Observational laboratory, Assignment 7
Due date: March 31, 2021

Long-slit spectroscopy is known for low to medium resolution spectra. The resolving power, defined as $R = \lambda/\Delta\lambda$, typically ranges between 50 and 10,000, depending on the grating used. In class we demonstrated how to flatfield and debias the exposures, how to extract the aperture and how to wavelength-calibrate the spectrum. The data used were from the Boller & Chivens long-slit spectrograph mounted on a 1.52-m telescope at ESO in Chile. In this assignment we will extract all spectra from available images and determine the basic properties of the observed symbiotic binaries.

1. Explain in detail how the cosmetic reduction of stellar spectra differs from the cosmetic reduction of images.

2. Read up on symbiotic binaries and explain what type of objects they are, and what are the typical features in their spectra.

3. Extract all spectra. Explain in detail how you wavelength-calibrated and flux-normalized them. Plot them on the same graph, slightly offset vertically for comparison purposes. What is the resolving power of these spectra?

4. Identify typical spectral lines and comment on the similarities and differences across different objects. Look up the ephemerides for these objects and use them to compute the orbital phases at which the objects were observed. Annotate the plots with the corresponding phases.

5. Measure the observed wavelengths of at least 10 spectral lines; choose unblended, symmetrical lines. Match these lines with the originating element and look up their rest wavelengths. Then compute the differences; this will allow you to estimate the radial velocity of the bright companion. You can neglect any relativistic effects.

6. *Extra credit.* In class we said that flux-calibrating spectra is not typical. Among the targets there are several stars tagged with `STD`, which denotes a calibration standard. These are used to flux-calibrate spectra. Using the manual (Asiago Monographie 1 by T. Zwitter and U. Munari) available on the webpage, flux-calibrate all symbiotic binary spectra. When would this be a reasonable, perhaps even a necessary step?