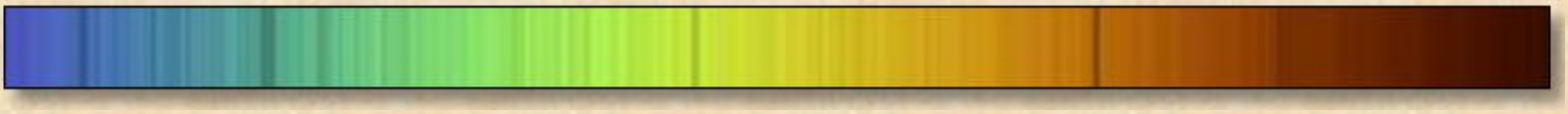
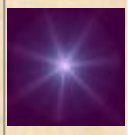
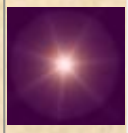
STELLAR CLASSIFICATION



CLASSIFICATION OF STELLAR SPECTRA		
O		O stars show the presence of hydrogen (H), neutral Helium (HeI), and singly ionized helium (HeII) in the optical spectra. Other spectral features may include SiIV (4089A) and CIII (4068, 4647, 4651A). In O stars the HeI and HeII line strengths are closely correlated with photospheric temperature, with HeII strength increasing with temperature and HeI strength decreasing with temperature. The HeII (4541A) / HeI (4471A) ratio define the spectral subclass.
B		B stars are defined by the presence of hydrogen (H) and neutral helium (HeI) in their spectra. H line strength increases over the B star subclasses while HeI decreases. There are a wide variety of sub-types, as B stars occur over a wide range of luminosity, many have companion stars, and many have circumstellar material. Other spectral features may include CaII, CII, CIII, NII, NIII, OII, SiII, SiIV, and MgII. Be stars are defined as B stars having at least one of the hydrogen Balmer lines in emission at some time. These stars are rapid rotators, and a circumstellar shell and/or disk of gas is present. The circumstellar material may be due to mass loss or due to accretion from an evolved companion star. They are variable in both brightness and spectra. Spectra of Be stars show broad HeI absorption, and complex hydrogen Balmer line profiles that show emission out of the absorption cores.. A sub-class of the Be stars are the shell stars, which are Be stars oriented so that we see a circumstellar disk edge-on. The shell stars have spectra that show Balmer emission with very sharp absorption centers, rather narrow absorption features of ionized metals, and broad HeI absorption lines.
A		A stars spectra are dominated by hydrogen Balmer series and can have a few heavier elements as well. Helium is no longer present. The H and K lines of Ca II are usually present.
F		F stars are characterized by the presence of strong Ca II H and K lines, hydrogen (about half as strong as in A0), Na, and other metals in the optical spectra. Moderately strong lines of some ionized elements such as Ca II, Ti II, Fe II. The Ca II K line is as strong as the blend of H epsilon and the H line of Calcium.
G		G stars are characterized by the presence of lots of metallic lines and the Hydrogen Balmer series is no longer conspicuous. The H and K lines of Ca II are the strongest features. Lines of neutral elements strong (Fe I, Ti I, Mg I) Sodium (Na).
K		K stars are characterized by having lots of metals; the strongest being neutral Calcium at 4227A. The G band (CH and metals) but 80A units away is even stronger. The Hydrogen Balmer series is now weak. The energy maximum of the K star spectrum is moved so far into the red that the H and K lines are difficult to see without a good exposure. The stars are cool enough for some molecular bands to become prominent, CH, and the MgH break in particular. Some weak TiO in the later K's.
M		M stars are cooler stars characterized by the presence of molecular TiO bands shaded towards the violet end of the spectrum. Spectrum dominated by these molecular features TiO, C2, and CH. Vanadium Oxide(VO) bands begin to appear as well. The 4227A line of Calcium is quite strong as is the G band. Hydrogen Balmer series lines are weak and many lines of neutral elements are present.