L. Y. Aaron Yung

Curriculum Vitae

Observational Cosmology Lab, Astrophysics Science Division
NASA Goddard Space Flight Center
l.y.aaronyung@gmail.com | aaron.yung@nasa.gov
https://lyaaronyung.github.io/

Professional Appointments

NASA Postdoctoral Fellow **Oct 2020 – Present**
Astrophysics Science Division, Goddard Space Flight Center
Greenbelt, Maryland, United States
science advisor: Dr. Jonathan Gardner

Flatiron Visiting Researcher **Sep 2016 – Sep 2020**
Center for Computational Astrophysics, Flatiron Institute
Manhattan, New York, United States

Education

Rutgers University – New Jersey, United States
Ph.D. in Astrophysics **Class of 2020**
doctoral thesis advisor: prof. rachel somerville

University of San Francisco – California, United States
B.S. in Physics (with Honors) and Mathematics (with Honors) **Class of 2014**
double minor in Astronomy and Astrophysics, Summa Cum Laude

Proposed NPP Research Title

"Semi-analytic model for high-redshift multi-messenger surveys and multi-instrument synergy"

Scientific Interests

I am an expert in modelling galaxies and AGN forming in the early universe and their subsequent impact on the reionization of the intergalactic hydrogen and helium using semi-analytic methods. During my doctoral studies, I published a series of well-received 'Semi-analytic forecasts for JWST' papers, which delivered a wide variety of predictions regarding objects that are yet to be detected, providing insights for how future observations may constrain the uncertainties in the underlying physical processes. I am an active member of the JWST Early Release Science (CEERS) Team and the Roman Space Telescope Cosmic Dawn Science Investigation Team.

Awards & Honors

2020 – 2023 NASA Postdoctoral Program Fellowship – National Aeronautics and Space Administration
2021 Richard J. Plano Dissertation Prize – Department of Physics & Astronomy, Rutgers
2014 Dr. Raymond Genolio Award – Department of Physics & Astronomy, USF
2012 Mike and Millie Lehmann Scholarship – Department of Mathematics, USF
2012 Arthur Furst Undergraduate Scholarship – College of Arts & Sciences, USF

Dean's List – College of Arts & Sciences, USF, Fall 2010 - Spring 2014 Every Semester

Elected Member of ΣΠΣ (Sigma Pi Sigma, Physics Honor Society), since 2013
Elected Member of ΠΜΕ (Pi Mu Epsilon, Mathematics Honor Society), since 2012

Grants Awarded as PI

2021 *JWST* Cycle 1 – Constraining the Seeding and Growth of First Black Holes via Observable Signatures from the Early Universe
grant award amount pending

Selected Observing Time and Grants Awarded as Co-I

2021 *JWST* Cycle 1 – The Webb Deep Extragalactic Exploratory Public (WDEEP) Survey
PI: Steve Finkelstein, 121.7 hours, grant award amount pending

A total of 5 Co-I proposals are accepted for JWST Cycle 1

2020 *JWST* ERS – The Cosmic Evolution Early Release Science (CEERS) Survey
PI: Steve Finkelstein, 63.2 hours, $[redacted] awarded for three months of support

2019 *HST* Cycle 26 – Photometic Confirmation of the Brightest Known Galaxy Candidate at $z > 9$
PI: Steve Finkelstein, 2 orbits

Current and Past Collaborations

JWST Cosmic Evolution Early Release Science (CEERS) Survey Team Mar 2018 - Present

PI: Steve Finkelstein
Funded JWST early release science (ERS) program that surveys the high-redshift Universe.
See `https://ceers.github.io`

Roman Space Telescope Cosmic Dawn Science Investigation Team Jun 2019 - Present

PI: James Rhoads
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 and Anthony Pullen
NASA-funded line intensity mapping survey for CO and CII line emission from $z = 0 - 3.5$ galaxies. (here)

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.

Selected Past Research Projects

Doctoral Thesis Research Advisor: Prof. Rachel Somerville

"Semi-analytic forecasts for galaxy formation and cosmic reionization in the ultrahigh-redshift universe"

Doctoral Candidacy Research Advisor: Prof. Rachel Somerville

"The Interplay of Cosmic Reionization and Galaxy Formation"

Undergraduate Research Advisor: Prof. Aparna Venkatesan

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

Outreach & Service

2015 - 2016 President – Graduate Student Organization, Rutgers

2013 - 2014 Chapter Officer – Mathematics Honor Society (ΠΜΕ), USF

2013 - 2014 President – USF Astronomy Club

2012 - 2013 Vice President – USF Astronomy Club

Peer-reviewed journal referee for MNRAS

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 × 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`, LaTeX, `IDL`, `MATLAB`, `Mathematica`

Conference Contribution Talks

"Semi-analytic forecasts: uncovering galaxy formation at high redshift with JWST and Beyond"
Jul 6-9, 2020 – Virtual Meeting – Summer All Zoom Epoch Of Reionization Astronomy Conference

"Semi-analytic forecasts: uncovering galaxy formation at high redshift with JWST and Beyond"
Jan 4-8, 2020 – Honolulu, Hawai'i – the 235$^{\text{th}}$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

"Semi-analytic forecasts: uncovering galaxy formation with joint constraints from wide and deep surveys"
Aug 30-31, 2018 – Princeton, New Jersey, United States – 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 32$^{\text{nd}}$ 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 223$^{\text{rd}}$AAS Meeting – Poster #246.54

Selected External Talks

Feb 1, 2021 – Santa Cruz, California – UC Santa Cruz, CGI Seminar (Virtual Talk)
Jul 16, 2020 – Sussex, England – University of Sussex, Astro Seminar (Virtual Talk)
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, Niel 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

Conference & Workshop Organized

[Main organizer]
CCA/STScI Epoch of Reionization and Early Galaxy Evolution with *JWST* Workshop
– *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*

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

Main Author Publications

[1] **Yung, L.Y.A.** et al., 2019, *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., 2019, *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., 2020, *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., 2020, *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* $z = 2 - 7$, in preparation

[6] **Yung, L.Y.A.** et al., in prep., *Semi-analytic forecasts for JWST – VI. Mock photometric and spectroscopic observations with public data release*, 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*, accepted for publication in ApJ (arXiv:2103.14690)

[10] 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)

[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*, submitted to ApJ (arXiv:2106.13813)

[12] 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*, submitted to JATIS

References

Dr. Jonathan P. Gardner – jonathan.p.gardner@nasa.gov

- *Chief of the Laboratory for Observational Cosmology at NASA Goddard*
- *Deputy Senior Project Scientist for the James Webb Space Telescope*
- *Science Advisor on NPP research project*

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 Team 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*