Meet Alex!

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Abstract: We measure the light from an astronomical object with a detector as simple as what’s in a smartphone, but in order for us to extract the information (i.e., object’s light only) from an astronomical image, we must “reduce the data.” Data reduction allows us to eliminate what we do not want from an image (“noise”) and extract just the information (“signal”) we are interested in. Data reduction is very important in astronomy because it enables us to measure what’s really going on in the universe. As a 2015-2016 Hawai`i/NASA Space Grant Trainee, I learned data reduction with the guidance of my mentor Dr. Cooksey. We are currently analyzing the reduced data to study galaxy evolution.

Background: The Magellan Echellette (MagE; Marshall et al. 2009) Spectral Extractor (MASE; Bochanski et al. 2009) is a graphical user interface (GUI) which helps the user run the data reduction process for one night of observation. Last semester, I learned how to use MASE, which reduces one night of observation from start to finish. Each night has its un-reduced data in its Raw/ directory (see orange boxes, right).

My Work: This semester, I developed mase_non_gui.pro, an IDL program, to run MASE non-interactively. The program has been added to the XIDL User Library (http://www.ucolick.org/~xavier/IDL/) so that anyone can access it. The user makes a configuration file (see green boxes, right) to define specific parameters and mase_non_gui.pro uses that file to reduce the data for a given night. With my code, the user may run through any step of the reduction (e.g., step 4) for all nights at once—instead of running the entire reduction procedure for one night of observation only (like MASE). An example schematic is shown below.

Science Overview: The Milky Way and Andromeda Galaxies will become a “red-sequence galaxy” (RSG) when they collide in a few billion years. RSGs are the result of galaxy mergers. They are no longer forming stars, so we aim to understand what happened to the gas that once formed these stars. The gas may have been ejected during the collision and ended up in the extended gaseous halo of the resulting RSG. We are using the technique of “quasar absorption-line” (QAL) spectroscopy to study the cooler gas in the halo.

To the right (bottom) is the final 1D spectrum of the quasar, J212034 (zQSO = 1.481). The absorption lines marked in blue correspond to a redshift of zabs = 0.277, which means they are likely from the gaseous halo of the RSG. We see absorption lines of elements such as magnesium (Mg) and iron (Fe). By studying the QAL system associated with the RSG, we can characterize the gaseous halo.

References:
Background: “Steven’s Quintet,” Hubblesite.org