2. The colour-magnitude relation follows the period-amplitude relation and increases again after the 7–8 day period for the SMC cepheids, in contrast to the behaviour in the Galaxy (Fig. 7).

The mean colour indices for SMC cepheids, galactic cepheids in clusters (less than 8 days period) and cepheids in globular clusters all agree to within $\pm 0^{m}1$, however, in the present measures (Fig. 8).

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4. THE INTRINSIC COLOURS OF CEPHEID VARIABLES

GERALD E. KRON

In 1951, S. C. B. Gascoigne and I, working at the Mount Stromlo Observatory in Australia, found that variable stars [1] in the Small Magellanic Cloud were apparently much bluer than classical cepheids of equivalent period in the Galaxy. It therefore became important to know if this colour difference was a property of the stars, or if it was caused by different space reddening.

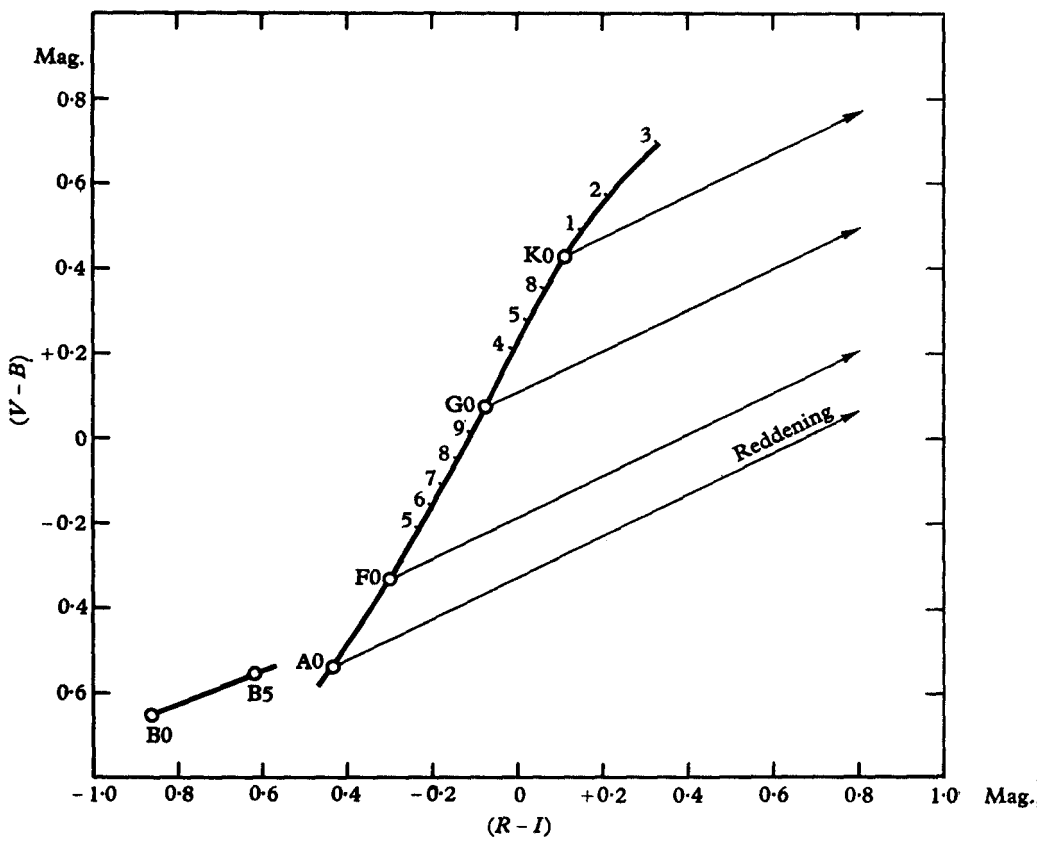

Fig. 9. Calibration curve for determining the reddening of cepheid variables by means of six-colour photometry. Two-colour differences are formed from four of the six colours, the other two not being used.

At the Lick Observatory, observations of 139 normal super-giant stars and twenty-four cepheid variables in the Galaxy have been made with the six-colour photometric technique of Stebbins and Whitford. The observations were made with the 22-inch Tauchmann reflector and a photo-multiplier furnished by Professor Lallemand. About 75 % of the cepheid observations were made by Mr S. Svolopoulos. Of the data on normal super-giants, about one-third came from the published six-colour photometry of Stebbins and Whitford [2] and Stebbins and Kron [3], whereas the rest are new, many of the stars newly identified as super-giants by Bidelman.

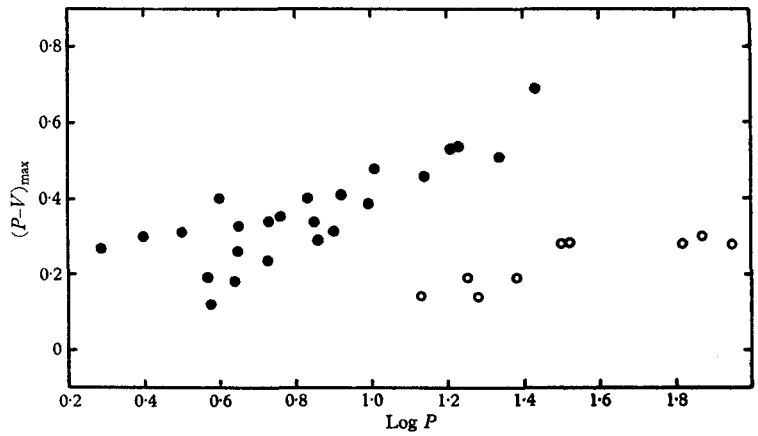

Fig. 10. Intrinsic colours of 24 galactic cepheids (solid dots) and of nine SMC variables (open dots), plotted against log P.

The observations of the normal super-giant stars form the basis of a calibration for determining the intrinsic colours of these stars by an application of the method of Becker [4] for separating thermal from space reddening. The resulting calibration curve is shown in Fig. 9, a diagram in two-colour differences $(V-B)$ and $(R-I)$ of the six-colour photometry. The U and G colours were not used. By means of this diagram, the reddening of the cepheids can be determined as well as the reddening of the normal super-giants, provided one assumes that the spectral distribution of the light from the two kinds of stars does not differ seriously for equivalent spectral type. On the basis of this assumption, reddening, and therefore the intrinsic colours, have been determined for the twenty-four cepheids.

When these derived intrinsic colours are compared with the colours of the variable stars in the Small Magellanic Cloud corrected for a colour excess of $0^{m}1$, it is found that the Cloud variables are considerably bluer than the galactic variables. This is shown in Fig. 10, a plot of the intrinsic colours of Cloud and galactic variables at maximum light against the log of their periods. The intrinsic colours of the galactic cepheids were computed by employing the observed colours of Eggen, Gascoigne and Burr [5], and applying the colour excesses found in the present study.

On the basis of this result and our present knowledge of the properties of the cepheid variable stars, it is reasonable to conclude that the variable stars of the Small Magellanic Cloud differ from those of the Galaxy in at least one way that may have an important bearing on the use of stars of this type as distance indicators.

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