

L. Y. Aaron Yung

Curriculum Vitae

Observational Cosmology Lab, Astrophysics Science Division
NASA Goddard Space Flight Center
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<https://lyaaronyung.github.io/>

PROFESSIONAL APPOINTMENTS

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| NASA Postdoctoral Fellow
Astrophysics Science Division, Goddard Space Flight Center
Greenbelt, Maryland, United States
<i>science advisor: Dr. Jonathan Gardner</i> | Oct 2020 – Present |
| Flatiron Visiting Researcher
Center for Computational Astrophysics, Flatiron Institute
Manhattan, New York, United States | Sep 2016 – Sep 2020 |

EDUCATION

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| Rutgers University – New Jersey, United States
Ph.D. in Astrophysics
<i>doctoral thesis advisor: prof. rachel somerville</i> | Class of 2020 |
| University of San Francisco – California, United States
B.S. in Physics (with Honors) and Mathematics (with Honors)
<i>double minor in Astronomy and Astrophysics, Summa Cum Laude</i> | Class of 2014 |

SCIENTIFIC INTERESTS

I am an expert in using semi-analytic methods to model the formation of galaxies and AGN in the early universe and their subsequent impact on the reionization of the intergalactic hydrogen and helium. Throughout my doctoral thesis studies, I published a series of well-received ‘Semi-analytic forecasts for JWST’ papers, which deliver a wide variety of predictions for high-redshift objects that are expected to be detected by JWST, providing insights for how future observations can constrain the underlying physical processes. I am an active member on numerous observing teams that utilize HST, JWST, and other ground-based instruments; I am also a member of the Roman Space Telescope Cosmic Dawn Science Investigation Team.

AWARDS & HONORS

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| 2021 | Richard J. Plano Dissertation Prize – Department of Physics & Astronomy, Rutgers
– <i>given annually to a PhD graduate who wrote the best PhD dissertation in the past year</i> |
| 2020 | NASA Postdoctoral Program (NPP) Fellowship – NASA
– <i>extremely selective fellowship in recognition of highly ranked academic and scientific achievement</i> |
| 2014 | Dr. Raymond Genolio Award – Department of Physics & Astronomy, USF
– <i>award to graduating senior who ranks highest in scholarship in the Department of Physics</i> |
| 2012 | Mike and Millie Lehmann Scholarship – Department of Mathematics, USF
– <i>award annually to the most outstanding student in the Department of Mathematics</i> |
| 2012 | Arthur Furst Undergraduate Scholarship – College of Arts & Sciences, USF
– <i>award to a science student who demonstrates outstanding ability and passion to pursue research</i> |
| Dean’s List – College of Arts & Sciences, USF, Fall 2010 - Spring 2014 Every Semester | |

GRANTS AWARDED AS PI

- 2021 *JWST* Cycle 1 – Constraining the Seeding and Growth of First Black Holes via Observable Signatures from the Early Universe
– a budget of \$[REDACTED] requested, grant award amount pending (AR 2108)
- 2020 NPP Fellowship – Semi-analytic model for high-redshift multi-messenger surveys and multi-instrument synergy
– a total grant of \$208,024 is awarded towards FY20-22 research and travel

SELECTED GRANTS AND OBSERVING TIME AWARDED AS CO-I

- 2021 *JWST* Cycle 1 – The Webb Deep Extragalactic Exploratory Public (WDEEP) Survey
PI: Steve Finkelstein, prime/parallel time: 121.7/96.4 hours
– a budget of \$[REDACTED] requested, grant award amount pending

A total of 5 Co-I proposals are accepted for JWST Cycle 1
(GO 2079; GO 2123; GO 2426; AR 2608; AR 2687)
- 2020 *JWST* DD-ERS – The Cosmic Evolution Early Release Science (CEERS) Survey
PI: Steve Finkelstein, observing time: 63.2 hours
– a budget of \$[REDACTED] requested, grant award amount pending
- 2019 *HST* Cycle 26 – Photometric Confirmation of the Brightest Known Galaxy Candidate at $z > 9$
PI: Steve Finkelstein, 2 orbits

SELECTED EXTERNAL COLLABORATIONS

- JWST* Cosmic Evolution Early Release Science (CEERS) Survey Team Mar 2018 - Present
PI: Steve Finkelstein
Funded JWST Early Release Science program that surveys the high-redshift Universe. <https://ceers.github.io>
- Webb Deep Extragalactic Exploratory Public (WDEEP) Survey Team Mar 2020 - Present
PI: Steve Finkelstein; Co-PI's Casey Papovich & Nor Pirzkal
Selected JWST Cycle 1 major public GO/Treasury extragalactic survey program. Deepest survey among all selected.
- PRIMER: Public Release IMaging for Extragalactic Research Team Oct 2021 - Present
PI: Jim Dunlop & Garth Illingworth
Selected JWST Cycle 1 major public GO/Treasury extragalactic survey program.
- Roman Space Telescope* Cosmic Dawn Science Investigation Team Jun 2019 - Present
PI: James Rhoads (NASA GSFC)
NASA-funded Science Investigation Team with objectives focused on studying the epoch of “Cosmic Dawn”.
- Experiment for Cryogenic Large-Aperture Intensity Mapping (EXCLAIM) Feb 2019 - Present
PI: Eric Switzer (NASA GSFC)
NASA-funded line intensity mapping survey for CO and CII line emission from $z = 0 - 3.5$ galaxies. ([link](#))
- The Isolated and Quenched (IQ) Collaboratory Sep 2017 - Present
PI: Tjitske Starkenburg
The IQ Collaboratory aims to bridge the gap between simulations and observations of star-forming and quiescent galaxies to better characterize internal quenching processes. See <https://iqcollaboratory.github.io>
- Undergraduate ALFALFA Team Aug 2012 - May 2014
The NSF-funded UAT is a consortium of 19 institutions engaging in an undergraduate research under the Arecibo Legacy Fast ALFA (ALFALFA) project, which aims to detect neutral hydrogen in the local universe by utilizing the Arecibo L-band Feed Array (ALFA) at the Arecibo Observatory.

OUTREACH & SERVICE

- 2021 - Present Extra-Galactic Science Interest Group – as part of NASA’s Cosmic Origins Program
- 2021 - Present Subject Matter Expert for the Webb Mission – STScI’s JWST Community Events Team
- 2021 - Present Referee for peer-reviewed journals

- 2021 - Present Main host for the popular weekly science series on the social platform “*Clubhouse*”
 - in collaboration with *NSAS’s Chief Scientist Jim Green* and many other experts
 - weekly events include the “*Astro Newsroom*” and the topical “*Ask An Astronomer* – $[A^3]$ ” room
 - typical room reaches hundreds of listeners, with a peak of 1.6k for our room on Black Holes
 - I run the “*Astronomy & Astrophysics*” club that attracted 23k+ members since March 2021 debut

- 2019 - Present Member of the American Astronomical Society (AAS)

- 2015 - 2016 President – Graduate Student Organization, Rutgers
- 2013 - 2014 President – USF Astronomy Club
- 2013 - 2014 Chapter Officer – Mathematics Honor Society (IIME), USF
- 2012 - 2013 Vice President – USF Astronomy Club

TEACHING APPOINTMENTS

- 2014 - 2016 Graduate Teaching Assistant – Department of Physics & Astronomy, Rutgers
- 2012 - 2014 Teaching Assistant – Department of Mathematics, USF
- 2011 - 2014 Teaching Assistant – Department of Physics & Astronomy, USF
- 2011 - 2013 Observation Assistant for Astronomy – Department of Physics & Astronomy, USF

ADDITIONAL TRAINING & QUALIFICATIONS

- 2021 “Share the Science” Training – NASA Headquarters, nominated by NASA Goddard Science Communications
- 2021 Machine Learning \times Physics/Astronomy – Center for Computational Astrophysics, Flatiron Institute
- 2016 Certificate of Training in Physics Mentorship – Department of Physics & Astronomy, Rutgers
- 2014 Certificate of Training in Physics Teaching – Department of Physics & Astronomy, Rutgers

OTHER SKILLS & BACKGROUND

- Language Proficiency: English (Fluent), Mandarin (Fluent), French (Basic), Japanese (Basic)
- Scientific Programming: Python (Primary), C++, FORTRAN, L^AT_EX, IDL, MATLAB, Mathematica

CONFERENCE CONTRIBUTED TALKS

- “*How can JWST help find ionizing photon sources?*”
Jan 24-28, 2022 – Sesto, Italy – The Growth of Galaxies in the Early Universe – VII (*invited*)

- “*Semi-analytic forecasts: mock lightcone and data releases*”
Jan 9-13, 2022 – Salt Lake City, Utah – the 239th AAS Meeting

- “*Lightcones for Roman Space Telescope & Simulated Observations*”
Nov 15-19, 2021 – Virtual – Roman Science Investigation Team Community Briefing

- “*Semi-analytic forecasts: uncovering galaxy formation at high redshift with JWST and Beyond*”
Jul 6-9, 2020 – Virtual – Summer All Zoom Epoch of Reionization Astronomy Conference (SAZERAC)

- “*Semi-analytic forecasts: uncovering galaxy formation at high redshift with JWST and Beyond*”
Jan 4-8, 2020 – Honolulu, Hawai’i – the 235th AAS Meeting – dissertation talk

“Semi-analytic forecasts: high-redshift galaxy demographics and implications for reionization”

Jan 21-25, 2019 – Sesto, Italy – The Growth of Galaxies in the Early Universe – V (*invited*)

“Semi-analytic forecasts: uncovering galaxy formation with joint constraints from wide and deep surveys”

Aug 30-31, 2018 – Princeton, New Jersey – Workshop on *WFIRST*/LSST Deep Fields

“Semi-analytic forecasts: uncovering galaxy formation with joint constraints from wide and deep surveys”

Jul 23-27, 2018 – Noordwijk, Netherlands – ESA-ESTEC *JWST*/Euclid Synergy Conference

“Galaxy Formation in the Epoch of Reionization with SAM: Predictions for Upcoming JWST Observations”

Feb 4-10, 2018 – Aspen, Colorado, United States – Aspen Winter Conference on Astrophysics: Cosmic Dawn

“Galaxy Formation at Extreme Redshifts: Semi-analytic Model Predictions and Challenges for Observations”

Jun 12-16, 2017 – Paris, France – Galaxy Evolution Across Time

“UV Luminosity Functions at $z > 6$ predicted by Semi-analytic Models and implications for Reionization”

Jun 20-24, 2016 – Paris, France – the 32nd Institut d’Astrophysique de Paris Colloquium

CONFERENCE POSTERS

“Semi-Analytic Forecasts for JWST: Uncovering galaxy formation with joint constraints from deep surveys & reionization”

Aug 5-9, 2019 – Santa Cruz, California – 2019 Santa Cruz Galaxy Workshop

“Semi-Analytic Forecasts for JWST: Uncovering galaxy formation with joint constraints from deep surveys & reionization”

Jun 24-28, 2019 – Paris, France –

CosmoGold IAP 2019: The golden age of cosmology from Planck to Euclid

“Semi-Analytic Forecasts for JWST: Uncovering early galaxy evolution in the ALMA and JWST era”

Jun 3-9, 2019 – Viana do Castelo, Portugal –

IAU Symposium 352: Uncovering early galaxy evolution in the ALMA and JWST era

“Evolution of physical properties & scaling relations for high-redshift galaxies”

Jul 15-20, 2018 – Kingston, Ontario, Canada –

The Physics of Galaxy Scaling Relations and the Nature of Dark Matter

“Semi-analytic forecasts for JWST Trilogy”

Jun 18-22, 2018 – Strasbourg, France – Rise and Shine: Galaxies in the Epoch of Reionization

“Constraints on First-Stars Models From Observations of Local Low-Mass Dwarf Galaxies and Galactic Metal-Poor Halo Stars”

Jan 5-9, 2014 – Washington D.C., United States – the 223rd AAS Meeting – Poster #246.54

SELECTED EXTERNAL TALKS

Dec 9, 2021 – Baltimore, Maryland – Joint STScI–JHU Galaxies and AGN Seminar (*virtual, invited*)

Oct 14, 2021 – New York, New York – Columbia University, Astro Seminar (*invited*)

Feb 1, 2021 – Santa Cruz, California – UC Santa Cruz, CGI Seminar (*virtual, invited*)

Jul 16, 2020 – Sussex, England – University of Sussex, Astro Seminar (*virtual, invited*)

Mar 2, 2020 – New York, New York – *WFIRST* Science Jamboree II, *WFIRST* Science Community Meeting

Feb 7, 2020 – Toledo, Ohio – University of Toledo, Astro Seminar

Nov 7, 2019 – Oxford, England – University of Oxford, Galaxy Evolution Seminar

Nov 5, 2019 – Copenhagen, Denmark – Dark Cosmology Centre, Niels Bohr Institute

Nov 1, 2019 – Leiden, Netherlands – Lorentz Center, Leiden galaxy workshop

Sep 17, 2019 – Cambridge, Massachusetts – Harvard-Smithsonian *CfA*, Galaxies & Cosmology Seminar

Sep 4, 2019 – New Haven, Connecticut – Yale University, Galaxy Journal Club

Jul 30, 2019 – Goddard, Maryland – *WFIRST* Science Jamboree, *WFIRST* Science Community Meeting

Jun 21, 2019 – New York, New York – *Origins Space Telescope* Community Science Meeting
 Feb 15, 2019 – Baltimore, Maryland – Space Telescope Science Institute, Galaxy Seminar
 Nov 8, 2018 – San Francisco, California – University of San Francisco, Physics Colloquium
 Oct 16, 2017 – Cape Town, South Africa – MPA-UWC Bilateral Workshop
 Oct 12, 2017 – Heidelberg, Germany – Max-Planck-Institut für Astronomie, Galaxy Coffee

SELECTED INVITED PUBLIC TALKS

Nov 14, 2021 – Arlington, Virginia – David M. Brown Planetarium – JWST Community Event
 Oct 28, 2021 – Annapolis, Maryland – Cafe Scientifique – JWST Community Event

CONFERENCE & WORKSHOP ORGANIZED

Models and Simulations of High-Redshift Galaxies – SAZERAC SIPS
 – *Virtual conference, Oct 27-28, 2021* (served as SOC Chair)
 – *As part of the long lines of topic-focused, all-zoom mini conference series*

Joint CCA/STScI Workshop on “Epoch of Reionization and Early Galaxy Evolution with *JWST*”
 – served as one of the five main organizers for the two-part conference series
 – *Part I at the Space Telescope Science Institute (STScI), Baltimore, MD on Apr 20, 2018*
 – *Part II at the Center for Computational Astrophysics (CCA), New York, NY on Jun 1, 2018*

SKA Pathfinders HI Science Coordination Committee (PHISCC) Workshop
 – *Rutgers University, Mar 16-18, 2015* (served as LOC)

MAIN AUTHOR PUBLICATIONS

- [1] **Yung, L.Y.A.** et al. 2019a, *Semi-analytic forecasts for JWST – I. UV luminosity functions at $z = 4 - 10$* , MNRAS, 483, 2983 (arXiv:1803.09761)
- [2] **Yung, L.Y.A.** et al. 2019b, *Semi-analytic forecasts for JWST – II. Physical properties and scaling relations for galaxies at $z = 4 - 10$* , MNRAS, 490, 2855 (arXiv:1901.05964)
- [3] **Yung, L.Y.A.** et al. 2020a, *Semi-analytic forecasts for JWST – III. Intrinsic production rate of Lyman-continuum radiation*, MNRAS, 494, 1002 (arXiv:1910.11345)
- [4] **Yung, L.Y.A.** et al. 2020b, *Semi-analytic forecasts for JWST – IV. Implications for cosmic reionization and LyC escape fraction*, MNRAS, 496, 4574 (arXiv:2001.08751)
- [5] **Yung, L.Y.A.** et al. 2021, *Semi-analytic forecasts for JWST – V. AGN luminosity functions and helium reionization at $z = 2 - 7$* , MNRAS, 508, 2706 (arXiv:2109.13241)
- [–] **Yung, L.Y.A.** et al., *Semi-analytic forecasts for JWST – VI. Mock photometric and spectroscopic observations with public data release*, in preparation
- [–] **Yung, L.Y.A.** et al., *Semi-analytic forecasts for Roman Space Telescope: an early assessment for the next generation wide-field galaxy surveys*, in preparation

CO-AUTHOR PUBLICATIONS

- [1] Jones, Michael G.; Papastergis, Emmanouil; Pandya, Viraj; include **Yung, L.Y.A.** 2018, *The contribution of HI-bearing ultra-diffuse galaxies to the cosmic number density of galaxies*, A&A 614, A21 (arXiv:1712.01855)

- [2] Stevans, Matthew L.; Finkelstein, Steven; Wold, Isak; include **Yung, L.Y.A.** 2018, *Bridging Star-Forming Galaxy and AGN Ultraviolet Luminosity Functions at $z = 4$ with the SHELA Wide-Field Survey*, ApJ 863, 63 (arXiv:1806.05187)
- [3] Popping, Gergo; Pillepich, Annalisa; Somerville, Rachel S.; include **Yung, L.Y.A.** 2019, *The ALMA Spectroscopic Survey of the Hubble Ultra Deep Field: putting the H₂ content of galaxies and of the Universe in a theoretical context with IllustrisTNG and the Santa Cruz SAM*, ApJ 882, 137 (arXiv:1903.09158)
- [4] Walter, Fabian; Carilli, Chris; Neeleman, Marcel; include **Yung, L.Y.A.** 2020, *The Evolution of the Baryons Associated with Galaxies Averaged over Cosmic Time and Space*, ApJ 902, 111 (arXiv:2009.11126)
- [5] Behroozi, Peter; Conroy, Charlie; Wechsler, Risa H.; include **Yung, L.Y.A.** 2020, *The Universe at $z > 10$: Predictions for JWST from the UNIVERSEMACHINE DR1*, MNRAS 499, 5702 (arXiv:2007.04988)
- [6] Yang, Guang; Papovich, C.; Bagley, M. B.; include **Yung, L.Y.A.** 2021, *JWST/MIRI Simulated Imaging: Insights into Obscured Star-Formation and AGN for Distant Galaxies in Deep Surveys*, ApJ 908, 144 (arXiv:2011.08192)
- [7] Somerville, Rachel S.; Olsen, Charlotte; **Yung, L.Y.A.**; 2021, *Mock Lightcones and Theory Friendly Catalogs for the CANDELS Survey*, MNRAS 502, 4858 (arXiv:2102.00108)
- [8] Dickey, Claire M.; Starkenburg, Tjitske K.; Geha, Marla; include **Yung, L.Y.A.** 2021, *IQ Collaboratory II: The Quiescent Fraction of Isolated Galaxies Across Simulations and Observations*, ApJ 915, 53 (arXiv:2010.01132)
- [9] Stevans, Matthew L.; Finkelstein, Steven; include **Yung, L.Y.A.** 2021, *The NEWFIRM HETDEX Survey: Photometric Catalog and the Quiescent Fraction of Massive Galaxies at $z = 3 - 5$ over 17.5 deg^2 in the SHELA Field*, ApJ 921, 58 (arXiv:2103.14690)
- [10] Switzer, Eric R.; Ade, Peter A. R.; Anderson, Christopher J.; include **Yung, L.Y.A.** 2021, *Experiment for Cryogenic Large-Aperture Intensity Mapping: Instrument design*, accepted for publication in JATIS
- [11] Finkelstein, Steven L.; Bagley, Micaela; Song, Mimi; include **Yung, L.Y.A.** 2021, *A Census of the Bright $z=8.5-11$ Universe with the Hubble and Spitzer Space Telescopes in the CANDELS Fields*, accepted for publication in ApJ (arXiv:2106.13813)
- [12] Hahn, ChangHoon; Starkenburg, Tjitske K.; Angles-Alcazar, Daniel; include **Yung, L.Y.A.** 2021, *IQ Collaboratory III: The Empirical Dust Attenuation Framework – Taking Hydrodynamical Simulations with a Grain of Dust*, submitted to ApJ (arXiv:2106.09741)
- [13] Gabrielpillai, Austen; Somerville, Rachel S.; Genel, Shy; include **Yung, L.Y.A.** 2021, *Galaxy Formation in the Santa Cruz semi-analytic model compared with IllustrisTNG – I. Galaxy scaling relations, dispersions, and residuals at $z = 0$* , submitted to MNRAS (arXiv:2111.03077)
- [14] Tacchella, Sandro; Finkelstein, Steven L.; include **Yung, L.Y.A.** 2021, *On the Stellar Populations of Galaxies at $z=9-11$: the Quest of Measuring Star-Formation Histories to Elucidate the First Galaxies*, submitted to ApJ (arXiv:2111.05351)

NON-REFEREED / WHITE PAPERS

- [1] Harikane, Yuichi et al. (include **Yung, L.Y.A.**) 2021, *Roman Cosmic Dawn Survey*, NASA/Goddard's call for Roman Early-Definition Astrophysics Survey Concept
- [2] Koekemoer, Anton et al. (include **Yung, L.Y.A.**) 2021, *Roman Ultra Deep Field*, NASA/Goddard's call for Roman Early-Definition Astrophysics Survey Concept
- [3] Malhotra, Sangeeta et al. (include **Yung, L.Y.A.**) 2021, *Deep Slitless Spectroscopy with Roman*, NASA/Goddard's call for Roman Early-Definition Astrophysics Survey Concept
- [4] Papovich, Casey et al. (include **Yung, L.Y.A.**) 2021, *Roman Multi-Tiered Surveys (Roman-MTS) for Extragalactic Science*, NASA/Goddard's call for Roman Early-Definition Astrophysics Survey Concept

REFERENCES

- Dr. Jonathan P. Gardner – jonathan.p.gardner@nasa.gov
- *Chief of the Observational Cosmology Laboratory at NASA Goddard Space Flight Center*
 - *Deputy Senior Project Scientist for the James Webb Space Telescope*
 - *Science Advisor for the NASA Postdoctoral Fellowship*
- Dr. Rachel S. Somerville – rsomerville@flatironinstitute.org
- *Group leader at the Center of Computational Astrophysics, Flatiron Institute*
 - *Long-term collaborator on semi-analytic model development and related science*
 - *Doctoral Thesis Advisor*
- Prof. Steven L. Finkelstein – stevenf@astro.as.utexas.edu
- *Associate Professor at the University of Texas at Austin*
 - *PI of the JWST CEERS and WDEEP Teams and Co-I of the WFIRST Cosmic Dawn SIT*
 - *Main collaborator for the Semi-analytic forecasts work series*
 - *Long-term collaborator on JWST, HST, ALMA, Keck observing programs*
- Prof. Romeel Davé – rad@roe.ac.uk
- *Chair of Physics at the University of Edinburgh*
 - *Main collaborator for the Semi-analytic forecasts work series*
 - *Long-term collaborator on projects related to cosmic reionization and 21-cm mapping*