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# NATALIA C. VILLANUEVA

*PhD Student at the University of Texas at Austin*

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## EDUCATION

**University of Texas at Austin**, Austin, TX

Ph.D. Astronomy

Fall 2024 —

*Advised by Prof. Steven Finkelstein*

**University of Cambridge**, Cambridge, UK

MPhil Physics — Cavendish Laboratory, Kavli Institute for Cosmology

November 2024

*Advised by Dr. Sandro Tacchella*

*The size growth of star formation in the early Universe: Measuring multiwavelength sizes of  $z \sim 4 - 5$  galaxies*

**Harvard University**, Cambridge, MA

A.B. Physics and A.B. Astrophysics, High Honors and cum laude in field; GPA: 3.84

May 2023

*Senior Thesis: [Pixel-Scale H \$\alpha\$  Mapping of  \$z \sim 4 - 5\$  Morphologically Complex JWST JADES Galaxies](#)*

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## RESEARCH EXPERIENCE

**UT Austin PhD**

University of Texas at Austin, Austin, TX

*advisor Prof. Steven Finkelstein, Finkelstein High- $z$  Group, CEERS Collaboration*

*August 2024 —*

High-redshift resolved galaxy properties, pixel-scale spectral energy distribution (SED) fitting

**Cambridge Master's Thesis**

Kavli Institute for Cosmology (KICC), Cambridge, UK

*advisor Dr. Sandro Tacchella, Extragalactic Group, JADES Collaboration*

*October 2023 - November 2024*

High-redshift galaxy morphology, star formation structure growth of JWST H $\alpha$  line-emitters

**Harvard Bachelor's Thesis**

Center for Astrophysics (CfA), Cambridge, Massachusetts

*advisors Prof. Daniel Eisenstein & Dr. Benjamin Johnson, JADES Collaboration*

*Sep. 2022 - May 2023*

High-redshift galaxy morphology, star formation structure growth of JWST H $\alpha$  line-emitters

**Harvard College Research Program**

CfA, Cambridge, Massachusetts

*advisors Dr. Sandro Tacchella & Prof. Charlie Conroy*

*May 2022 - August 2022*

High-redshift galaxy morphology, empirical modelling of star formation size evolution

**Astronomy Junior Thesis**

CfA, Cambridge, Massachusetts

*advisor Prof. Daniel Eisenstein, DESI Collaboration*

*September 2021 - December 2021*

Circumgalactic medium (CGM), [quasar-galaxy cross-correlation](#) DESI spectral stacking analysis

**Harvard Program for Research  
in Science and Engineering (PRISE) Fellowship**

CfA, Cambridge, Massachusetts

*advisor Dr. Sandro Tacchella*

*June 2021 - August 2021*

High-redshift galaxy morphology, empirical modelling of star formation size evolution

**Maria Mitchell Observatory (MMO) Summer REU Program**

Nantucket, Massachusetts

*advisor Dr. Suvi Gezari*

*May 2020 - August 2020*

Tidal disruption events (TDEs), [light curve classification analysis](#) of Zwicky Transient Facility TDE sample

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**Harvard-Smithsonian Center for Astrophysics (CfA)**

advisor Dr. Gonzalo Gonzalez-Abad, MEaSUREs group

Cambridge, Massachusetts

June 2019 - August 2019

Atmospheric science, integrate elevation information to satellite observations of NASA's MEaSUREs program

**Astrophysics Laboratory Course Research Project**

advisors Prof. John Kovac & Harvard BICEP team

CfA, Cambridge, Massachusetts

January 2022 - March 2022

Instrumentation, [optimize BICEP CMB polarization sensitivity](#) with thin vacuum cryostat window

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**PUBLICATIONS**

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C. Simmonds, et al. (including **N. Villanueva**) (2024). [“Ionising properties of galaxies in JADES for a stellar mass complete sample: resolving the cosmic ionising photon budget crisis at the Epoch of Reionisation”](#)

F. D'Eugenio, et al. (including **N. Villanueva**) (2024). [“JADES Data Release 3 – NIRSpec/MSA spectroscopy for 4,000 galaxies in the GOODS fields”](#)

S. Tacchella, et al. (including **N. Villanueva**) (2024). [“Resolving the nature and putative nebular emission of GS9422: an obscured AGN without exotic stars”](#)

D. Eisenstein, et al. (including **N. Villanueva**) (2023). [“Overview of the JWST Advanced Deep Extragalactic Survey \(JADES\)”](#)

M. Rieke, et al. (including **N. Villanueva**) (2023). [“JADES Initial Data Release for the Hubble Ultra Deep Field: Revealing the Faint Infrared Sky with Deep JWST NIRCам Imaging”](#), *ApJS*, 269(1), 16, [doi:10.3847/1538-4365/acf44d]

A. Bunker, et al. (including **N. Villanueva**) (2023). [“JADES NIRSpec Initial Data Release for the Hubble Ultra Deep Field: Redshifts and Line Fluxes of Distant Galaxies from the Deepest JWST Cycle 1 NIRSpec Multi-Object Spectroscopy”](#)

M. Eiben, et al. (including **N. Villanueva**) (2022). [“Laminate polyethylene window development for large aperture millimeter receivers”](#), *SPIE Proceedings*, 12190 [doi:10.1117/12.2629591].

E. Hammerstein, et al. (including **N. Villanueva**) (2023). [“The Final Season Reimagined: 30 Tidal Disruption Events from the ZTF-I Survey”](#), *ApJ*, 942(1), 9 [doi:10.3847/1538-4357/aca283].

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**AWARDS & GRANTS**

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1. Henry Fellowship, 2023 (*Master's study at University of Cambridge, 1 Harvard student award per year*)
2. Harvard College Research Program (HCRP) Summer Research Grant, 2022
3. Harvard Program for Research in Science and Engineering (PRISE) Fellowship, 2021
4. Massachusetts Space Grant Consortium NASA Space Grant Fellowship, 2020
5. Maria Mitchell Observatory Research Experiences for Undergraduates (REU) Fellowship, 2020
6. Lucy Cavendish College Travel, Research, and Conferences Fund, 2024
7. Lindsey Traub Sports Fund, *Lucy Cavendish College*, 2024

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**TECHNICAL PRESENTATIONS**

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**Talks:**

GASPIA2024 Conference Talk, May 2024. *The size growth of star formation in early galaxies: Comparing galaxy sizes across star formation timescales for a large sample of  $z \sim 4 - 5$  galaxies — Pisa, Italy.*

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Extragalactic Group meeting, Kavli Institute for Cosmology, April 2024. *Multiwavelength sizes of JADES  $z \sim 4-5$  star-forming galaxies* — Cambridge, UK.

Extragalactic Group meeting, Kavli Institute for Cosmology, July 2022. *Empirical model for the size growth of galaxies* — Cambridge, UK.

[Astronomy Senior Thesis Presentation](#), April 2023. *Mapping star formation of morphologically complex  $z \sim 4-5$  galaxies* — CfA, Cambridge, MA.

Extragalactic Group meeting, Kavli Institute for Cosmology, July 2022. *Empirical model for the size growth of galaxies* — Cambridge, UK.

[Astronomy Junior Thesis Presentation](#), December 2021. *Exploring Circumgalactic Gas: Through spectroscopic cross-correlations of DESI quasar-galaxy pairs* — CfA, Cambridge, MA.

MIT PRISM Conference Talk, August 2021. *Growing Galaxies: Modeling the Time and Spatial Evolution of Individual Galaxies* — virtual.

Harvard Program for Research in Science and Engineering (PRISE) Final Talk, August 2021. *From birth to quench: Growing galaxies* — virtual.

[Maria Mitchell Observatory Public Research Talk](#), August 2020. *Exploring the optical emission of tidal disruption events* — virtual.

### Poster Presentations:

[AAS 240 Poster Presentation](#), June 2022. *Empirical Model for the Size Growth of Galaxies* — Pasadena, CA.

[AAS 237 Poster Presentation](#), January 2020. *Systematic Classification of Tidal Disruption Event Light Curves from the Zwicky Transient Facility* — virtual.

[CfA SAO/LIP Research Poster Session](#), August 2019. *Elevation Information for Satellite Observations of Earth's Atmosphere* — CfA, Cambridge, MA.

MIT MOSTEC Poster Symposium, August 2018 — MIT, Cambridge, MA.

## OBSERVING

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**JADES JWST GTO Cycle 1 Program** (D. Eisenstein PI)

**CEERS JWST ERS Cycle 1 Program** (S. Finkelstein PI)

**OASIS JWST Cycle 3 Program** (T. Looser PI, N. Villanueva Co-I)

**Fred Lawrence Whipple Observatory — Mt. Hopkins, AZ**

*Methods of Observational Astronomy course project (remote observing)*

60" Tillinghast refractor telescope (FAST spectrograph instrument), 48" imaging optical telescope

**1.2m Millimeter-Wave Telescope — CfA, Cambridge, MA**

*Astrophysics Laboratory course project*

## WORKSHOPS

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**XXXV Canary Islands Winter School of Astrophysics**, October 2024

Baryon Cycle Across Space and Time

**UC Berkeley AstroTech instrumentation Summer School**, August 2022

Instrumentation process and design

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## LEADERSHIP & OUTREACH

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### **Leadership and Service:**

Local Organizing Committee, *Raising the Veil on Star Formation Near and Far: A conference in honour of Richard Hills*

Telescope course instructor with STAHR, *Loomis-Michael Observatory at Harvard*

Harvard AstroSoc Board, *Event Coordinator*

Harvard Undergraduate Women in Physics Board

Harvard Society of Physics Students, *Chilloquium and Polaris Peer Mentoring Committees*

Academic Resource Center Peer Tutoring, *Astronomy*

### **Outreach Talks:**

[Maria Mitchell Observatory “Noche Abierta” \(“Open Night”\)](#), November 2020. *In Spanish.*

[Maria Mitchell Observatory “Noche Abierta” \(“Open Night”\)](#), March 2021. *In Spanish.*

[Maria Mitchell Observatory Open Night](#), March 2021.

Maria Mitchell Observatory Open Night, August 2021. *Loines Observatory, Nantucket, MA.*

Harvard Kirkland Teaches Kirkland, April 2023. *Senior Thesis outreach presentation.*

### **Miscellaneous Membership & Leadership:**

University of Cambridge Women’s Varsity Volleyball

Harvard Women’s Club Volleyball

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## SKILLS

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### **Programming skills:**

Python, DS9, IRAF/PyRAF, Mathematica, Matlab

[Forcepho](#) morphology-modeling photometry code

[SEDFlow](#) machine learning spatially-resolved SED fitting code

### **Technical skills:**

L<sup>A</sup>T<sub>E</sub>X, LINUX/UNIX, Microsoft Office Suite (Excel, Word, Powerpoint), Adobe Creative Suite

### **Languages:**

English, Spanish (native)