ASTR 1020

Lab CLEA: Classification of Stellar Spectra

Different Types of Stars

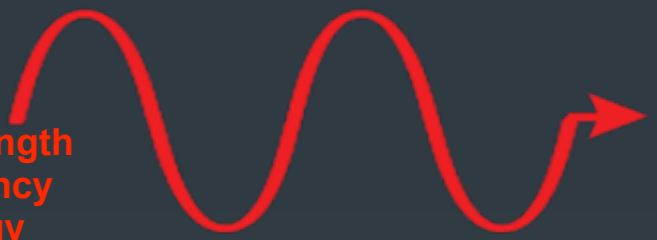
Even with your naked eye, you can see that stars come in different colors and brightnesses.

Reminder: Red is Cold, Blue is Hot

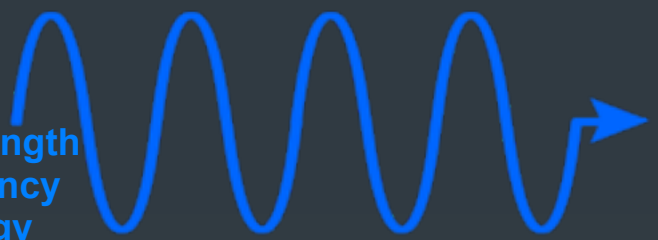
Blue (short wavelength, high frequency) has higher energy than red (long wavelength, low frequency). Think of a candle flame, which is red, versus a gas stove flame, which is blue and much hotter than a candle flame.

1400 °C (2600 °F)

1950 °C (3542 °F)



Long wavelength
Low frequency
Low energy
COLD

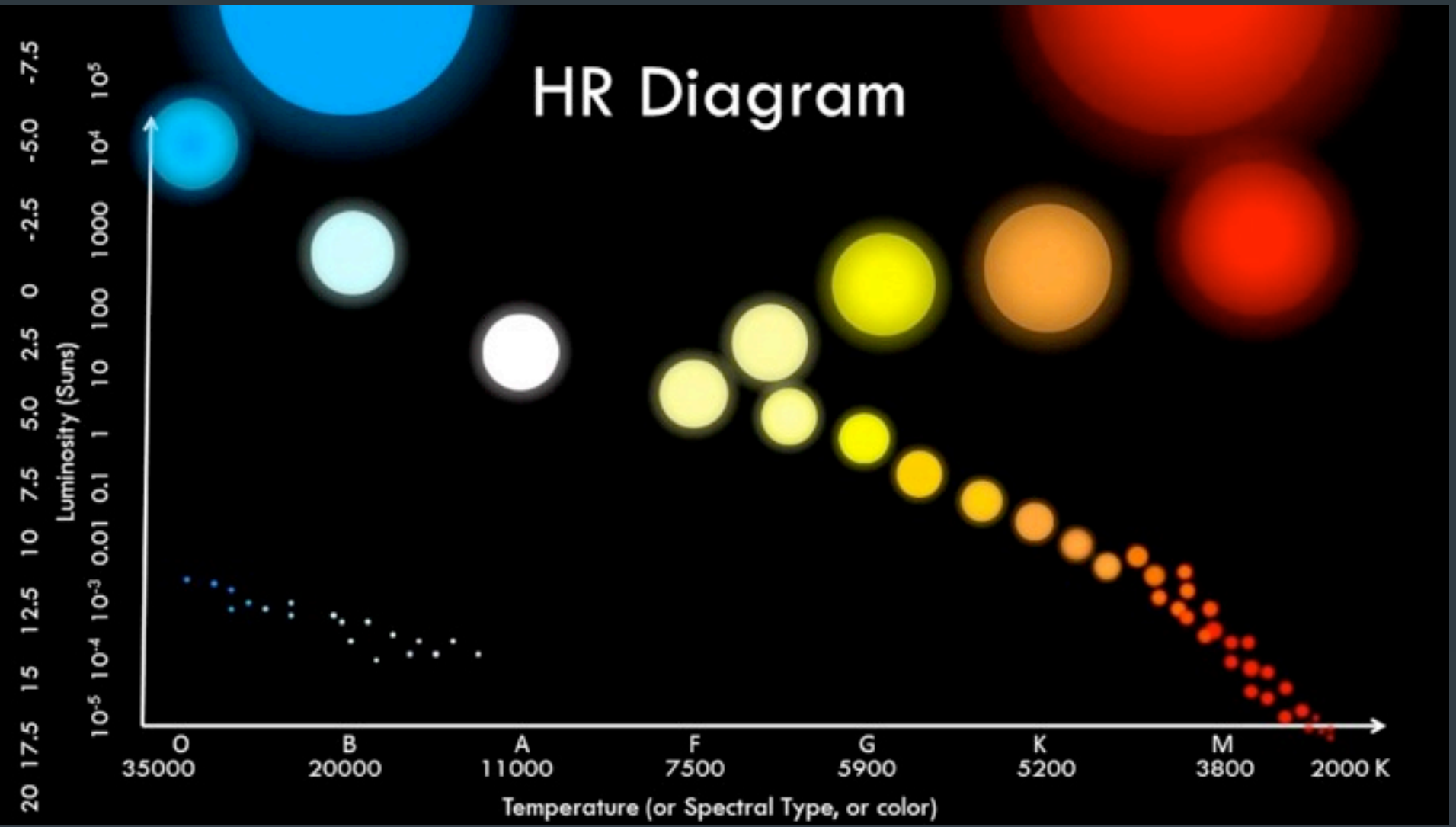


Short wavelength
High frequency
High energy
HOT

Spectral Classes

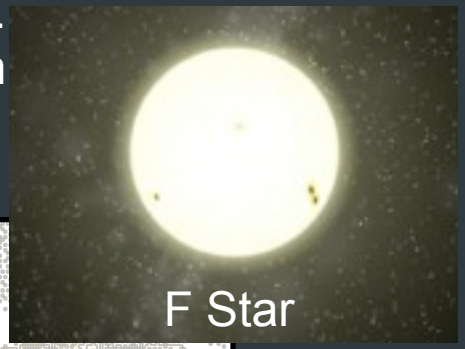
Blue O stars are hottest, while red M stars are coolest. Mnemonic:

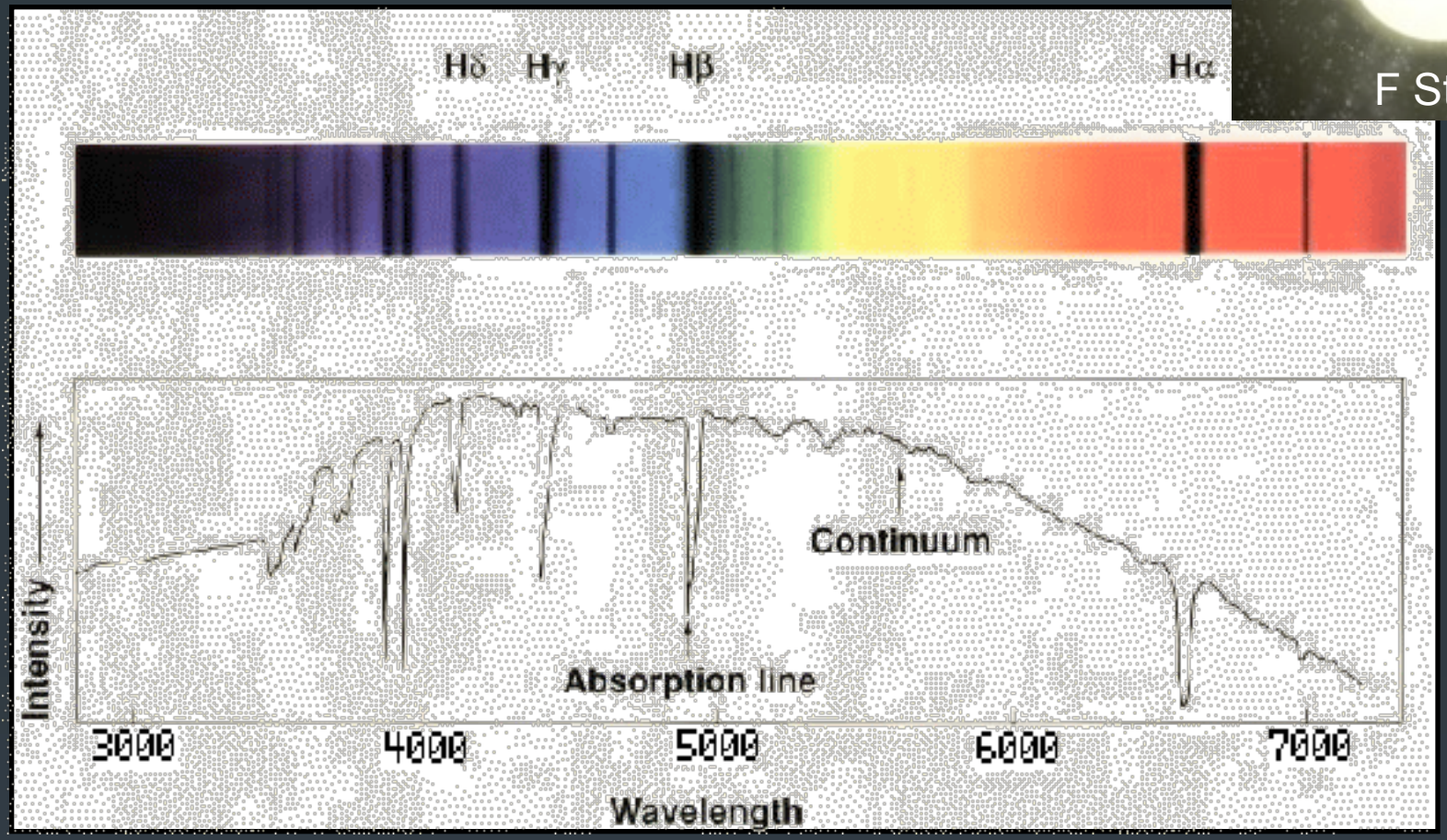
Oh Be A Fine Girl Kiss Me



Stellar Spectra

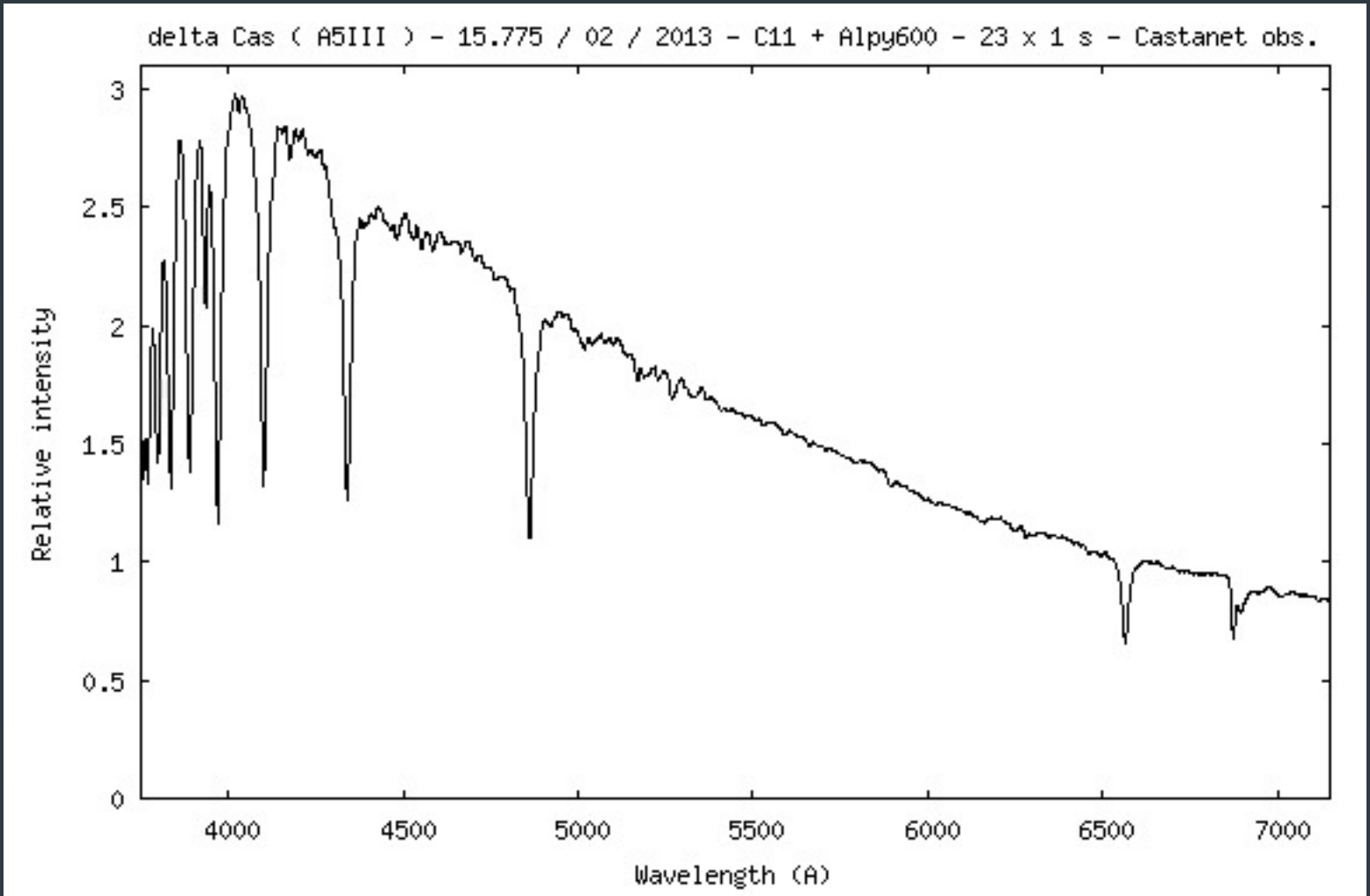
Different-color stars have different spectra. Just like we did with the gases last week, we can classify stars by their spectra. Look at the wavelength of the highest part of the spectrum (peak) and the depths of various absorption lines.





Absorption Spectrum Parts

The dips are **absorption lines**. Pay attention to how deep they are.
If you ignore the absorption lines and trace along the top, you get the stellar **continuum**. The most intense wavelength (top of hill) is the **peak wavelength**.



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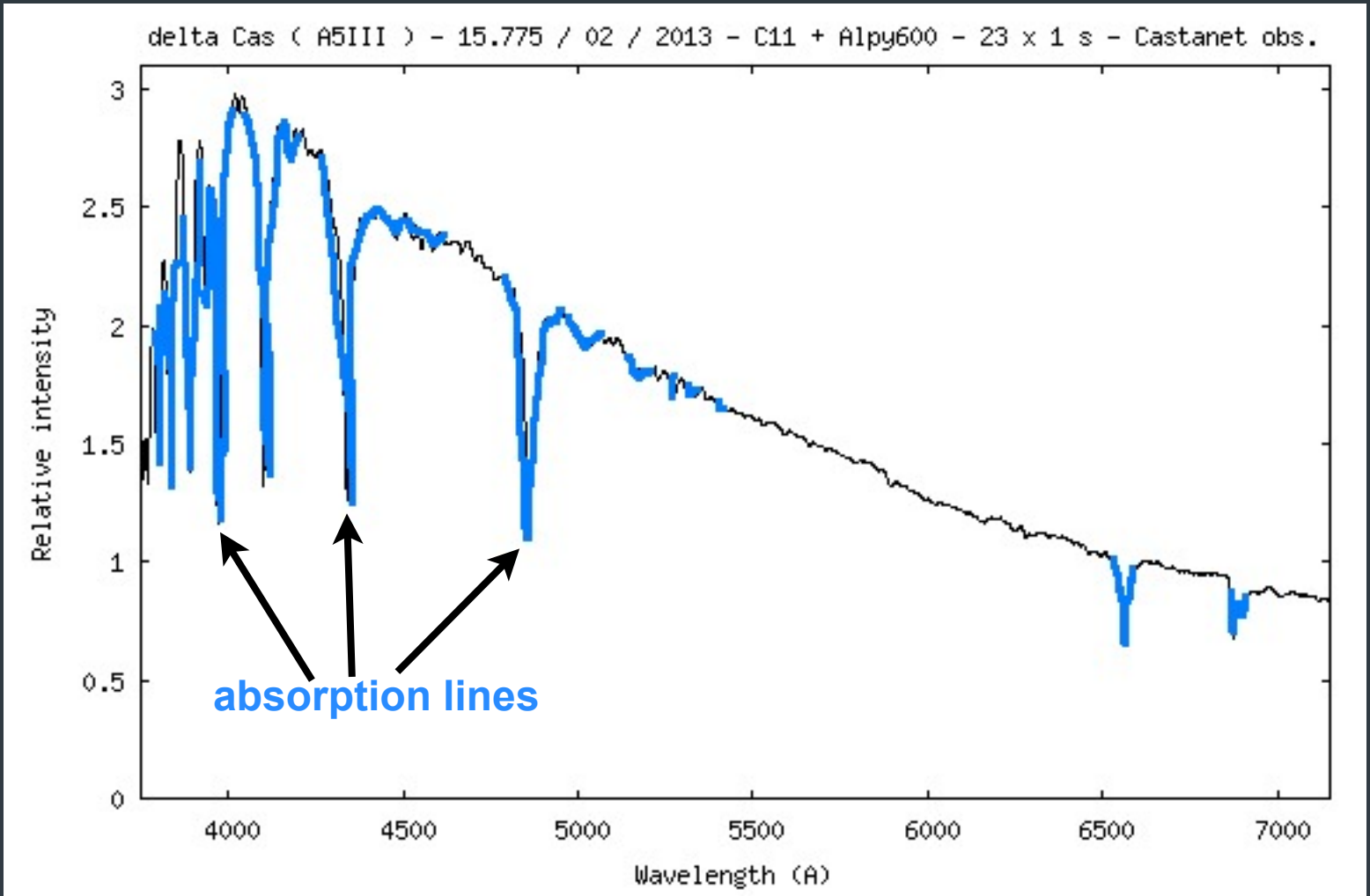

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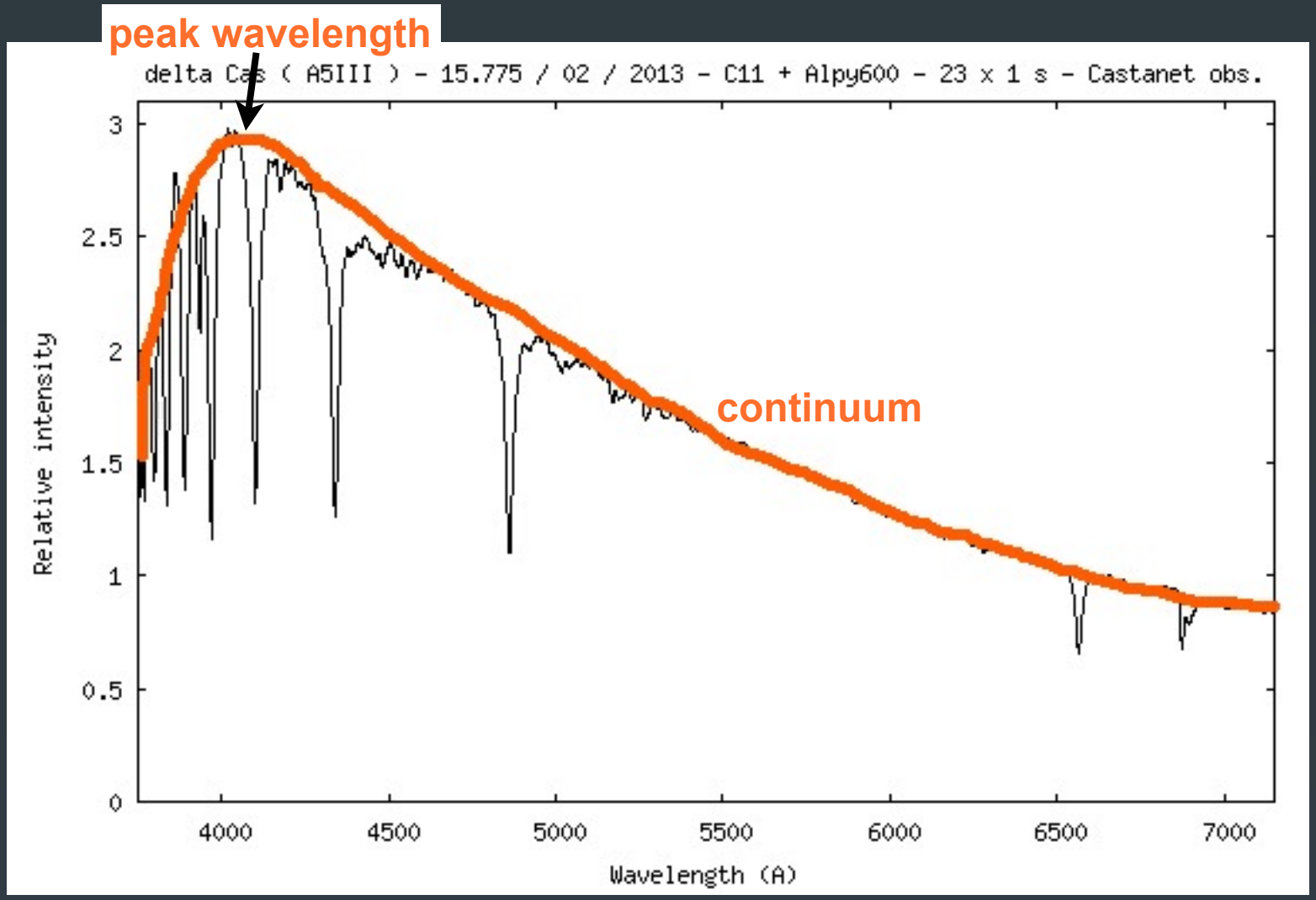
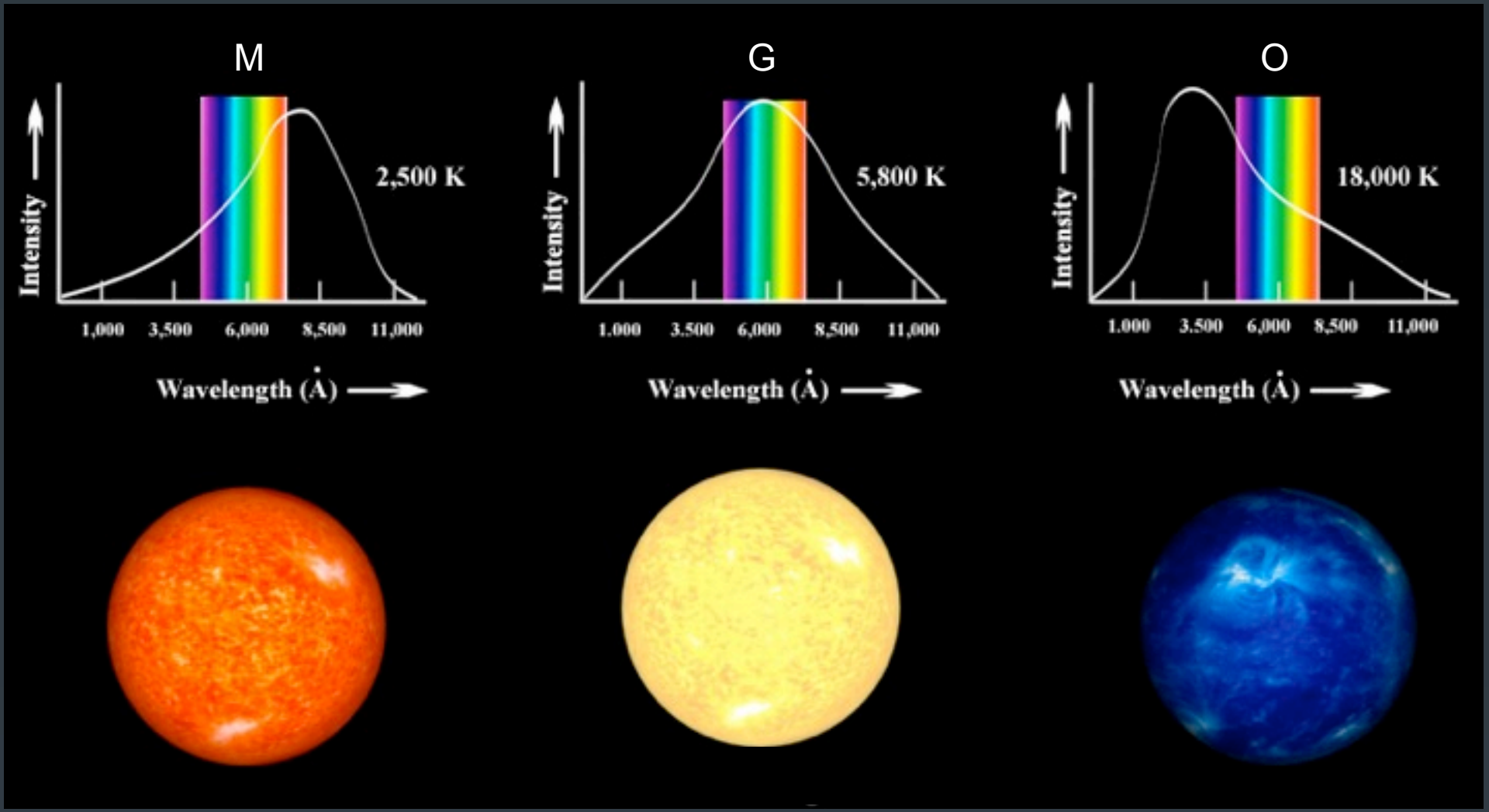


Peak Wavelength

From the peak wavelength of the stellar continuum, you can figure out what temperature a star is and what color it will appear.

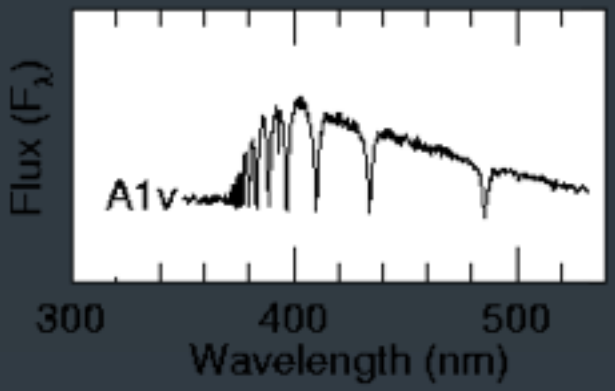
Wien's law: $\lambda_{peak} = 2.9 * 10^7 / T$, in angstroms.



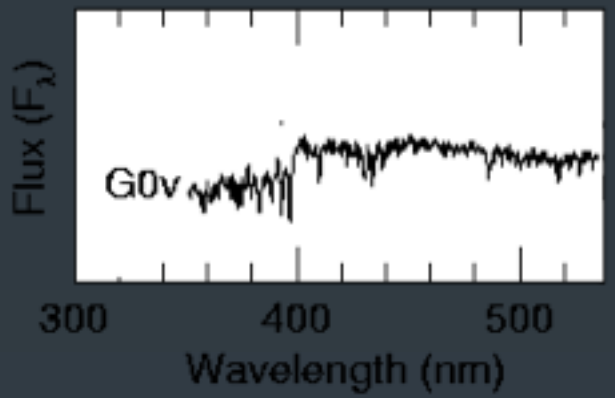
Line Depth

The letter classes OBAFGKM actually come from the strength (depth) of hydrogen lines. By comparing depths of lines, you can pinpoint spectral class.

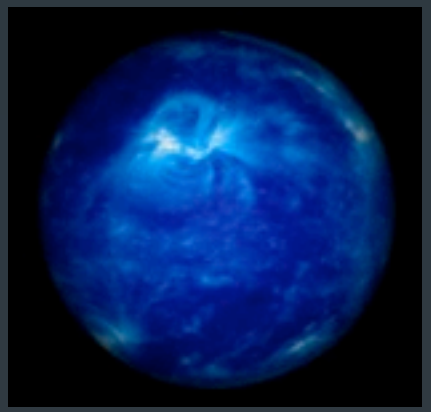
A

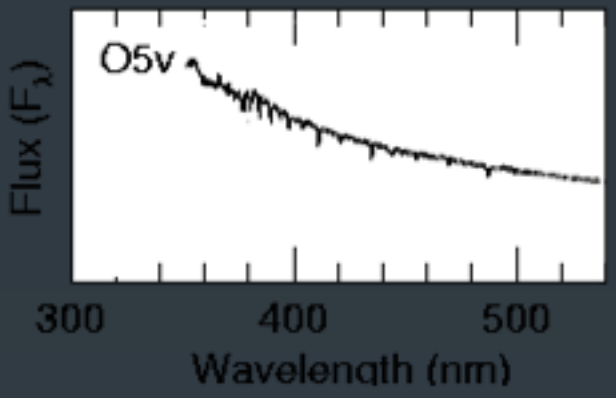


G



O





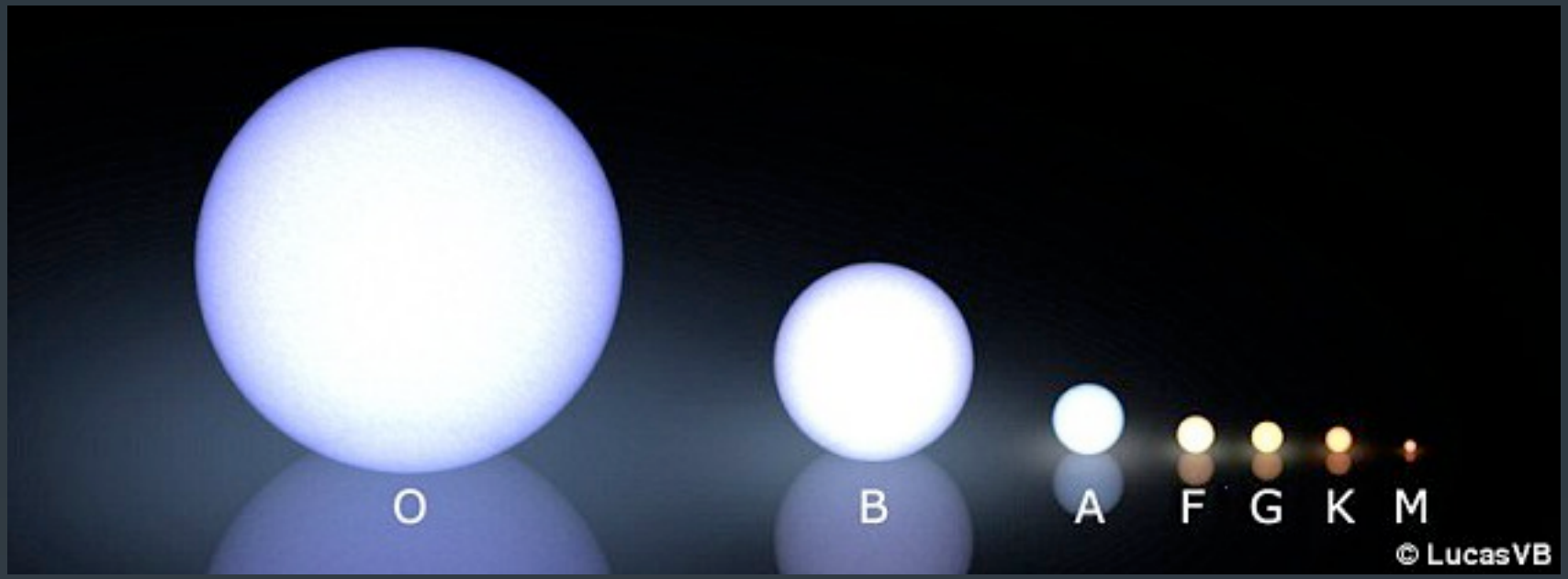
Counting in Spectral Classes

From hot to cold:

Letters count up from O to M according to the mnemonic: O, B, A, F, G, K, M.

Numbers count up from 0 to 9: ...B8, B9, A0, A1, A2, A3, A4, A5, A6, A7, A8, A9, F0, F1...

O2 is at the top of the temperature scale, and M9 is at the bottom. (O0 would be the top, but we haven't found a star that hot yet).



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