

TWO NEW FAINT GALACTIC STAR CLUSTERS

BY CLYDE W. TOMBAUGH

In the course of the Trans-Neptunian planet search survey with the 13-inch Lawrence Lowell Telescope, I recently came upon two faint, open, galactic star clusters.

The two clusters are actually within two-thirds of a degree of each other. Their positions, 1935 Epoch, are:

$$\begin{array}{ll} \text{No. 1} & \left\{ \begin{array}{l} \alpha = 6^{\text{h}} 58^{\text{m}} 1 \\ \delta = -20^{\circ} 30' \end{array} \right. & \text{No. 2} & \left\{ \begin{array}{l} \alpha = 7^{\text{h}} 00^{\text{m}} 5 \\ \delta = -20^{\circ} 44' \end{array} \right. \end{array}$$

The nature of the two objects is clearly evident on the one-hour exposure plates taken with the 13-inch telescope. Both of these clusters might be classed as "c" or "d" type on the Harvard system of classification.

Cluster No. 1 has an angular diameter of about 5 minutes of arc. The individual stars, of which I counted about thirty, are of the 14th and 15th magnitudes. It is hard to understand how this one has been missed, although the numerous stars of the sky field would tend to obscure the cluster.

Cluster No. 2 has an angular diameter of only 2 minutes of arc. About twenty-five stars are shown, ranging from the 16th to the 17th magnitudes. This cluster is evidently more remote than the other one.

These clusters are not listed in the *Catalogue of Galactic Clusters* (Appendix B), in *Star Clusters* by Shapley, nor do they appear in *Handbuch der Astrophysik*, 1936 edition. Neither cluster appears in the *N.G.C.* or the *Index Catalogues*. An inspection of recent publications has also failed to reveal any mention of them.

LOWELL OBSERVATORY
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THE NEW PHOTOELECTRIC PHOTOMETER OF THE
LICK OBSERVATORY*

BY GERALD E. KRON
(Abstract)

A photoelectric photometer has been designed and constructed for use with the 36-inch refractor of the Lick Ob-

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servatory. The light-sensitive element is a gas-filled quartz-potassium photocell made by Jakob Kunz. The photo-current from this cell is amplified by a special direct-current amplifier employing a Western Electric D96475 electrometer tube in a balanced circuit of the DuBridge and Brown type. The effective wave length to which the cell is sensitive is 4500 angstroms, and the faintest star that may be profitably observed is an 11th magnitude star of early spectral class. Following Whitford,¹ both amplifying tube and photocell operate in a vacuum to eliminate troubles arising from atmospheric effects. Auxiliary optical equipment is provided for introducing color filters into the light beam, and for reducing the light of a bright star by means of a rotating sector.

A new and hitherto untried instrument makes it possible to compare the brightness of two stars with the photometer almost instantaneously. This apparatus, named the "photo-comparator," consists essentially of two right-angle prisms mounted so they can be moved perpendicularly to the optic axis of the telescope by a single right-and-left-handed screw. A third prism is mounted in the optic axis in such a manner as to be rotated to face either of the other two prisms. Mounted at the eye end of the telescope, the instrument is so adjusted that the light from the two stars to be compared is intercepted, respectively, by the two outer prisms. The light is reflected at right angles toward the optic axis, and is restored to parallelism with the axis by the third prism, from which it goes to the photocell. The observer may change from one star to the other with great rapidity by simply turning the third prism. The photo-comparator is essentially a timesaver. The telescope need not be moved bodily from one star to the other, and a certain percentage of otherwise necessary "dark" readings may profitably be omitted. It has been found that observing time is reduced to about a third of what it was without the comparator, no reduction in accuracy being noted. A limitation to the use of the instrument is set by the extreme separation of the outer prisms of about one degree. It is not possible to compare two stars that are farther apart than this. The principle behind

¹ *Ap.J.*, 76, 213, 1932.

the photo-comparator was suggested by Professor Joel Stebbins.

The photometer was used on a sixth-magnitude variable star during the autumn of 1937. With the photo-comparator it was found possible to obtain observations having a probable error of from ± 0.0015 to ± 0.0025 magnitude in just six minutes. The size of the probable error depends upon the quality of the "seeing" and the brightness of the stars being compared.

A light-sensitive unit, which may be used to observe in another wave length, perhaps around 6500 angstroms, is now being planned, and it is hoped that this will be in operation by August, 1938. The addition of this unit will complete the photometer.

LICK OBSERVATORY
May 10, 1938

DARKENING AT THE LIMB IN A STAR OF SPECTRAL CLASS A3*

BY GERALD E. KRON

(*Abstract*)

The star 21 Cassiopeiae, an A3 eclipsing variable of the sixth magnitude, makes an admirable object for a limb-darkening study because of the fine comparison star near by which contributes to accuracy of observations, and because the orbital elements of the binary are adapted to this kind of an analysis. This star 21 Cassiopeiae was observed during all or part of 27 nights from August, 1937, until January, 1938, with the new photoelectric photometer of the Lick Observatory. The data for the primary minimum were combined into 27 normal points having a probable error of ± 0.0011 magnitude, as compared with normals of the best previous observations which had a probable error of ± 0.0040 magnitude. The portion of the light-curve between minima showed that the reflection effect and ellipticity were negligibly small. Spectroscopic observations yielded an eccentricity which is also too small to be of consequence in a determination of darkening.

* Read at the San Diego meeting of the Society, June, 1938.