

# L. Y. Aaron Yung

Curriculum Vitae 

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Observational Cosmology Lab, Astrophysics Science Division

NASA Goddard Space Flight Center

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<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*

## DOCTORAL THESIS RESEARCH

*“Semi-analytic forecasts for galaxy formation and cosmic reionization in the ultrahigh-redshift universe”*

## SCIENTIFIC INTERESTS

*My scientific interests lie primarily in modeling the formation of galaxies in the early universe and their co-evolution with the cosmic environment during the Epoch of Reionization. In my thesis work, I assembled a modeling pipeline that can efficiently predict large populations of galaxies at high-redshift galaxies and explore their subsequent contributions to cosmic reionization, which effectively connects the physical processes that shape galaxy formation to a variety of large-scale observables that can be tested with future observations. My work is used to inform the development of science case and the planning of optimal observing strategies for future premium observatories, such as JWST and WFIRST. I am also interested in exploring the role played by the first stars and the first black holes in shaping galaxy populations at extreme redshifts.*

## AWARDS & HONORS

2020 – 2023 NASA Postdoctoral Program (NPP) Fellowship – NASA, administered by USRA

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

**CURRENT AND PAST COLLABORATIONS**

*WFIRST* Cosmic Dawn Science Investigation Team (SIT) Jun 2019 - Present

PI: James Rhoads

*NASA-funded Science Investigation Team with objectives focused on studying the epoch of “Cosmic Dawn”.*

*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>

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>*

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.*

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.*

**PAST RESEARCH PROJECTS**

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 (HME), USF

2013 - 2014 President – USF Astronomy Club

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 TEACHING RELATED QUALIFICATIONS**

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<sup>A</sup>T<sub>E</sub>X, 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<sup>th</sup> 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<sup>nd</sup> 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<sup>rd</sup> AAS Meeting – Poster #246.54

**SELECTED EXTERNAL TALKS**

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)

**CO-AUTHOR PUBLICATIONS**

- [1] Jones, Michael G.; Papastergis, Emmanouil; Pandya, Viraj; Leisman, Lukas; Romanowsky, Aaron J.; **Yung, L.Y.A.**; Somerville, Rachel S.; Adams, Elizabeth A. K. 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; ... **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.; ... **Yung, L.Y.A.** 2019, *The ALMA Spectroscopic Survey of the Hubble Ultra Deep Field: putting the H<sub>2</sub> 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; ... **Yung, L.Y.A.** 2020, *The Evolution of the Baryons Associated with Galaxies Averaged over Cosmic Time and Space*, accepted for publication in ApJ (arXiv:2009.11126)
- [5] Behroozi, Peter; Conroy, Charlie; Wechsler, Risa H.; Hearin, Andrew; Williams, Christina C.; Moster, Benjamin P.; **Yung, L.Y.A.**; Somerville, Rachel S.; Gottlöber, Stefan; Yepes, Gustavo; Endsley, Ryan; 2020, *The Universe at  $z > 10$ : Predictions for JWST from the UNIVERSEMACHINE DR1*, accepted for publication in MNRAS (arXiv:2007.04988)
- [6] Dickey, Claire M.; Starkenburg, Tjitske K.; Geha, Marla; ... **Yung, L.Y.A.** 2020, *IQ Col-laboratory II: The Quiescent Fraction of Isolated Galaxies Across Simulations and Observations*, accepted for publication in ApJ (arXiv:2010.01132)

#### AWARDED OBSERVING TIME AS CO-I

- 2019 *HST* – Photometric Confirmation of the Brightest Known Galaxy Candidate at  $z > 9$   
(PI: Steve Finkelstein, 2 orbits)

#### REFERENCES

Prof. Rachel S. Somerville – rsomerville@flatironinstitute.org

- *Distinguished Professor and Downsbrough Chair in Astrophysics at Rutgers University*
- *Group leader at the Center of Computational Astrophysics, Flatiron Institute*
- *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 HST, ALMA, Keck observing proposals*

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*