Name Solution

Star Temperature and Size

Temperature from the Line Spectrum: The Spectral Class

If λ_{peak} isn't known, thanks to the work of Cecilia Payne-Gaposchkin (1900-1979), the spectral class can be used to estimate the temperature. This is done by interpolation between the minimum and maximum temperatures of each spectral class:

Temperature from Spectral Type

$$T = T_{max} - \left\{(\text{subclass}) \times \left(\frac{T_{max} - T_{min}}{10}\right)\right\}$$

Here the subclass is the number given with the spectral type (*e.g.* the 2 in Sol's G2), T_{max} is the highest temperature in the spectral class and T_{min} is the lowest.

Size of an Opaque, Spherical Star: The Stefan-Boltzmann Law:

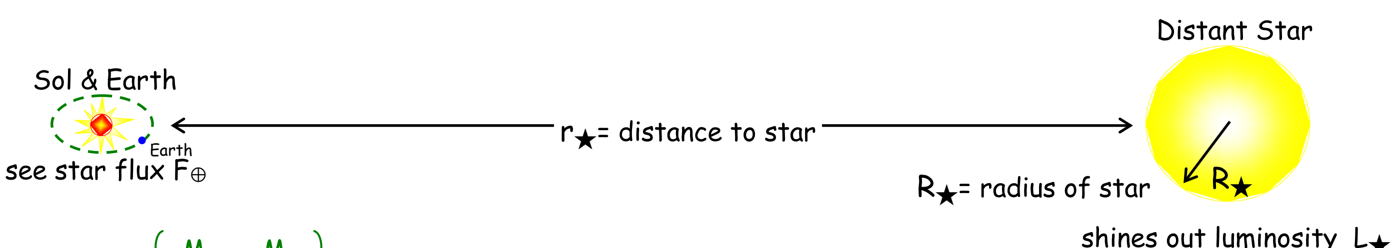
The Stefan-Boltzmann law relates the luminosity of a star to its temperature and its emitting surface area ($4\pi R^2$)

Radius from Luminosity and Temperature

$$R_\star = \sqrt{\frac{L_\star}{4\pi\sigma T^4}}$$

where $R_\star$ is the *radius of the star* in m, $\sigma = 5.67 \times 10^{-8}$ W/M^{2}K^4, $R_\odot = 6.96 \times 10^8$ m, and $r_\oplus = 1.496 \times 10^{11}$ m.

Star	Field Guide to the Stars and Planets Table A2: V	M_V	$r_\star$ ly	Spec. Type	Calculated: *FG* A3 T K	Luminosity: $L_{\star,SOL}$ In L_{sol}	$L_\star$ In Watts	Size: $R_\star$ Billions of m	$R_\star/R_⊠$ (number)	$R_\star / r_\oplus$ %
Polaris (α UMi)	2.0	-4.1	431	F5 I	6,750	3698	1.42×10^{30}	30.9	44.4	20.7
Rigel (β Ori)	0.12	-6.6	773	B8 I	13,800	36,982	1.42×10^{31}	23.4	33.6	15.6
Sirius (α CMa)	-1.46	1.5	9	AI V	10,650	21.3	8.14×10^{27}	0.9	1.4	0.6
Aldebaran (α Tau)	0.85	-0.8	65	K5 III	4250	177	6.77×10^{28}	17.1	24.5	11.4
Betelgeuse (α Ori)	0.5	-5.0	522	M2 I	3400	8472	3.24×10^{30}	184.5	265	123
Procyon (α CMi)	0.38	2.8	11	F5 IV	6,750	6.4	2.46×10^{27}	1.3	1.9	0.9



$$L_\star = 10^{\left(\frac{M_{SOL} - M_\star}{2.5}\right)}, \quad r_{\star,m} = r_{\star,ly} \times (9.46 \times 10^{15}) \text{ Meters}, \quad L_{SOL} = (3.827 \times 10^{26}) \text{ Watts.}$$