

# Sofía Rojas Ruiz | Curriculum Vitae

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## Education

- International Max Planck Research School - Heidelberg (IMPRS-HD)
  - Natural Sciences Ph.D. in Astrophysics 2019 – Present  
"Accreting supermassive black holes in the first billion years: impact on their environments from parsecs to mega-parsecs"
- The University of Texas at Austin
  - B.S. Astronomy & B.S. Physics, GPA:3.52 2015 – 2019
- Corazonista School - Bogotá, Colombia
  - High School GPA:3.96 2007 – 2013

## Previous Employment

- The University of Texas at Austin (UT Austin)
  - Undergraduate Research Assistant 2016 – 2019  
Search for galaxies at  $z \sim 8-10$  in the HST-BoRG survey under the supervision of Dr. Steven Finkelstein.
- Max Planck Institute for Astronomy
  - Summer Research Intern Summer 2018  
Analyzed varying chemical abundances in nuclear star clusters with Dr. Nadine Neumayer and Dr. Nikolay Kacharov.
- The National Radio Astronomy Observatory
  - Summer Research Intern Summer 2017  
Analyzed and mapped star formation in different areas of LIRG-type interacting galaxies under the supervision of Dr. Eric Murphy.

## Research Projects

- Spectral Energy Distribution of an Extreme Radio Quasar at  $z \sim 6$  Dr. Eduardo Bañados
  - Max Planck Institute for Astronomy - Heidelberg 2019-2021  
Analyzed ALMA, NOEMA, and GMRT data to study the influence of jets in the host galaxy of an extreme radio-loud QSO at  $z \sim 6$  with evidence of extended radio lobes.
- Finding Galaxies at  $z=8-10$  with the Hubble Space Telescope Dr. Steven Finkelstein
  - The University of Texas at Austin 2016-2019  
Reduced HST imaging data, used Source Extractor and EAZY to perform photometric detections of galaxies at redshifts 8-10.
- Investigating Chemical Abundances in Nuclear Star Clusters Dr. Nadine Neumayer
  - Max Planck Institute for Astronomy Summer 2018  
Fit synthetic model spectra generated with MOOG to integrated light spectra from X-Shooter/VLT of the nuclear star clusters in six nearby galaxies.
- Star formation tracing in Infrared-Bright Interacting Galaxies Dr. Eric Murphy
  - The National Radio Astronomy Observatory Summer 2017  
Analyzed Mid-Infrared spectra to find PAH features, molecular hydrogen, and characteristic AGN compounds in eight LIRG interacting galaxies.
- HETDEX (Hobby-Eberly Telescope Dark Energy Experiment) Dr. S. Finkelstein, Dr. K. Gebhardt
  - The University of Texas at Austin Summer 2016  
Tested the first spectrographs for the HETDEX project by running calibrations and using QFitsView to find Lyman-Alpha galaxies at redshifts 2-4.
- Measuring the Color-Magnitude Diagram of M67 Dr. Michael Montgomery
  - The University of Texas at Austin Spring 2016  
Took images of M67 with the 0.8m telescope at McDonald observatory and performed PSF photometry to analyze Color-Magnitude diagrams.

## Publications

- Rojas-Ruiz, Sofía; Bañados, Eduardo; Neeleman, Marcel et al. **2021**, *The Impact of Powerful Jets on the Far-infrared Emission of an Extreme Radio Quasar at  $z \sim 6$* , The Astrophysical Journal, 920, 150
- Rojas-Ruiz, Sofía; Finkelstein, Steven L.; Bagley, Micaela B. et al. **2020**, *Probing the Bright End of*

*the Rest-frame Ultraviolet Luminosity Function at  $z = 8-10$  with Hubble Pure-parallel Imaging*, The Astrophysical Journal, 891, 146

- Tacchella, Sandro et al. (Rojas-Ruiz, Sofía 16<sup>th</sup> of 21 authors) **2021**, *On the Stellar Populations of Galaxies at  $z = 9 - 11$ : The Growth of Metals and Stellar Mass at Early Times*, arXiv:2111.05351
- Finkelstein, Steven L. et al. (Rojas-Ruiz, Sofía 21<sup>st</sup> of 24 authors) **2021**, *A Census of the Bright  $z=8.5-11$  Universe with the Hubble and Spitzer Space Telescopes in the CANDELS Fields*, arXiv:2106.13813
- Connor, Thomas et al. (Rojas-Ruiz, Sofía 7<sup>th</sup> of 11 authors) **2021**, *Enhanced X-Ray Emission from the Most Radio-powerful Quasar in the Universe's First Billion Years*, The Astrophysical Journal, 911,120

Talks

- **Interactions of Radio Jets and Interstellar Medium in an Extreme Radio-loud Quasar in the First Gyr of the Universe**  
Rojas Ruiz, S., Bañados, E., Neeleman, M. et al.
  - European Astronomical Society Annual Meeting (EAS), Leiden, Netherlands (Virtual) 2021
  - Galaxy Coffee at the Max Planck Institute for Astronomy, Heidelberg, Germany 2021
  - Astronomy Seminar, Universidad de Los Andes, Colombia 2021
  - Orígenes Seminar, Universidad de Antioquia, Colombia 2021
- **Search for Bright Galaxies at  $z=8-10$  with the Hubble Space Telescope**  
Rojas Ruiz, S., Finkelstein, S., Bagley, M. B. et al.
  - 'Black Holes and Galaxies at the Edge of the Universe', Ringberg Castle, Germany 2020
  - TMT Seminar, European Southern Observatory, Chile (ESO-Santiago) 2020
  - Galaxy Coffee at Max Planck Institute for Astronomy, Heidelberg, Germany 2019
  - Astronomy on Tap - Bogotá, Colombia 2018
  - Extragalactic Seminar at The University of Texas at Austin 2017
  - Texas Astronomy Undergraduate Research Symposium 2016

Poster Presentations

- **Investigating the Mpc-scale Environment around the  $z \sim 7.54$  Quasar ULAS J1342+0928**  
Rojas Ruiz, S., Mazzucchelli, C., Bañados,E., et al.
  - 'Formation and Evolution of Galaxy Clusters Across Cosmic Time', XXXII Canary Islands Winter School of Astrophysics, La Laguna, Tenerife, Spain. 2021
- **The Host Galaxy of an Extreme Radio Quasar at  $z \sim 6$**   
Rojas Ruiz, S., Bañados, E., Neeleman, M., et al.
  - Extragalactic jets on all scales - launching, propagation, termination, MPIA and IIT Indore, Virtual 2021
  - Summer All Zoom Epoch of Reionization Astronomy Conference (SAZERAC) 2020
- **Search for Bright Galaxies at  $z=8-10$  with the Hubble Space Telescope.**  
Rojas Ruiz, S., Finkelstein, S., Bagley, M. B. et al.
  - 'First Light School': Stars, Galaxies and Black Holes in the Epoch of Reionization, Brazil 2019
  - 'Barefoot Reionization': Exploring the first billion years of the Universe, Australia 2019
  - 233rd American Astronomical Society (AAS), #233, id. 144.03 2019
  - Board of Visitors Meeting, UT Austin 2018
  - Frank N. Bash Symposium, UT Austin 2017
  - College of Natural Sciences Research Forum, UT Austin 2016
- **Infrared-Bright Interacting Galaxies.**  
Rojas Ruiz, S., Murphy, E. J., Armus, L., Smith, J.D.T., Bradford, C.M., Stierwalt, S. 2018  
231th American Astronomical Society (AAS), #231, id. 251.07

Awards

- Research Funding.....
- **European Southern Observatory Science Support Discretionary Fund (ESO-SSDF)** Fall 2020  
Awarded to an ESO-Chile Fellow and a student visitor to complete a research project.
  - **IMPRS Fellowship for PhD at International Max Planck Research School - Heidelberg** Spring 2019  
Awarded every year to the most outstanding applicant to fund the full studies of the Ph.D. (4 years).

- **Student Researcher Award, UT Office of Undergraduate Research** Spring 2019  
Two fellowships awarded yearly to students in all areas of research to advance and showcase their projects.
- **Undergraduate Research Fellowship, UT Office of Undergraduate Research** Spring 2018  
Financial support for a research project conducted at the university.
- **John W. Cox Endowment for the Advanced Studies in Astronomy** Summer 2016  
Awarded to develop a research project at the Astronomy Department during the summer.
- **FRI Summer Research Fellowship** Summer 2016  
Awarded to a freshman student developing a summer research project at the College of Natural Sciences.

## Scholarships.....

- **Ralph Cutler Greene Endowed Scholarship, UT Astronomy Department** Spring 2019  
Awarded annually to an outstanding senior astronomy student entering their final year.
- **General ISSS Financial Aid, UT International Office** Fall 2016-Spring 2019  
Awarded every year in cash assistance to international students who demonstrate financial need.
- **Melvin J. Rieger Scholarship Fund in Physics, UT Physics Department** Fall 2018-Spring 2019  
Endowed scholarship awarded every academic year to an outstanding physics student.
- **Jeannie Hunter Hackett Memorial Scholarship, PART - Austin Chapter** Spring 2018  
Awarded every year to an outstanding UT Austin junior or senior from Latin America.
- **College of Natural Sciences out-of-state tuition waiver** Fall 2016-Spring 2018  
Waiver allowing non-resident of Texas students to pay one year of tuition at in-state rates.
- **Thomas and Elizabeth Merner Scholarship, College of Natural Sciences** Fall 2017-Spring 2018  
Awarded to students in financial need and with strong academic performance
- **Brian M. Welch Endowed Memorial Scholarship, College of Natural Sciences** Fall 2016-Spring 2017  
Offered to students in the College of Natural Sciences with a minimum 3.0 GPA.
- **Abel Family Scholarships in Physics, UT Physics Department** Fall 2016-Spring 2017  
Awarded to outstanding students in the Physics Department

## Honors.....

- **Astronomy Departmental Honors, UT Austin.** Spring 2019  
Awarded to students presenting a written and oral thesis in astronomy and who have a GPA above 3.50.
- **Graduate Physics Departmental Honors, UT Austin** Spring 2019  
Awarded to students graduating with a thesis in physical sciences and a GPA above 3.50.
- **Graduate of Distinction in Research, College of Natural Sciences, UT Austin** Spring 2019  
Awarded to students who demonstrated excellence in the area of Research during their career.
- **College of Natural Sciences Aspire Professor's Choice Awards** Spring 2018  
Awarded every year to honor excellent Black and LatinX students nominated by their professors.
- **College of Natural Sciences Aspire Research Excellence Award** Spring 2017  
Awarded every year to honor the research accomplishments of Black and LatinX students.
- **Honors in IV Colombian Astronomy Olympiad** 2013  
Received 4th place at the national competition and was selected to participate in the Latin American Olympiad.
- **Bronze Medal in V Latin American Olympiad of Astronomy and Astronautics** 2013  
Awarded every year to students from Latin America participating in this competition.
- **High School Valedictorian, Corazonista School Bogotá** 2013  
Awarded to one graduating student with the best academic record during the periods of 6th to 11th grades.

## Research Skills

### Research Classes.....

- **AST 376: Observational Methods in Astronomy** Dr. Finkelstein, Dr. Kraus  
Used the 0.9m and 2.7m telescopes at McDonald Observatory to obtain and analyze data for projects in different areas of astronomy. Fall 2018
- **AST 210K: FRI-White Dwarfs** Dr. Michael Montgomery  
Gained experience analyzing light curves of white dwarfs using Fourier transforms, and MESA software for simulations of stellar evolution. Spring 2016
- **AST 376R: A Practical Introduction to Research** Dr. Shardha Jogee  
Learned to use the Linux/Mac OSX operating systems, used IRAF/PyRAF and DS9 software for analysis of nearby galaxies with different morphologies. Fall 2015

## Software and Programming Skills.....

- Use of  $\text{\LaTeX}$  and programming experience with the Interactive Data Language (IDL), Python, and Mathematica for array manipulations, reading multi-dimensional catalogs, statistical analyses, and plotting.
- Reduction and analysis of interferometry data with **GILDAS** and **CASA**.
- Performance of photometry in images using **Source Extractor**.
- Application of the **EAZY** program “Easy and Accurate Z(photometric redshifts) from Yale” to find photometric redshifts of galaxies.
- Utilization of Software **CUBISM** (Cube Builder for IRS Spectral Mapping) and **SMART** (Spectroscopy Modeling Analysis and Reduction Tool) to reduce and analyze Mid-Infrared spectra from galaxies.
- Use of the code **MOOG** to generate synthetic spectra for analyzing the chemical composition of stars.

## Telescope Experience

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### Observing Proposals Led.....

- **James Webb Space Telescope (JWST) Cycle 1 GO (Rojas–Ruiz Co-PI)**  
“Spectroscopic Confirmation and Characterization of Bright Galaxies at  $z \sim 9$ ”.  
Awarded 18.2 hours with NIRSpec/Fixed slit from the JWST TAC.
- **Very Large Array (VLA) (Rojas–Ruiz PI)**  
“Constraining the Synchrotron Lifetime of an Extreme Radio Quasar at Redshift 6”.  
Awarded 5.00 hours at Priority A from the NRAO TAC.

### Observing time.....

- The MPG/ESO 2.2m Telescope, La Silla Observatory.
- Keck 1 Telescope with the MOSFIRE spectrograph, W.M Keck Observatory.
- The 2.7m, 0.8m, and 0.9m telescopes at McDonald Observatory.
- The Mayall 4-meter telescope at Kitt Peak National Observatory.
- The 40-ft radio telescope at Green Bank Observatory.

### Work with data from.....

- *Hubble* Space Telescope data (WFC3/UVIS and WFC3/IR Instruments.)
- *Spitzer* Space Telescope IRS data.
- VLT X-Shooter integrated light spectral data.
- NOEMA and ALMA interferometry data.

## Teaching Experience

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- **Heidelberg University, Germany**  
*Tutor of the class ‘Introduction to Astronomy and Astrophysics’* Winter 2021  
Prepared classes of additional material on topics of Galactic and Extragalactic Astronomy. Specifically presented research on nuclear star clusters, dwarf galaxies and Dark Matter, galaxy clusters and lensing, and galaxies and quasars in the Epoch of Reionization. Also helped students reviewing and clarifying the homework exercises.
- **Mentoring Program for Future Colombian Astronomers**  
*Red de Estudiantes Colombianos de Astronomía (RECA)* 2020 – 2021  
Mentored students in pursuit of doctoral education in Astronomy overseas. Helped them prepare for the TOEFL English test, guided application materials, gathered funding resources and supported the student until successful acceptance to high-quality astronomy programs in Europe. <https://recaastronomia.wixsite.com/website-5/mentores>
- **Heidelberg University, Germany**  
*Tutor of Advanced Lab F36: ‘Wavefront analysis with a Shack-Hartmann wavefront sensor.’* Summer 2020  
Prepared short quizzes for the preparation of the lab, instructed and graded students on the development of the experiment.
- **The University of Texas at Austin**  
*Undergraduate Learning Assistant of “AST 301: Introduction to Astronomy”* Fall 2016  
Collaborated on preparing activities to teach this class targeted for non-science majors and helped them prepare for exams.

## Service to the Community

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- Referee for the *Astrophysical Journal* 2021
- Committee Organizer of the Network of Colombian Astronomy Students 2021  
(Red Estudiantes Colombianos Astronomía - RECA) <https://recaastronomia.wixsite.com/website-5>
- Leader of RECA - Education Node, Colombia 2021  
<https://recaastronomia.wixsite.com/website-5/educación>

## University Involvement

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- Student advisor of the Texas Institute for Discovery Education in Science (TIDES) Board 2017-2019
- Astronomy Students Association, UT elected Webmaster 2016-2017
- Student in the Freshman Research Initiative stream “Exploring the Universe with White Dwarfs” 2016
- Undergraduate Women in Physics, UT chapter member 2015-2019
- Society of Physics Students, UT chapter member 2015

## Extracurricular Activities

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- Co-Organizer of Astronomy on Tap Bogotá, Colombia 2017-2018
- Stargazing with Newtonian telescope 2007-present
- Build Hydraulic Rockets 3 yrs
- Outreach volunteer of the Colombian Astronomy Association “ACDA” 4 yrs
- Salsa dancing 15 yrs
- Play tennis 13 yrs
- Play soccer 2 yrs
- Languages: Spanish (Native), English (Fluent), and German (A2.2 level).

## References

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- Dr. Eduardo Bañados, MPIA, Heidelberg Email: [banados@mpia.de](mailto:banados@mpia.de)
- Dr. Steven Finkelstein, UT Austin Email: [stevenf@astro.as.utexas.edu](mailto:stevenf@astro.as.utexas.edu)
- Dr. Nadine Neumayer, MPIA, Heidelberg Email: [neumayer@mpia.de](mailto:neumayer@mpia.de)
- Dr. Eric Murphy, NRAO, Charlottesville, VA Email: [emurphy@nrao.edu](mailto:emurphy@nrao.edu)