

Arcelia Hermosillo Ruiz

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Overview

I am a phd student at UC Santa Cruz studying the evolution of planetary systems by looking at their debris disk structure both in the solar system and extrasolar systems. I do this primarily with analytical, numerical methods. I am applying to postdoctoral programs, excited to create a research program focused on understanding the planet—debris disk connection and what dynamical processes are common particularly around young systems. I care about creating equitable spaces and increasing the participation of students traditionally excluded from higher academia and STEM. I do this primarily through mentorship and public outreach.

Education

University of California, Santa Cruz

(EXPECTED JUN. 2025) PHD ASTRONOMY AND ASTROPHYSICS; (AUG. 2022) M.S. ASTRONOMY AND ASTROPHYSICS

University of California Berkeley

(DEC. 2018) B.A. PHYSICS & ASTROPHYSICS

Research Experience

Graduate Student Researcher, University of California Santa Cruz

Sept. 2019 - PRESENT

CONSTRAINING MIGRATION PROCESSES IN THE OUTER SOLAR SYSTEM AND PLANET ARCHITECTURE IN DEBRIS DISKS

- Advisor: Prof. Ruth Murray-Clay

I explore how the outer Solar System has evolved. By comparing nbody simulations with observations, we get closer to constraining how the planets' orbits changed over the last 4 billion years because of how they gravitationally interact with planetesimals which make up today's Kuiper Belt. I also run simulations to understand how planets dynamically excite debris around other stars to understand observations from HST, ALMA, JWST and more.

Undergraduate Researcher, University of California Berkeley

May 2016 - May 2020

THERMALIZATION EFFECTS IN LATE-TIME TYPE IA SUPERNOVA LIGHT CURVES

- Advisors : Daniel Kasen & Dr. Jennifer Barnes

Explored the discrepancy of "twin" Supernovae (SNe) lightcurves several hundred days after explosion. Simulated how radioactive isotopes and magnetic fields affect heating in the ejecta using Python and C++.

Undergraduate Researcher, INFN-Padova, Italy

Summer 2018

B-JET AND C-JET IDENTIFICATION AT LHCb USING DEEP LEARNING TECHNIQUES

- Advisors: Prof. Donatella Lucchesi & Dr. Lorenzo Sestini & Dr. Alessio Gianelle

I improved a deep learning algorithm identifying subatomic particles from the Large Hadron Collider beauty (LHCb) experiment at CERN. I accomplished this by analyzing newly simulated data with recent LHCb conditions and assessing which observables and configurations would improve the performance of the algorithm.

Undergraduate Researcher, Banneker Institute-Harvard | Smithsonian

Summer 2017

IDENTIFYING M DWARFS AND THEIR STELLAR COMPANIONS

- Advisor: Dr. Jennifer Winters

I studied the environment of M dwarf stars to assess the number of close-orbit stellar companions. By translating an existing IDL program to python, I cross checked two data sets to find distances and colors of the stars. From the 800 images, I discovered 10 new binary candidates.

Publications

FIRST AUTHOR AND LEAD MENTOR

Arcelia Hermosillo Ruiz, Ruth Murray-Clay, Meredith MacGregor, *Nbody Simulations of an Inclined, Eccentric Planet and Exterior Debris Disk Show Asymmetric Structure Similar to AU Mic*, to be submitted to ApJ

Arcelia Hermosillo Ruiz, Kathryn Volk, Ruth Murray-Clay, Rosemary Pike, *Forcing Planets to Evolve: Uranus' Eccentricity Damping Could be Linked to Neptune*, submitted to ApJ, <https://doi.org/10.48550/arXiv.2410.11813>

Arcelia Hermosillo Ruiz, Harriet C.P Lau, Ruth Murray-Clay, *Randomness and Retention: Using Weak Resonances to Constrain Neptune's Late-Stage Migration*, MNRAS, 05/24, <https://doi.org/10.1093/mnras/stae1246>

Sricharan Balaji, Nihaal. Zaveri, Nенаe Hayashi, Arcelia Hermosillo Ruiz, Jackson Barnes, Ruth Murray-Clay, Kathryn Volk, Jake Gerhardt, and Zain Syed, *Can the 3:2 mean motion resonance orbital distribution result from stability sculpting*, MNRAS, 07/23, <https://doi.org/10.1093/mnras/stad2026>

CO-AUTHOR

Rosemary E. Pike, et. al., *LiDO: The 10:1 Resonator*, in prep

Kathryn Volk, Arcelia Hermsillo Ruiz, Ruth Murray-Clay, Rosemary E Pike, How variations in giant planet migration simulations affect predicted resonant transneptunian populations, in prep

Rosemary E. Pike et. al., Resonant TNO Surface Colors: Constraints on TNO Formation and Evolution, in prep

Maissa Salama et. al., *An Adaptive Optics Census of Companions to Northern Stars Within 25 pc with Robo-AO*, ApJ, 04/22, <https://doi.org/10.3847/1538-3881/ac53fc>

Research Mentorship

(2019-2022) , **Sricharan Balaji, Nihaal Zaveri**, UCSC undergraduate students co-advised with Prof. Ruth Murray-Clay

(2023-) , **Katrina Kianpoor**, UCSC undergraduate student co-advised with Prof. Ruth Murray-Clay

Presentations

CONFERENCE

10/24	Using Surface Colors of Resonant TNOs to Probe Neptune's Migration History With Well-Controlled Planetary Evolution Simulations , Division of Planetary Science, Virtual	<i>talk</i>
07/24	Reproducing Vertical Asymmetric Structure Similar to the AU Mic Debris Disk with an Inclined, Eccentric Planet , OWL Summer School, Santa Cruz, CA	<i>talk</i>
07/24	Forcing Planets to Evolve: How Damping Neptune's Eccentricity can Indirectly Affect the Orbit of Uranus , REBOUND 2024, virtual	<i>talk</i>
06/24	Using Surface Colors of Resonant TNOs to Probe Neptune's Migration History With Well-Controlled Planetary Evolution Simulations , Trans Neptunian Objects, Taipei City Taiwan	<i>talk</i>
05/24	Forcing Planets to Evolve: Uranus' Eccentricity Damping Could be Linked to Neptune , Division of Dynamical Astronomy, Toronto Canada,	<i>talk</i>
03/24	Nbody Simulations of an Inclined, Eccentric Planet and Exterior Debris Disk Show Asymmetric Structure Similar to AU Mic , Dust Devils, Tucson Arizona	<i>talk</i>
03/24	Nbody Simulations of an Inclined, Eccentric Planet and Exterior Debris Disk Show Asymmetric Structure Similar to the AU Mic Debris Disk , Extreme Solar Systems, Christchurch New, Zealand	<i>poster</i>
09/23	Investigating a Gravitational Upheaval Through Studying the Kuiper Belt , Bay Area Planetary Science Conference, Santa Cruz, Ca	<i>talk</i>
06/23	Investigating how eccentric, inclined planets affect planetesimal debris around young stars , GRC: Origins of Solar Systems, South Hadley, MA	<i>poster</i>
05/22	Constraints on Migration Scenarios of Neptune that Explain the Kuiper Belt , Exoplanets IV, Las Vegas, NV	<i>poster</i>
04/22	Constraints on Migration Scenarios of Neptune due to Stochasticity in Planetesimal-Driven Migration , Division of Dynamical Astronomy, New York, NY	<i>talk</i>
05/21	Impact of Stochastic Migration on Weak Resonances in the Kuiper Belt , Division of Dynamical Astronomy, Virtual	<i>talk</i>

INSTITUTION

03/22	Investigating how eccentric, inclined planets scatter planetesimal debris in and outside of our solar system , Yale Stars and Exoplanets Seminar, Virtual
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Teaching and Science Communication

San Francisco State Planetarium—Noche de Estrellas , INVITED SPEAKER	<i>March 2024</i>
MESA Day , KEYNOTE SPEAKER	<i>March 2024</i>
ASTR 19—Introduction to Astronomy Research , GUEST LECTURER	<i>Winter 2023</i>
LAMAT Summer Institute—UCSC Summer Research Program , PYTHON INSTRUCTOR	<i>Summer 2021</i>
ASTR 19—Practical Programming for the Sciences , TEACHER ASSISTANT	<i>Spring 2022</i>
ASTR 3—Introductory Astronomy: Planetary Systems , TEACHER ASSISTANT	<i>Spring 2020</i>
ASTR 6—The Space Age Solar System , TEACHER ASSISTANT	<i>Winter 2020</i>
Lawrence Hall of Science Planetarium , PRESENTER	<i>2016-2019</i>
DaVinci Camp Summer Institute , PHYSICS INSTRUCTOR AND TEACHER ASSISTANT	<i>Summer 2015</i>

Awards

- 2019-23 **NSF Graduate Research Fellowship,**
2021 **LSSTC Data Science Fellowship ,**
2021 **Division of Dynamical Astronomy Duncombe Student Research Prize,**
2020 **Outstanding Graduate Student Mentor Award,**
2019 **UC Santa Cruz Regents Fellowship,**
2019 **Honorable Mention—Ford Foundation Predoctoral Fellowship,**
2019 **University of Washington Graduate Opportunities and Minority Achievement Program (not accepted),**
2017-18 **Bergeron Women in STEM Leadership Scholarship,**
2017-18 **NSF CAMP (LSAMP) Scholar,**
2018 **Honorable Mention—NSF CAMP Symposium Presentation Competition,**
2016,17 **Undergraduate Poster Presentation Award, SACNAS Conference,**
2018 **Hispanic Scholarship Fund Recipient,**
2014-18 **S-STEM Scholar,**

Selected Service and Outreach

Division of Dynamical Astronomer DEI Committee, MEMBER	2024-
UCSC Astro Grad Mentoring Program, MENTOR	2022-
Astrophysics Division of the Science Mission Directorate for NASA, IDEA PRACTITIONER	2022-
Various Programs, PANELIST FOR EVENTS INTENDED FOR FIRST GEN/LOW INCOME/UNDERREPRESENTED STUDENTS	2020-
Various Programs, MENTOR TO 2-3 STUDENTS PER YEAR	2015-
UCSC/MESA Astronomy Outreach Event, LEAD ORGANIZER	Mar. 2024
Women of Color Graduate CommUNITY Group, COORDINATOR	2022-2024
UC Santa Cruz Astronomy and Astrophysics, GRAD STUDENT LIAISON—MEETING ORGANIZER	2021-2022
UCSC Noche de las Estrellas, VOLUNTEER	Oct. 2021
UCSC Graduate Student Association, ASTRONOMY AND ASTROPHYSICS GRADUATE STUDENT REPRESENTATIVE	2020-2021
Hispanic Engineers and Scientists, SECRETARY (2 YEARS) AND PRESIDENT (1 YEAR)	2016-2019
RAICES Center, CO-LEAD FOR SPRING BREAK HIGHER EDUCATION OUTREACH	2015-2017