Module 5: "The Message of Starlight"

Assignment 7 – How Astronomers Plot and Analyze Spectra

In module 3 you examined a digital, or graphical, representation of a spectrum While the visual colors are more eye catching, the digital plot contains far more information. That is why virtually all modern astronomical spectra (as well as spectra in other branches of physics) are represented this way. Let's explore this with software for plotting spectra. You will need to install and start Graphical Analysis 3, included in your kit, (henceforth GA) on your computer.
You will also need the pdf "Spectroscopy-GA3_ABITS", and the spectrum of the star 41 Cygnus

From within GA open the spectrum of the star 41 Cygnus. Follow the tutorial on pp. 9-10 of the "Stellar Spectroscopy_(GA 3)" PDF file. The horizontal axis on the plot is wavelength, with short wavelengths (violet) on the left and long wavelengths (red) on the right. The vertical axis on the plot shows the intensity of light *as a function of wavelength*.

Post your screen shot of the spectrum of 42 Cygnus, Explain what your temperature estimate is for this star.

Once you are done with the tutorial you can compare your answer to the pros. Go to the website:

http://simbad.harvard.edu/sim-fid.pl

This is a website that astronomers use - with it you can download information about any known astronomical object outside of the Solar System, including a complete list of all the astronomical papers ever written about it! To see how it works, type in the name "41 cygnus" in the box under where it says "Identifier:" and hit return. A window should come up which will list a whole mess of numbers about the object. (Note: Like most astronomical objects, 41 Cygnus has several names. Don't be confused that Simbad calls it "NSV 13111". It's the same star.) Look down the list and you will notice it says "Spectral type F5 Iab". The spectra class of 41 Cygnus is "F5". Luminosity class "Iab" refers to a finer gradation of classification that we aren't covering: it is a measure of the star's intrinsic brightness.

Assignment 8 – Developing Your Analysis Skills

From the stellar spectroscopy pdf, you know that the spectral classes of stars are organized by temperature into "OBAFGKM," where "O" stars are the hottest and

“M” stars are the coolest. For this assignment you are going to develop your stellar identification skills by analyzing more spectra of stars from the list below. These stars' spectra were taken with the Kitt Peak 2.1m telescope during 2001. Your assignment is to determine the following for several stars using GA. The jacoby_atlas.pdf file has further examples of spectral classes. By comparison of your star with the atlas, see what spectral class you assign.

a. Determine the spectral class of the star based solely upon the spectral lines present (or absent).
b. Identify several prominent absorption lines in the spectra.
c. Estimate the peak of the continuum; and using Wien's law calculate the surface temperature of the star as you did in the previous module.

Each person should choose a minimum of three stars, available as GA spectra on our website (so that everyone does not choose the same three), if your last name starts with A to F, choose from group 1, G to L from group 2, and M to Z from group 3

Group 1: HD 331054
HD 331055
HD 331057
HD 331059
HD 331061

Group 2: HD 331066
HD 331072
HD 331078
HD 331081
HD 331083

Group 3: HD 331085
HD 331241
HD 331246
HD 332087

After classifying the spectra, look up the stars on the SIMBAD website. Record:
1) the spectral type given there,
2) the B and V magnitude (these are listed as fluxes). B and V represent how bright the star appears through either the V (visual) or B (blue) filter. We will use these in the next module.

Post the answers to the following questions on the blog**:**

1. Post your spectral class and temperature for three of the stars, identified

by the HD number, as well as the spectral type, B, and V from SIMBAD.

2. Include a screen shot of at least one spectrum with the lines you have identified.
3. Which technique do you think is more accurate for determining spectral class- temperature as determined by Wien's Law or as determined by spectral lines?