

## Tim B. Miller

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CIERA  
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<b>Research Interests</b>	Galaxy Evolution; Galaxy morphology; Bayesian Inference; Machine learning	
<b>Education &amp; Experience</b>	<i>Postdoctoral Fellow</i> Northwestern University, IL, USA Center for Interdisciplinary Exploration and Research in Astrophysics (CIERA)	Fall 2023-Present
	<i>Ph.D, Astronomy</i> Yale University, CT, USA Supervisor: Pieter van Dokkum Thesis: A New View of Galaxy Morphology	Awarded July 2023
	<i>Masters of Science, Physics</i> Dalhousie University, Nova Scotia, Canada Supervisor: Scott Chapman Thesis: <i>Star Formation Rate Indicators in the FIRE Simulations &amp; SPT2349-56: A Massive and Active Proto-cluster</i>	Awarded August 2017
	Visiting Researcher California Institute of Technology Supervisors: Phil Hopkins and Chris Hayward	2015-2016
	<i>Bachelor of Science, First Class Honors in Physics</i> Dalhousie University, Nova Scotia, Canada	Awarded May 2015
<b>Scholarships &amp; Awards</b>	CIERA Postdoctoral Fellowship · Independent Postdoctoral Fellowship Gruber Science Fellowship · Award to highly ranked Ph.D applicants Killam Predoctoral Scholarship · University wide scholarship for M.Sc program NSERC Canada Graduate Scholarship · Federal scholarship spanning many areas of study Nova Scotia Graduate Scholarship · Province wide scholarship for M.Sc program NSERC Undergraduate Summer Research Award · Federal award to support summer research projects	2023 - 2026 2017 - 2020 2015 - 2017 2016 2016 - 2017 Summers 2013 - 2015
<b>Conferences &amp; Seminars</b>	Extragalactic Seminar - Arizona State University Early results from the JWST - Cambridge AAS 241 - Dissertation Talk First Results from JWST - STSCI Tea Talk - Caltech	Jun. 2023 Mar. 2023 Jan. 2023 Dec. 2022 Oct. 2022

Galaxies and AGN journal club - John Hopkins U.	Feb. 2022
Local “Local Group” Group - Flatiron Institute	Nov. 2021
Thunch - Princeton	Sept. 2021
EAS Annual Meeting	July 2021
AAS 235 - Dragonfly Telephoto Array Special Session	Jan 2020

## Open Source Software & Contributions

Co-Lead Developer - <a href="#">pysersic</a> 	· Fully Bayesian Sersic fitting implemented in <code>jax</code>
Lead Developer - <a href="#">imcascade</a> 	· Flexible, Bayesian method for measuring galaxy morphology
Contribution - <a href="#">sbi</a> 	· Added flexibility to memory management, helpful for training large datasets on GPUs
Contribution - <a href="#">ArtPop</a> 	· Algorithmic improvements to speed up simulations by $> 4\times$

## Observational Experience

JWST - NIRCam	
· Experience with early imaging data	
HST - ACS & WFC3	
· Extensive experience working with optical and NIR data	
Keck I - LRIS	Apr. 2021
· 2 nights observing	
Dragonfly Telephoto Array	2020 - 2022
· Recurring remote observer	
Keck I - MOSFIRE	Nov. 2018
· 3 nights observing	
Sub-millimetre Array	July 2016
· Guest observer for 5 nights	

## Community & Outreach

Journal Referee	2022 - Present
· AAS Journals, JOSS	
Astronomy $\times$ Data Science Journal Club – Organizer	Fall 2021 - Spring 2023
· Moderated and organized weekly journal club and speaker series	
Galaxy Lunch – Organizer	Fall 2019 - Fall 2021
· Moderated and organized weekly journal club and speaker series	
Yale Astronomy Student Council – Founding Member	Fall 2018 - Fall 2021
· Worked with students to communicate concerns to faculty and improve program	
Astronomy on tap New Haven – Public Talk	July 2019
· “The Hubble constant and our expanding universe”	
Physics Fun and Discovery Days – Presenter	Summers 2013-2016
· Performed physics demonstrations to elementary and junior high school students	

## Publications

*10 First Author, 26 Co-Authored, [ads library](#)*

## First Authored

Pasha, I. & Miller, T. B. (Co-lead authors), 2023. “pysersic: A Python package for determining galaxy structural properties via Bayesian inference, accelerated with `jax`”. *JOSS*, 8(89), 5703

Miller, T. B., van Dokkum, P., & Mowla, L. 2023, “Color gradients and half-mass radii of galaxies out to  $z = 2$  in the CANDELS/3D-HST fields: further evidence for important differences in the evolution of mass-weighted and light-weighted sizes” , *ApJ*, 945, 2, 155

Miller, T. B., Whitaker, K. E., Nelson, E. J., et al. 2022, “Early JWST imaging reveals

strong optical and NIR color gradients in galaxies at  $z \sim 2$  driven mostly by dust”, ApJL, 941, 2, L37

**Miller, T. B.** & van Dokkum, P., 2021, “Bayesian fitting of multi-Gaussian expansion models to galaxy images”, ApJ, 923, 1, 124

**Miller, T. B.**, van Dokkum, P., Danieli, S., et al. 2021, “The Dragonfly Wide Field Survey. II. Accurate Total Luminosities and Colors of Nearby Massive Galaxies and Implications for the Galaxy Stellar Mass Function”, ApJ, 909, 74

**Miller, T. B.**, van den Bosch, F. C., Green, S. B., et al. 2020, “Dynamical self-friction: how mass loss slows you down”, MNRAS, 495, 4496.

**Miller, T. B.**, Chapman, S., Hayward, C. C., et al., 2020, “Investigating overdensities around  $z > 6$  Galaxies through ALMA observations of [CII]”, ApJ, 889, 2

**Miller, T. B.**, van Dokkum, P., Mowla, L. and van der Wel, A. 2019, “A New View of the Size-Mass Distribution of Galaxies: Using  $r_{20}$  and  $r_{80}$  Instead of  $r_{50}$ ”, ApJL, 872, L14

**Miller, T. B.**, Chapman, S. C., Aravena, M., et al., 2018, “A massive core for a cluster of galaxies at a redshift of 4.3”, Nature, 556, 469

**Miller, T. B.**, Hayward, C. C., Chapman, S. C., et al. 2015, “The bias of the submillimetre galaxy population: SMGs are poor tracers of the most-massive structures in the  $z \sim 2$  Universe”, MNRAS, 452, 878

#### Co-authored

Price, S. H., Suess, K. A., .. **Miller, T. B.** ... , et al. 2023, “UNCOVER: The rest ultraviolet to near infrared multiwavelength structures and dust distributions of sub-millimeter-detected galaxies in Abell 2744”, arXiv:2310.02500. Submitted to ApJ

Kokorev, V., Fujimoto, S., .. **Miller, T. B.** ... , et al. 2023, “UNCOVER: A NIRSpect Identification of a Broad-line AGN at  $z = 8.50$ ”, ApJL, 957, L7.

Martorano, M., van der Wel, A., .. **Miller, T. B.** ... et al. 2023, “Rest-frame Near-infrared Radial Light Profiles up to  $z = 3$  from JWST/NIRCam: Wavelength Dependence of the Sérsic Index” ApJ, 957, 46.

Fujimoto, S., Bezanson, R.,... **Miller, T. B.** ... et al. 2023, “DUALZ: Deep UNCOVER-ALMA Legacy High-Z Survey”, arXiv:2309.07834. Submitted to ApJS

Greene, J. E., Labbe, I., ... **Miller, T. B.** ... et al. 2023, “UNCOVER spectroscopy confirms a surprising ubiquity of AGN in red galaxies at  $z > 5$ ” arXiv:2309.05714. Submitted to ApJ

Goulding, A. D., Greene, J. E., ... **Miller, T. B.** ... et al. 2023, “UNCOVER: The Growth of the First Massive Black Holes from JWST/NIRSpec-Spectroscopic Redshift Confirmation of an X-Ray Luminous AGN at  $z = 10.1$ ”, ApJL, 955, L24.

Baggen, J. F. W., van Dokkum, P., ... **Miller, T. B.** ... et al. 2023, “Sizes and Mass Profiles of Candidate Massive Galaxies Discovered by JWST at  $7 < z < 9$ : Evidence for Very Early Formation of the Central 100 pc of Present-day Ellipticals”, ApJL, 955, L12.

Fujimoto, S., Wang, B., ... **Miller, T. B.** ... et al. 2023, “UNCOVER: A NIRSpect Census of Lensed Galaxies at  $z = 8.50 - 13.08$  Probing a High AGN Fraction and Ionized Bubbles in the Shadow” arXiv:2308.11609, submitted to ApJ

Furtak, L. J., Labbé, I., ... **Miller, T. B.** ... , et al. 2023, “A supermassive black hole in the early universe growing in the shadows” arXiv:2308.05735, submitted to Nature

Wang, B., Fujimoto, S., ... **Miller, T. B.** ... , et al. 2023, "UNCOVER: Illuminating the Early Universe – JWST/NIRSpec Confirmation of  $z > 12$  Galaxies", arXiv:2308.03745, submitted to ApJL

van der Wel, A., Martorano, M., ... **Miller, T. B.** ... et al. 2023, "Stellar Half-Mass Radii of  $0.5 < z < 2.3$  Galaxies: Comparison with JWST/NIRCam Half-Light Radii", submitted to ApJ, arXiv:2307.03264

Nelson, E. J., Suess, K. A., ... **Miller, T. B.** ... et al. 2023, "JWST reveals a population of ultra-red, flattened disk galaxies at  $2 < z < 6$  previously missed by HST", ApJL, 948, L18

Suess, K. A., Bezanson, R., ... **Miller, T. B.** ..., et al. 2022, "Rest-frame near-infrared sizes of galaxies at cosmic noon: objects in JWST's mirror are smaller than they appeared ", ApJL, 937, L33

Lokhorst, D., Abraham, R., ... **Miller, T. B.** ..., et al. 2022, "A Giant Shell of Ionized Gas Discovered near M82 with the Dragonfly Spectral Line Mapper Pathfinder", ApJ, 927, 136.

Pasha, I., Lokhorst, D., ... **Miller, T. B.** ..., et al. 2021, "A Nascent Tidal Dwarf Galaxy Forming within the Northern H I Streamer of M82", ApJL 923

Liu, Q., Abraham, R., ... **Miller, T. B.** ..., et al. 2021, "A Method To Characterize the Wide-Angle Point Spread Function of Astronomical Images", ApJ, 925, 219

Keim, M. A., van Dokkum, P., ... **Miller, T. B.** ... , et al. 2021, "Tidal Distortions in NGC1052-DF2 and NGC1052-DF4: Independent Evidence for a Lack of Dark Matter ", ApJ, 935, 160

Hill, R., Chapman, S. C., ... **Miller, T. B.** ... , et al. 2021, "A census of the stellar content in the protocluster core SPT2349–56 at  $z = 4.3$ ", submitted to MNRAS, arXiv:2109.04534

Cunningham, D. J. M., Chapman, S. C. .... **Miller, T. B.** ... , et al. 2020, "The [C II]/[N II] ratio in  $3 < z < 6$  sub-millimetre galaxies from the South Pole Telescope survey MNRAS, 494, 4090

Danieli, S., Lokhorst, D., ... **Miller, T. B.** ... , et al. 2020, "The Dragonfly Wide Field Survey. I. Telescope, Survey Design and Data Characterization", ApJ , 894, 119

Ogiya, G., van den Bosch, F. C., ... **Miller, T. B.** ... et al. 2019, "DASH: a library of dynamical subhalo evolution ", MNRAS, 485, 189.

Mowla, L., van der Wel, A., van Dokkum, P. and **Miller, T. B.**, "A Mass-dependent Slope of the Galaxy Size-Mass Relation out to  $z \sim 3$ : Further Evidence for a Direct Relation between Median Galaxy Size and Median Halo Mass", 2019, ApJL, 872, L13

Marrone, D. P., Spilker, J. S., ... **Miller, T. B.** ... , et al. "Galaxy growth in a massive halo in the first billion years of cosmic history", Nature, 2018, 553, 51

Strandet, M. L., Weiss, A., ... **Miller, T. B.** ... , et al. , "ISM Properties of a Massive Dusty Star-forming Galaxy Discovered at  $z \sim 7$ ", ApJL, 2017, 842, L15

Orr, M. E., Hayward, C. C., ... **Miller, T. B.** ... , et al. "Stacked Star Formation Rate Profiles of Bursty Galaxies Exhibit "Coherent" Star Formation", ApJL , 2017, 849, L2