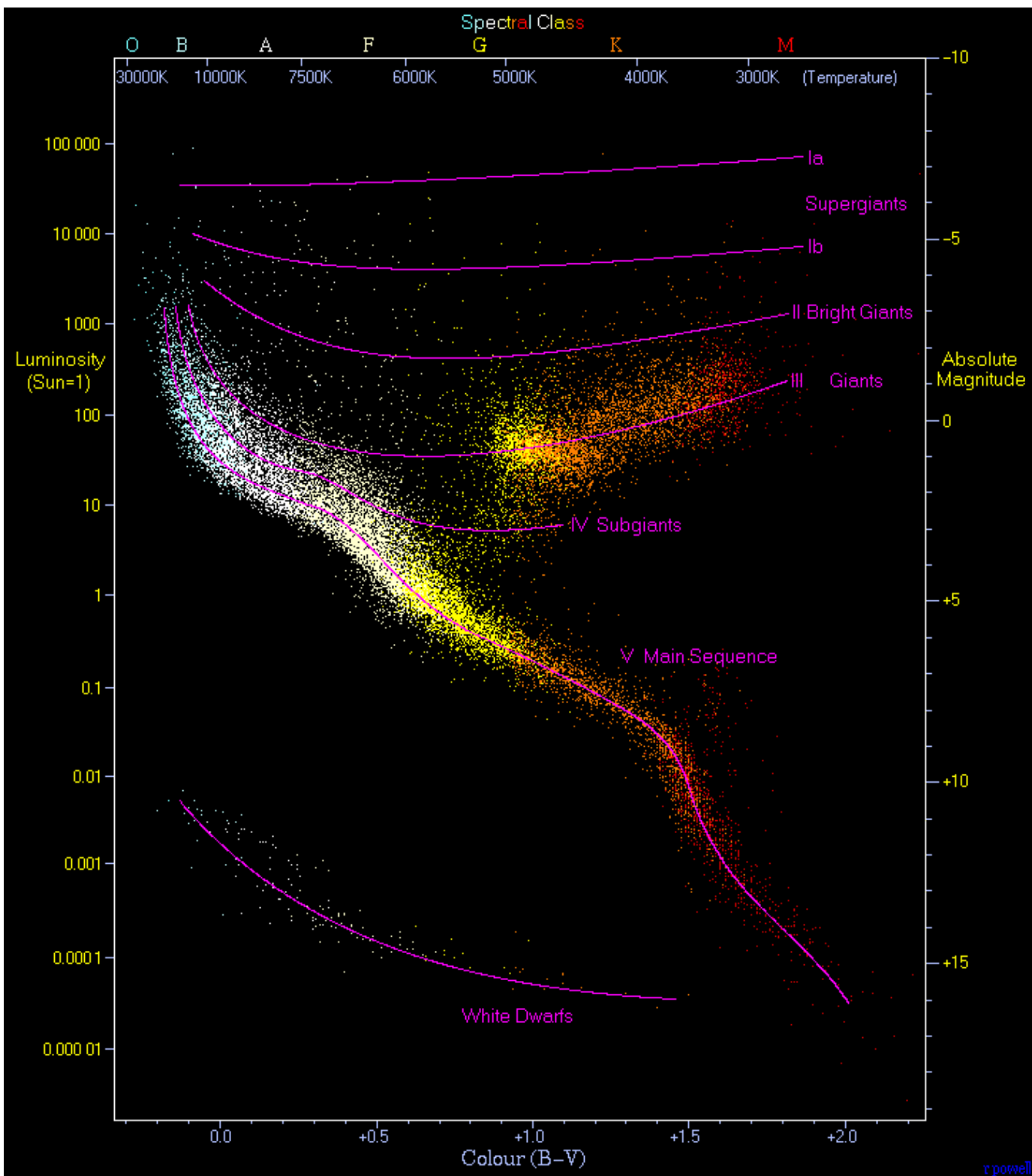
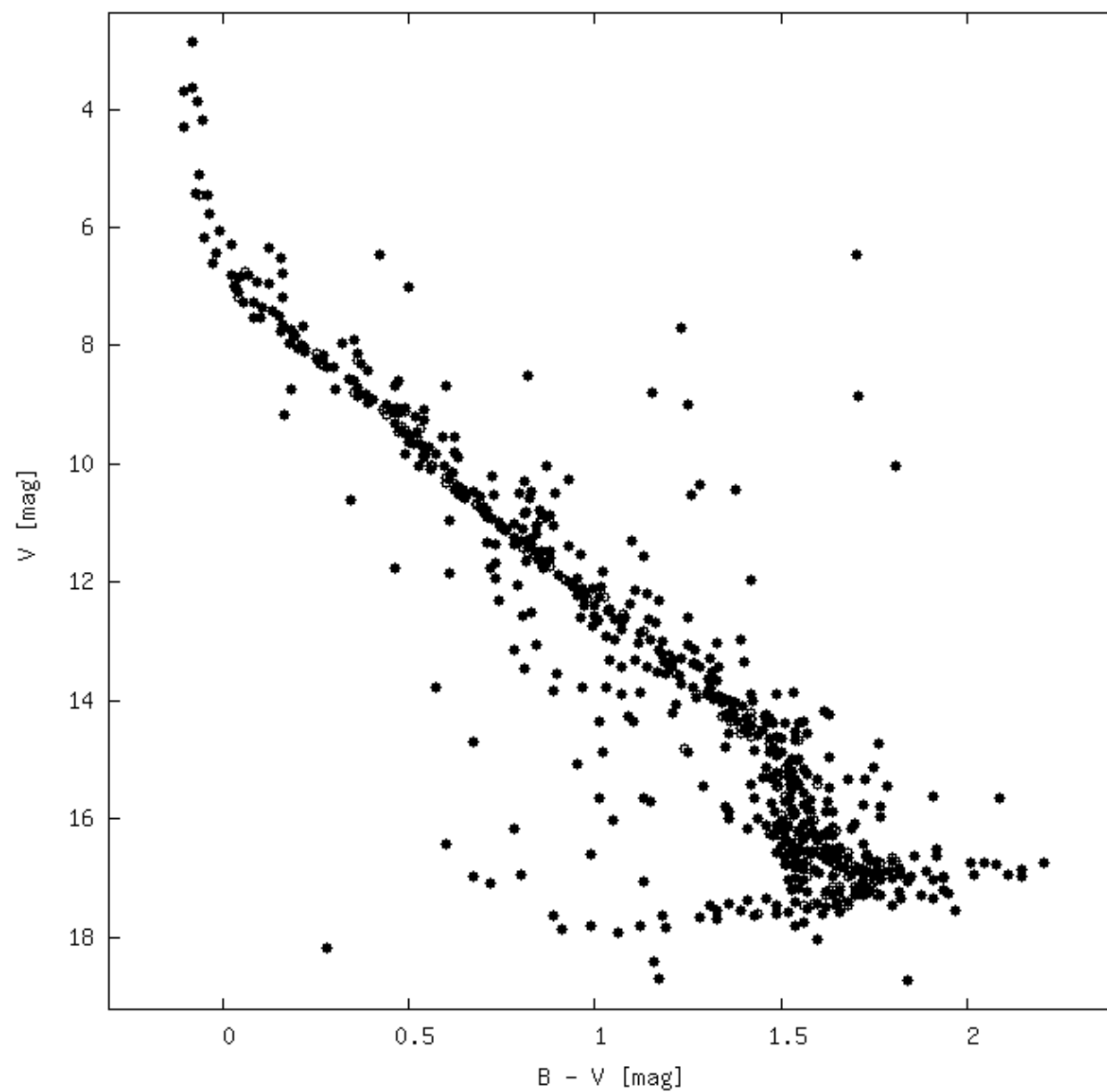


Introdução à Astronomia
Prof. Antônio Kanaan
Aula 5 – 07 maio 2007
O Sol como uma Estrela





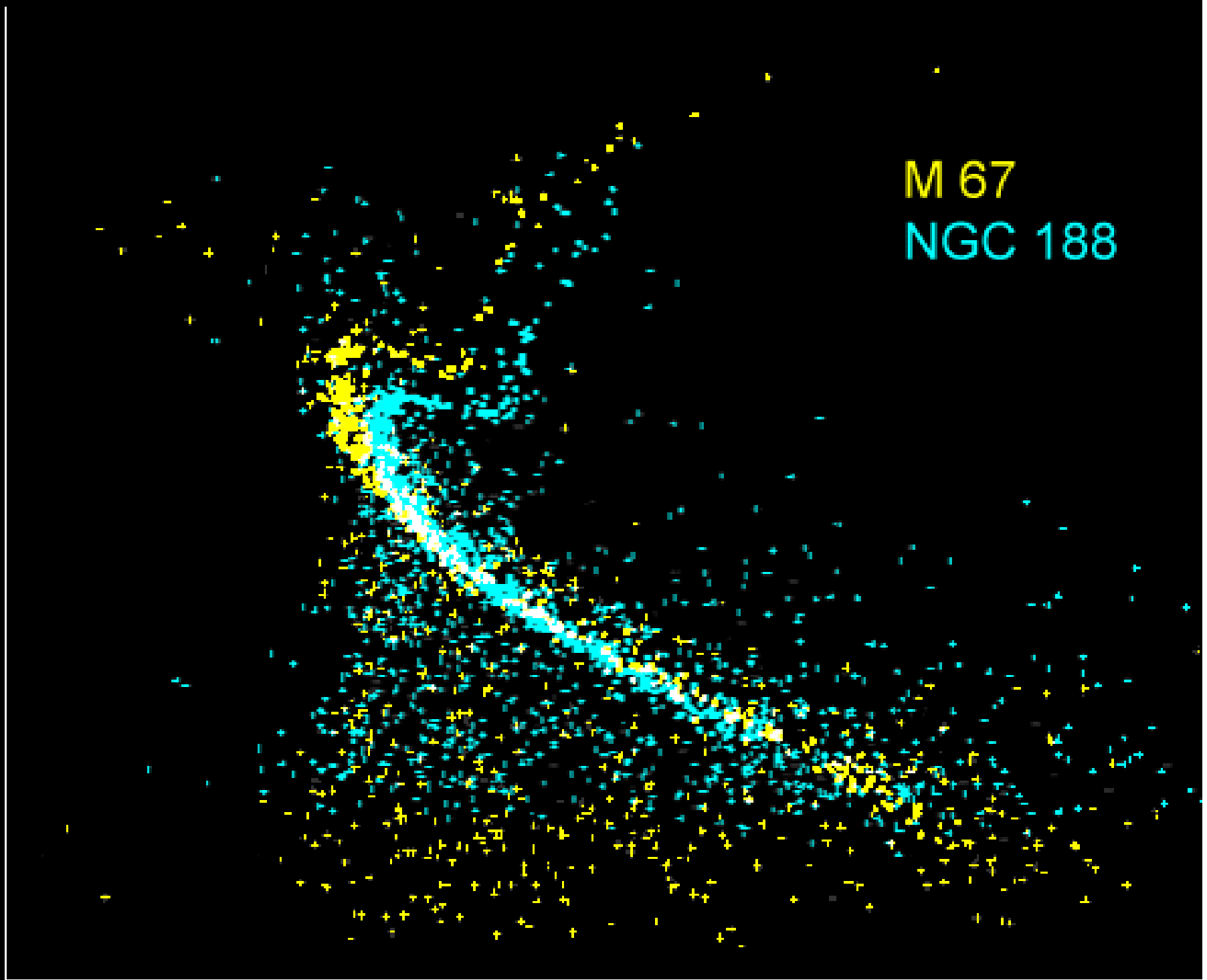
Pleiades



Absolute magnitude $\rightarrow$

M 67
NGC 188

$\leftarrow$ Temperature



luminosity relation also holds approximately for the giants and supergiants. We find several of them in binaries for which we can determine the masses. In Fig. 9.17 we show the mass–luminosity relation as seen for all well-determined masses in binaries. The exceptions are the red giants which for a given luminosity have generally smaller masses. In Volume 3 we will explain this result which at first sight appears very surprising.

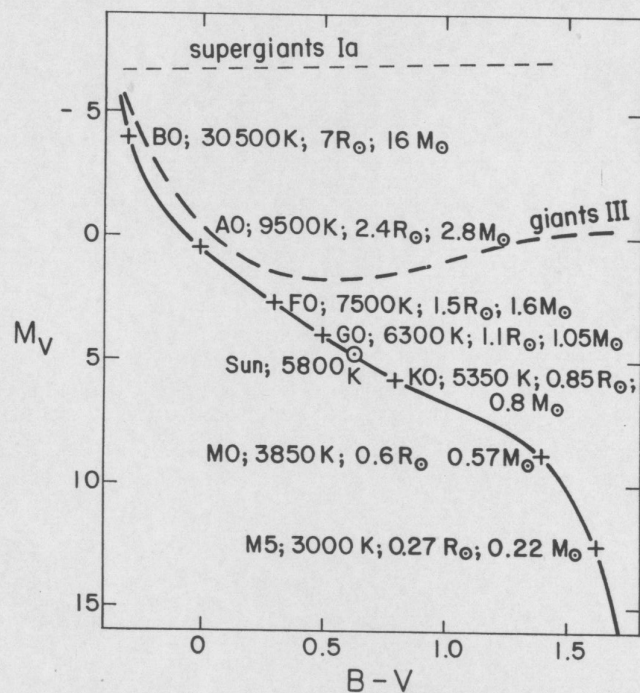


Fig. 9.16. The solid line outlines the main sequence in the color magnitude diagram. At the different points of the main sequence the masses, radii, and effective temperatures of the stars are given.

The dashed line shows the position of the giant sequence, and the dotted line the approximate positions of the brightest supergiants, called luminosity class Ia.

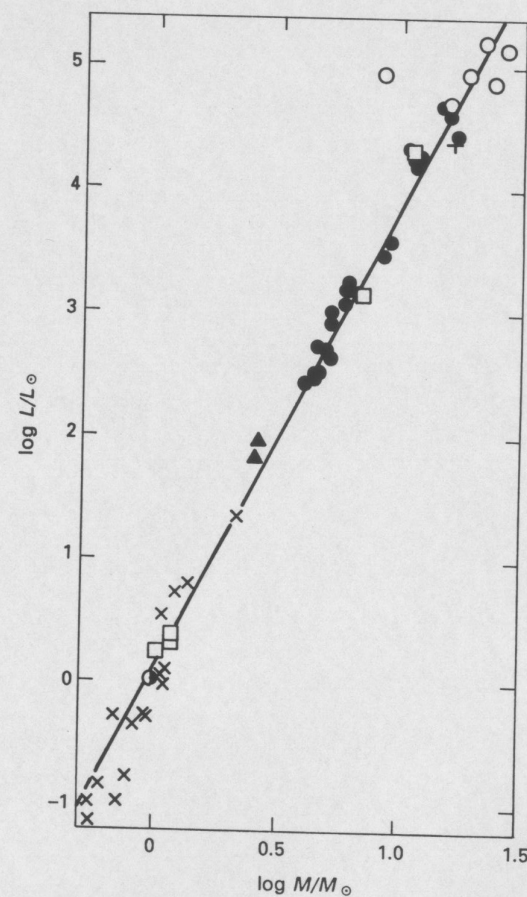
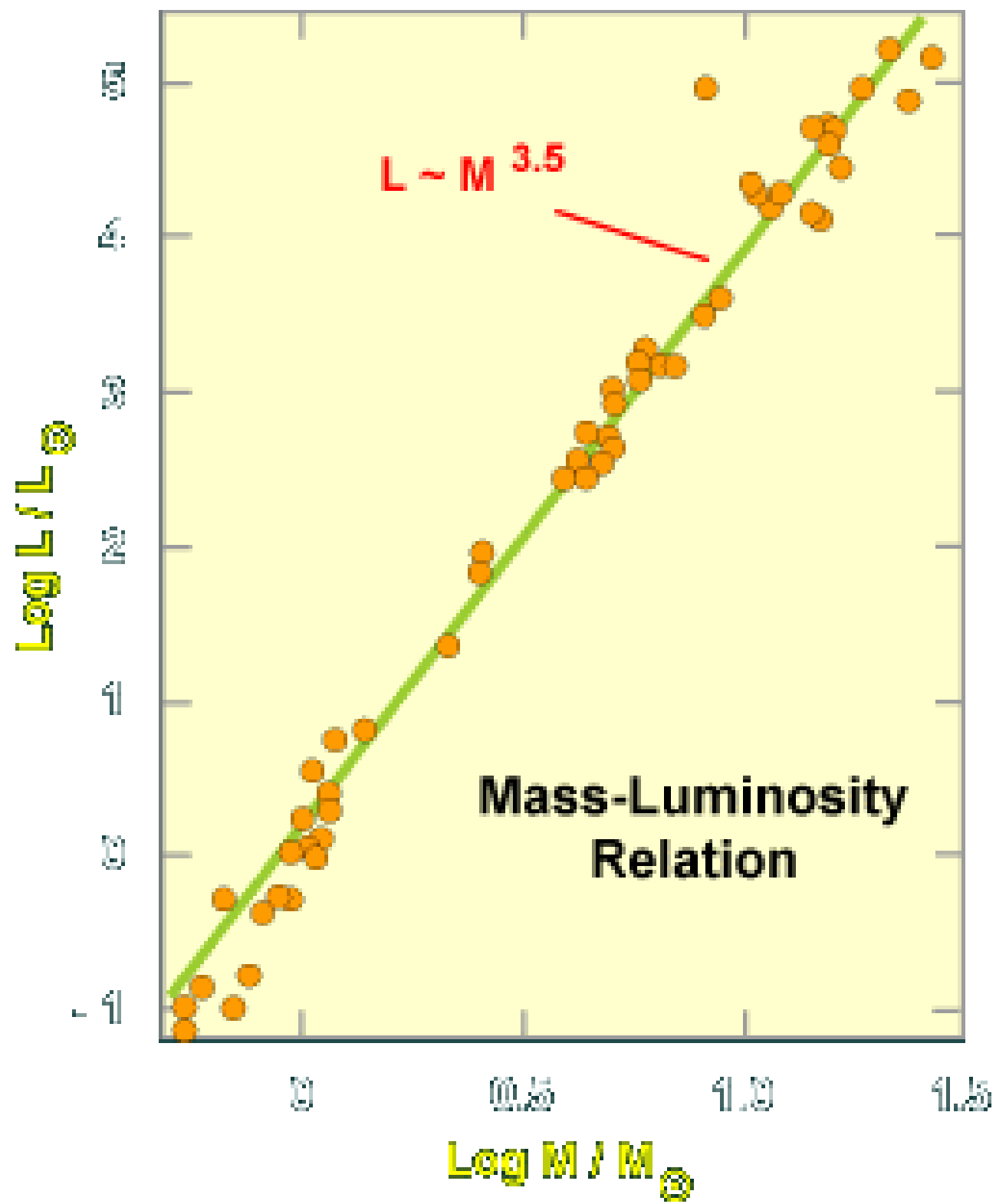
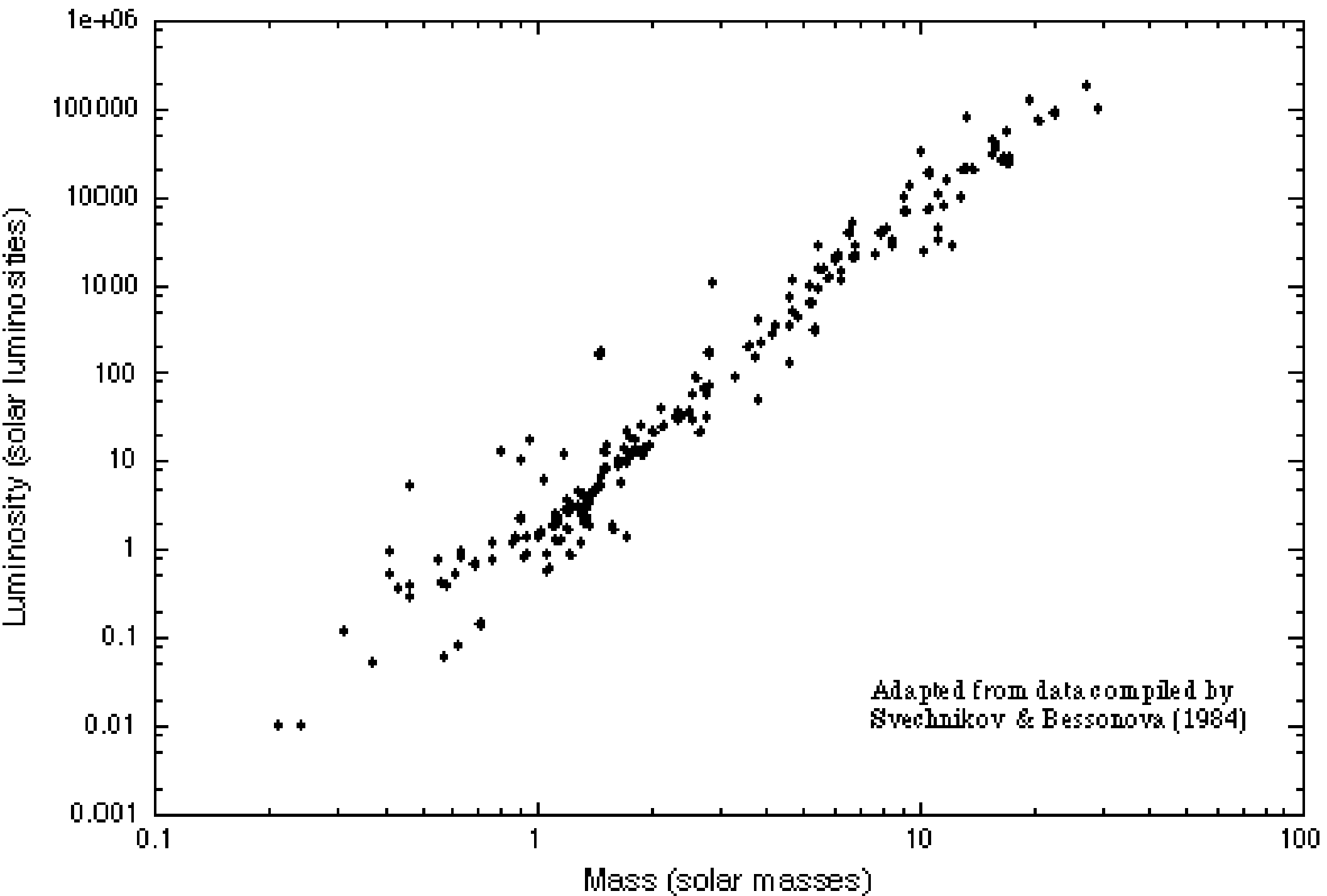
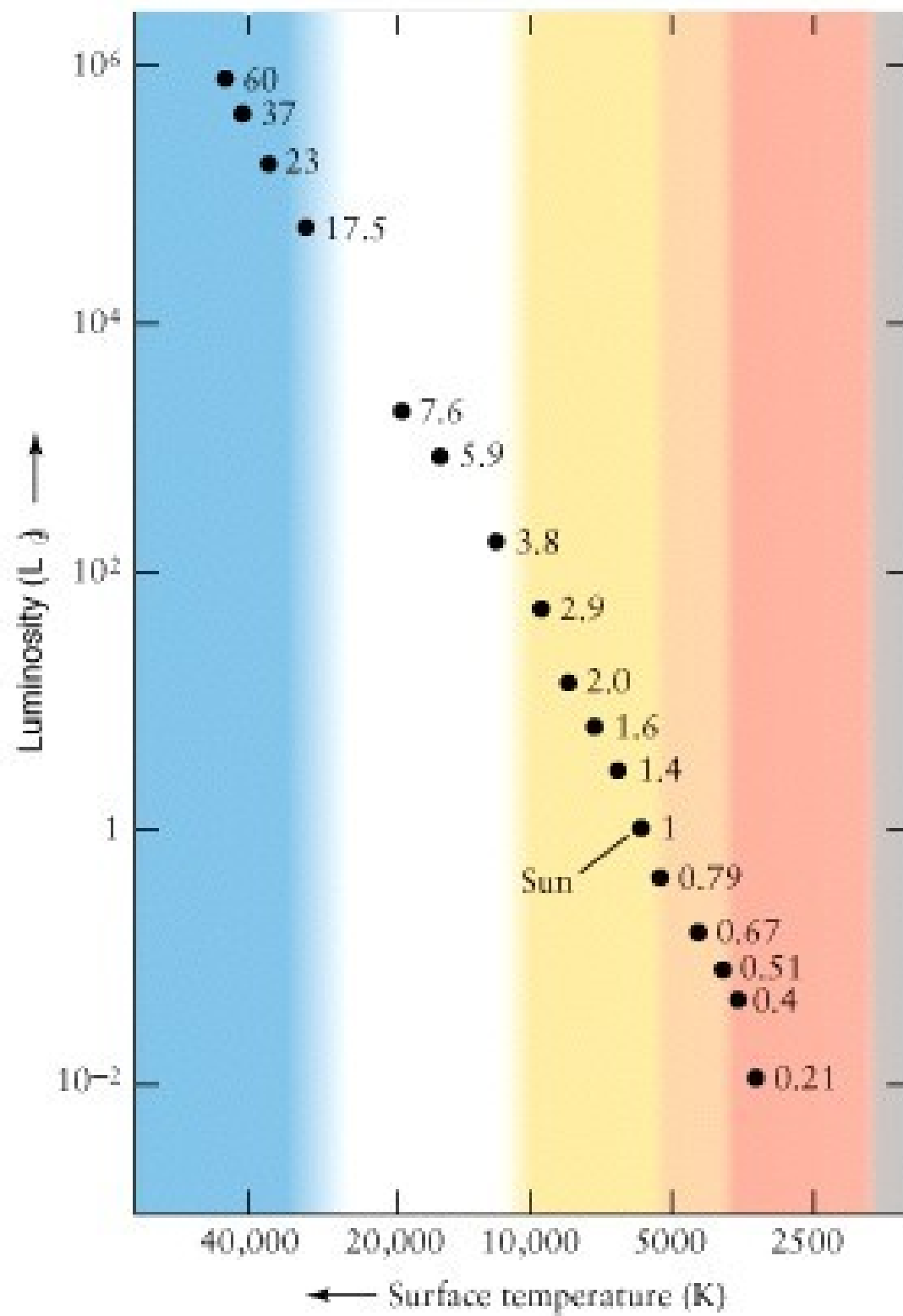


Fig. 9.17. The relation between stellar masses and their luminosities is shown for binaries with well determined masses, according to Popper (1980). The different symbols refer to different kinds of binaries. The open circles refer to O type binaries, the filled circles to O, B pairs, the $\times$ to visual binaries, and the triangles to giants. The open squares refer to resolved spectroscopic binaries.



Mass-Luminosity Relation for Main Sequence Stars





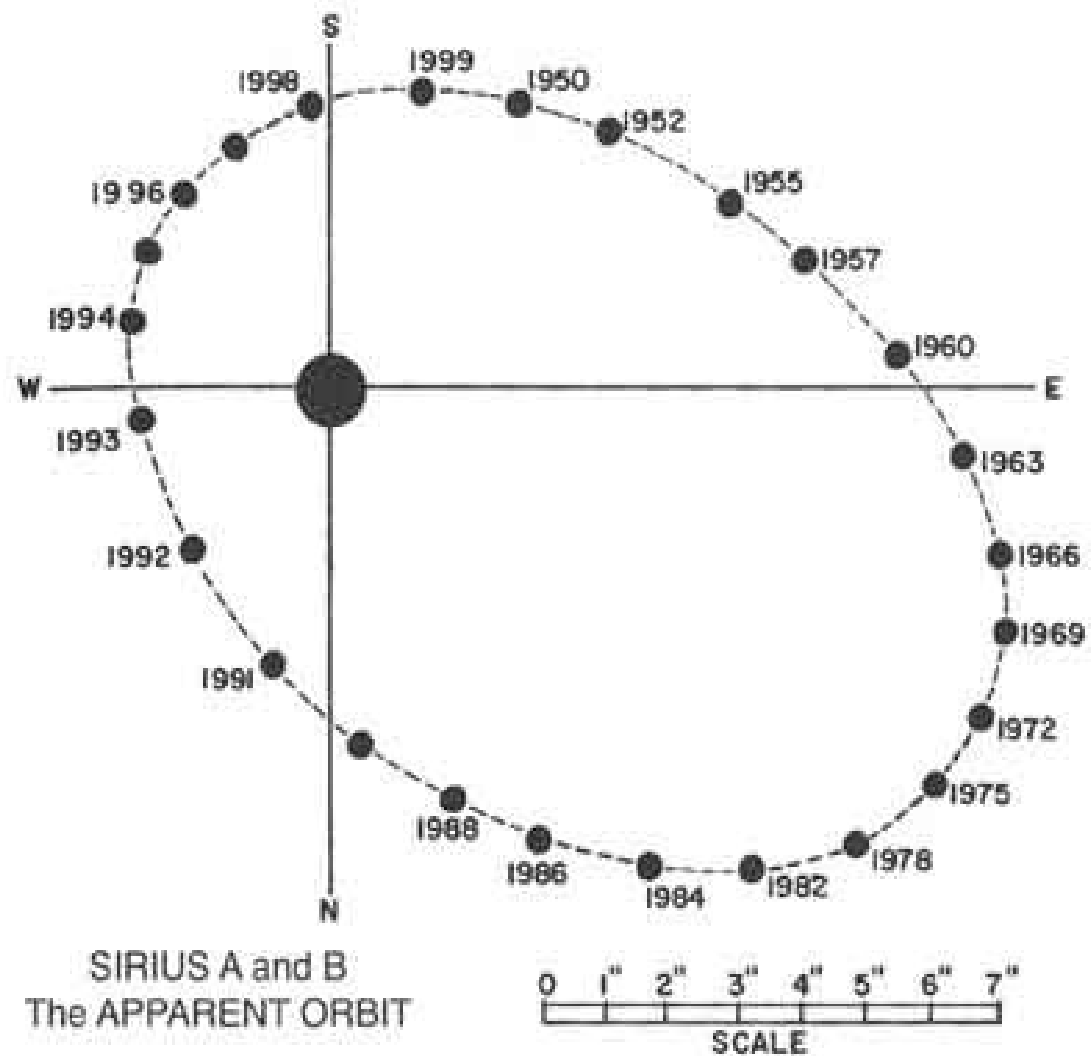
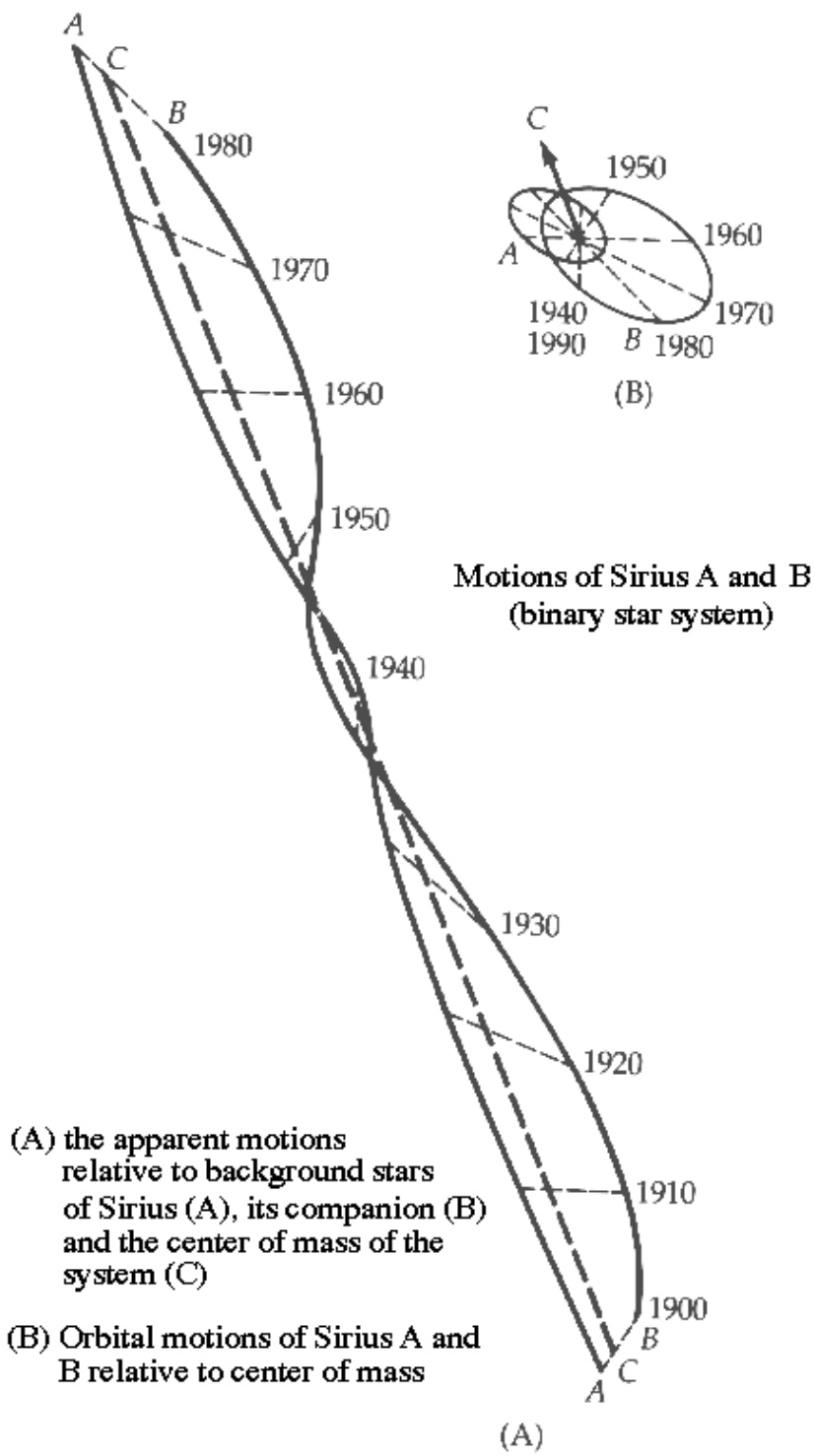
MASSAS

Como se sabe?

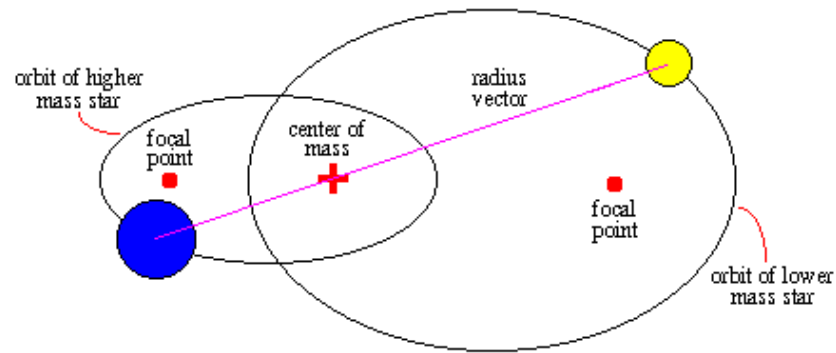
Leis de Kepler.

Assim como a paralaxe é quase tão boa quanto uma balança, mas poucas estrelas são tão próximas para vermos tudo que precisamos.



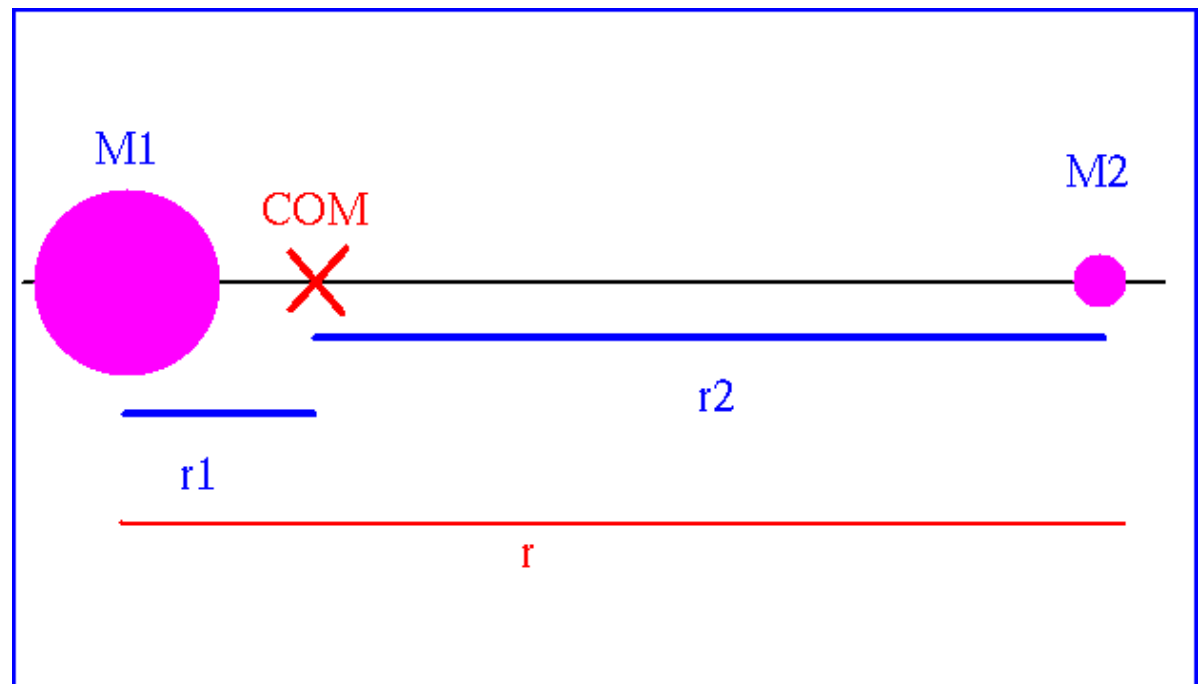


Binary Star Orbit



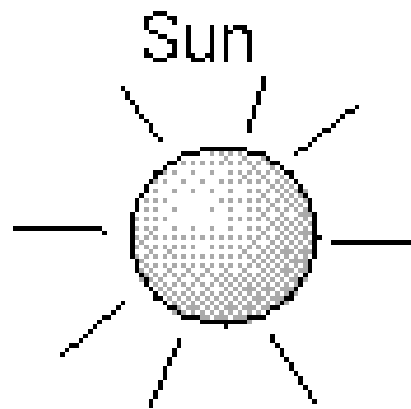
$$(M1+M2)P^2 = A^3$$

$$M1 * R1 = M2 * R2$$



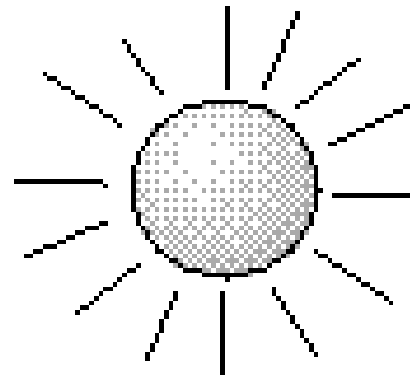
RAIOS

Luminosity is proportional to *fourth* power of temperature.



6000 K

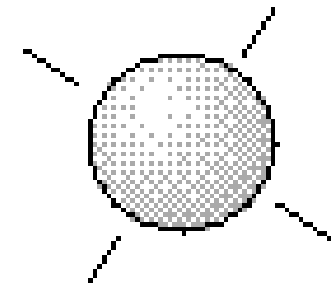
$$L = 1$$



12,000 K

$$L = 16$$

$$\left(\frac{12,000}{6000}\right)^4 = 2^4$$

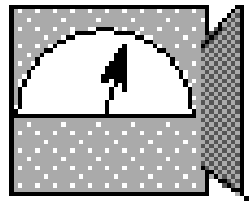


2000 K

$$L = \frac{1}{81}$$

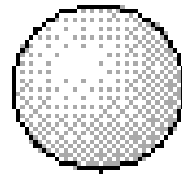
$$\left(\frac{2000}{6000}\right)^4 = (1/3)^4$$

Luminosity is also proportional to the surface area.



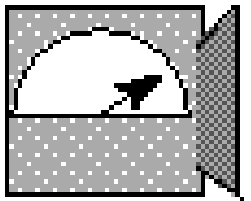
100 photons

Sun

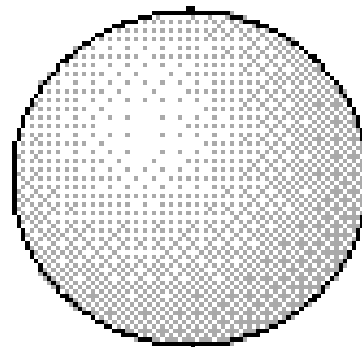


$R = 1 \text{ sun}$

$$\text{surface area} = 4\pi R^2$$



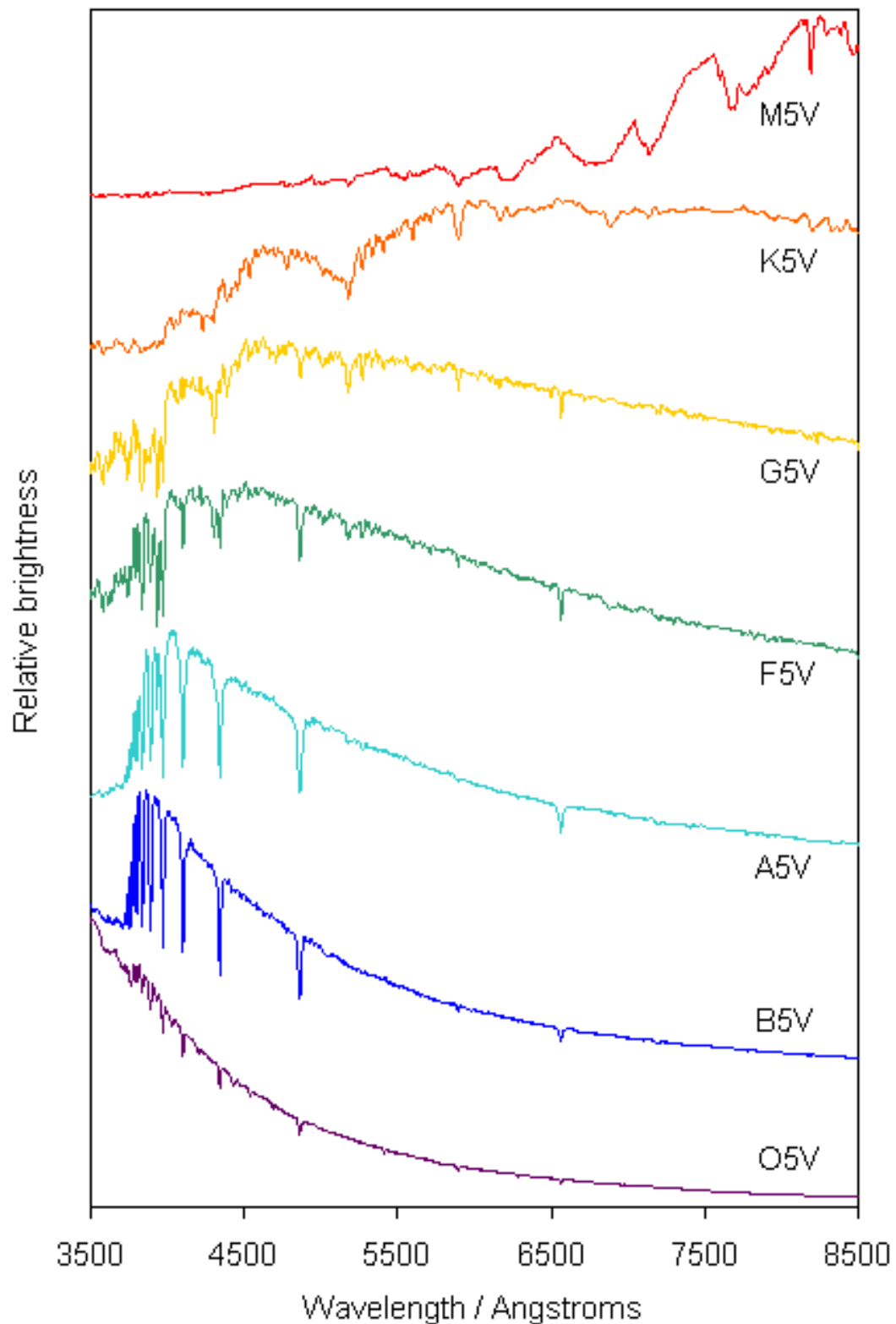
400 photons



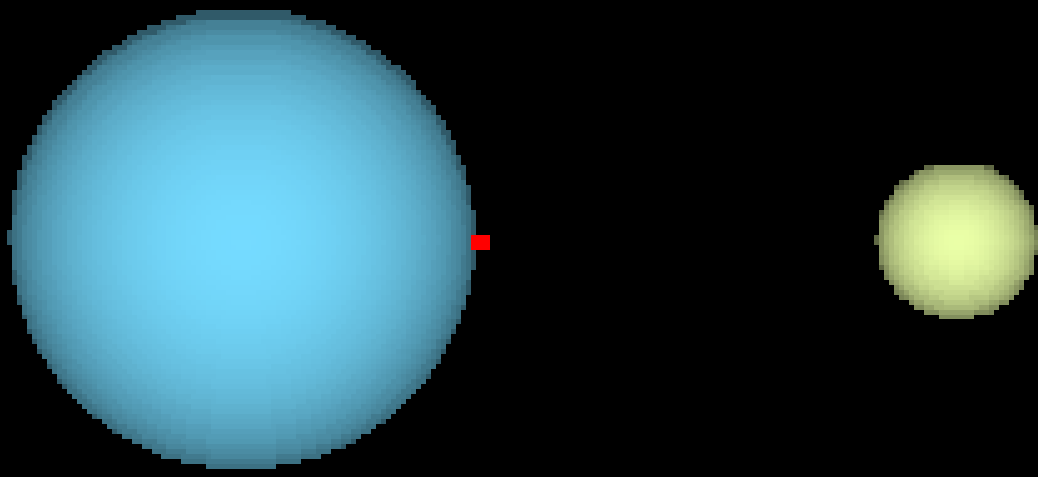
$R = 2 \text{ sun}$

$$\frac{\text{star surface area}}{\text{Sun surface area}} = \left(\frac{2}{1}\right)^2$$

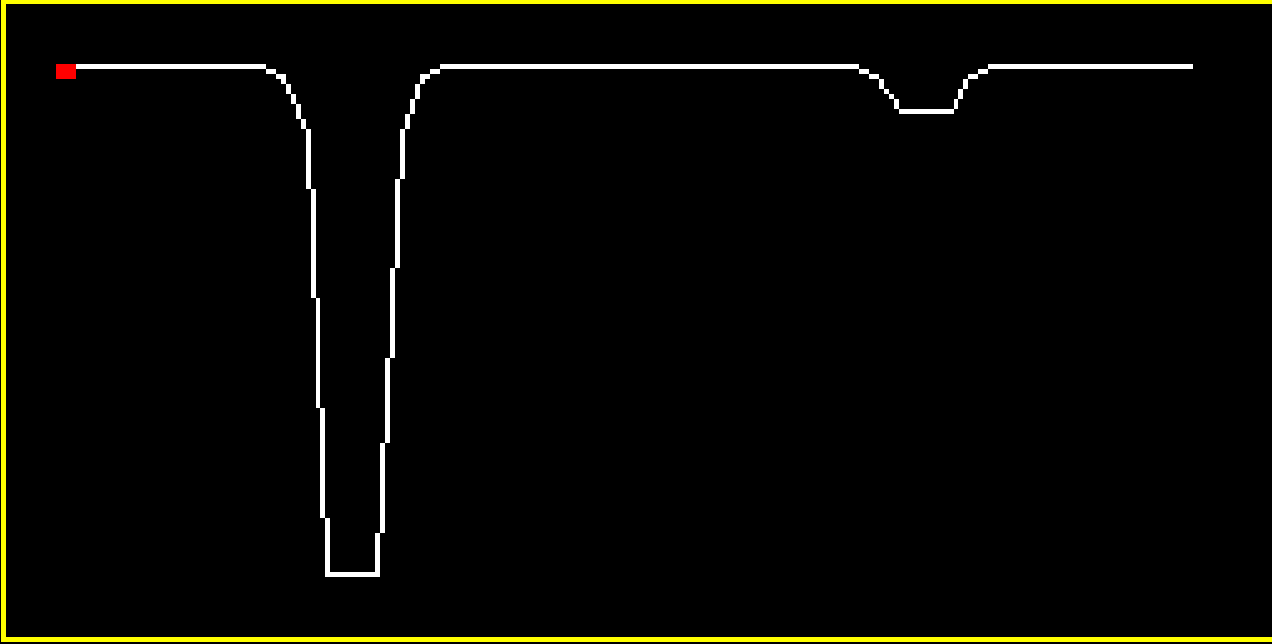
$$L = 4\pi R^2 * \sigma T^4$$

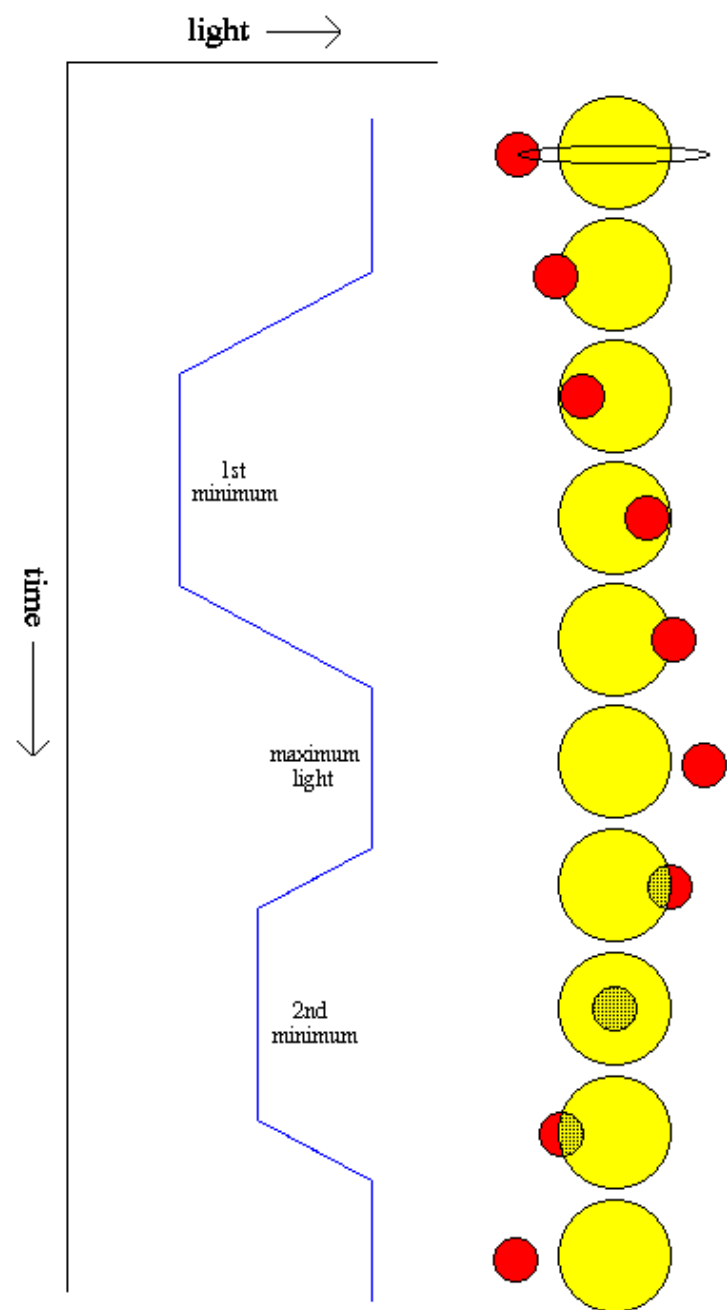


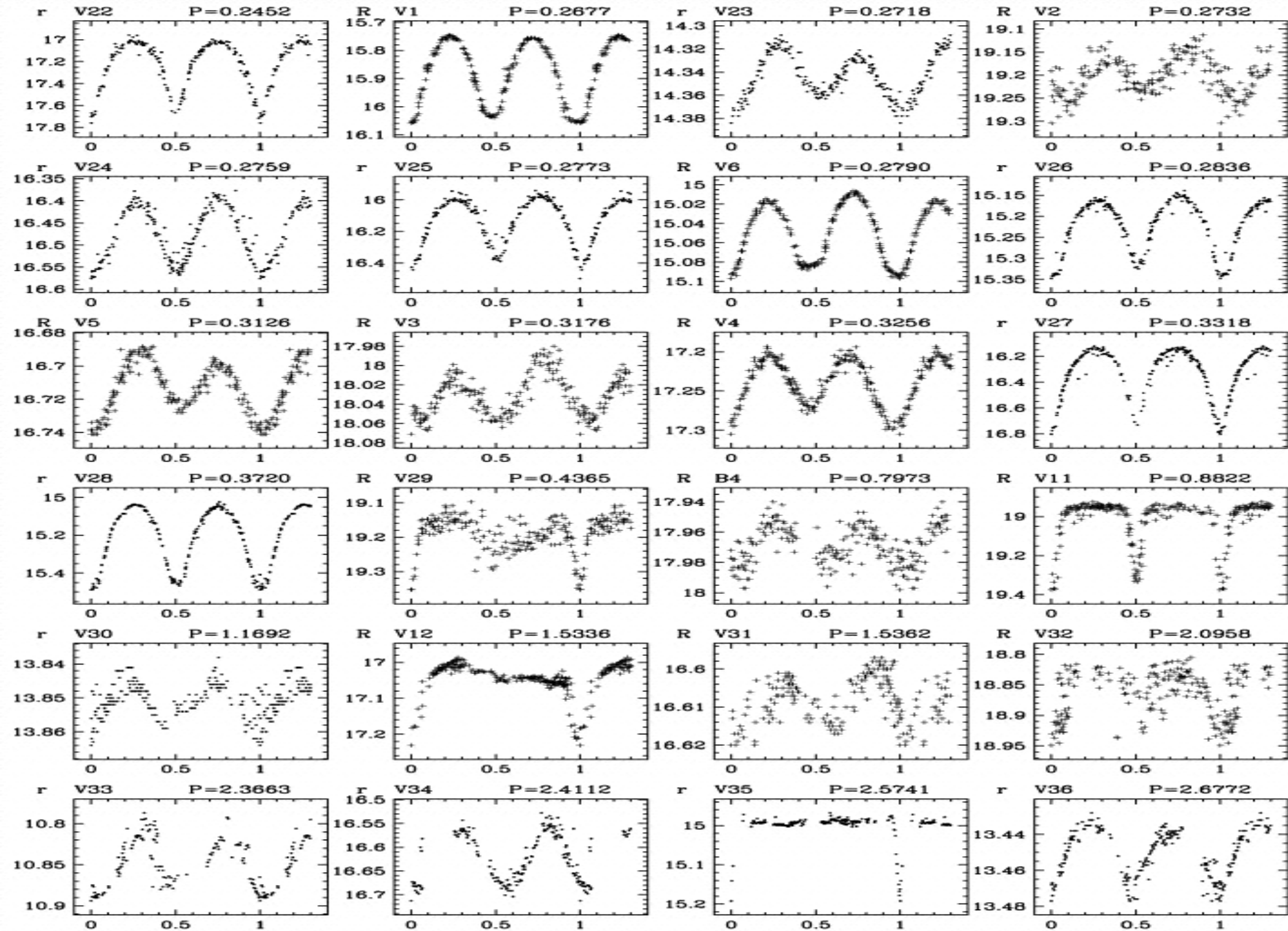
Eclipses:



Total Brightness







phase

