Carter Flayhart

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Education

Ph.D. Astrophysical Sciences & Technology	Rochester Institute of Technology	2023 - Present
M.S. Astrophysical Sciences & Technology	Rochester Institute of Technology	2023 - 2025
B.S. Physics & Astronomy	Case Western Reserve University	2019 - 2023

Research Interests

High Redshift Galaxy Evolution; Quiescent Galaxy Populations; Spectroscopic & Photometric Data Analysis; Data Reduction & Cataloging; Machine Learning

Work Experience

Graduate Research Assistant, Lab for Multiwavelength Astrophysics May 2024 - Present

Early Universe Galaxy Evolution: Utilizing COSMOS-Web photometric data with co-PI Dr. Jeyhan Kartaltepe, along with ancillary photometric data in the COSMOS field, to identify high redshift quiescent galaxy candidates, confirm their properties with SED fitting programs such as CIGALE, and gather spectroscopic follow up observations via both available archival observations and our own proposals. Also a member of the CLUTCH, an HST program in COSMOS, data reduction and cataloging teams and the CAPERS, a JWST legacy spectroscopic program, spectrophotometric modelling team.

REU Graduate Student Liaison, Rochester Institute of Technology June - Aug; 2024-2025

Aided Dr. Jeyhan Kartaltepe in running the summer Multimessenger Astrophysics REU. Served as a local student point of contact for out of town students, including connecting them with their advisors, informing them about campus resources, and providing support to those navigating new research experiences.

Graduate Teaching Assistant, Rochester Institute of Technology Aug 2023 - May 2024

Aided with two undergraduate courses taught by Dr. Aditya Yechan Gunja: College Physics I and II. Helped lead "flipped classroom" sessions, graded assignments including labs & worksheets, and offered guidance and support to students navigating academic challenges.

Undergraduate Research Assistant, CWRU Astronomy June 2022 - Aug 2022

Advised by Dr. Chris Mihos and Dr. Bill Janesh, determined and documented how to access and use newly released astronomical datasets for future research. Also worked with astronomical datasets (MaNGA, Gaia) to develop coursework for upper-level astronomy classes, developing Python command packages for students to more easily access and process real astronomical data.

Undergraduate Research Assistant, CWRU Computer & Data Science June 2021 - May 2022

Advised by Dr. Shuai Xu and funded by Dr. Yanfang Ye, worked on the beginning stages of developing a comprehensive evaluation system to benchmark various quantum processors. Planned for performance to be quantified both for specific metrics, useful for coders to find best fit for their tasks, and overall quality.

Undergraduate Laboratory Assistant, CWRU Physics June 2021 - Aug 2021

Set up and prepared the Advanced Physics Laboratory for post-pandemic instruction. Tested and repaired physics instruments, including oscilloscopes, multimeters, Geiger counters, etc. Advised by Dr. Kathleen Kash, researched and identified a variety of unknown physics equipment dating back to the 1890s.

Undergraduate Teaching Assistant, CWRU Physics Jan 2021 - May 2021

Responsible for grading assignments and tutoring students for Dr. Phil Taylor's Introduction to Modern Physics undergraduate course.

Publications

Abedini, F., *et al.*, "COSMOS-Web: estimating physical parameters of galaxies using Self-Organizing Maps." *Monthly Notices of the Royal Astronomical Society* 548. 337 (2026)

Franco, M., *et al.*, "COSMOS-Web: Comprehensive Data Reduction for Wide-area JWST NIRCam Imaging." *The Astrophysical Journal* 999. 200 (2026)

Toni, G., *et al.*, "COSMOS-Web galaxy groups: Evolution of red sequence and quiescent galaxy fraction." *Astronomy & Astrophysics* 707. 87 (2026)

Shuntov, M., *et al.*, "COSMOS2025: The COSMOS-Web galaxy catalog of photometry, morphology, redshifts, and physical parameters from JWST, HST, and ground-based imaging." *Astronomy & Astrophysics* 704. 339 (2025)

Gozaliasl, G., *et al.*, "Brightest group galaxies in COSMOS-Web: Evolution of the size-mass relation since z = 3.7." *Astronomy & Astrophysics* 703. 129 (2025)

Projects

Master's Thesis, RIT Astrophysical Sciences & Technology

Advised by Dr. Jeyhan Kartaltepe, I utilized JWST COSMOS-Web & ancillary photometric data to identify a sample of high redshift (z>2) quiescent galaxy candidates and investigate their evolution. The final measured number densities show good agreement with previous observational results, leveraging the large area of COSMOS-Web to mitigate the uncertainty in these calculations, and extend these measurements out to higher redshifts. While only photometrically observed and still to be confirmed, the highest redshift sources in this sample contend with the earliest confirmed quiescent galaxy.

Undergraduate Senior Capstone, CWRU Astronomy

Advised by Dr. Chris Mihos, I conducted research focused on evaluating galaxy formation theories through a study of elliptical galaxies utilizing MaNGA, a dataset comprised of spatially resolved spectroscopic data for more than 10,000 galaxies. More specifically, the research focus was to evaluate whether galaxy formation could be explained by one simple hierarchical formation theory or if there were differences dependent on properties (mass, metallicity, environmental density, etc.).

Accepted Proposals & Awards

Constraining the Population of High-z Quiescent Galaxies, $16,300 Keck Cycle 2025B

Awarded one night on K1/MOSFIRE for H band observations of rare massive quiescent galaxy candidates, using this spectroscopy to capture a potential Balmer break and determine if they are truly quiescent.

American Astronomical Society International Travel Grant, $1,500 Spring 2025

Awarded funds to present ongoing research at the COSMOS Conference in Marseille.

CWRU Richard F. Sigal Physics Scholarship, $7,500 Spring 2022

Awarded to a physics student who has demonstrated excellence in their studies and intends to pursue a career in physics.

CWRU Albert A. Michelson Prize Spring 2022

Awarded on completion of the undergraduate junior year to physics majors who have demonstrated superior performance.

Presentations

End of Star Formation Conference at UIUC March 2026

Presented preliminary results on the selection of a rich high redshift quiescent galaxy candidate population in the COSMOS-Web field, including derivation of the photometric number density, showing good agreement with previous observations, and identification of candidates out to the most extreme redshifts.

IPAC 2025 Infrared Spectroscopy from Space Symposium October 2025

Presented on the quiescent galaxy candidate population in the COSMOS-Web field, including results from the photometric number density work & preliminary results based on CAPERS spectroscopic observations.

COSMOS Conference in Marseille May 2025

Presented preliminary results on the selection of a quiescent galaxy candidate population evolution in COSMOS-Web, as well as the derivation of this population's photometric number density and its evolution.

RIT Astrophysical Sciences & Technology Research Jamboree October 2024

Departmental presentation introducing my intended Master's Thesis and current progress report at these early stages, with a focus on sample selection and intended methods for analysis.

Skills

1. Execution of widely used SED fitting softwares with an expertise in CIGALE
2. Developing Python packages and documentation for both research and student use
3. Data reduction, aided with visualization through the use of ds9
4. Collaboration with a variety of scientific contributors within the community including the COSMOS (including both the CLUTCH & CHAMPS teams) and CAPERS Scientific Collaborations.