

OPTICS. – *The speed of light and its dependence on the movement of the source of light.* Note ⁽¹⁾ by M. **La Rosa**

Mr. Salet ⁽²⁾ believes he can say, on the basis of certain calculations he has made, that not only is the speed of the light source (mobile star) not added to that of the light, but that it is not even added as a small fraction ($< \frac{1}{200}$) of it.

Mr. Salet unfortunately indicates neither the broad outlines of the idea which governed his calculation, nor the numerical data which was used for this; so that, in an attempt to examine the merits of this assertion, I must endeavor to compensate for this absence while following the approach suggested by my theory and take advantage of *data* provided to me by some qualified people with whom I spoke for this purpose.

The *only* explicit and concrete example that Mr. Salet invokes is that of Algol, and he merely states that the star of this “brilliance does not vary from one tenth in magnitude between the abrupt variations of the successive minima, that is to say, during a period when the radial velocity varies in a known manner. *Given the distance of star, we deduce* (3) that speed of light is not altered by more than $\frac{1}{200}$, of the value the speed of the source”. In this short and categorical assertion are all the condensed *conclusive arguments* which should persuade us to give up forever the ballistic principle, even with “very small distances”.

I could not say exactly what value Mr. Salet wanted to give to the opposition, that he highlights, among the ways to vary brightness and the ways to vary speed. But if this opposition were the fulcrum of his objection, it would be enough to point out here what I already wrote in the answer that, on a preceding occasion, I made to Mr. Salet, knowledge that my theory does not only not deny, but cannot not admit admitting the existence of light changes due to eclipses, that is to say, the existence of variables of the discontinuous type; and in this case, the phenomenon occurs in a way perfectly

(1) Meeting of 18 May 1925.

(2) *Comptes Rendus*, **180**, 1925, p. 647

independent of the “ballistic effect” and, consequently, with methods which are not subject to the rules rising from this theory, as regards the values of Kb as the connection between *changes in light and radial speed*.

But let’s look more closely at the specific case of Algol. I will initially point out that the variation of light of this star can be interpreted as the result of two changes, one by abrupt jerks, and the other of a fuller, smooth nature.

In addition to the first change, where one is brought back to the usual assumption of the eclipse, there is thus a second to explain.

And to that, my theory lends itself very well, provided that one can suppose that the magnitude Kb , which plays a so important part in the phenomenon of “variability”, satisfies the conditions

$$0.02 < Kb < 5$$

while reminding however, in the case of Algol, which is very near one of the extremes, that it is the *small* magnitude of change in question.

It is only when the calculation of Kb would lead to values very close to $\frac{1}{2}\pi$ (a value in the neighborhood where the changes of light are very large) that the theory would be questioned by observation; because then the variation of light should be *of a continuous type* and keep pace with speed changes.

And here I cannot even say exactly if it is the point there where the thought of Mr. Salet stopped, that is to say, if he estimates that the calculation of Kb leads properly to provide great changes of light of the continuous type (which are not observed in reality) with changes of speed to a parallax operation.

If it were thus, I would point out that the rather great uncertainty which still reigns in the field of parallax measurements, and just as in those of radial speed, we cannot attribute a *value* or serious agreement with the discrepancies between theory and numerical proof.

In the case of Algol, of which we will occupy ourselves, the data which I could procure, in respect to the parallax (completely essential element for the calculation of Kb) are:

$$\pi = 0''.007 + 0.027 \quad (\text{Russell})$$

$$\pi = 0''.122 + 0.026 \quad (\text{Flirt})$$

$$\pi = 0''.037 + 0.025 \quad (\text{Chase}).$$

A more recent determination, made according to the photographic method of Messrs Lee and Joy at the Yerkes Observatory, gave

$$\pi = 0''.027 + 0.010.$$

But I was also communicated with, quite recently, this other data:

$$0''.052 + \quad \quad \quad ({}^1).$$

As one sees it by the whole of the figures that we have just transcribed, we are far from possessing that *factually certain* element which would enable us to carry out a *quantitatively final* decision, and to scorn the many beautiful confirmations which my theory has largely collected while giving an account in one general manner, and for the first successful time, of the photometric phenomena, spectroscopic and statistics of variable stars.

Later, when it is possible to measure with a *sufficient exactitude* the parallax of certain variables, one will be able to institute the quantitative control that Mr. Salet claims; and perhaps one will find whereas my theory indicates the simplest way and most direct for the measurement of the stellar distances.

(1) As curiosity, we can try to calculate the value of Kb which it is possible to draw from the figures indicated above. If we take for π the value $0''.027$ (allowed like most approximate), the distance Algol-Earth appears equal to 121 light-years, and, consequently, the value of K is $1.54 \cdot 10^{-4}$. And as b is $1.3 \cdot 10^{-4}$ for the principal star and $3 \cdot 10^{-4}$ for the companion, we find for Kb the values: 2 for the principal star, and 4.62 for the companion. We should therefore conclude that the companion does not give rise to a change of light, and that the principal star gives rise to a small amplitude change. But the uncertainty of π does not make it possible to trust these results.