

NOTES FROM PACIFIC COAST OBSERVATORIES

OMICRON CETI A VISUAL BINARY STAR

Under date of October 6, 1923, Dr. A. H. Joy, of the Mount Wilson Observatory, wrote to me that \circ *Ceti* had a strange sidewise displacement of the peculiar spectrum of bright hydrogen and helium lines which comes up at minimum. "The displacement is along the length of the slit and there appears to be no way of explaining it except by assuming that the star has a tail or asymmetrical shell on one side or that there is a companion star distant about 0.25" in position angle 135°." He expressed the hope that I might examine the star with the 36-inch refractor.

An observation of any value on such a phenomenon as this appeared to be must be made when the seeing is very good, and it was not until October 19th, at midnight, that I considered the conditions good enough for the test. Turning the telescope upon the variable, I was amazed to see a companion one-half to three-quarters of a magnitude fainter than *Mira* about 1" south-following it. The companion would be an easy object in a 12-inch telescope. It appeared to be blue-white in color, and this can only in part be a subjective, or contrast effect for, according to Joy, the companion has a spectrum of early type with excessively strong $H\beta$ and $H\gamma$ and fairly strong $\lambda 4471$ and H and K of calcium.

Measures on October 19th, when according to Shapley the star was exactly at minimum, with the apparent visual magnitude of 9.2, and on three later nights give the following mean result:

$$1923.824 \quad 130.^{\circ}3 \quad 0.''90 \quad \Delta M = \frac{3}{4} \text{ mag.}$$

The companion is considerably more distant than Joy had expected but is very nearly in the position angle he gave. The credit for its discovery is obviously due to him.

It should be added that the variable star image shows no peculiarity of form, differing from other star images of the same magnitude only in its color. When the focussing-tube

is drawn out about 4 cm. beyond the normal stellar focus the variable shows a small, sharply defined, red disk and the companion is not clearly visible.

How the companion escaped earlier discovery is a question that arises at once. The variability of *o Ceti* was discovered by Goodricke in 1596 and the star has probably been examined more or less carefully by almost every astronomer from that time to the present day. Burnham measured the distant companions (the fainter one of which he himself discovered) with the 18-inch Dearborn telescope in October, 1877, and with the 36-inch telescope in September and November, 1890. *Mira* was nearly as bright as 6.0 magnitude at the earlier date and still brighter in the autumn of 1890 and it is perhaps conceivable that the companion even at its present brightness and angular distance might have escaped his notice. On January 15, 1903, in the course of my double star survey, I examined the star with the 36-inch under fair observing conditions. The variable was near minimum brightness, Stebbins recording the magnitude as 9.0, in January, 1903, and my observing book shows that I discovered three new pairs that night and measured more than 20 other pairs, many of them considerably more difficult than *o Ceti* is at present. It is hardly credible that the companion could have escaped notice if it had then been as bright and as far from its primary as now.

Again, on December 17, 1905, Professor Eric Doolittle measured the distant companions, estimating the variable to be of 7.2 magnitude. His note reads "0.4 is easily separable but there is nothing peculiar about the appearance of *o Ceti* except its deep red color."

Finally, Professor Barnard wrote to Dr. Adams, on December 28, 1921, that he had observed *Mira* on the meridian on the preceding night when "the seeing was, say, 3 on a scale of 5. It was not good enough to allow me to see the stellar disk either in *Mira* or the star following (B)." *Mira* was again near minimum brightness, Barnard's estimate making it "perhaps 2/10 m. less than the following star (B) which is white."

**Pub. Univ. of Pa. Astron. Series*, 4, 19, 1921.

The observing conditions were evidently not very good and Barnard's attention was mainly directed upon the red-focus disk, but even so it is hard to understand how the companion could have escaped Barnard's eye.

The pair is unquestionably a binary system for the annual proper motion of the variable is $0.''23$ in about 186° . It may be in rapid orbital motion and just at present at its maximum angular separation. Whether the companion is also a variable star remains to be determined, but the probabilities do not favor this explanation.

It is apparent that this discovery affects the interpretation of all phenomena hitherto observed in *o Ceti* at or near its minimum brightness. The light-curve, for example; for, when *Mira* is at minimum the observed apparent magnitude (9.2 in the present minimum) must be corrected by approximately half a magnitude to allow for the effect of the companion, provided the latter does not also vary in brightness. When the variable is bright, the companion's share in the integrated light is, of course, negligible. The range of variability is therefore greater than has been supposed.

Again, as Joy points out, by reason of its early spectral class and consequent difference of color index, the companion must be considerably brighter, *photographically*, than *Mira*, and the observed spectrum must be that of the companion rather than that of the variable—"on our spectrograms hardly a trace of the M-type spectrum remains after the star has passed below magnitude 9.2." This remark doubtless applies to the spectral peculiarities observed at earlier minima, unless the companion is also a variable.

November 12, 1923.

ROBERT G. AITKEN.

THE SPECTRUM OF R CORONÆ AT MINIMUM

The irregular variable *RCoronae* was observed at Mount Wilson at intervals in 1922 in the hope of finding some change in its spectrum. During this time the brightness was nearly