



**Istituto Nazionale di Astrofisica**  
Osservatorio astronomico di Brera



*Universo in fiore*  
**Evoluzione stellare**



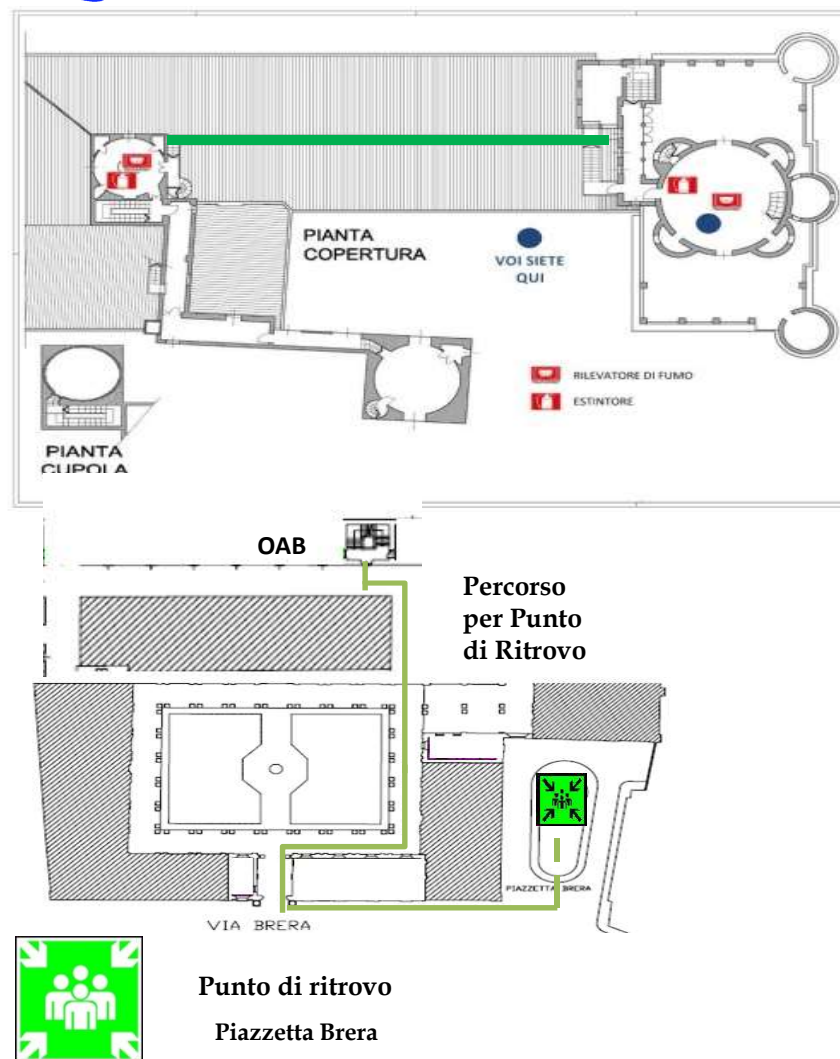
*Ilaria Arosio*

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INAF-Osservatorio Astronomico di Brera



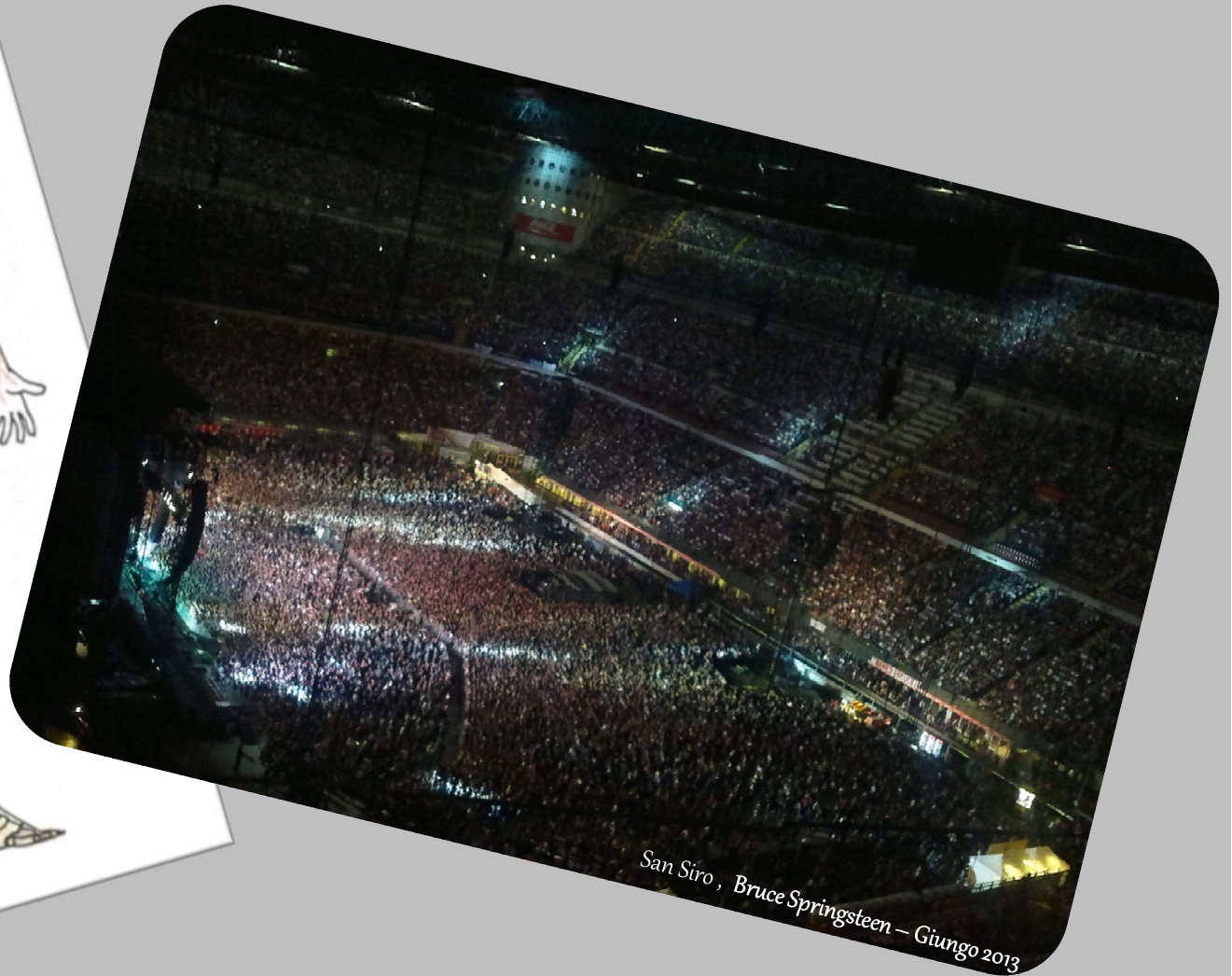
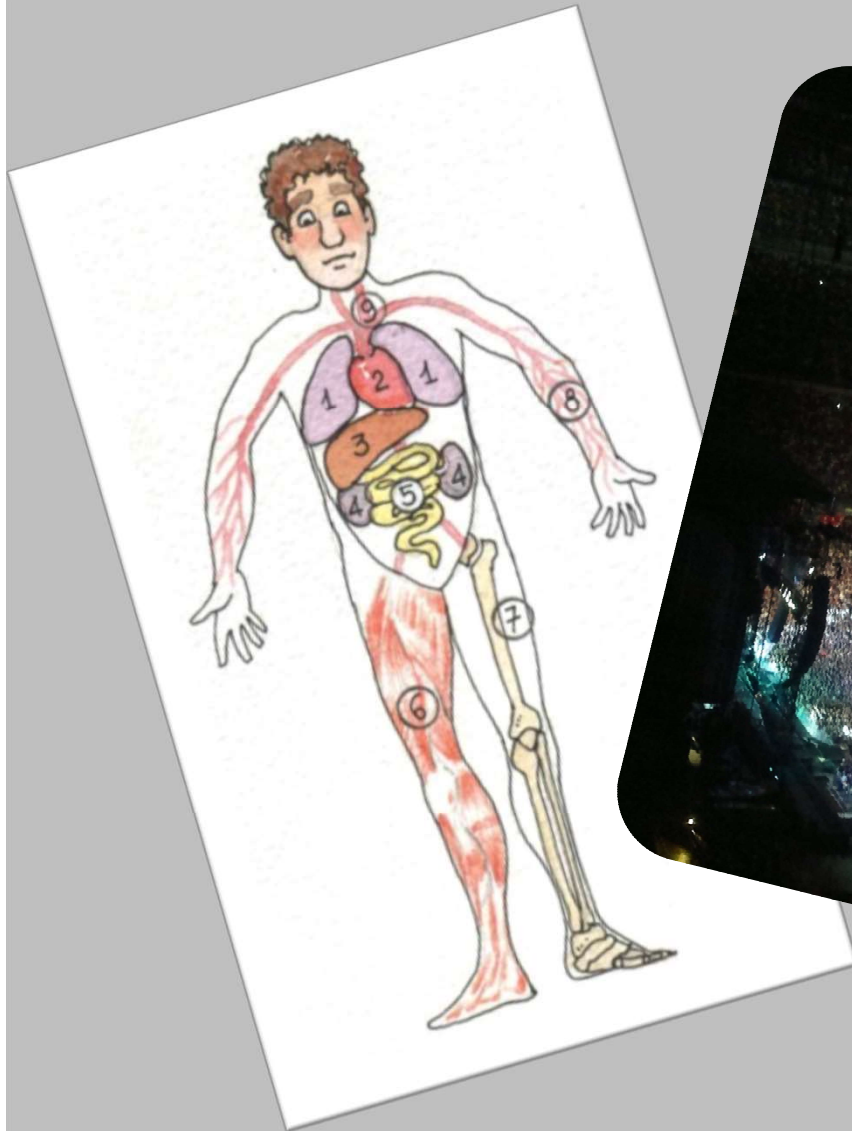
## Uscite di Sicurezza vie di fuga in caso di Emergenza



# Osservazione



Ci sono due modi per studiare una specie:



San Siro , Bruce Springsteen – Giungo 2013

Sole

Lista

# Il Sole a occhio nudo

È luminoso



È colorato

È sferico



**1910**

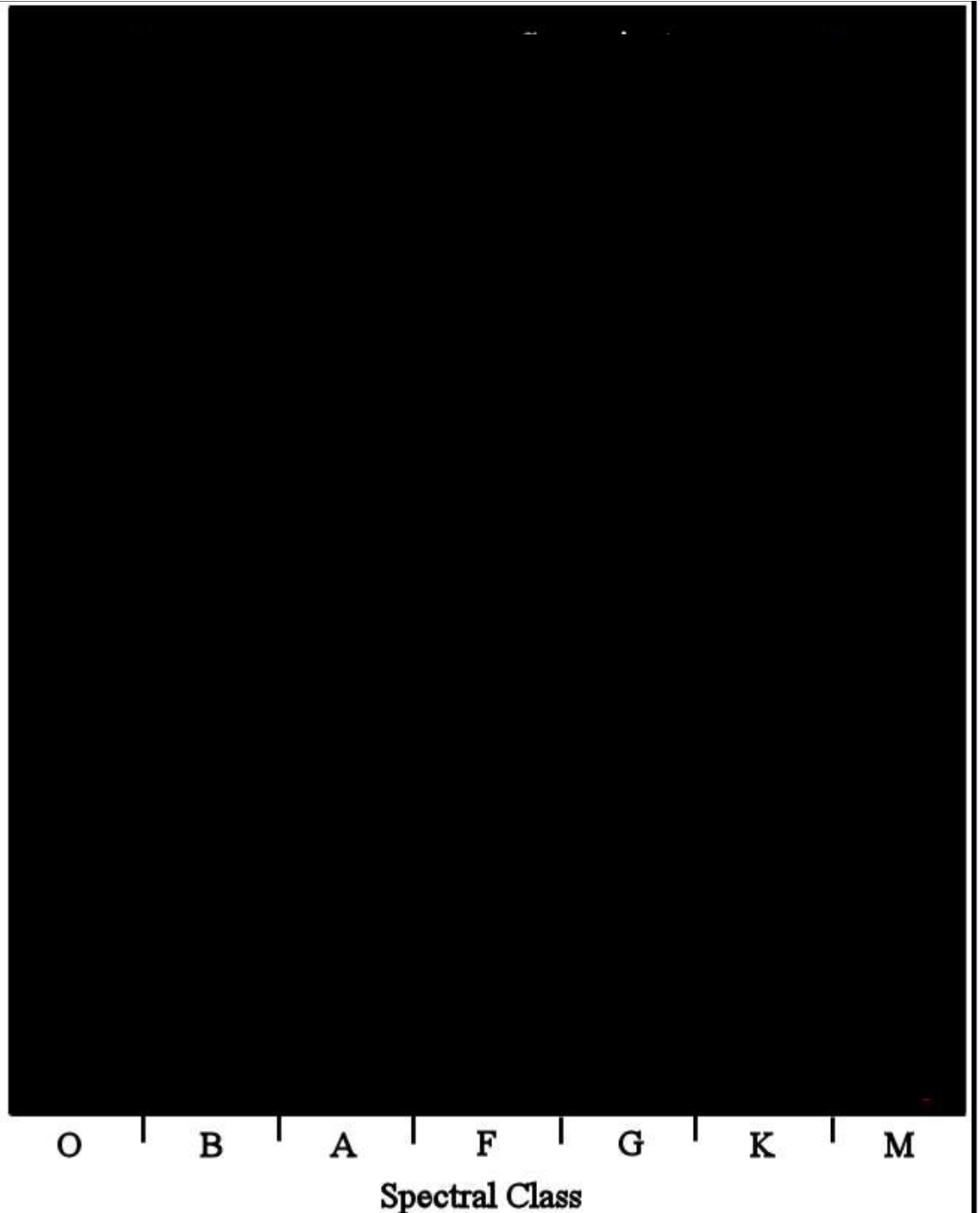
Ejnar Hertzsprung e

Henry Norris Russell

idearono

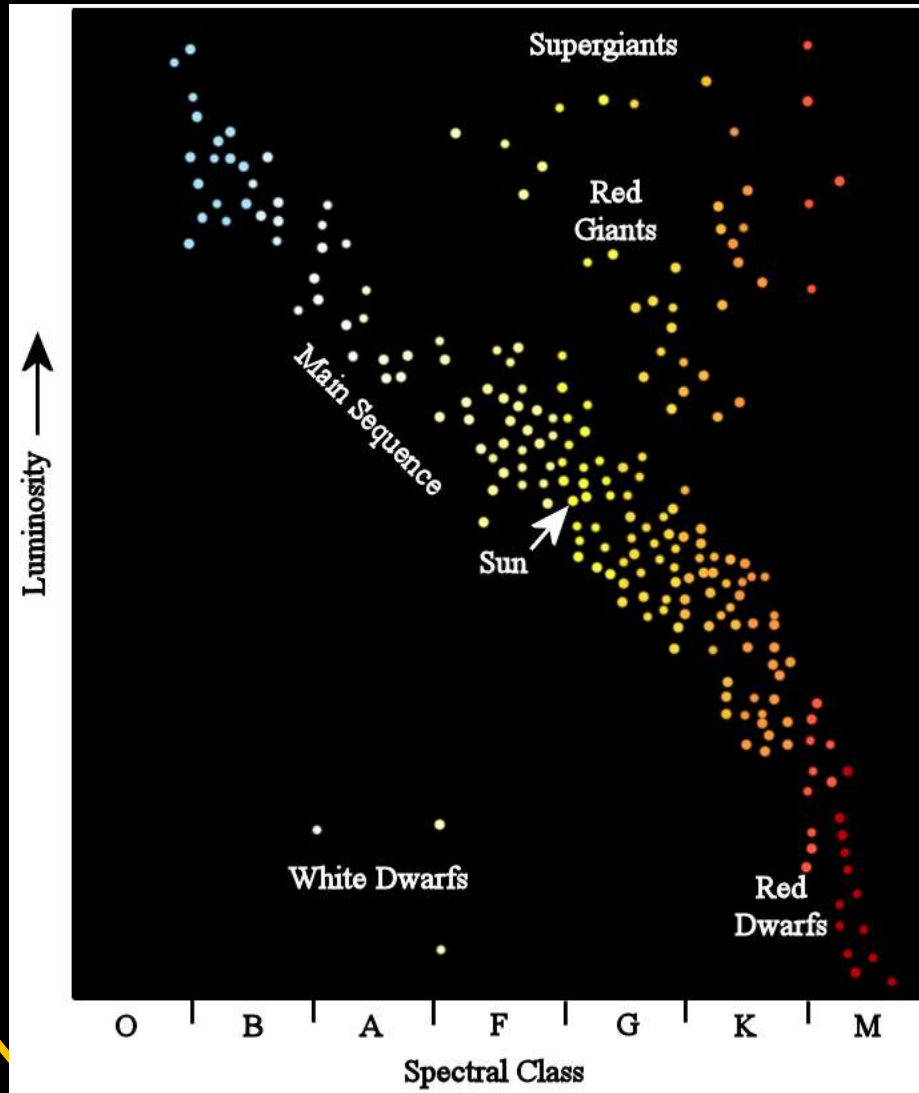
indipendentemente il  
grafico che da loro prende  
il nome

↑  
Luminosity



Luminosità

temperatura



Classe spettrale

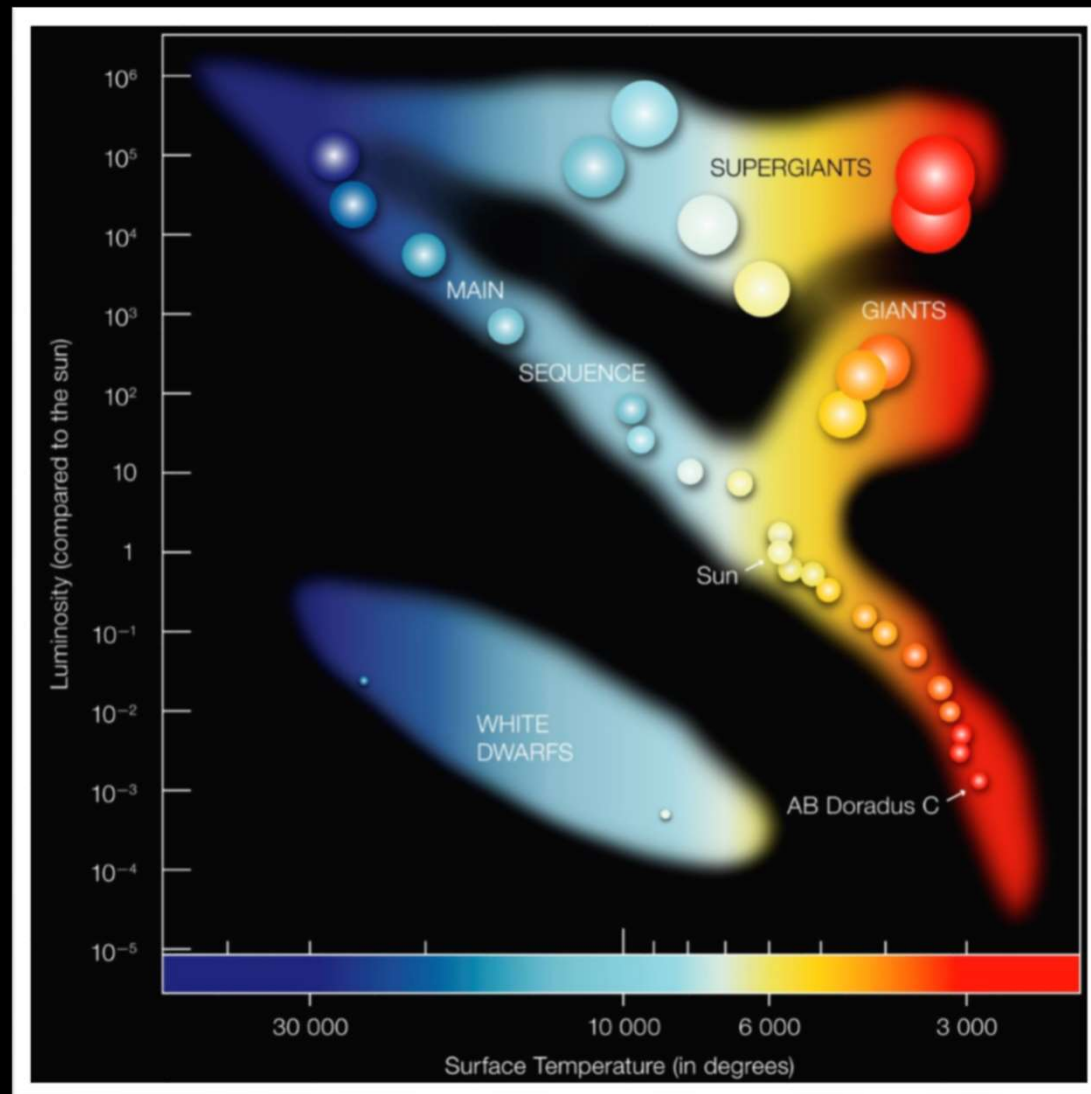
colore



equilibrio

composizione

luce

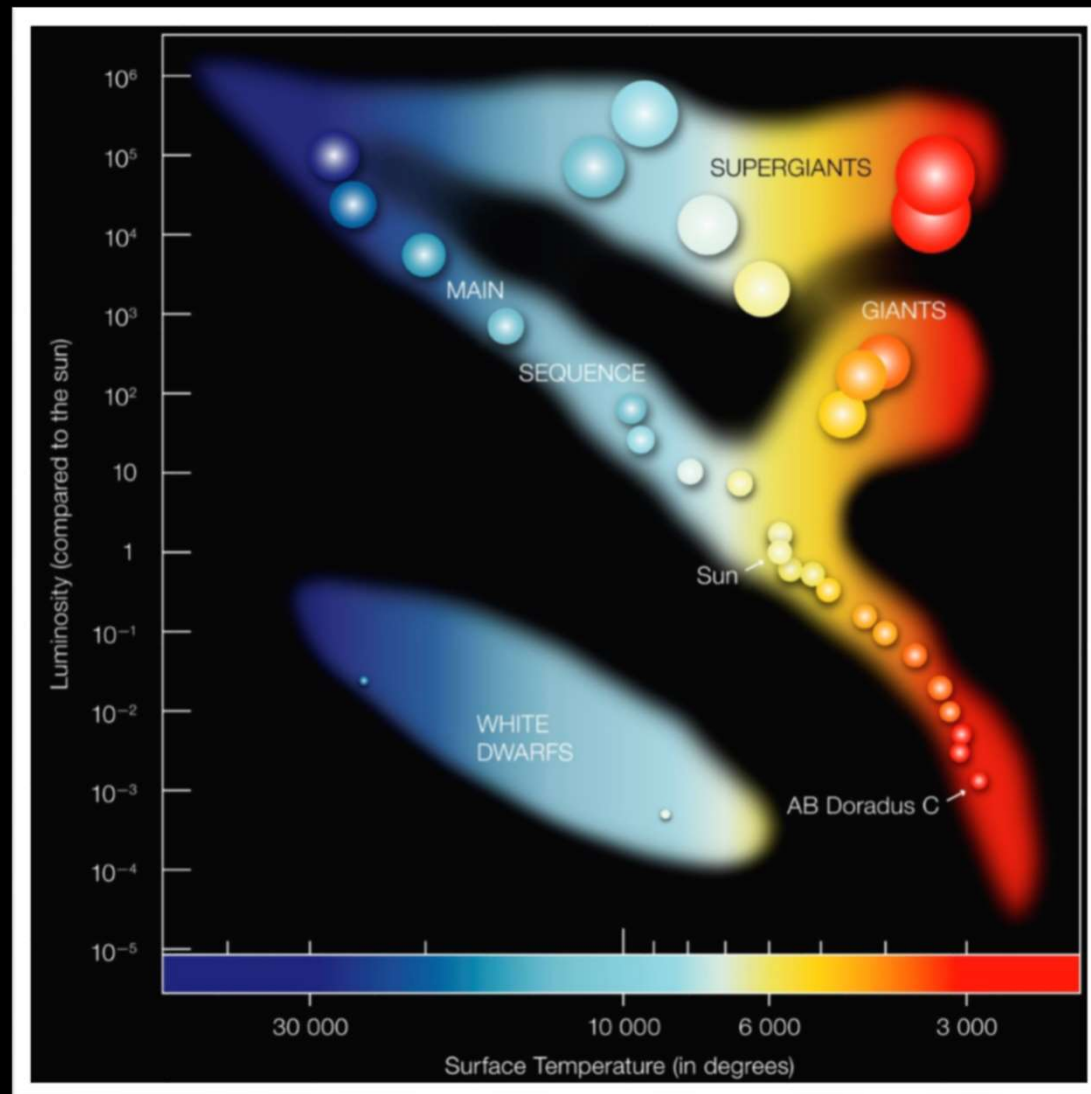


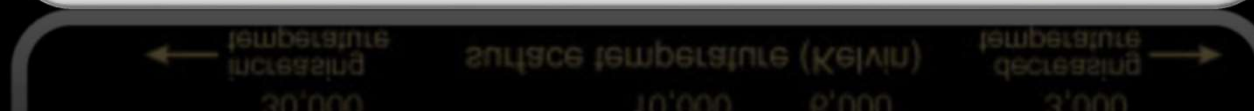
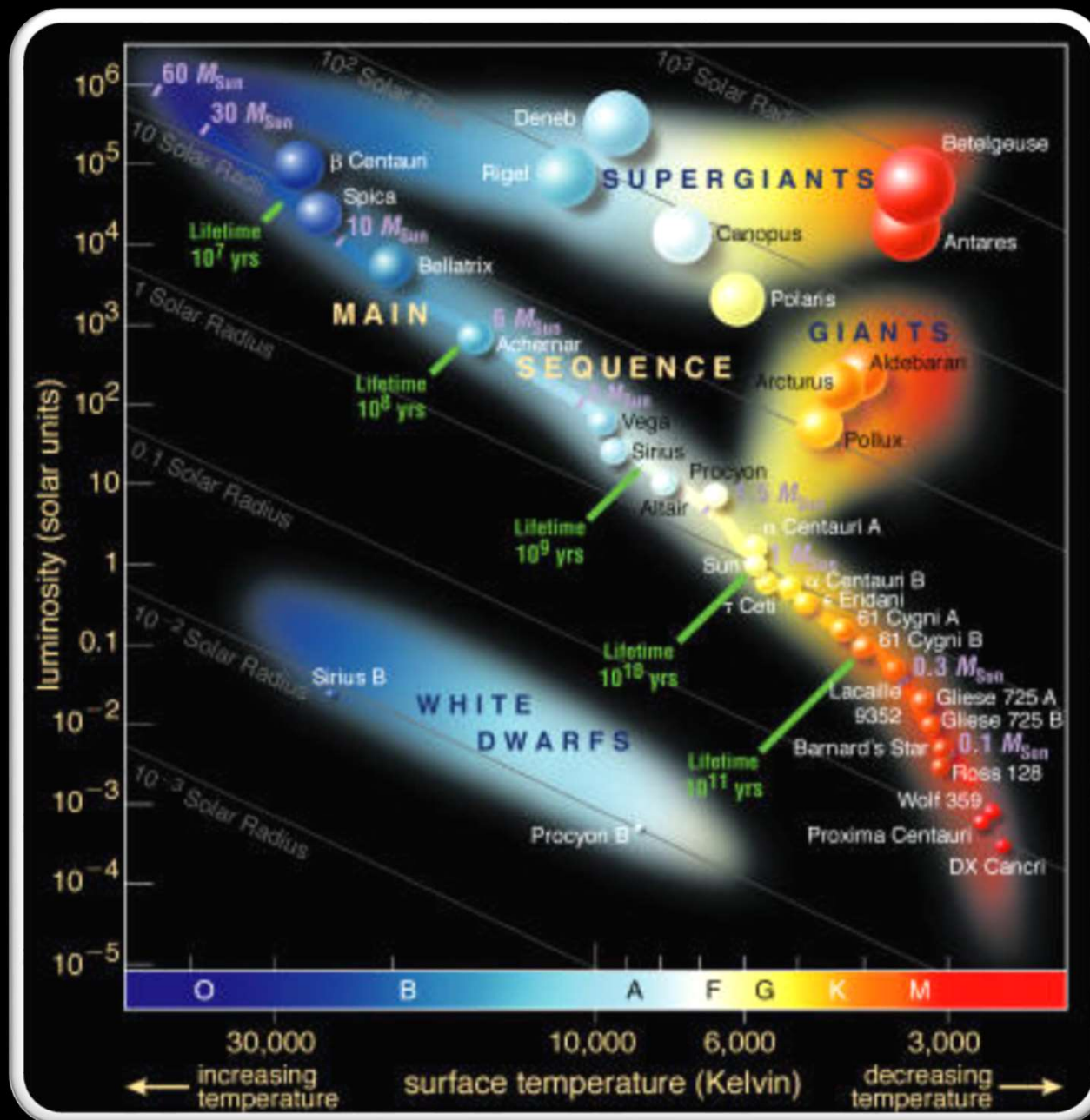
equilibrio

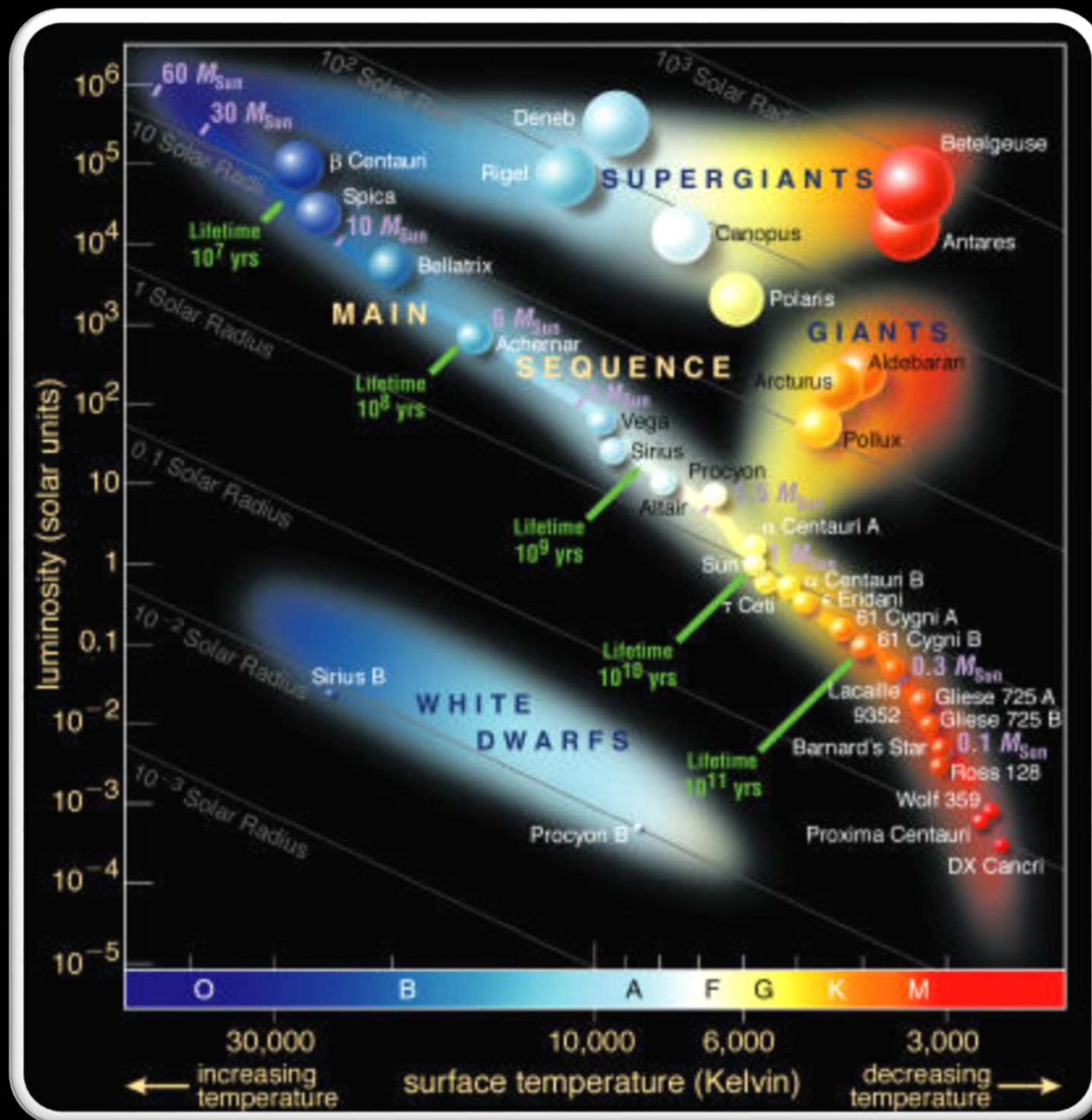
composizione

luce

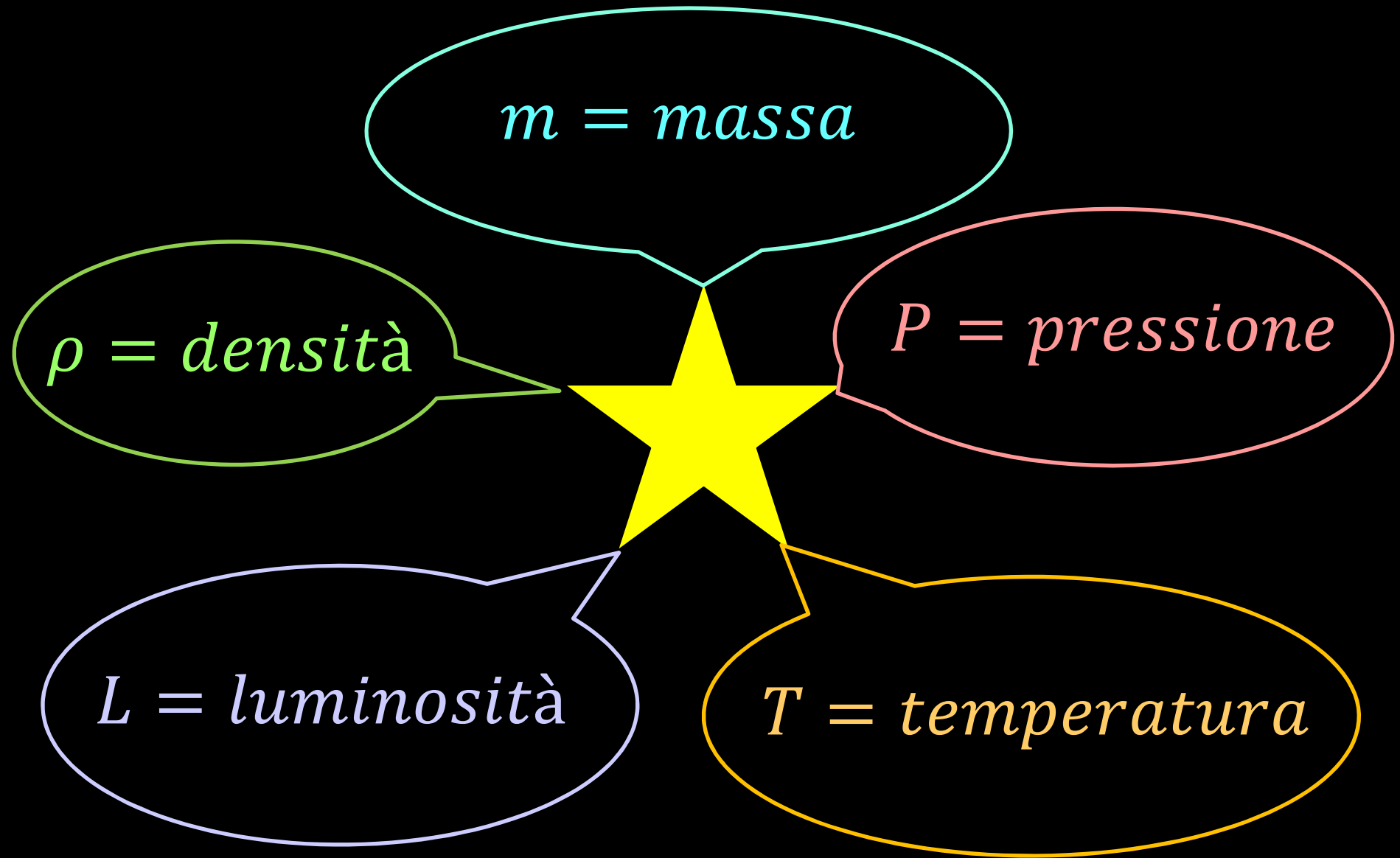
evoluzione







# Modelli stellari – equilibrio stellare:





# Modelli stellari – equilibrio stellare:

$m$

$\rho$

$L$

$T$

$P$

Equilibrio idrostatico:  $\frac{dP}{dr} = -\rho \frac{Gm}{r^2}$

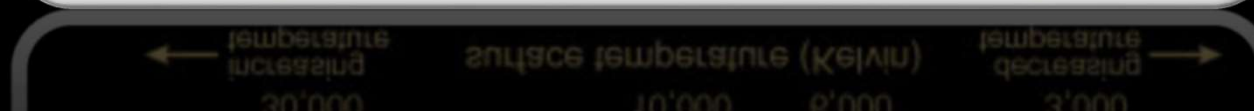
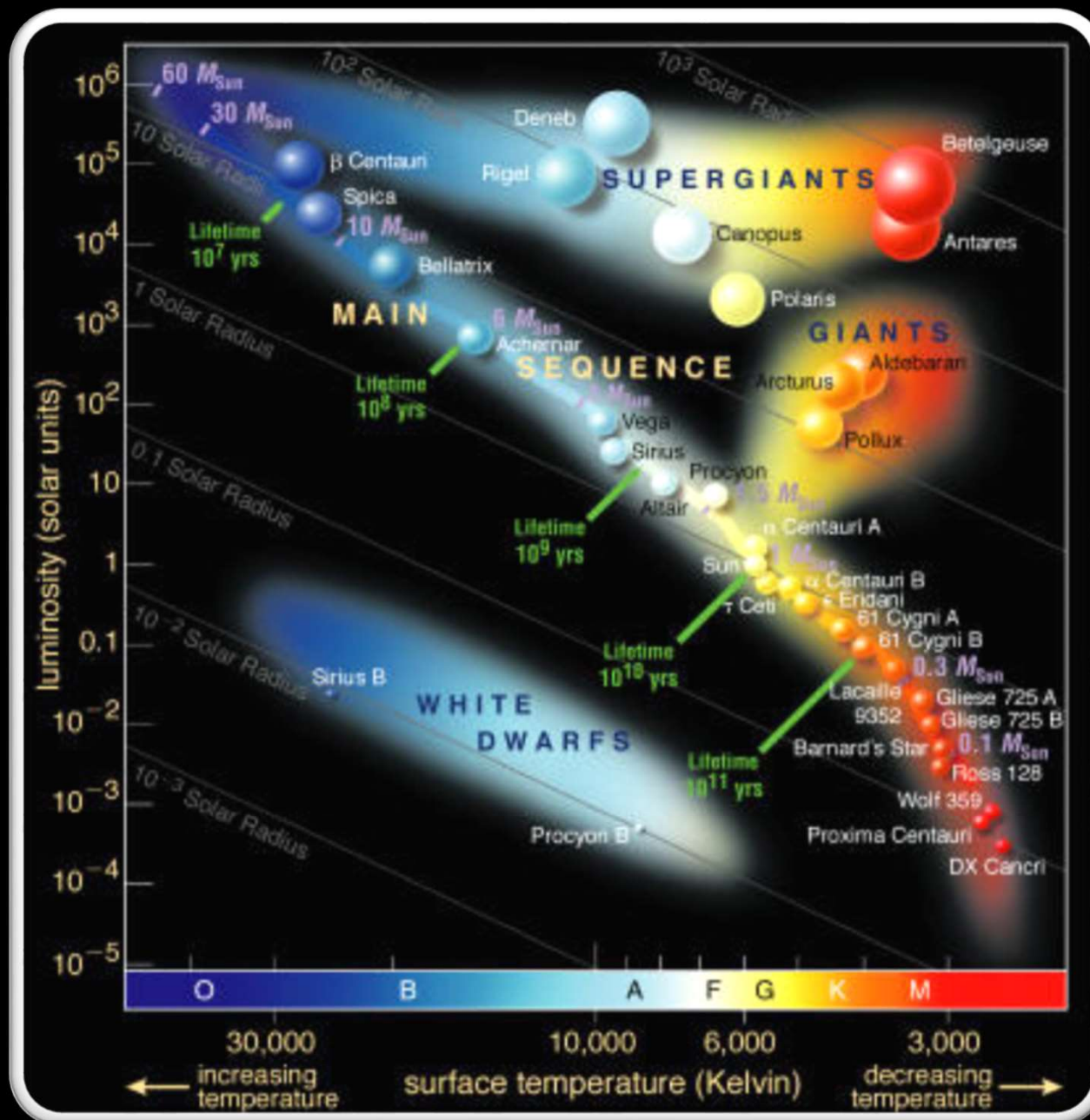
Densità:  
 $\frac{dm}{dr} = 4\pi r^2 \rho$

Pressione :  
 $P = P_e + \frac{\rho kT}{m_h \mu} + \frac{1}{3} a T^4$

Equilibrio energetico:  
 $\frac{dL}{dr} = 4\pi r^2 \rho \varepsilon_{nuc}$

Trasferimento di energia:  
 $\frac{dT}{dr} = \text{radiativo o convettivo}$







*Nebulosa della carena – formazione stellare*





*Ammasso aperto- NGC 3603*





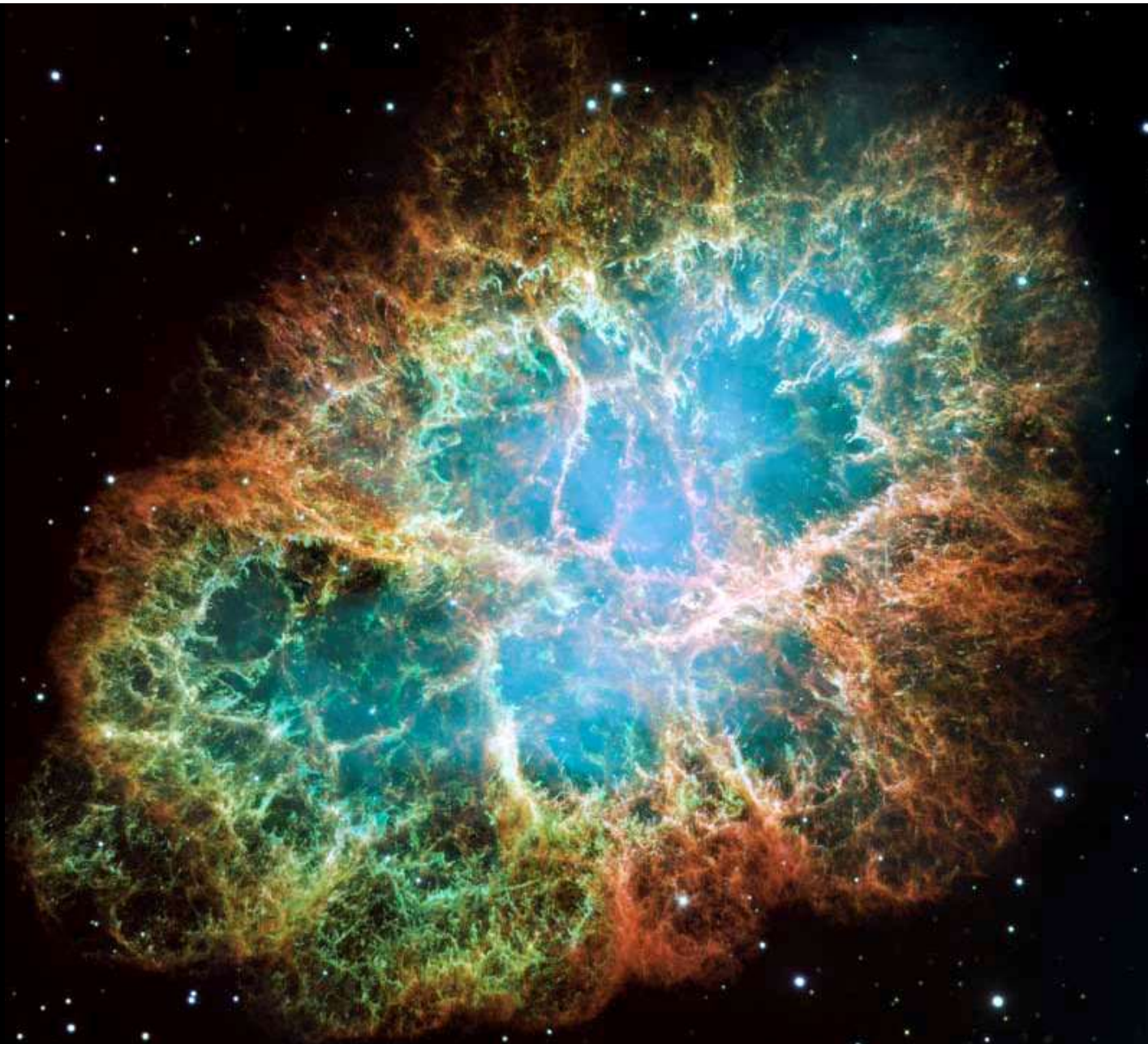
*Nebulosa della carena – formazione stellare*





*Ammasso aperto – NGC 290*





*Nebulosa del granchio - Resto di supernova*





*Ammasso globulare – Omega Centauri*





*Getto di gas nella nebulosa della carena*



*Nebulosa planetaria – NGC 6302*





*V838 Monocerotis – stella variabile*



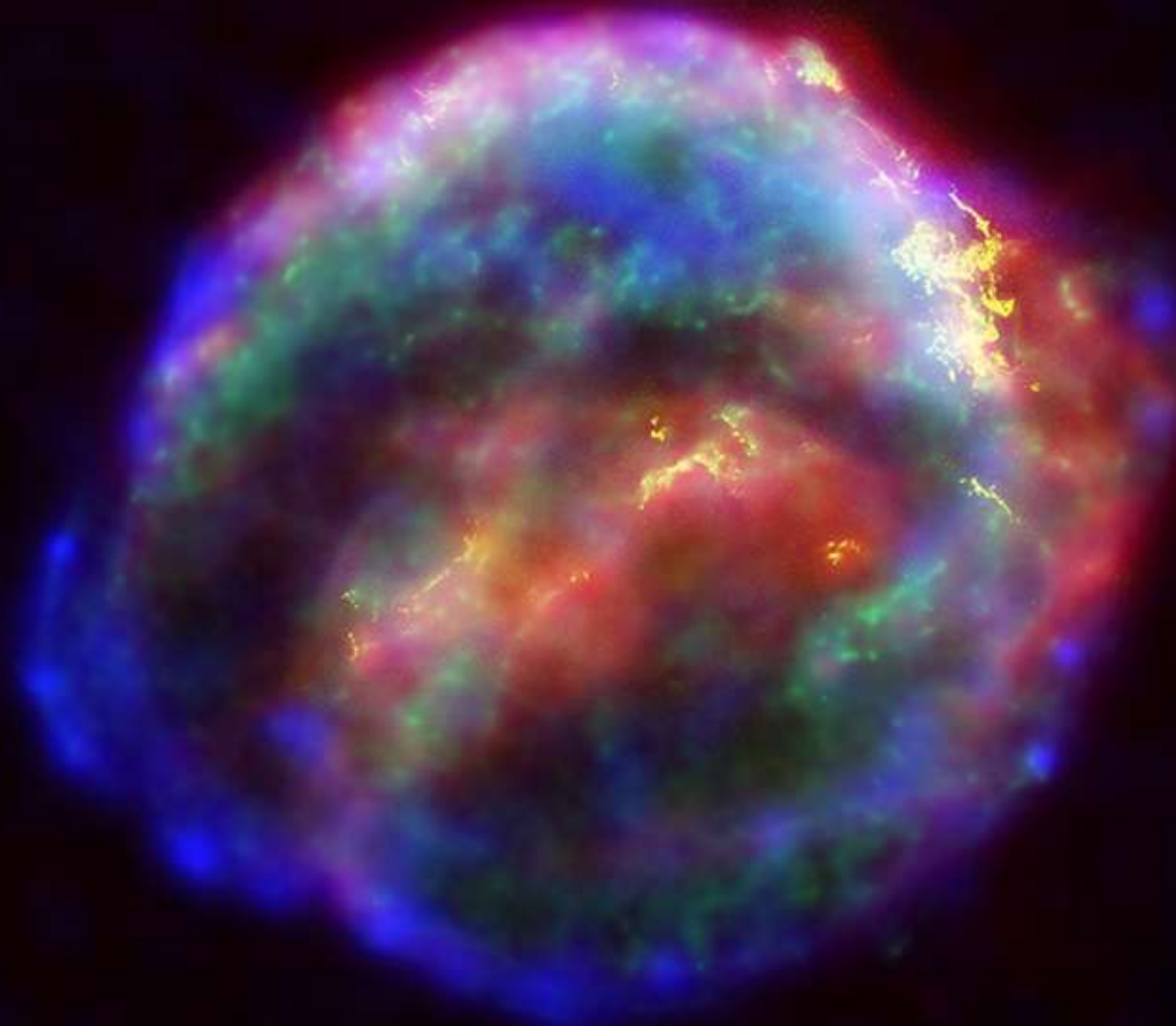


*Ammasso globulare – M80*



*Nebulosa planetaria - Occhio di gatto*





*Resti della supernova Keplero*

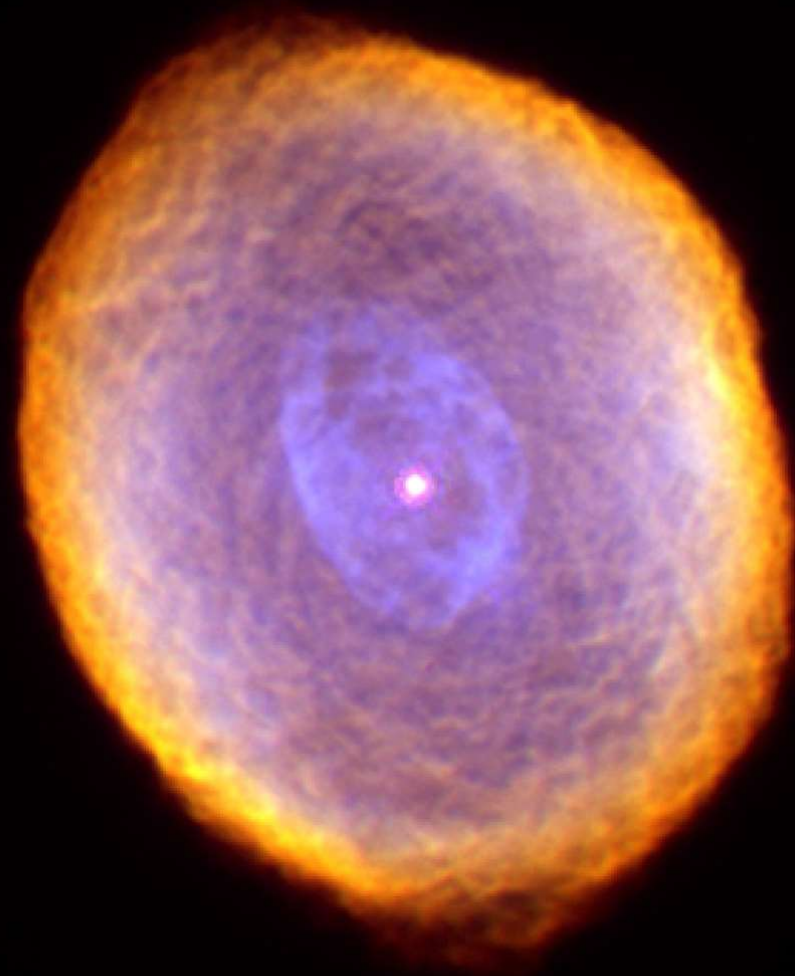


*Formazione stellare nella piccola nube di Magellano*



A deep-field astronomical image of a globular cluster, NGC 1846. The cluster is a dense, spherical collection of stars, with a high concentration of stars in the center and a more sparse distribution towards the edges. The stars appear in various colors, including white, yellow, orange, and blue, indicating different temperatures and stages of stellar evolution. The background is a deep black, punctuated by the light of the cluster's stars.

*Ammasso globulare NGC 1846*



*Nebulosa planetaria – IC 418*






*Nebulosa testa di cavallo – formazione stellare*



*Nebulosa planetaria - Clessidra*





*«La Chiocchetta per l'aia azzurra  
va co suo pigolio di stelle»*

*- Il gelsomino notturno - G. Pascoli*