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"
- **University of Texas at Austin**
  B.S. Astronomy & B.S. Physics, GPA:3.52 — *2015 – 2019*
- **Corazonista Bogotá School, Colombia**
  High School GPA:3.96 — *2007 – 2013*

Previous Employment

- **The University of Texas at Austin**
  Undergraduate Research Assistant — *2016 – 2019*
  Search for galaxies at z∼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∼6** — **Dr. Eduardo Bañados**
  Max Planck Institute for Astronomy - Heidelberg — *2019-present*
  Analyzed ALMA, NOEMA, and GMRT data to study the influence of jets in the host galaxy of an extreme radio-loud QSO at z∼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∼6* , Accepted to The Astrophysical Journal, arXiv:2108.04257
- 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, 146R
- Connor, Thomas et al. (Rojas-Ruiz, Sofía 7^{th} 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
- Finkelstein, Steven L. et al. (Rojas-Ruiz, Sofía 21^{th} 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,

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*
- **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*
  - *Galaxy Coffee at Max Planck Institute for Astronomy, Heidelberg, Germany* *2019*
  - *Astronomy on Tap - Bogotá, Colombia* *2018*
  - *Extragalactic Seminar at The University of Texas, Austin* *2017*
  - *Texas Astronomy Undergraduate Research Symposium* *2016 & 2018*

Poster Presentations

- **The Host Galaxy of an Extreme Radio Quasar at $z \sim 6$**
  Rojas Ruiz, S., Bañados, E., Eilers, A.-C., et al. *2020*
  Summer All Zoom Epoch of Reionization Astronomy Conference (SAZERAC)

- **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

- **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

Scholarships

- *IMPRS Fellowship for PhD at International Max Planck Research School - Heidelberg.* — *Spring 2019*
- *Ralph Cutler Greene Endowed Scholarship, UT Astronomy Department* — *Spring 2019*
- *General ISSS Scholarship, UT International Office* — *Fall 2016-Spring 2019*
- *McMinn Scholarship, UT Physics Department* — *Fall 2018-Spring 2019*
- *Pan American Round Table Scholarship, City of Austin* — *Spring 2018*
- *College of Natural Sciences out-of-state tuition waiver* — *Fall 2016-Spring 2018*
- *Thomas and Elizabeth Merner Scholarship, College of Natural Sciences* — *Fall 2017-Spring 2018*
- *Brian Murray Welch Endowed Memorial Scholarship, College of Natural Sciences* — *Fall 2016-Spring 2017*
- *Abel Scholarship, UT Physics Department* — *Fall 2016-Spring 2017*

Research Funding

- *European Southern Observatory Science Support Discretionary Fund (ESO-SSDF)* — *Fall 2020*
- *Student Researcher Award, UT Office of Undergraduate Research* — *Spring 2019*
- *Undergraduate Research Fellowship, UT Office of Undergraduate Research* — *Spring 2018*
- *Cox Endowment Undergraduate Excellence Fund and the McDonald Observatory/* Department of Astronomy Board of Visitors — *Summer 2016*
- *FRI Summer Research Fellowship* — *Summer 2016*

Honors

- *Bachelor's Thesis Honors, Astronomy Department, UT Austin.* — *Spring 2019*
- *Graduate Physics Departmental Honors, UT Austin* — *Spring 2019*
- *'Graduate of Distinction in Research', College of Natural Sciences, UT Austin* — *Spring 2019*
- *College of Natural Sciences Professor's Choice Awards* — *Spring 2018*
- *College of Natural Sciences Aspire Award for Excellence in Research* — *Spring 2017*
- *Honors in IV Colombian Astronomy Olympiad* — *2013*
- *Bronze medal in V Latin American Olympiad of Astronomy and Astronautics* — *2013*
- *High School Valedictorian* — *2013*

Research Skills

Research Classes

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

Software and Programming Skills

- Use of 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

Observing Proposals Led

- ***James Webb Space Telescope (JWST) Cycle 1 GO*** **(Rojas–Ruiz Co-PI)**
  "Spectroscopic Confirmation and Characterization of Bright Galaxies at z∼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

- **Mentoring Program for Future Colombian Astronomers**
  Red de Estudiantes Colombianos de Astronomía (RECA) *2020 – 2021*
  Mentored a student 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 three high-quality astronomy programs in Europe. `https://recastronomia.github.io/mentores/programa/`

- **University of Heidelberg, 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 pepare for exams.

University Involvement

- *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

- *Principal Organizer of Red Estudiantes Colombianos Astronomía (RECA), Colombia* *2021*
  `https://recastronomia.github.io/`
- *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*
- *Play tennis and soccer* *7 yrs*
- *Salsa dancing* *10 yrs*
- *Languages: Spanish (Native), English (proficient), and German (A2 level).*

References

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