

## **University of Rochester**

### ***Summer 2018 undergraduate research in Physics, Optics, and Astronomy***

Natalie Allen, class of '20 at the University of Rochester, used Hubble Space Telescope data to analyze outflow jets from stars and HH objects to determine characteristics of star formation and match models with observed data with Prof. Dan Watson. She plans to apply to graduate school for astronomy.

Danielle Bovie, class of '21 at the University of Rochester, organized and taught PREP, Pre-college Experience in Physics, explaining a wide range of physics topics to young women in 9<sup>th</sup>-11<sup>th</sup> grades to inspire them about physics and science in general.

Alyssa Bulatek, class of '20 at Macalester College, developed an algorithm to make a first-order correction for signal-dependent interpixel capacitive coupling (IPC) in long-wave infrared detector arrays like those that will fly on the NEOCam mission with Prof. Judy Pipher and Craig McMurtry as well as their graduate students. She plans to apply to graduate school for astronomy or physics.

Matthieu Chalifour, Swarthmore class of '20, worked with the Minerva group on analyzing the interactions of muon neutrinos, specifically on events which produce multiple protons. He plans on applying to graduate school in particle physics, potentially continuing to explore neutrinos.

Kurt Cylke, class of '20 at the University of Rochester, worked with Prof. Andrew Jordan's research group to examine topological phase space discrepancies between models based on Bayesian probability and Ito calculus for continuous qubit measurement.

Jordan Darling, class of '19 at MCLA, with the research group of Prof. Pierre Gourdain, is assisting in the assembly of the linear transformer driver system for HADES by machining containment units for various electric components and by assisting with various smaller projects, along with creating a control panel which allows varying inputs and readings to be observed.

Frederick Dauphin, class of '20 at Carnegie Mellon University, is modeling and analyzing J shocks produced from outflow jets during star formation to illustrate and explain different trends as this process evolves with Prof. Dan Watson. He plans to apply to graduate school for astrophysics.

Laura Early, class of '19 at Juniata College, worked on creating a mode-hopping-free tunable external cavity diode laser in the Bigelow Cooling and Trapping (CAT) group.

Isabel Fernandez, class of '20 at American University, created a forked diffraction grating using Python code and then download it onto a Digital Micromirror Device (DMD) that was then hit with a laser beam to create a Laquerre-Gaussian beam to be used on the Bose Einstein Condensate (BEC) with Prof. Nicholas Bigelow.

Michaela Guzzetti, class of '20 at Smith College, researched identifying voids in large samples of galaxies which will contribute to the Dark Energy Spectroscopic Instrument (DESI) group's research on the baryon acoustic oscillation (BAO) signal. She plans to get a Ph.D. in physics.

Jeremy Hartse, class of '19 at the University of Rochester, studied the kinematics of Neutrino-Nucleus interactions as a part of the MINERvA collaboration with Professor Kevin McFarland. He plans to apply to graduate school for physics.

Denis A. Ortega Ioni, class of '19 at Florida International University, prepared and imaged polyacrylamide gels under different conditions in order to analyze their effects on gel stiffness. The collected data will be used to perform measurements of cell stiffness sensing experiments with Dr. Patrick Oakes at the University of Rochester. She plans to apply to graduate school for physics.

Abigail Kaplan, class of '19 at Hamilton College, with the research group of Prof. Segev BenZvi, evaluated methods of correcting for optical fiber offsets for the DESI collaboration, that will produce 3D sky surveys to be used to constrain cosmological models.

Shiva Lakshmanan, at Cornell University, with Prof. Gourab Ghoshal and the Data Science REU, investigated how people browse the web and how it compares to how people move in physical space.

Connor Luckett, class of '19 at Austin College did research with Prof. Gourab Ghoshal with the Data Science REU writing a python package to be used for modeling the network of the Galician language by the University of Santiago de Compostela.

Larkin Martini, class of '19 at Colorado School of Mines, did research with Prof. Alice Quillen studying the spin of the moon during its early formation and the uneven heat when facing the earth and the resulting uneven crust thickness.

Victoria Parrish, class of '19 at Mount Holyoke College studied with Prof. Kevin McFarland studying MINERvA data. She is writing her thesis about z expansion analysis used to reconstruct the CC0pi data. She has applied to graduate school for experimental high energy neutrino dark matter particle physics.

MacKenzie Randle, class of '19 at Stevens Institute of Technology worked on coding a Quantum Key Distribution System that allows for the transfer of secure codes with the research group of Prof. Robert Boyd and graduate student Jiapeng Zhao.

Ross McFarland-Porter, class of '19 at Beloit College, worked with the research group of Prof. Yongli Gao. He transferred graphene onto hybrid organic-inorganic perovskite thin films, and then analyzed elemental concentrations and chemical state changes when the interface was biased to simulate a device. He intends to apply to graduate school for inorganic chemistry.

Yufan Qie, class of '20 at the University of Rochester, did research with the LZ group of Prof. Frank Wolfs. She worked on calculating the rotational curve of the matter in the Milky Way Galaxy and dealing with electronics such as VME crates and high voltage crates for detecting dark matter.

Shane Rickard, class of '19 at St. John Fisher College, designed and built multiple electronic devices for Prof. John Nichol to use in quantum dot experiments. These devices include multiple "filter boxes" each consisting of 20 low pass filter circuits, as well as a digital-to-analog converter (DAC) voltage source.

Jacob Smith, class of '21 at the University of Rochester, analyzed rotation curves of galaxies to determine how their dark matter halo and stellar mass relate to the galaxy's large-scale environment with Prof. Kelly Douglass. He plans to apply to graduate school for astrophysics.

Kate Wagner, class of '20 at Roberts Wesleyan College, modeled asteroids exhibiting non-principal axis rotation in order to determine if normal mode excitation within the body accelerated tumbling damping where the spin frequency was similar to low frequency normal modes with Professor Alice Quillen. She plans to apply to graduate school for astronomy or planetary science.

Yue Wang, class of '21 at the University of Rochester, did research with the group of Prof. Frank Wolfs for the LZ collaboration. The LZ experiment is an underground experiment looking for the dark matter. She worked on testing the electronics that will be used in the experiment and some projects to simulate the behavior of the dark matter detector under various circumstances.

Amanda Wasserman, class of '21 at the University of Rochester, organized and taught a three week summer camp for high school girls interested in physics. Created lecture slides, scheduled talks from professors, and performed demos to pique the girl's interests in an attempt to persuade them to study physics in the future.

Rhea Zhou, class of '21 at the University of Rochester, did theoretical particle physics research with Prof. C.R. Hagen.