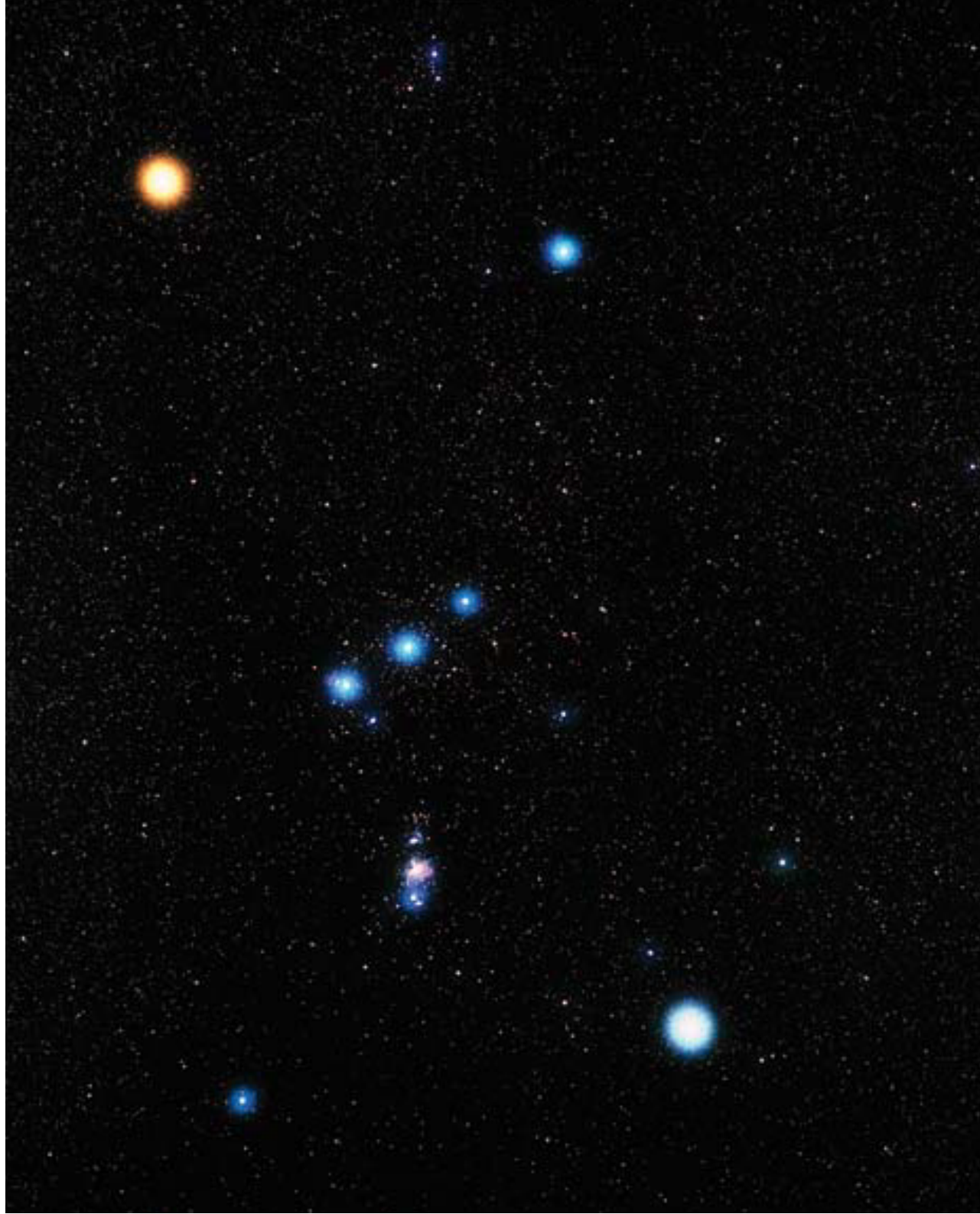


Zvezde



Kaj so zvezde?

1. zvezde veže lastna gravitacija:

sferične ali sferoidne

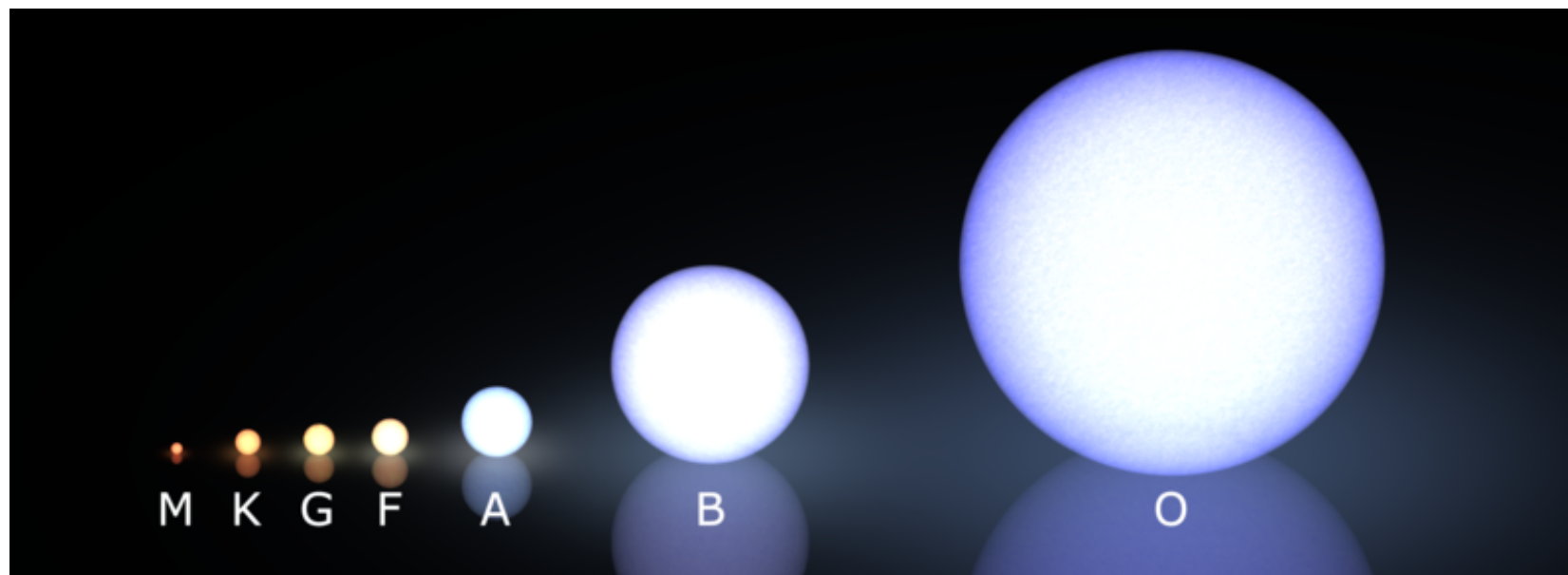
2. proizvajajo energijo:

v jedrskih reakcijah, včasih tudi gravitacijsko krčenje

zvezda umre, ko ne velja 1. ali 2. ali oboje

Kakšne so?

- izsev L : $(10^{-5} L_S - 10^5 L_S)$, $L_S = 3.85 \times 10^{26} \text{ W}$
- površina T_{eff} : $T_S = 5800 \text{ K}$; $3000 - 40.000 \text{ K}$
- masa : $0.1 - 150 M_S$
- radij : $0.01 - 1000 R_S$



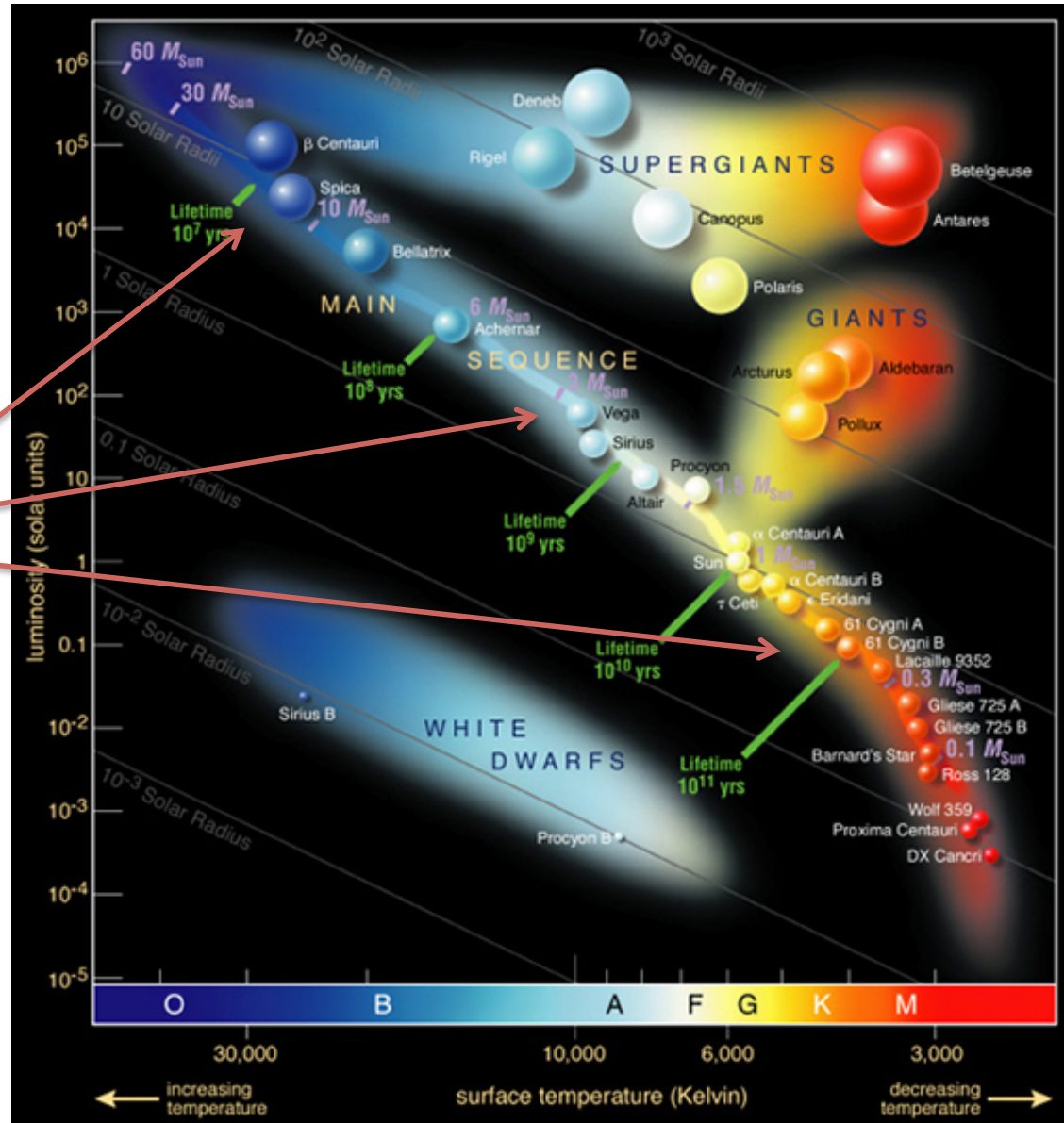
HR diagram

okrog 1910:
Ejnar Hertzprung in
Henry Norris Russel

glavna veja
HR diagrama

glavni parameter, ki
določa zvezdo je
masa!

v grobem velja:
 $L \propto M^{3.8}$



Spekter zvezde

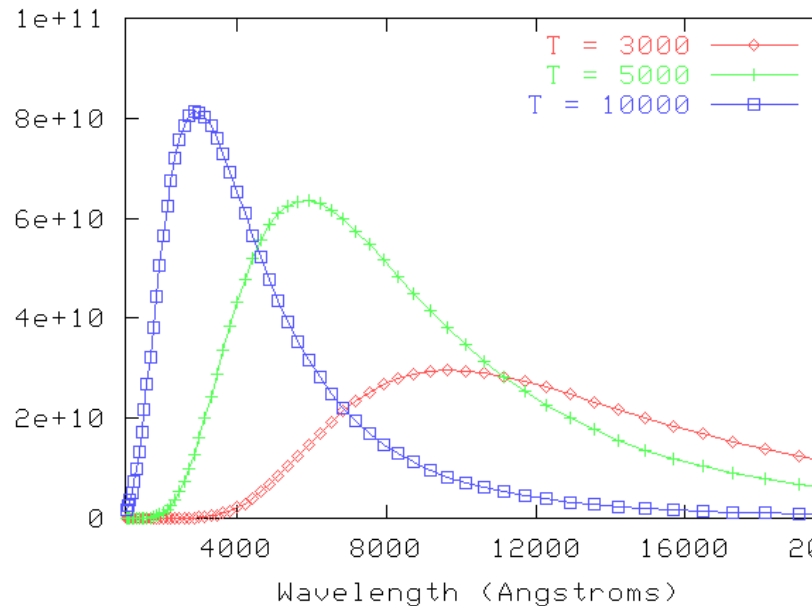
sevanje črnega telesa:

Stefanov zakon: $j = \sigma T^4$

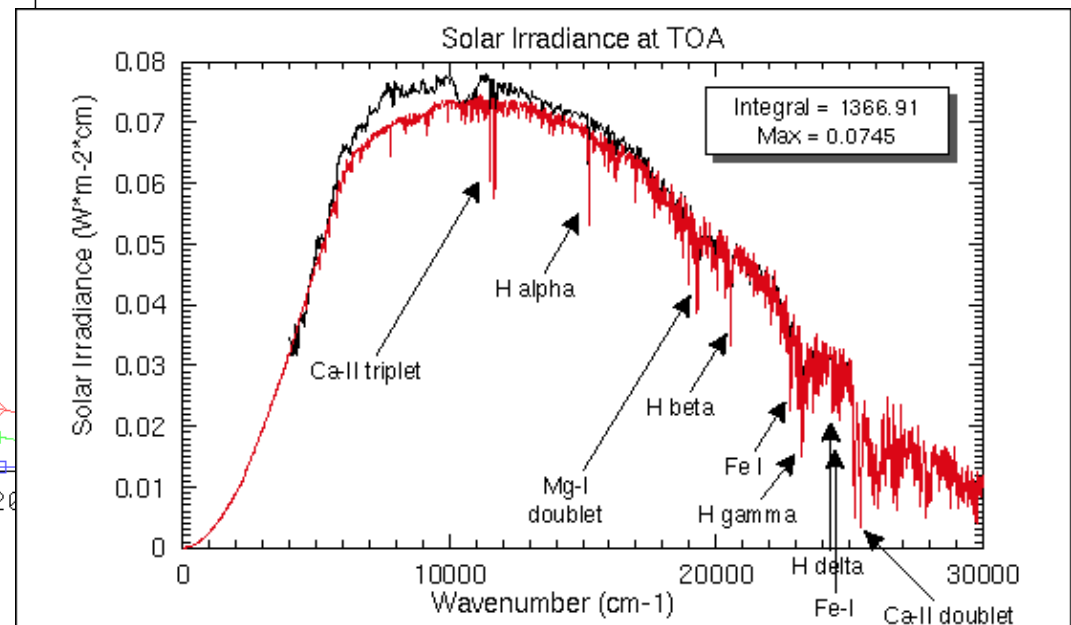
Wienov zakon: $\lambda_{\max} T = 2.8979 \times 10^{-3} \text{ Km}$

$$E(\lambda, T) = \frac{2hc^2}{\lambda^5} \frac{1}{e^{\frac{hc}{\lambda kT}} - 1}$$

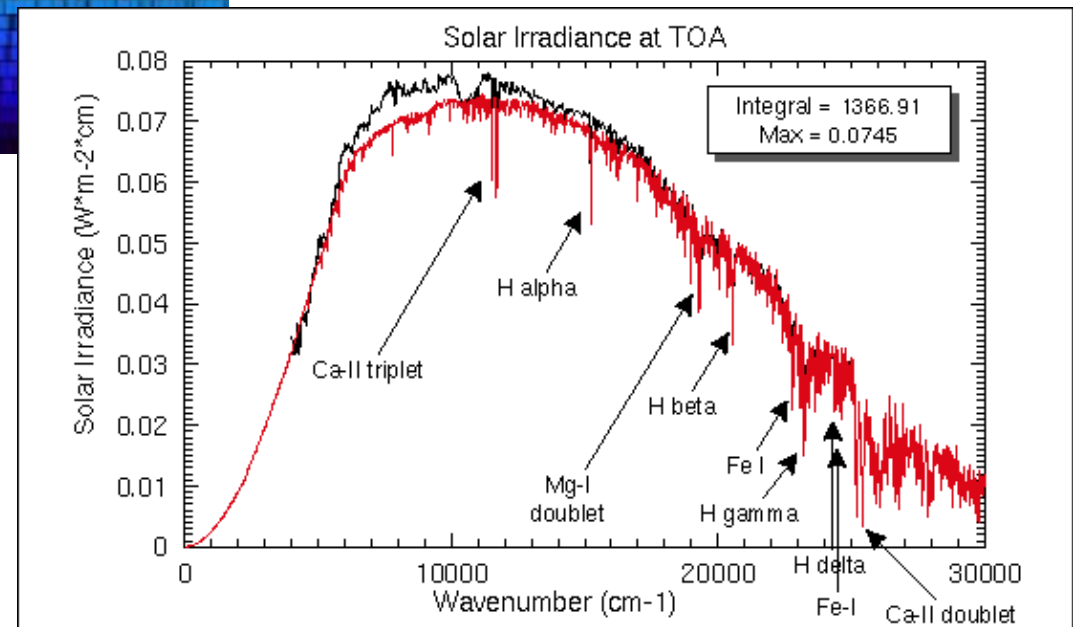
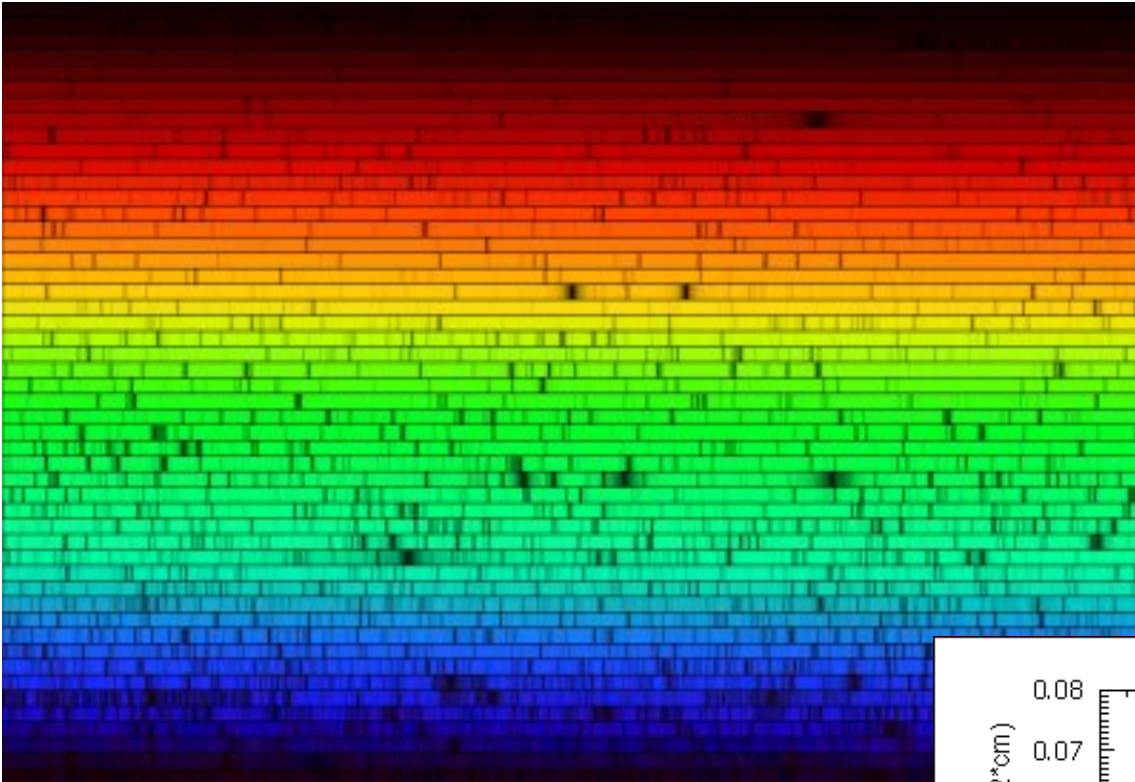
Blackbody spectra for different temperatures

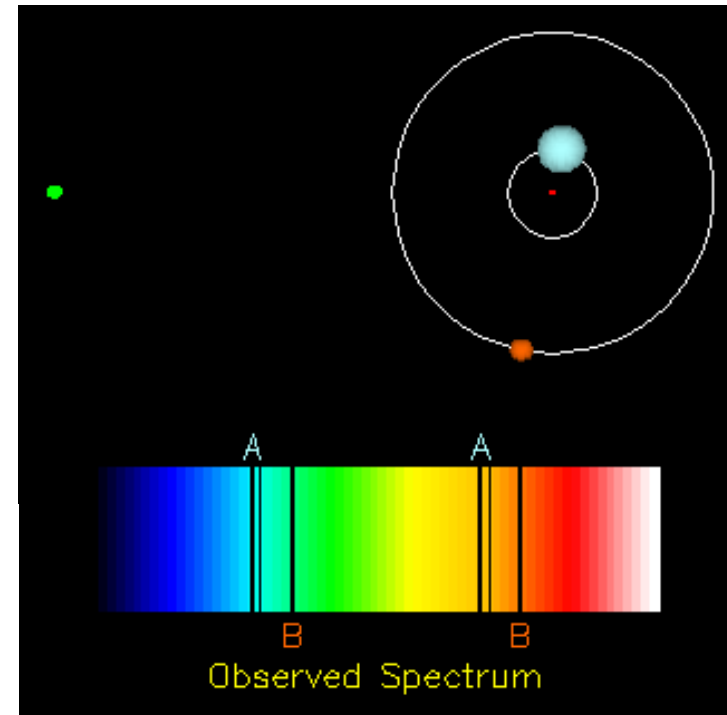
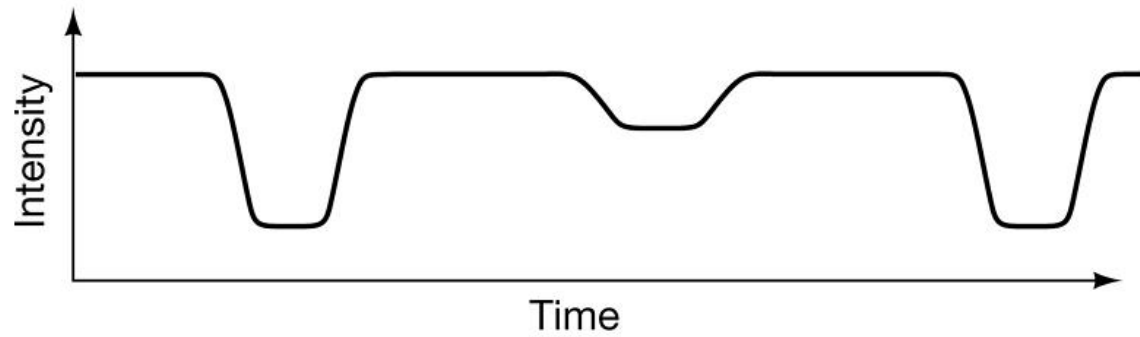
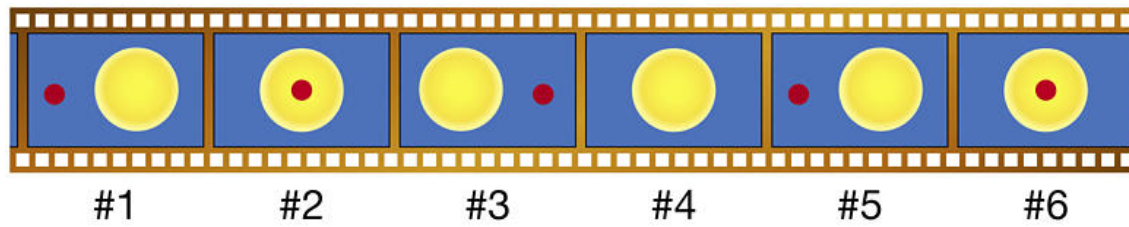


+ "naložene" absorpcijske črte:



spekter Sonca

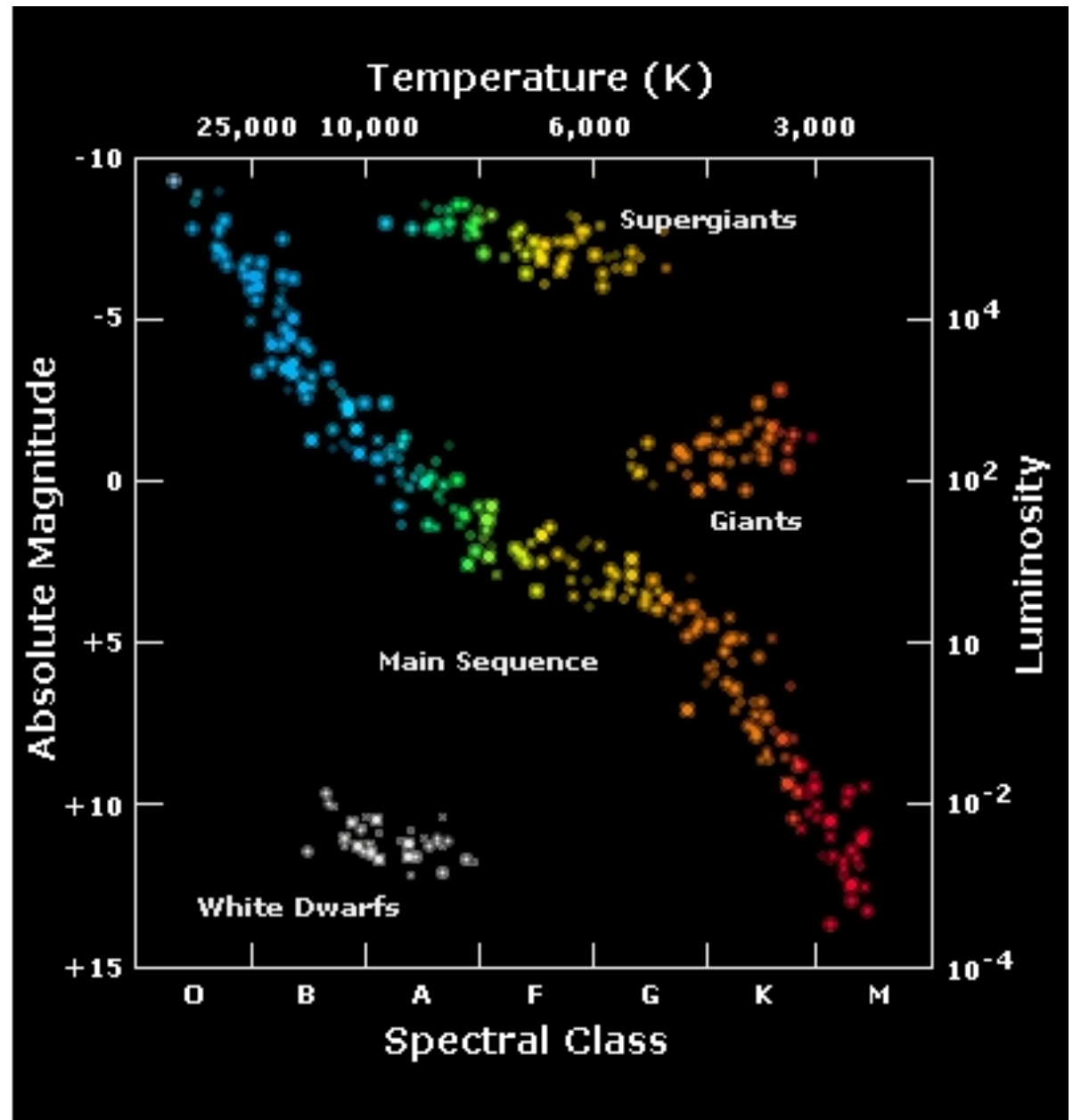




HR diagram

Hertzsprung-Russell
(1911-1913)

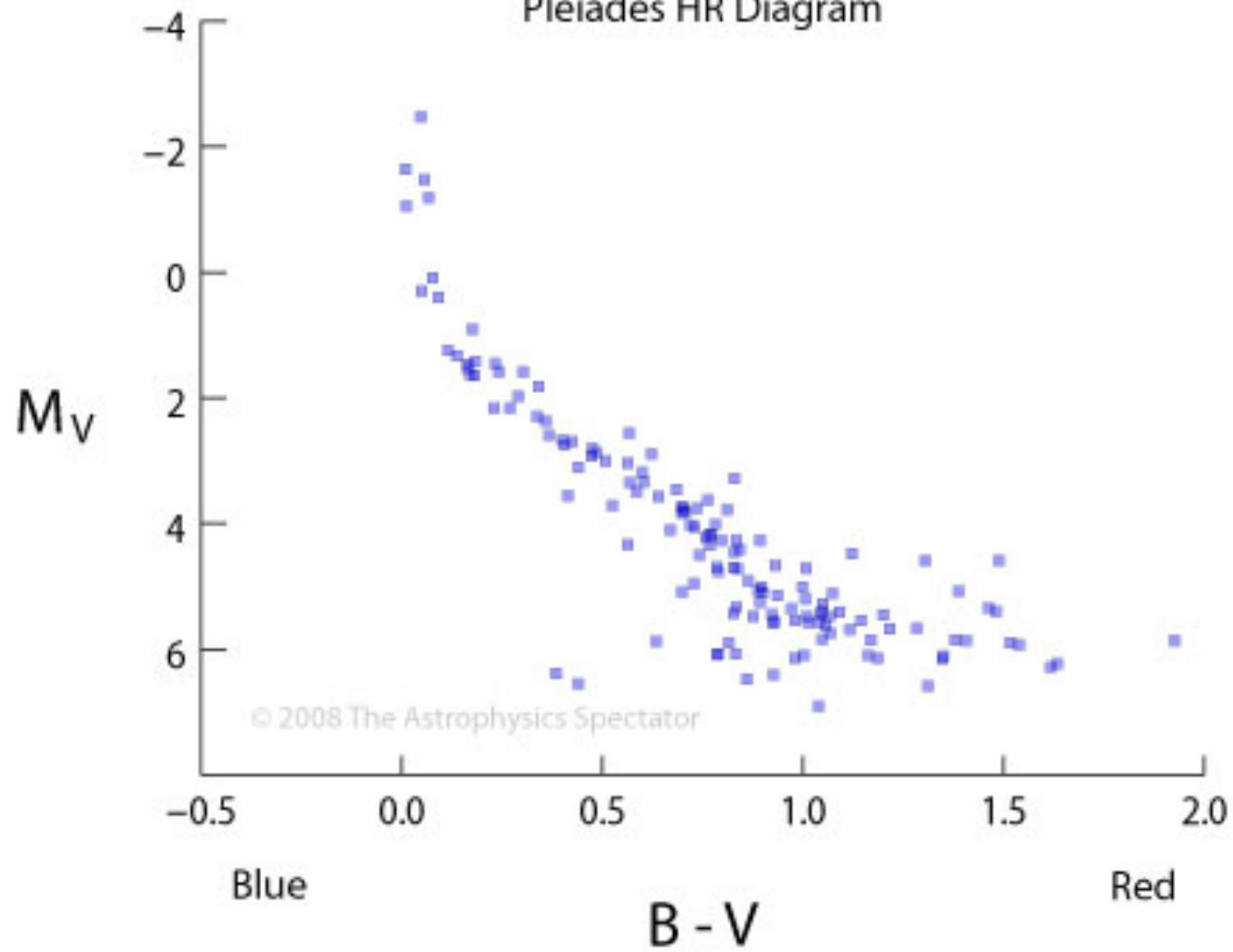
$\log_{10} L \uparrow$



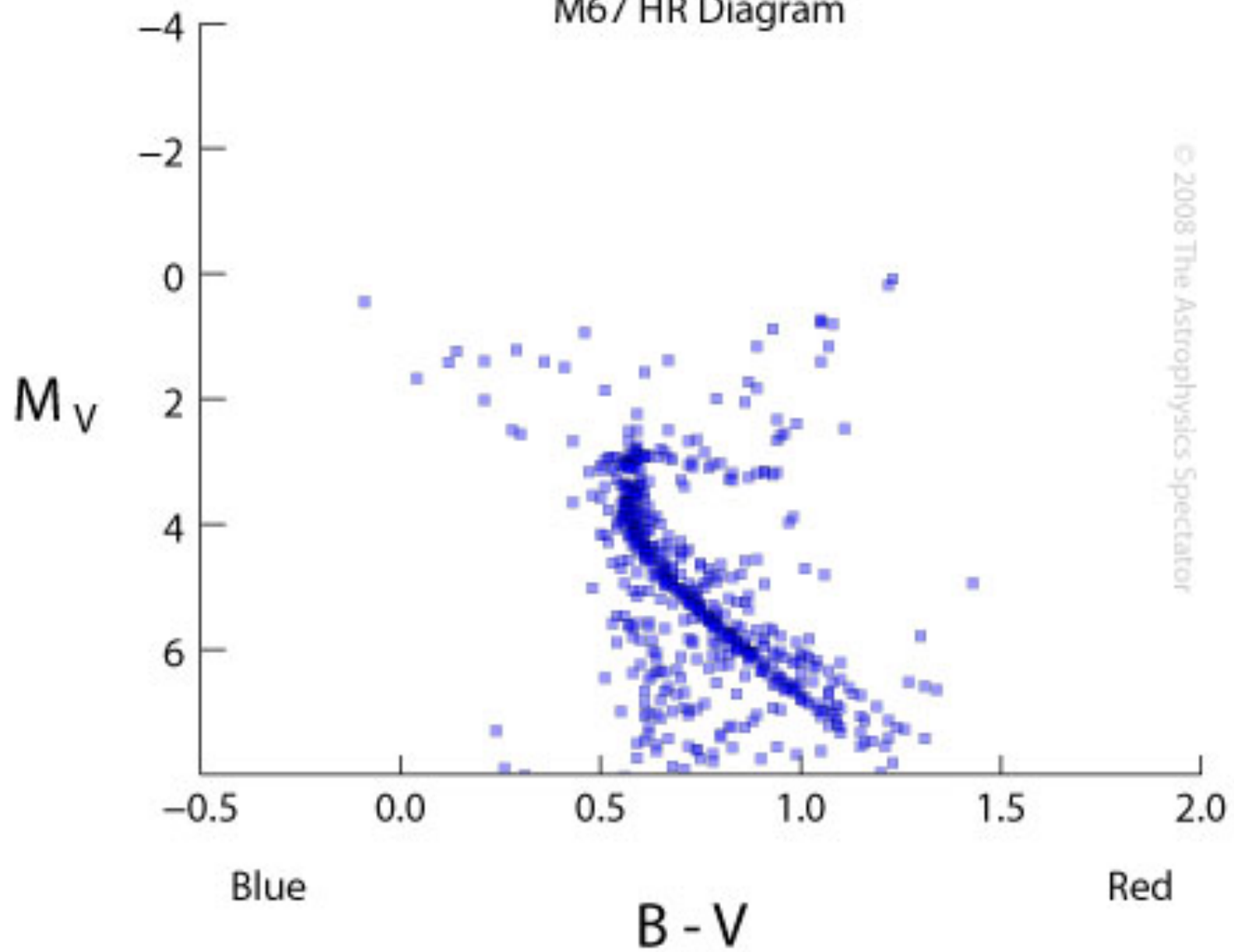
$\leftarrow \log_{10} T$



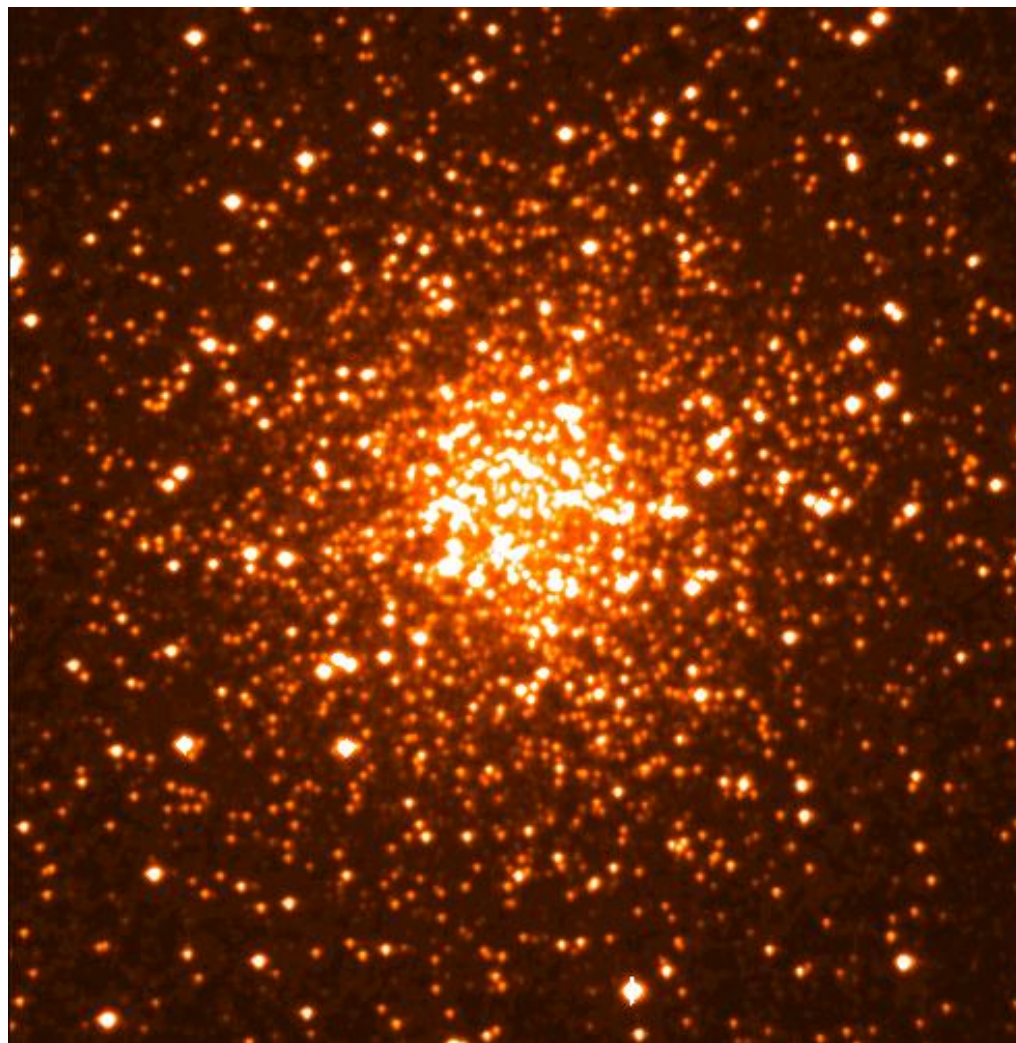
Pleiades HR Diagram

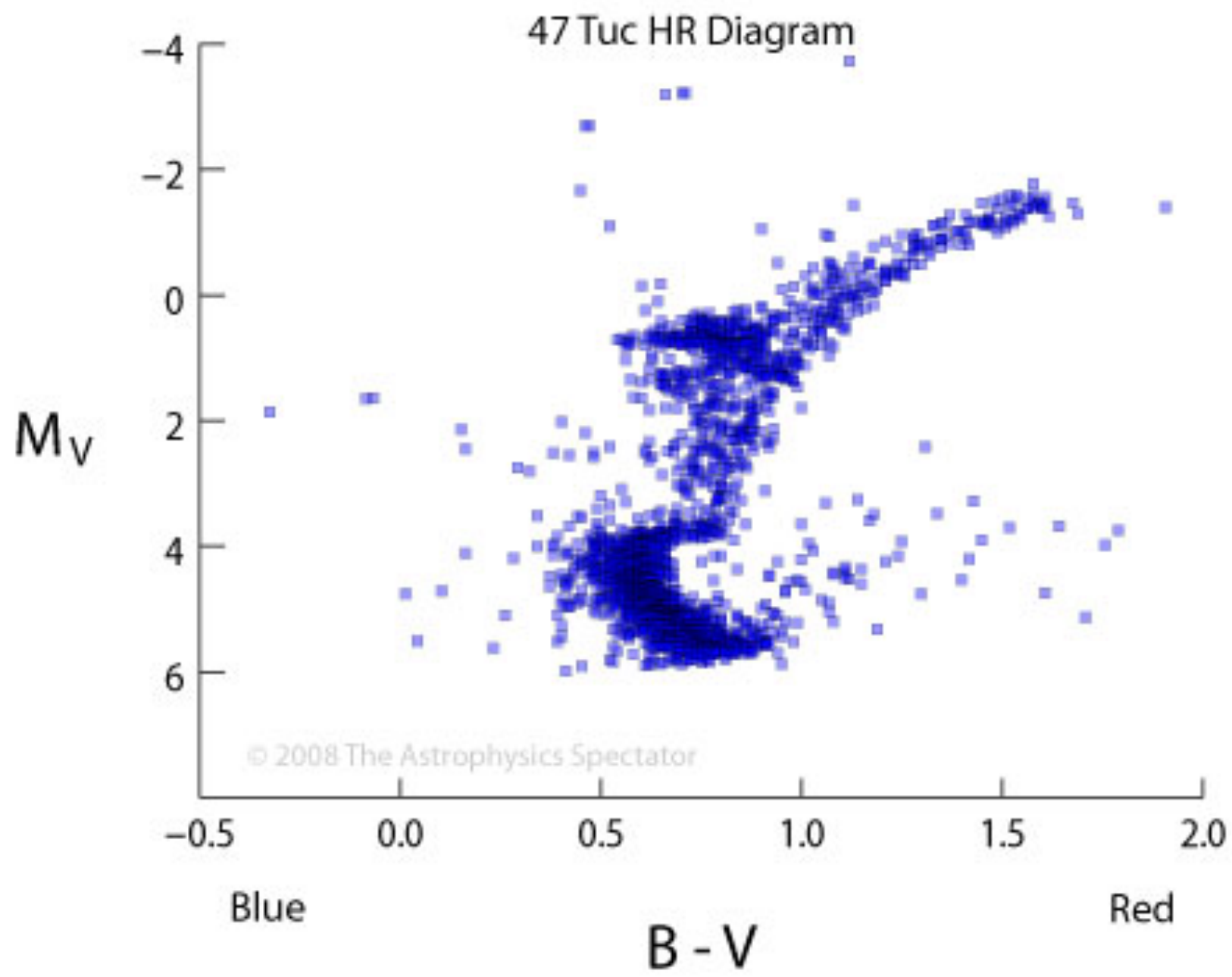


M67 HR Diagram

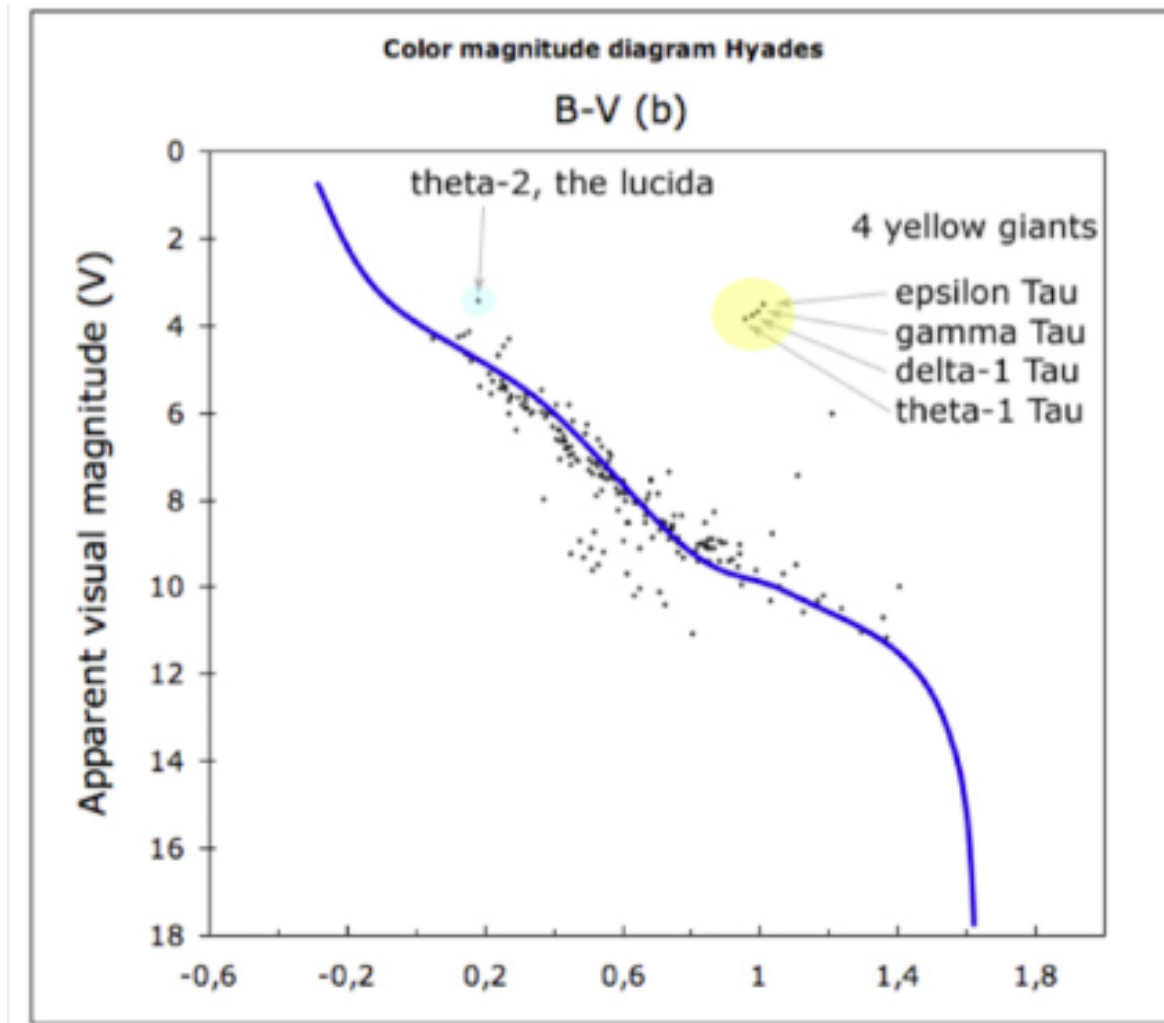


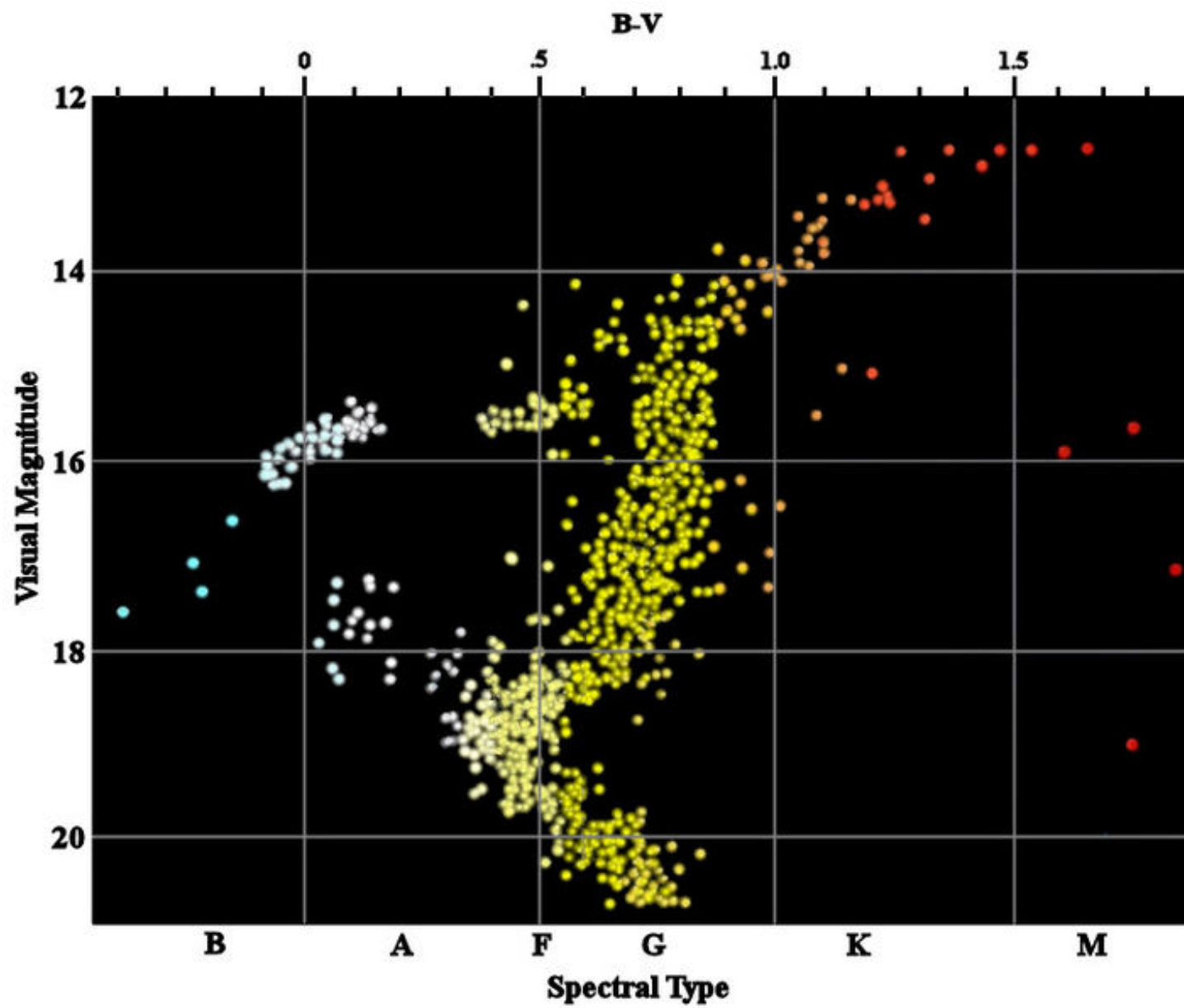
47 Tucanae

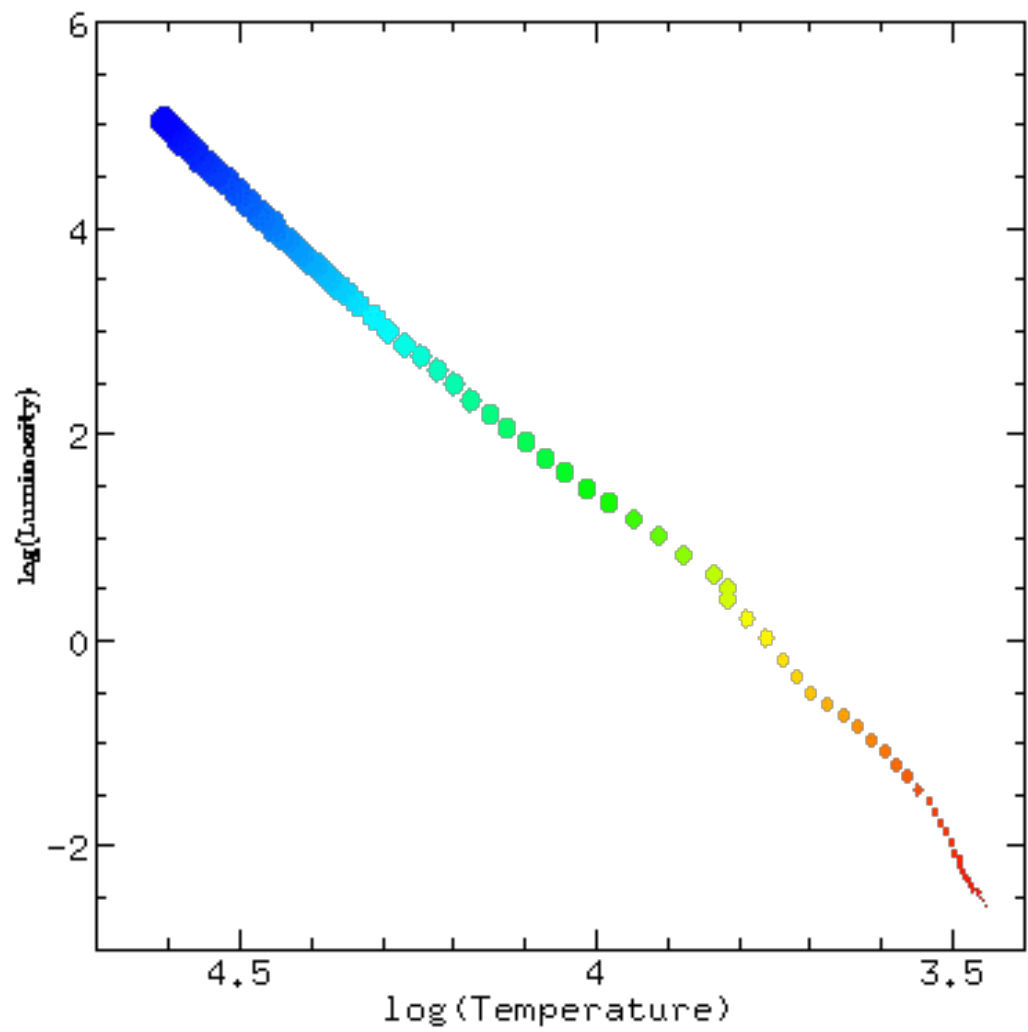


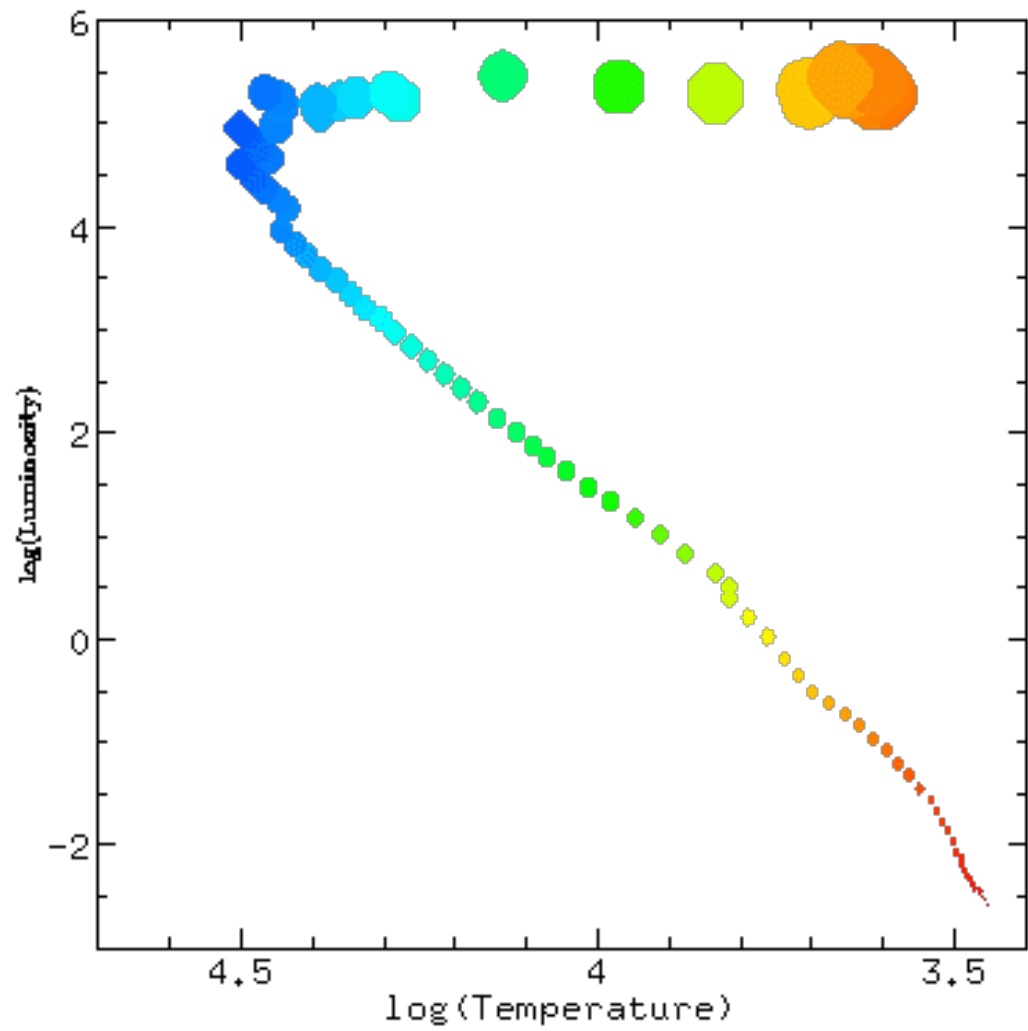


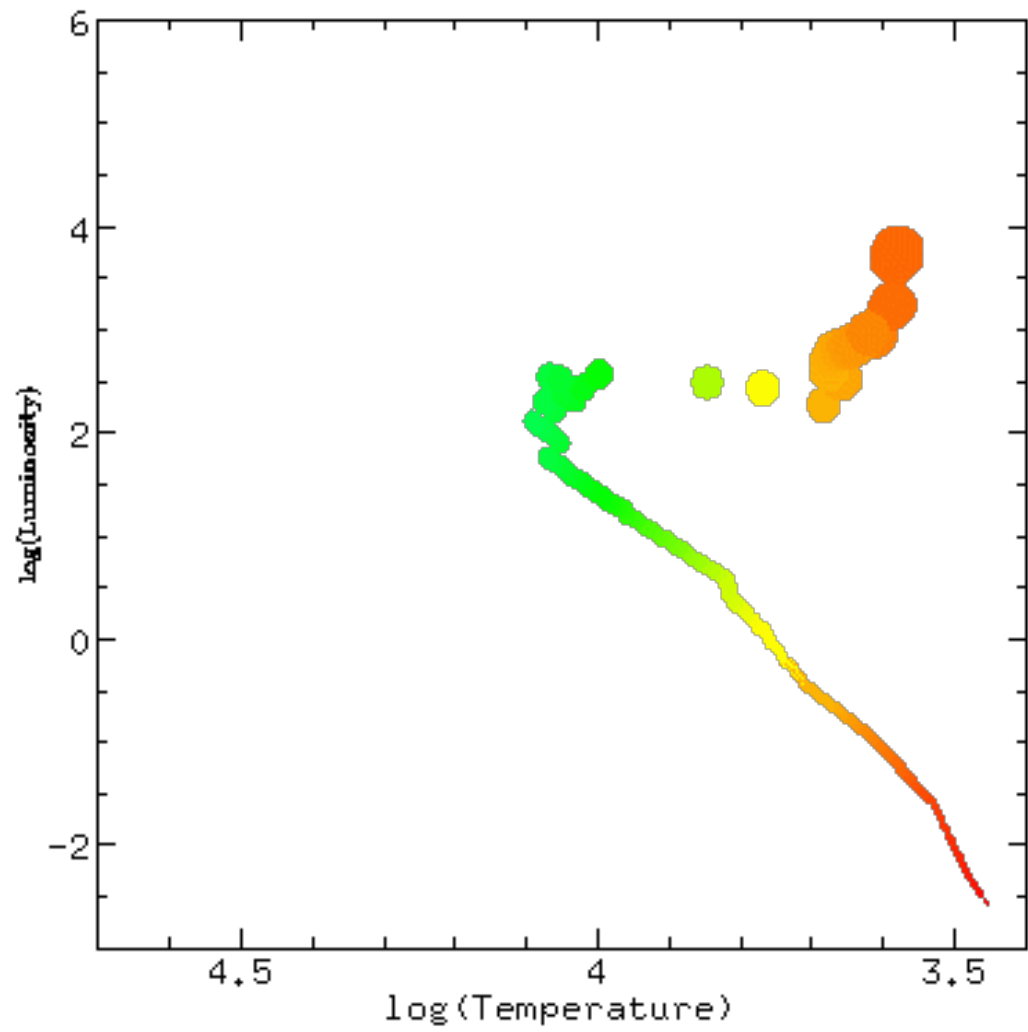
Hyades

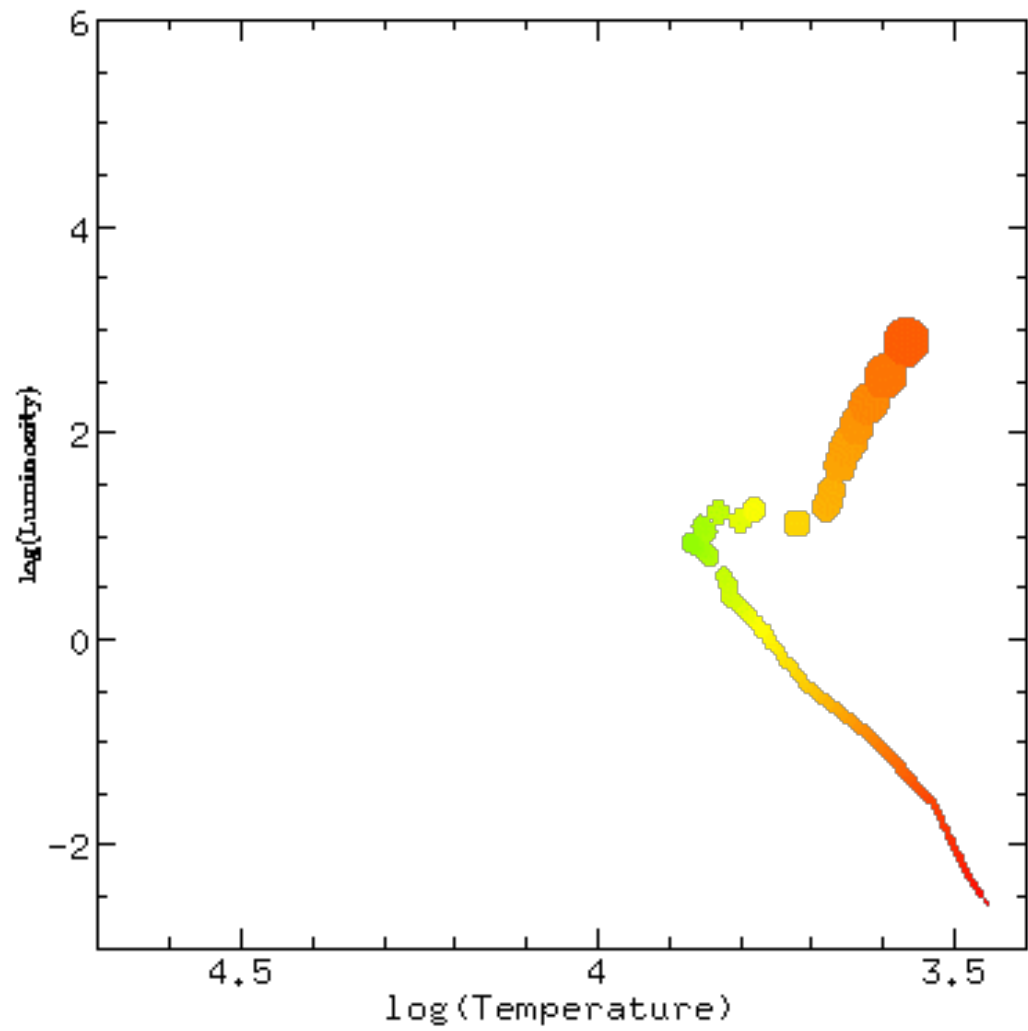


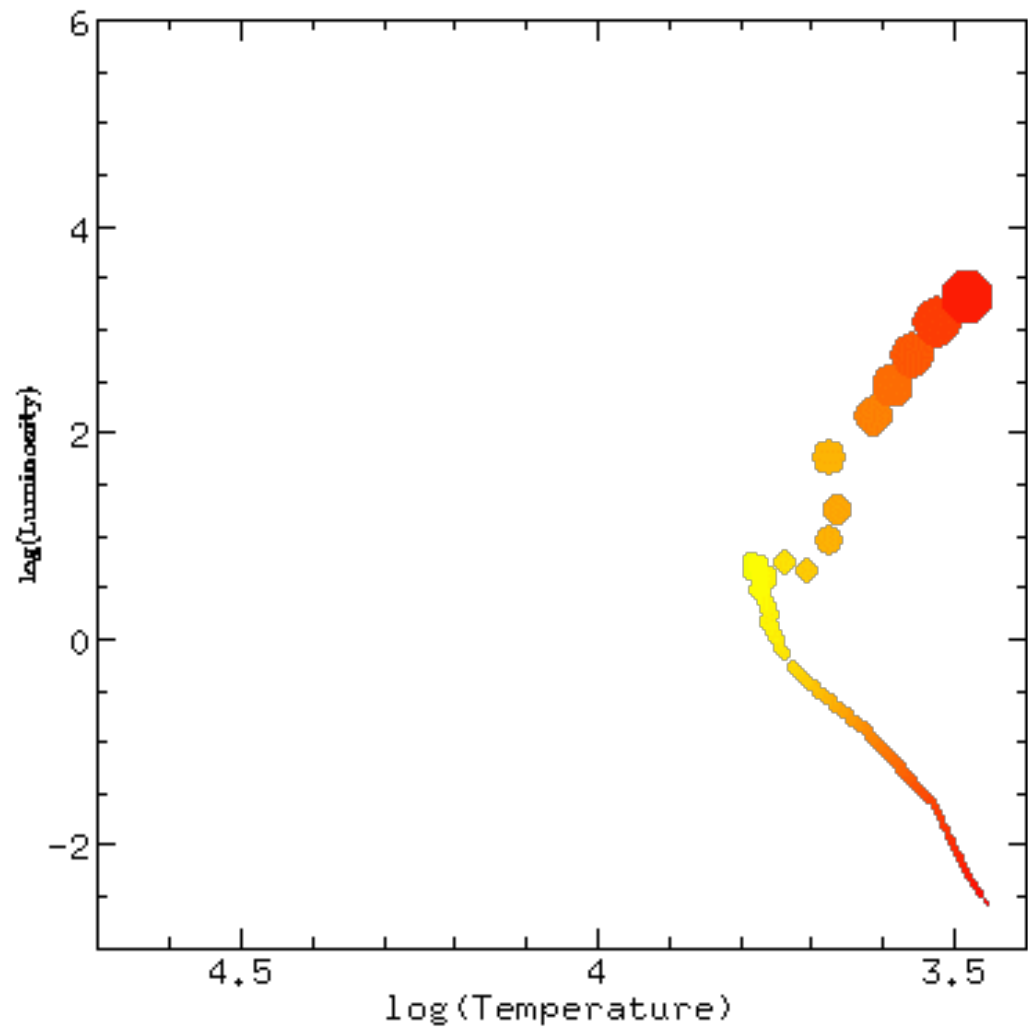


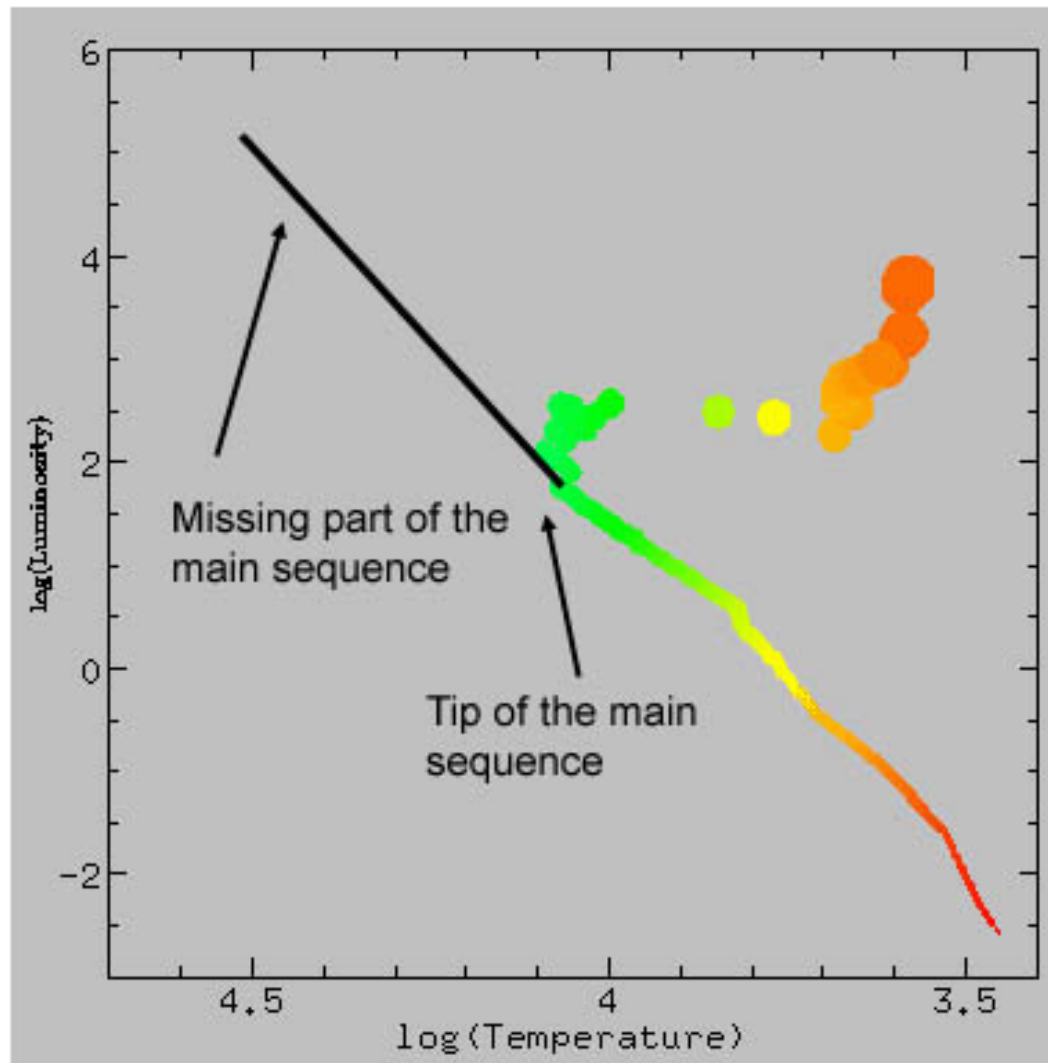


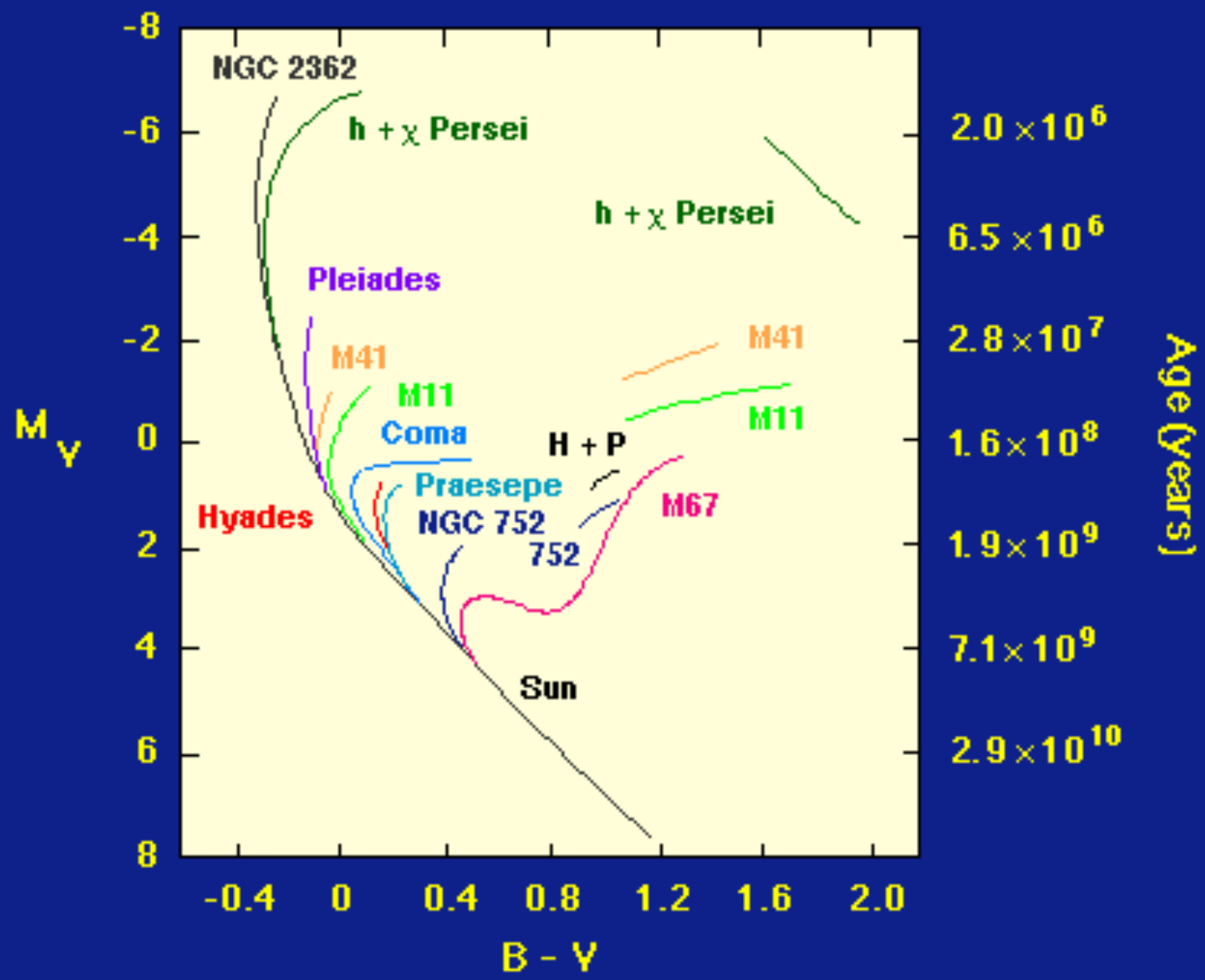








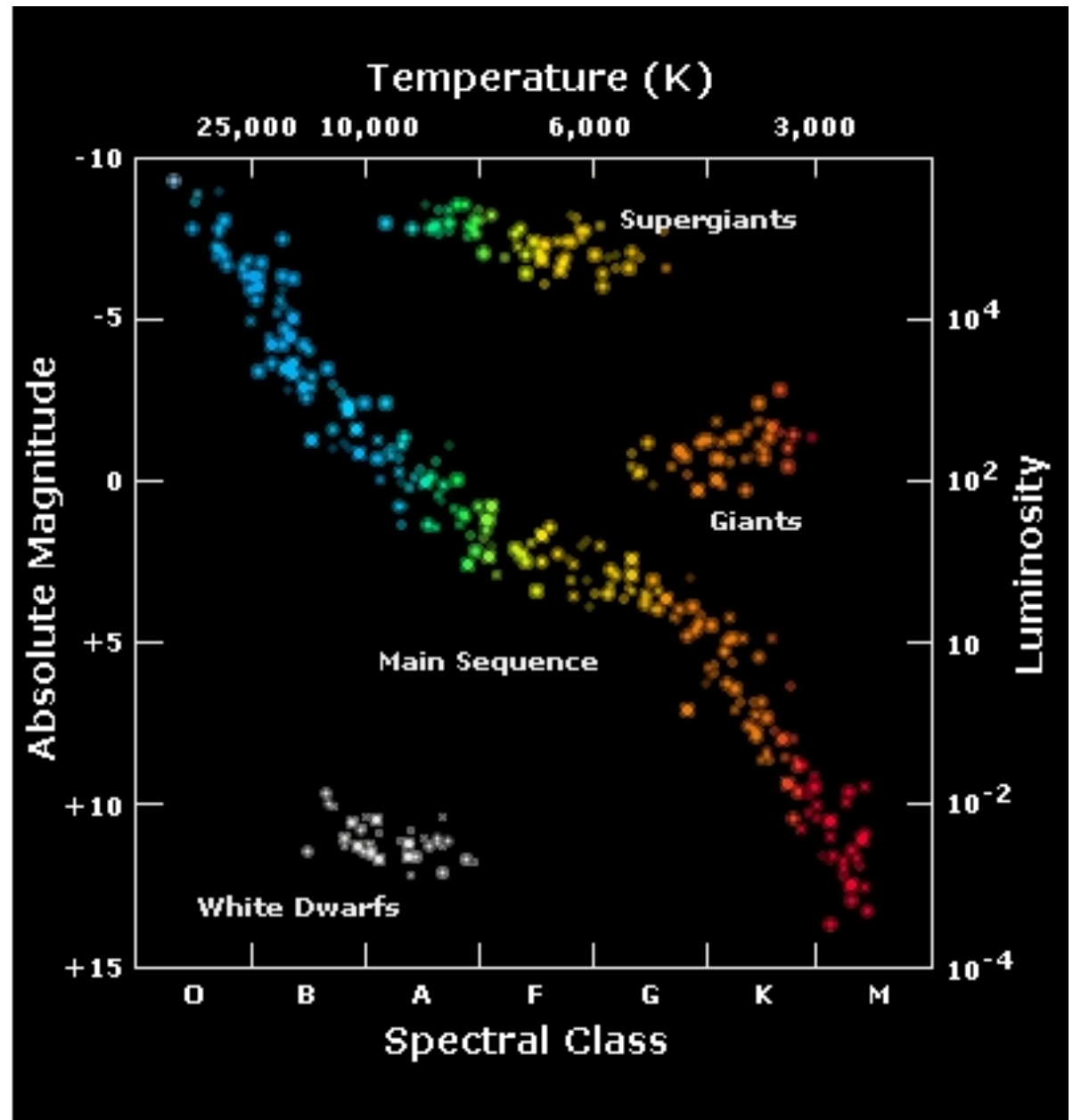




HR diagram

Hertzsprung-Russell
(1911-1913)

$\log_{10} L \uparrow$



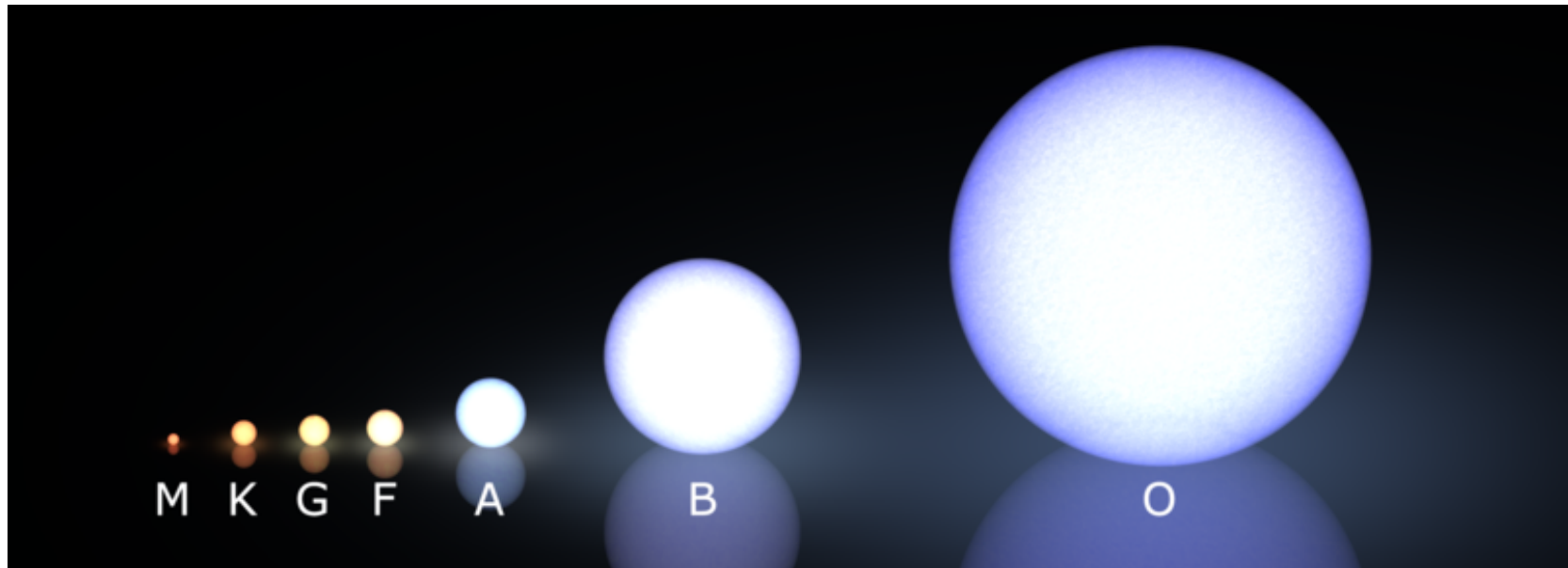
$\leftarrow \log_{10} T$

Spektralni tipi

Spectral Class Characteristics

Data from J. C. Evans, George Mason University

Spectral Class	Intrinsic Color	Temperature (K)	Prominent Absorption Lines
O	Blue	41,000	He ⁺ , O ⁺⁺ , N ⁺⁺ , Si ⁺⁺ , He, H
B	Blue	31,000	He, H, O ⁺ , C ⁺ , N ⁺ , Si ⁺
A	Blue-white	9,500	H(strongest), Ca ⁺ , Mg ⁺ , Fe ⁺
F	White	7,240	H(weaker), Ca ⁺ , ionized metals
G	Yellow-white	5,920	H(weaker), Ca ⁺ , ionized & neutral metal
K	Orange	5,300	Ca ⁺ (strongest), neutral metals strong, H(weak)
M	Red	3,850	Strong neutral atoms, TiO



Izsevni razredi (Luminosity classes)

- Ia najsvetlejše nadorjakinje
- Ib manj svetle nadorjakinje
- II svetle orjakinje
- III normalne orjakinje
- IV podorjakinje
- V zvezde glavne veje (pritlikavke)
- VI, sd (subdwarfs) podpritlikavke
- D bele pritlikavke