

RYAN F. TRAINOR

Associate Professor of Physics & Astronomy
Franklin & Marshall College

Contact:

Physics & Astronomy Department
Franklin & Marshall College
415 Harrisburg Pike
Lancaster, PA 17603

ryan.trainor@fandm.edu
+1 (717) 945-2117 (cell)
ryantrainor.github.io/
orcid: 0000-0002-6967-7322

Academic Positions:

Franklin & Marshall College, Department of Physics & Astronomy

- Associate Professor (2023-present)
- Assistant Professor (2017-2023)

Universidad de Chile, Santiago, Department of Astronomy

- Visiting Fulbright US Scholar in Astronomy & Data Science (2024-2025)

Johns Hopkins University, William H. Miller III Department of Physics and Astronomy

- Visiting Scientist (2021-present)

University of California Berkeley, Miller Institute for Basic Research in Science

- Miller Postdoctoral Fellow in Astronomy (2014-2017)

Honors & Awards:

- Fulbright US Scholar Award (2024-2025)
- Cottrell Scholar Award (RCSA, 2022-2025)
- Miller Fellowship (UC Berkeley, 2014-2017)
- Troesh Graduate Fellowship in Astronomy (Caltech, 2013)
- Outstanding Senior in Physics (UC Irvine, 2008)

Education:

California Institute of Technology

- PhD in Astrophysics (Defended August 2014, Conferred June 2015). Thesis: *Faint Galaxies in the Mpc-scale Environments of Hyperluminous QSOs at $2 < z < 3$*
Advisor: Charles Steidel

- MS in Astrophysics (June 2010)

University of California, Irvine

- BS in Physics (Honors, Phi Beta Kappa, *magna cum laude*)
Honors Thesis: *Improving Galaxy Mass Estimates by Accounting for Binary Systems*
Advisors: Manoj Kaplinghat & James Bullock

Peer-Reviewed & Submitted Publications:

32. Rogers, Noah et al. including RFT [6 authors]; *CECILIA: Direct O, N, S, and Ar Abundances in Q2343-D40, a Galaxy at $z \sim 3$* ; ApJL 964, L12 (2024)
31. Strom, Allison et al. including RFT [10 authors]; *CECILIA: The Faint Emission Line Spectrum of $z \sim 2-3$ Star-forming Galaxies*; ApJ 958, L11 (2023)
30. Erb, Dawn et al. including RFT [8 authors]; *The Circumgalactic Medium of Extreme Emission Line Galaxies at $z \sim 2$: Resolved Spectroscopy and Radiative Transfer*

- Modeling of Spatially Extended Lyman-alpha Emission in the KBSS-KCWI Survey*; ApJ 953, 118 (2023)
29. Crawford, F. et al. including RFT [7 authors]; *Measurements of the Crab Pulsar's Giant Radio Pulse Amplitude Power-Law Index Using Low-Frequency Arecibo and Green Bank Telescope Observations*; ApJ 948, 46 (2023)
 28. Runco, Jordan et al. including RFT [24 authors]; *Reconciling the Results of the $z \sim 2$ MOSDEF and KBSS-MOSFIRE Surveys*; MNRAS 513, 3871 (2022)
 27. Strom, Allison et al. including RFT [4 authors]; *Chemical abundance scaling relations for multiple elements in $z \sim 2-3$ star-forming galaxies*; ApJ 925, 116 (2022)
 26. Chen, Yuguang et al. including RFT and F&M student Noah Lamb [12 authors]; *The KBSS-KCWI Survey: The connection between extended Ly α halos and galaxy azimuthal angle at $z \sim 2-3$* ; MNRAS 508, 19 (2021)
 25. Chen, Yuguang et al. including RFT [16 authors]; *The Keck Baryonic Structure Survey: using foreground/background galaxy pairs to trace the structure and kinematics of circumgalactic neutral hydrogen at $z \sim 2$* ; MNRAS 499, 1721 (2020)
 24. Trainor, Ryan. F. et al. [6 authors]; *Predicting Ly α Emission From Galaxies Via Empirical Markers Of Production And Escape*. ApJ 887, 85 (2019)
 23. Rudie, Gwen C. et al. including RFT [8 authors]; *The Column Density, Kinematics, and Thermal State of Metal-Bearing Gas within the Virial Radius of $z \sim 2$ Star-Forming Galaxies in the Keck Baryonic Structure Survey*. ApJ 885, 61 (2019)
 22. Martin, D. Christopher et al. including RFT [16 authors]; *Multi-filament gas inflows fuelling young star-forming galaxies*, Nature Astronomy, July 2019 Issue
 21. Hill, Ryley et al. including RFT [15 authors]; *The SCUBA-2 web survey: I. Observations of CO(3-2) in hyper-luminous QSO field*, MNRAS 485, 753 (2019)
 20. Theios, Rachel L. et al. including RFT [6 authors]; *Dust Attenuation, Star Formation, and Metallicity in $z \sim 2-3$ Galaxies from KBSS-MOSFIRE*, ApJ 871, 128 (2019)
 19. Steidel, Charles C et al. including RFT [8 authors]; *The Keck Lyman Continuum Spectroscopic Survey (KLCS): The Emergent Ionizing Spectrum of Galaxies at $z \sim 3$* , ApJ 869, 123 (2018)
 18. Law, David R et al. including RFT [6 authors]; *Imaging Spectroscopy of Ionized Gaseous Nebulae around Optically Faint AGN at Redshift $z \sim 2$* , ApJ 866, 119 (2018)
 17. Strom, Allison L. et al. including RFT [5 authors]; *Measuring the Physical Conditions in High-redshift Star-forming Galaxies: Insights from KBSS-MOSFIRE*, 868, 117 (2018)
 16. Strom, Allison L. et al. including RFT [6 authors]; *Nebular Emission Line Ratios in $z \sim 2-3$ Star-Forming Galaxies with KBSS-MOSFIRE: Exploring the Impact of Ionization, Excitation, and Nitrogen-to-Oxygen Ratio*, ApJ 836, 164 (2017)
 15. Trainor, R. F. et al. [4 authors]; *The Rest-Frame Optical Spectroscopic Properties of Ly α -emitters at $z \sim 2.5$* , ApJ 832, 171 (2016)
 14. Erb, D. K. et al. including RFT [8 authors]; *A High Fraction of Ly-alpha-Emitters Among Galaxies with Extreme Emission Line Ratios at $z \sim 2$* , ApJ 830, 52 (2016)
 13. Steidel, C. C. et al. including RFT [6 authors]; *Reconciling the Stellar and Nebular Spectra of High Redshift Galaxies*, ApJ 826, 159 (2016)
 12. Martin, D. C. et al. including RFT [7 authors]; *A Newly Forming Cold Flow Protogalactic Disk, a Signature of Cold Accretion from the Cosmic Web*, ApJ 824, L5 (2016)
 11. Mostardi, R. E. et al. including RFT [6 authors]; *A High-Resolution Hubble Space Telescope Study of Apparent Lyman Continuum Leakers at $z \sim 3$* , ApJ 810, 107 (2015)

10. Trainor, R. F. et al. [4 authors]; *The Spectroscopic Properties of Ly α -Emitters at $Z \approx 2.7$: Escaping Gas and Photons from Faint Galaxies*, ApJ 809, 89 (2015)
 9. Steidel, C.C. et al. including RFT [14 authors]; *Strong Nebular Line Ratios in the Spectra of $z \sim 2-3$ Star Forming Galaxies: First Results from KBSS-MOSFIRE*, ApJ 795, 165 (2014)
 8. Erb, D. K. et al. including RFT [16 authors]; *The Ly-alpha Properties of Faint Galaxies at $z \sim 2-3$ with Systemic Redshifts and Velocity Dispersions from Keck-MOSFIRE*, ApJ 795, 33 (2014)
 7. Mostardi, R. E. et al. including RFT [6 authors]; *Narrowband Lyman-Continuum Imaging of Galaxies at $z \sim 2.85$* , ApJ 779, 65 (2013)
 6. Kulas, K. R. et al. including RFT [10 authors]; *The Mass-Metallicity Relation Of A $Z \sim 2$ Protocluster With MOSFIRE*, ApJ 774, 130 (2013)
 5. Trainor, R. F., Steidel, C. C., *Constraints on Hyperluminous QSO Lifetimes via Fluorescent Ly α Emitters at $Z \sim 2.7$* , ApJ 775, L3 (2013)
 4. McLean, I. S. et al. including RFT [20 authors]; *MOSFIRE, the multi-object spectrometer for infra-red exploration at the Keck Observatory*, SPIE 8446, 0J (2012)
 3. Trainor, R. F., Steidel, C. C., *The Halo Masses and Galaxy Environments of Hyperluminous QSOs at $Z \sim 2.7$ in the Keck Baryonic Structure Survey*, ApJ 752, 39 (2012)
 2. Rudie, G. C. et al. including RFT [10 authors]; *The Gaseous Environment of High- z Galaxies: Precision Measurements of Neutral Hydrogen in the Circumgalactic Medium of $z \sim 2-3$ Galaxies in the Keck Baryonic Structure Survey*, ApJ 750, 67 (2012)
 1. Minor, Q. E. et al. including RFT [5 authors]; *Correcting Velocity Dispersions of Dwarf Spheroidal Galaxies for Binary Orbital Motion*, ApJ 721, 1142 (2010)
- Total citations: 3653; H-index: 25 (via the Astrophysical Data System, 19 Feb 2025)

Student Research Mentoring and Collaboration:

Italicized students have completed an Honors Thesis and/or had co-authorship on a peer-reviewed paper. Students marked (HS) are high-school student interns.

- | | |
|---------------------------|-------------------------------|
| 1. Luciano Yañez | 20. Fiorella Comparini Donoso |
| 2. Héctor Díaz | 21. Zach Nusbickel |
| 3. Javiera Toro Grey | 22. Io Kovach |
| 4. Hongbo Chen | 23. Yang Yang |
| 5. Delaney Adair | 24. Ojima Abraham |
| 6. Omar Khattab | 25. Ye "Issac" Lin |
| 7. Sophie Bergstrom | 26. Rebecca McClain |
| 8. Youssef El Gharably | 27. Rafael Silva |
| 9. Ahmed Sherif | 28. Ayana Stuart |
| 10. Eyosias Berhanu (HS) | 29. Brandon Perezous |
| 11. Ben Tubiello | 30. Conor Larison |
| 12. Raisa Rahman Richi | 31. Christopher Chapman |
| 13. Maggie Shaw | 32. Erik Garcia |
| 14. Emma Levy | 33. Donald Fasce |
| 15. Mckenzie Golden | 34. Noah Lamb |
| 16. Lillian Williams | 35. Sandra Chilson |
| 17. Keyli Motino Chirinos | 36. Anna de Graaf |
| 18. Menelaos Raptis | 37. Shanon Oden |
| 19. Charles Reisner | 38. Elizabeth Trenholm |

39. Jose Zamora Zeledon
40. Duncan Rocha (HS)

41. Elijah Wilensky (HS)

Invited Research Talks:

- *Astronomy Seminar*, Astronomy Department at U. de Chile (December 2024)
- *Colloquium*, Astronomy Department at Yale University (September 2023)
- *Colloquium*, Physics & Astronomy Department at Amherst College (February 2022)
- *CAS Seminar*, Johns Hopkins University (March 2021)
- *Colloquium*, Astronomy Department at University of British Columbia (March 2021)
- *Colloquium*, Physics & Astronomy Department at Williams College (March 2021)
- *Colloquium*, Astrophysics Science Division, NASA Goddard (December 2019)
- *Colloquium*, Physics Department at U Wisconsin, Milwaukee (December 2017)
- *Colloquium*, Physics Department at Millersville University (October 2017)
- *Colloquium*, Astronomy Department at Penn State U, State College (October 2017)
- *The Snowbird Cosmic Lyman-Alpha Workshop*, University of Utah (March 2017)
- *Colloquium*, Physics & Astronomy Dept at Pomona College (February 2017)
- *Colloquium*, Physics & Astronomy Dept at Oberlin College (February 2017)
- *Colloquium*, Physics & Astronomy Dept at Franklin & Marshall College (January 2017)
- *Colloquium*, Physics Department at CSU East Bay (January 2017)
- *Near-Far Galaxy Workshop (Review Talk)*, Sonoma, CA (December 2016)
- *Colloquium*, University of Hawaii, Hilo (October 2016)
- *Cosmology Seminar*, UC Davis (November 2015)
- *IMPS Seminar*, UC Santa Cruz (September 2015)
- *Astrophysics Seminar*, UC Irvine (May 2014)
- *ITC Seminar*, Harvard/CfA (December 2013)
- *Theoretical Astrophysics Center Seminar*, UC Berkeley (October 2013)
- *Lyman Alpha as an Astrophysical Tool*, Stockholm, Sweden (September 2013)

Funding Awarded (Post-PhD):

- **PI**, RCSCA Cottrell Scholar Award (2022-2025), **\$100,000 awarded to F&M**
- **PI**, Pittsburgh Foundation Research Award (2021-2023), **\$95,230 awarded to F&M**
- Co-I, James Webb Space Telescope Cycle 1 GO (2022-2024, PI: Strom/Northwestern), \$374,172 total, **\$86,397 awarded to F&M**
- Co-I, NASA Keck Observatory allocation (2021B), \$13,650
- **PI**, Hubble Space Telescope Cycle 24 (2017-2020), **\$91,956 awarded to F&M**

Telescope Time Awarded (Post-PhD):

- **PI**, IRAM NOEMA interferometer (5 hours; Summer 2021)
- Co-I, Keck Observatory 2021B (NASA TAC; 2n awarded)
- Co-I, James Webb Space Telescope Cycle 1 GO (40 hours awarded)
- **PI**, Hubble Space Telescope Cycle 24 (20 orbits awarded)
- Co-I (lead observer, PI Eliot Quataert): Keck Observatory 2017B (2n)
- Co-I (lead observer, PI Eliot Quataert): Keck Observatory 2016B (2n)
- Co-I (lead observer, PI Eliot Quataert): Keck Observatory 2015B (2n)
- Co-I (lead observer, PI Eliot Quataert): Keck Observatory 2015A (1.5n)
- Co-I (PI Valentino González): Las Campanas Observatory 2024B (2n)
- Co-I (PI Alicia Lanz): Las Campanas Observatory 2021B (4n)
- Co-I (PI Gwen Rudie): Las Campanas Observatory 2017B (3n)

- Co-I (PI Gwen Rudie): Las Campanas Observatory 2017A (3n)
- Co-I (PI Gwen Rudie): Las Campanas Observatory 2016B (3n)

Courses Taught:

Franklin & Marshall College

- PHY111, Fundamental Physics 1 (4x), Lab (6x)
- PHY112, Fundamental Physics 2 (1x)
- PHY226, Classical Mechanics (1x), Lab (2x)
- PHY333, Electric and Magnetic Fields (3x)
- AST100, Survey of Astronomy (2x), Lab (3x)
- AST101, Exploring Ideas in Astronomy (4x)
- AST121, Introduction to Astrophysics (3x), Lab (1x)
- AST332, Galaxies & Cosmology (1x)
- INT178, Identity, Power, & Inequality (1x)
- Independent study in physics or astronomy (50x)
- Faculty advisor for internship for credit (8x)

Previous Teaching Experience (* = graduate course)

- UC Berkeley: Introduction to Astronomy (Instructor of Record, 2015)
- Caltech: Galaxies & Cosmology (Head TA for MOOC with 28K students, 2013)
- Caltech: Introduction to Astronomy (TA with weekly teaching responsibilities, 2010)
- Caltech: Radiative Processes in Astrophysics (TA, 2010)*
- Caltech: The Interstellar Medium (TA, 2010)*

Service:

Scientific Field

- Scientific referee for *The Astrophysical Journal*, *Monthly Notices of the Royal Astronomical Society*, and *Astronomy & Astrophysics*
- Review panel member: NSF AAG, JWST TAC

College

- Workload Task Force Committee (2023-2024)
- Chair of Fringe Benefits Committee (2022-2023)
- Secretary of the Faculty (2021-2022)
- Accelerated DEI Curricular Working Group, Subcommittee Co-Chair (2020)
- Inclusivity in Sciences Working Group (2020)
- Committee on Enrollment (Fall 2020)
- Common Hour Committee (Spring 2020)
- Working Group on Bias Response System (2019)
- Quality of Campus Life Committee (2018-2019)
- Provost's Advisory Committee for Faculty Inclusion and Diversity (2018-2019)

Club Advising

- Black Student Union, National Society for Black Engineers, Automative Club, Sigma Pi Sigma

Outreach

- Star parties + science talks for Center for Talented Youth summer program and College Prep summer program at Franklin & Marshall College (2018-2023). Co-organized April 2024 eclipse party at Franklin & Marshall College (2024).
- Public lectures: F&M Space Week, UC Berkeley Astro Night, Science @ Cal, Community College of San Francisco

- K-12 classroom visits in the Pasadena Unified School District, Los Angeles Unified School District, Mountain View-Los Altos Union High School District, Berkeley Unified School District, and the School District of Lancaster
- Led public outreach event organization at Caltech including viewing of Supernova 2011fe (~600 visitors), the May 2023 solar eclipse (~1000 visitors) and the June 2012 transit of Venus (~1800 visitors)

Professional Development

Teaching

- Participant, AAPT New Faculty Workshop
- Participant, NASA Center for Astronomy Education *Teaching Excellence* Workshop
- Co-founder, Caltech *Workgroup for Educational Science and Technology*
- Co-I, ESCIP (Enhancing Science Courses by Integrating Python)
- Co-I, Cottrell (RCSA-funded program to incorporate LLMs into classroom learning)

Diversity, Equity, and Inclusion

- Unproductive Thinking Workshop (Jennifer Stollman, PhD, January 2020)
- SACNAS Annual Meeting (Honolulu, Hawai'i, September 2019)
- Implicit Bias Workshop (Dr. Julie Ancis, August 2019)
- HHMI Diversity, Equity, and Inclusion Workshop (Saundra McGuire, PhD, May 2019)
- F&M directed reading groups (*Dear America: Notes of an Undocumented Citizen* by Jose Antonio Vargas; *Hip Hop Beats, Indigenous Rhymes: Modernity and Hip Hop in Indigenous North America* by Dr. Kyle T. Mays; *White Fragility* by Robin DiAngelo)