Lab 6 – Spectroscopic Observations of Stars from CTO

In this lab we will plan and execute an observing run from the Campus Teaching Observatory obtaining spectra of stars with the "Pepito" instrument. The goal of this lab is to become familiar with spectroscopic data, from acquisition at the telescope as well as data reduction.

Scientifically, we will be observing a series of bright stars in order to construct a spectral sequence of stars from the blue end (easy) to the red end (hard – even the brightest M dwarf is not a naked eye star). To do this we will need to not only take spectral data of each of our targets but also to calibrate our data with lamp observations of known composition. In our list of targets we include main sequence stars as well as some giant stars (they're way brighter and easier to see even at very large distances).

The target list of objects is on the following page. Collect spectra of each of these objects (some categories have more than one object you can pick from). Remember, when planning your observing run to think about which objects are going to be setting first and observe them in an order that lets you collect your data when the object is in an advantageous position in the sky.

Remember your calibrations:

Biases
Flats
Darks
Wavelength calibrations with lamps (new to this lab!)

And also remember to keep an observing log of what you observed/when and what the file names are!

Data Analysis

Analyze your data based on the spectra data reduction techniques we discussed in class. This includes the standard CCD calibrations (bias, flat, darks) as well as obtaining a wavelength solution for your detector using the calibration lamps available to you. Remember, when analyzing spectra, you will need to extract your spectrum across the CCD where it has been projected.

For the lab report, please submit the following:

A) Please submit all the code you used for this lab as a PDF file (Canvas can load PDF files but can't display a jupyter notebook natively).

B) Methodology: What did you do during the lab? This includes a description of what your code does but also the reasoning for your target selections and observing log. How did you derive the wavelength solution? How did you extract the spectrum? Be detailed, as this is the bulk of the report.

C) Show your results and analysis. This includes everything from the derived spectra of your stars (wavelength calibrated) as well as your calibration lamp with line locations marked. For your spectra, discuss some of the features you see and lines you can identify (Hydrogen? Helium? Metals?). Where is the peak of the spectrum located? Can you estimate the temperature of your object from the location of the peak? For binary star observations (for example, Alberio), compare them to each other. Were you able to resolve them in your telescope (by how many pixels? This gives you the pixel size of the Pepito spectrograph). Essentially, if you can comment on a feature of the spectrum physically or derive something from its properties, please do so.

D) Conclusion: Summarize your results and what went right and what went wrong. If you could change anything about your analysis or observing strategy, what would it be?

Targets:

Star Type	**Star Name**	**RA**	**Dec**	**Vmag**
5% Extra Credit:				
M4	Barnard's Star	17h 57m 48.5s	+04d41m36s	9.5
Pick One:				
K5 + K7	61 Cygni A and B	21h 06m 53.9s	+38d44m58s	7.5
K0 + K5	70 Ophiuchus AB	18h 05m 27.4s	+02d29m59s	5.6
Pick One:				
G2V	The Sun (look at the Moon)	--	--	Bright
Pick One:				
A7 IV-V	Altair	19h 50m 47.0s	+08d52m06s	1.8
A0 V	Vega	18h 36m 36.3s	+38d47m01s	0.0
Pick One:				
B8 V	Iota Andromeda	23h 38m 08.2s	+43d16m05s	4.3
B8 IV + A3	Alpheratz	00h08m23.3s	+29d05m25s	2.1
O7	68 Cygni	21h 18m 27.2s	+43d56m45s	5.0
Get both components:				
K2 + B8	Albireo	19h 30m 45.4s	+27d57m55s	5.8
Pick One:				
K2 1b-II	Epsilon Peg	21h 44m 11.1s	+09d52m30s	2.4
LBV	P Cygni	20h 17m 47.2s	+38d01m58s	4.8

Pick 2 Additional Targets (Can be anything, doesn't have to be a star)