which have been attacked spectroscopically, the radii, masses and densities have been computed from the data thus obtained. From these results we obtain the surfaces of the stars and hence, having the luminosity, we arrive at a probable value for the intrinsic brightness or surface intensity. An example may, perhaps, be the best way to make clear the method of arriving at the luminosity of any star.

α Orionis has a parallax of 0″·03.

$$\text{Its distance from the earth therefore} = \frac{3{\cdot}26}{{\cdot}03} \text{ light years.}$$
$$= 109{\cdot}00 \text{ light years.}$$

The magnitude of α Orionis is 0·91.

Now we know that the light-ratio between successive magnitudes is $\sqrt[5]{100}$, or the number whose logarithm is ·4.

We have, therefore,

$$\log b_n - \log b_m = -\frac{4}{10}(n - m),$$

where b_n and b_m are the brightnesses, respectively, of stars of the nth and mth magnitudes. Taking a tenth magnitude star as the unit, we get

$$\log b_n = -\frac{4}{10}(n - 10).$$
$$= 4 - 0{\cdot}4\, n.$$

Using this formula, we get for the light of α Orionis

$$\text{log of brightness of } \alpha \text{ Orionis} = 4 - 0{\cdot}4\,(0{\cdot}91)$$
$$= 3{\cdot}636.$$

Now the luminosity is equal to the light multiplied by the distance squared.

Hence, in terms of the sun's luminosity, we have

$$\text{Luminosity of } \alpha \text{ Orionis} = \frac{\log^{-1} 3{\cdot}636 \times [109 \times 365 \times 24 \times 60]^2}{\log^{-1} 14{\cdot}52^* \times [8]^{2*}}$$
$$= 670 \odot$$

where $\odot$ denotes the luminosity of the sun.

* These are obtained from taking − 26·3 for the sun's magnitude and 8 light-minutes for its distance from the earth.