RYAN F. TRAINOR

Associate Professor of Physics & Astronomy
Franklin & Marshall College

Contact:

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Research Focus:

- Multi-wavelength imaging and spectroscopic observations with a focus on optical/infrared
- Interactions of stars, gas, black holes, and dark matter in galaxy formation
- Lyman-alpha emission as a probe of astrophysics and cosmology

Academic Positions:

Franklin & Marshall College, Department of Physics & Astronomy
- Associate Professor (2023-present)
- Assistant Professor (2017-2023)

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:

- 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 Publications:

30. Erb, Dawn et al. including RFT [8 authors]; *The Circumgalactic Medium of Extreme Emission Line Galaxies at z ~ 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~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~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 Lyα halos and galaxy azimuthal angle at z~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 ~ 2*; MNRAS 499, 1721 (2020)
24. Trainor, Ryan. F. et al. [6 authors]; *Predicting Lyα 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~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 ~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 ~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 ~ 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~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 Lyα-emitters at z ~ 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 ~ 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~3*, ApJ 810, 107 (2015)
10. Trainor, R. F. et al. [4 authors]; *The Spectroscopic Properties of Lyα-Emitters at Z ≈ 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 ~ 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~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 ~ 2.85*, ApJ 779, 65 (2013)
6. Kulas, K. R. et al. including RFT [10 authors]; *The Mass-Metallicity Relation Of A Z~2 Protocluster With MOSFIRE*, ApJ 774, 130 (2013)
5. Trainor, R. F., Steidel, C. C., *Constraints on Hyperluminous QSO Lifetimes via Fluorescent Lya Emitters at Z~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~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 ~ 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: 3015; H-index: 24 (via the Astrophysical Data System, 10 August 2023)

Student Mentoring and Collaboration:

Franklin & Marshall College

Italicized students have completed an Honors Thesis and/or had co-authorship on a peer-reviewed paper

- Eyosias Berhanu (2023, Conestoga Valley HS → Temple University)
- Ben Tubiello (2023)
- Raisa Rahman Richi (2023)
- Maggie Shaw (2023)
- Emma Levy (2023)
- Mckenzie Golden (2023)
- Keyli Motino Chirinos (2023)
- Menelaos Raptis (2022-present)
- Charles Reisner (2022-present)
- Fiorella Comparini Donoso (2022-present)
- Zach Nusbickel (2022-2023 → PhD student at U Rochester)
- Io Kovach (2022-2023 → PhD student at UIUC)
- *Yang Yang* (2022-2023 → MSc MechE at WUSTL)
- Ojima Abraham (2021-2022 → software engineer at MongoDB)
- *Ye "Issac" Lin* (2020-2022 → PhD student at UC Riverside)
- *Rebecca McClain* (2019-2022 → PhD student at Ohio State)
- Rafael Silva (2020 → PhD student at Colorado School of Mines)
- Ayana Stuart (2020 → working as a lab technician at EMSL Analytical)
- Brandon Perezous (2020 → Applied Data Science program at MIT)
- Conor Larison (2019-2021, post-bac researcher → PhD student at Rutgers University)
- Christopher Chapman (2019-2021 → working in computer engineering)
- Erik Garcia (2019 → looking for jobs in computer science)
- Donald Fasce (2019 → working at a high school and applying for PhD programs)
- *Noah Lamb* (2017-2019, post-bac researcher → PhD student at Drexel University)
- Sandra Chilson (2017-2018 → teaching high school physics)

UC Berkeley

- Anna de Graaf (2015-2016 → PhD student at Leiden Observatory)
- Shanon Oden (2014-2016 → SF Bay Area tech sector)
- Elizabeth Trenholm (2016 → MSc student in Data Science at Kings College London)
- Jose Zamora Zeledon (2016 → PhD in ChemE at Stanford University)
- Duncan Rocha (2016, *local HS student* → undergrad at Harvey Mudd College)
- Elijah Wilensky (2016, *local HS student*)

Invited Research Talks:

- *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 University of Wisconsin, Milwaukee (December 2017)

- *Colloquium*, Physics Department at Millersville University (October 2017)
- *Colloquium*, Astronomy Department at Penn State University, State College (October 2017)
- *The Snowbird Cosmic Lyman-Alpha Workshop*, University of Utah (March 2017)
- *Colloquium*, Physics & Astronomy Department at Pomona College (February 2017)
- *Colloquium*, Physics & Astronomy Department at Oberlin College (February 2017)
- *Colloquium*, Physics & Astronomy Department 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)

Contributed Research Talks:

- *Central Pennsylvania Astronomer's Consortium* (June 2020) – *presented with two students*
- *AAS Meeting*; Seattle, WA (January 2019) – *Two presentations, one with student*
- *Escape of Lyman radiation from galactic labyrinths II*; Kolymbari, Greece (September 2018)
- *Cosmic dawn of galaxy formation: linking observations and theory with new-generation spectral models*; Paris, France (June 2016)
- *The Escape of Lyman radiation from galactic labyrinths*; Kolymbari, Greece (April 2016)
- *The Physical Link between Galaxies and their Halos*; Garching, Germany (June 2013)
- *Keck Science Meeting*; San Diego, CA (September 2012)
- *AAS Meeting*; Austin, TX (January 2012)
- *New Horizons for High Redshifts*; Cambridge, UK (July 2011)
- *Galaxy Formation*; Durham, UK (July 2011)

Funding Awarded (Post-PhD):

- **PI**, RCSA 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 approved budget including **$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**
- NSF Astronomy & Astrophysics Postdoctoral Fellowship (2017-2020, declined), $300,000

Telescope Time Awarded (Post-PhD):

- **PI**, IRAM NOEMA interferometer (5 hours; observations completed 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 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

- PHY333, Electric and Magnetic Fields (3x)
- PHY111, Fundamental Physics 1 (4x), Lab (5x)
- PHY112, Fundamental Physics 2 (1x)
- PHY226, Classical Mechanics Lab (1x)
- AST332, Galaxies & Cosmology (1x)
- AST121, Introduction to Astrophysics (3x), Lab (1x)
- AST100, Survey of Astronomy (2x), Lab (3x)
- AST101, Exploring Ideas in Astronomy (2x)
- Independent study in physics or astronomy (41x)
- Faculty contact for internship for credit (6x)

Previous Teaching Experience (undergraduate courses)

- 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)

Previous Teaching Experience (graduate courses)

- 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*
- Panel member, Early Career Astronomers meeting with Thomas Zurbuchen, acting director for NASA's Science Mission Directorate
- Panel member, NSF Astronomy & Astrophysics Research Grants
- Panel member, JWST Time Allocation Committee

College

- 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)

Department

- Member of departmental search committee for two visitors and one TT hire
- Colloquium organizer
- Scribe for department meetings

Student Advising

- First year advisor (16 students)
- Major advisor: Astrophysics classes of 2021, 2022, 2024
- Club advisor: Black Student Union (2019-present)
- Club advisor: National Society for Black Engineers (2022-present)
- Club advisor: Sigma Pi Sigma (Physics Honor Society, 2018-2020)

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*

Diversity, Equity, and Inclusion

- Member, DisFPS (Faculty-Staff Disability Alliance)
- 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)