

RACHEL MARRA

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EDUCATION

Bachelor of Science - Physics, Bachelor of Arts - Astronomy

State University of New York at New Paltz

Department of Physics and Astronomy

Overall GPA: 3.57/4.00

August 2012 - May 2016

Cum Laude

Graduate School, PhD program

New Mexico State University

Department of Astronomy

Overall GPA: 3.79/4.00

July 2016 - Present

RESEARCH EXPERIENCE

Graduate Research

July 2016 - Present

New Mexico State University

- Analysis of the physical distribution and kinematics of metals (MgII, CIV, and OVI) in the circumgalactic medium (CGM) of Milky Way type galaxies using absorption features in synthetic spectra of Quasar sight lines. I use the Mockspec code to create 1000 lines of sight through a simulated galaxy and study the absorption features in the synthetic spectra to learn about metals in the CGM. These simulation results are compared with observed galaxies at $z \approx 0.2$ that have detected MgII or OVI. This work is done in collaboration with Dr. Chris Churchill at New Mexico State University, Dr. Glenn Kacprzak and Dr. Nikki Nielsen at Swinburne University of Technology, and Dr. Jacob Vander-Vliet at NASA Ames. (May 2017 - present)
- Modeling a galaxy's intrinsic properties using a variety of scaling relations to predict the Lyman- α equivalent width for high redshift galaxies with Dr. Kristian Finlator. Using this prediction we can determine how the fraction of Lyman Alpha Emitters (LAEs) changes with redshift to constrain the end of the Epoch of Reionization by taking the fraction of LAEs as a proxy for the fraction of neutral Hydrogen. (May 2017 - May 2018)
- Data analysis on Gemini North data for 3 Cataclysmic Variable (CV) star systems with Dr. Thomas Harrison; we determined the abundance ratios of Carbon isotopes in the CV secondary stars using a modified version of MOOG. (July 2016 - May 2017)

Undergraduate Research

May 2015 - May 2016

State University of New York at New Paltz

- Senior Thesis research in Astronomy with advisor Dr. Amy Forestell-Bartholomew; Using the campus observatory for observations, I created and analyzed the light curves of eclipsing binary star systems. (Spring 2016)
- Academic Year REU at State University of New York at New Paltz with Dr. Anca Radulescu in applied mathematics and theoretical biology. Created a model of interactions between different parts of the brain to allow a diagnosis of Obsessive Compulsive Disorder(OCD) with a functional-MRI image of the brain. (2015/2016 Academic Year)
- Alliance for Minority Participation (AMP) and Collegiate Science and Technology Entry Program (CSTEP) REU with advisor Dr. Michael Machczynski in Biochemistry: *Optimizing Laccase Rate of Reaction*. Conducted experiments in the biochemistry lab and presented results at a conference on campus. (Summer 2015)

WORK EXPERIENCE

Graduate Teaching Assistant

July 2016 - Present

New Mexico State University

- ASTR 105G First Year Seminar: Climate Change Across the Solar System. Responsibilities include teaching the weekly lab, attending lectures to help with in-class activities, and occasionally presenting some of the weekly lectures. (Fall 2018)
- ASTR 301: Revolutionary Ideas in Astronomy. Responsibilities include grading homework assignments and exams as well as holding office hours for students. (Spring 2018)
- ASTR 305: Life in the Universe. Responsibilities include grading homework assignments and exams as well as holding office hours for students. (Fall 2017)
- ASTR 105G: The Planets. Responsibilities included teaching the weekly lab and being available to the students for any questions they had about the lecture or lab. (Fall 2016, Spring 2017)

Teaching Assistant, Tutor

August 2012 - May 2016

State University of New York at New Paltz

- General Physics I: responsibilities included assisting students with in class problem sets and holding office hours. (TA-Spring 2016)
- General Physics I, II and Calculus I, II Tutor at the campus tutoring center. (Tutor-August 2013 - May 2016)

Planetarium and Observatory

August 2013 - May 2016

State University of New York at New Paltz

- Assisted with use of the 14 inch telescope at the Smolen Observatory on campus for biweekly public astronomy events. (August 2015- May 2016)
- Wrote and presented planetarium shows for public astronomy events and for private events (such as school classes, boy/girl scout troops, birthday parties, etc.) at the John R. Kirk Planetarium on campus. (August 2013 - May 2016)

AWARDS AND SCHOLARSHIPS

Visiting researcher at Swinburne University of Technology (Summer 2018)

Department of Astronomy Pegasus Teaching Award (2017)

New Mexico Space Grant (2016-Present)

Outstanding Graduate Award in Physics (2016)

Barbara and William Geider Annual Scholarship Recipient (2015-2016)

Outstanding Scholar Achievement Award for underrepresented students in STEM (2014-2016)

State University of New York at New Paltz Dean's List (2012-2016)

PUBLICATIONS AND CONFERENCES

Harrison, Thomas E, and Marra, Rachel E. *Determinations of the $^{12}\text{C}/^{13}\text{C}$ Ratio for the Secondary Stars of AE Aquarii, SS Cygni, and RU Pegasi.* The Astrophysical Journal, vol. 843, no. 2, 14 July 2017, iopscience.iop.org/article/10.3847/1538-4357/aa7946.

Radulescu, Anca, and Marra, Rachel. *A Mathematical Model of Reward and Executive Circuitry in Obsessive Compulsive Disorder.* Journal of Theoretical Biology, vol. 414, 2017, pp. 165-175., doi:10.1016/j.jtbi.2016.11.025.

‘Determinations of the 12C/13C Ratio for the Secondary Stars of Cataclysmic Variables’ talk at the New Mexico Space Grant Student Colloquium (November 2017)

Poster presentation of Academic Year REU results at: 2016 SUNY Undergraduate Research Posters at the Capitol. (April 2016)

Poster Presentation of Academic Year REU results at: Dynamic Days Conference (January 2016)

‘Finding a missing plane in four days’ talk on Mathematical Contest in Modeling (MCM) results at Spuyten Duyvil Undergraduate Mathematics Conference (April 2015)

TECHNICAL STRENGTHS

Computer Languages

Python, Fortran, Java, IRAF

Software & Tools

Experience using LaTeX, Microsoft Office, WordPress, Adobe Creative Suite

REFERENCES

Chris Churchill

Associate Professor

New Mexico State University

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Kristian Finlator

Assistant Professor

New Mexico State University

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Thomas Harrison

Research Faculty

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Anca Radulescu

Assistant Professor

State University of New York at New Paltz

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