Madeline J. Maldonado Gutierrez

Updated: June 2025 | mjm2418@barnard.edu | <u>LinkedIn</u> | <u>Personal Website</u>

EDUCATION

Barnard College of Columbia University New York, NY
B.A. in Astrophysics (Special Major in an Interdisciplinary Field) *Sept. 2022 – Present*
Thesis: *TBA*
Advisor: *Professor Reshmi Mukherjee*

RESEARCH INTERESTS

Planetary system formation; protoplanetary disks; planet-star interactions; planetesimals; neutrino physics; stellar populations; galaxy evolution; exoplanets (detection, characterization, dynamics, and systems)

RESEARCH PROJECTS

Connecting binary formation, dissipative precession, and planetary dynamics New Haven, CT
Yale University, Dept. of Astronomy | Advisors: Konstantin Gerbig & Malena Rice *May 2025 – Present*
- **Running** Rebound simulations and *N-body* codes of planetary dynamics

Independent Research Project in Stellar Astrophysics New York, NY
Columbia University, Dept. of Astrophysics | Advisor: Maryum Sayeed *Jan. 2025 – Present*
- **Testing** the binarity of red giants, by using spectra to measure radial velocities and chemical abundances of these objects
- **Defining** the abundance line and continuum, measuring equivalent line widths, performing quality checks, and more

Exoplanets Transiting nearby M-dwarf Stars New York, NY
American Museum of Natural History, Dept. of Astrophysics | Advisor: Dax Feliz *May 2024 – Aug. 2024*
- **Identified** transiting planets around nearby M-dwarfs using TESS and measured data
- **Validated** the authenticity of planet candidates by creating a custom Python algorithm
- **Applied** TLS & BLS algorithms to TESS light curves to identify periodic signals that would indicate the presence of orbiting planets or stellar activity of stars using Lightkurve and a cluster

Computational Astrophysics on OB-type stars in Star Clusters New York, NY
American Museum of Natural History, Dept. of Astrophysics | Advisor: Eric Anderson *May 2023 – Aug. 2023*
- **Analyzed** Torch simulations of star clusters, focusing specifically on the effect of massive stars on the star formation rate (SFR)
- **Modeled** how these massive stars affect cluster evolution, predicting that fewer stars will form based on their feedback

Virginia Aerospace and Technology Scholars (VASTS) Program Hampton, VA
NASA Langley Research Center, Internship *Nov. 2020 – July 2021*
- **Completed** astronomy and physics related modules by writing biweekly technical reports
- **Participated** in discussion forums to hone my current research and scientific writing skills
- **Created** potential missions, space vehicles, and other space-related technology to advance scientific research

RESEARCH PRESENTATIONS

Binary Formation and Planetary Dynamics in Orbital Architectures | Talk & Poster
Barnard College's Summer Research Institute Lida Orzeck '68 | New York, NY *July 2025*
Yale Astronomy Summer Research Symposium | New Haven, CT *July 2025*
Detection and Validation of Transiting Exoplanets Around Nearby M-dwarf Stars | Poster
*American Physical Society CU*iP at New York University | New York, NY* *Jan. 2025*
SACNAS Conference | Phoenix, AZ *Oct. 2024*
Columbia University's Astrofest | New York, NY *Sept. 2024*
Barnard College's Summer Research Institute Lida Orzeck '68 | New York, NY *July 2024*
The Effect of OB-type Stars on the Star Formation Rate in Star Clusters | Poster
SACNAS Conference | Portland, OR *Oct. 2023*
Barnard College's Summer Research Institute Lida Orzeck '68 | New York, NY *July 2023*

SKILLS

Computational Languages: Python, Java, bash, LaTeX, CSS, HTML, Git, Slurm Workload Manager
Python Libraries: Astropy, Astroquery, Pandas, Matplotlib, NumPy, Julia, os, sys
Astronomy Packages: Lightkurve, yt project, LEO-vetter, KORG, REBOUND
Misc. Tools: Overleaf, Excel, Github, Google Colab, Jupyter Notebook, Linux terminal, Visual Studio Code, HPC cluster

PUBLICATIONS

Radial Velocity Follow-Up of Li-Rich Giants with ESPRESSO *Sayeed et al., in prep.*

TEACHING

College Course Assistant: ASTRO-UN1836 Stars and Atoms (Instructor: Kathryn Johnston, Columbia University, Dept. of Astrophysics)
K-12 Spanish Instructor: Two first-grade classes and one second-grade class across three different elementary schools
K-12 Computer Science Instructor: Two classes using Hour of Code activities and computer programming in Python

OBSERVATIONAL

ASTR-UN3646: Observed two transits in 2 consecutive days with the 1.3m McGraw-Hill Telescope at the MDM Observatory in Kitt Peak, AZ

PROJECTS

AstroInk: a public web application for astrophysical literature search and summarization, integrating arXiv API querying, fast summarization, and citation generation using Streamlit and deployed on Streamlit Cloud.
Integrating a Fiber Optic Cable into a 3D-Printed Spectrograph: a spectrograph device adapted for observational use with a fiber optic cable

OUTREACH

Columbia Astronomy Outreach: Volunteer for the Library and High School Programs (Spring 2025 – Present)

PROFESSIONAL EXPERIENCE

NASA L'SPACE Misson Concept Academy Remote
Scholar, NASA Workforce Development Program *Jan. 2025 – May 2025*
- **Demonstrated** knowledge of the NASA mission life cycle up to the submission of a Preliminary Design Review for a robotic space mission to Venus
- **Attended** and actively engaged in weekly lectures and skill modules taught by NASA scientists, engineers, and managers
- **Collaborated** with a team, serving primarily as the Astrophysicist and secondarily as the Planetary Geologist within the science subteam

Exoplanet Watch Citizen Scientist Remote
Participant, NASA Citizen Science Project *May 2024 – Present*
- **Observing** transiting exoplanets using NASA's checkout system
- **Analyzing** the data using the open-source EXOTIC software to create my own transiting exoplanet light curves

General Library Assistant New York, NY
Butler Library Circulation Desk, Columbia University Libraries *June 2024 – Present*
- **Charge & process** circulating and non-circulating collections at Butler for undergraduate and graduate students, faculty, and staff
- **Handle** ReCAP books shared with Princeton University (PUL), New York Public Library (NYPL), and Harvard University (HD) and interlibrary loans from other partnered universities

Butler Library, Library Information Office (LIO)   *Jan. 2025 – Present*
- **Allow** guess access and appointments across campus libraries; process library fines and fees, & provide general information about CUL services and resources

Avery Architectural & Fine Arts Library   *Aug 2022 – June 2024*
- **Shelved, shelf-read, and shifted** non-circulating and circulating collections by Avery call numbers on the appropriate shelves (3 floor levels)

Columbia Undergraduate Science Journal (CUSJ)   New York, NY
Diversity, Equity & Inclusion (DEI) Committee   *May 2024 – Jan. 2025*
- **Increased** science engagement and accessibility to all audiences with different educational backgrounds

Communications Committee   *Sept. 2022 – May 2024*
- **Engaged** with the Columbia community and public outreach through panels and workshops
- **Promoted** publishing opportunities for CUSJ's professional-level, open-access science journal on and off campus to increase engagement and readership in science learning communities
- **Recorded** bi-weekly episodes for Science Beyond Jargon podcast to make science accessible and entertaining to the public outreach on multiple platforms including Spotify and YouTube

Summer Publishing Program (SPP) Participant   *July 2022 – Aug. 2022*
- **Learned** about scientific writing and editing processes
- **Wrote** an article about the improvement of the extravehicular mobility unit (EMU)
- **Peer-reviewed** other participants' articles to improve their scientific writing

AWARDS

VanguardSTEM Conference Sponsorship   Portland, Oregon
The SeRCH Foundation, Inc.   *Mar. 2023*
- **Sponsored** my registration, travel, & accommodations to attend the SACNAS NDiSTEM Conference

VanguardSTEM Scholarship Recipient   New York, NY
The SeRCH Foundation, Inc.   *Mar. 2023*
- **Awarded** a scholarship for participating in a mentorship program for my undergraduate and/or graduate studies.

Science Pathways Scholars Program (SP)²   New York, NY
Barnard College & National Science Foundation   *Aug. 2022 – Present*
- **Received** highly competitive **research funding** for three summers and eight semesters of paid undergraduate research positions within the New York City metropolitan area, in addition to faculty mentorship

National Science Foundation (NSF) Four-Year Scholarship Recipient   New York, NY
Barnard College & National Science Foundation   *Apr. 2022 – May 2026*
- **Awarded** an NSF scholarship for my undergraduate studies for pursuing an astrophysics major

Pathways to Science (Caminos a la Ciencia) Program   Ashland, VA
Randolph-Macon College & National Science Foundation   *Apr. 2020 – June 2022*
- **Awarded** their scholarship for participating in the program for my undergraduate and/or graduate studies

SOFTWARE WORKSHOPS & STEM MENTORSHIP

Code/Astro   Remote
CIERA at Northwestern University   *Aug. 2025 – Aug. 2025*
- **Purpose:** to teach software engineering skills and best practices for building sustainable open-source packages for astronomy applications in research for a week

AL1GN STEM Mentorship Program   Hybrid
Alliance for the Low-Income and First-Generation Narrative (AL1GN)   *Aug. 2023 – May 2025*
- **Connecting** with first-generation and low-income (FGLI) students across the USA, focusing on professional and academic development, and peer mentorship

[WoC] on Open Source Programming in Python Workshop   Remote
Michigan Institute for Research in Astrophysics   *May 2023 – Aug. 2023*

- **Software Covered**: Python programming skills, code design and testing, code optimization, version control and collaboration via Github, and deploying my code on PyP

Sciware Software Workshop
Flaitron Institute & Simons Foundation

New York, NY

May 2023 – June 2023

- **Software Covered**: Github, command line, Shell interaction, High-Performance Computing, VS Code, NVIDIA, & Machine Learning

VanguardSTEM Unbound Community Mentorship Program
Vanguard: Conversations with Women of Color in STEM & The SeRCH Foundation, Inc.

Hybrid

Mar. 2023 – Oct. 2023

- **Engaged** in conversations between emerging and established women of color, girls of color & non-binary people of color in STEM
- **Mentored** by community mentors for online mentoring sessions in the physics & astrophysics discipline