- ◇ C. O'Brien (UF REU)
  2022 - 2024

Service

Host
Journal Club (UVA)
2024 - Present

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

Referee
MNRAS
2023 - 2025

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

- ◇ The Multi-phase ISM in Galaxies – Bologna, Italy **[Poster]** *September 2024*
- ◇ Connecting Simulations and Observations – Barossa, Australia *June 2024*
- ◇ Regulating Star Formation Across Time – STScI, USA **[Video]** *April 2024*
- ◇ Building Galaxies from Scratch – Vienna, Austria **[Poster]** *February 2024*
- ◇ Resolving Galaxy Ecosystems – Hong Kong, China *December 2023*

Invited Seminars

- ◇ Cosmology Group – U. Maryland *October 2024*
- ◇ Astronomy Seminar – Virginia Tech *September 2024*
- ◇ Astronomy Seminar – Australian National University *June 2024*

Other Formal Presentations:

- ◇ Astrophysics Theory Group – U. Virginia *February 2025*
- ◇ Astrophysics Theory Group – U. Virginia *September 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*

Guest Lectures:

- ◇ McCormick Observatory Public Night – U. Virginia *July 2024*
- ◇ ASTR 3830 (×3) – U. Virginia *Spring 2024*
- ◇ ASTR 5110 – U. Virginia *September 2023*

Teaching

Institution				Course	Semester
Virginia	ASTR	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

[NASA/ADS Library]

*First Author †Corresponding Author ‡Student Led

17. *__Garcia, Alex M.__, et al. *"The Evolution of Metallicity Gradients in Modern Cosmological Box Simulations"*. 2025. In Preparation.
16. ‡Carnevale, L., __Garcia, A.__, et al. *"Does the Fundamental Metallicity Relation Evolve with Mass?"*. 2025. In Preparation.
15. Chen, Q, __Garcia, A.__, et al. *"How Mergers and Flybys Shape Azimuthal Age Patterns in Spiral Galaxies"* 2025. In Preparation.
14. †Qi, J., __Garcia, A.__, 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. Submitted.
13. ‡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. Submitted.
12. 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. Submitted.
11. Kewley, L., Grasha, K., Hemler, Z., __Garcia, A.__, Torrey, P., Hernquist, L., Chen, Q., Madore, B., Rich, J., Seibert, M. *"Extragalactic Archaeology: the chemical and accretion history of NGC 1365"*. 2024. Nature. Submitted.
10. Nyguen, T., et al., including __Garcia, A.__ *"How DREAMS are made: Emulating subhalo populations under alternative dark matter scenarios with Diffusion Models"*. 2024. MNRAS. Submitted.
9. Rose, J., et al., including __Garcia, A.__ *"Introducing the DREAMS project: DaRk mattEr and Astrophysics with Machine learning and Simulations"*. 2024. ApJ. Submitted
8. *__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, 119G.
7. 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.
6. 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.
5. Shurui, L., Villascusa-Navarro, F., Rose, J., Torrey, P., Farahi, A., Kollamn, 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.
4. *__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.
3. *__Garcia, A.__, Torrey, P., Grasha, K., Hernquist, L., Ellison, S., Zovaro, H., Hemler, Z., Neloson, 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.
2. ‡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.
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.