

A.J.Penny, Royal Greenwich Observatory, U.K. and
South African Astronomical Observatory

A globular cluster is an admirable object for the study of stellar evolution and theoretical investigations of the isochrones in the colour-magnitude diagram (CMD) have been numerous, with the most recent being that of Vandenberg (1983, Ap.J. Suppl. 51, 29), but there are still uncertainties such as rotation, abundance variations and gravitational settling. The matching observations are in fair agreement. However only a small number of clusters have been observed and the detailed matching is poor. Most of the CMDs are from photoelectrically calibrated photographic photometry which are affected by the variable background found in clusters. Modern detectors suffer less from this problem and are very sensitive. A programme has been underway on a number of clusters using electronographs and CCDs with the SAAO 1.0m telescope and the crowded-field Starlink Aspic software. This paper reports on preliminary results from four of the clusters. The CCD observations were done in collaboration with W.K.Griffiths of Leeds University.

Zero points for the CMDs came from existing photometry for NGCs 288 and 6809, and from CCD transfers for 3201 and 4590. The linearity and colour equation of the electronographs and CCD were found from exposures to standard stars. The CCD errors in particular were very small, with errors of 0.004mag being possible on bright stars.

The resultant CMDs are shown in the figures. The data are from fields of about 5' by 5', some 5' from the cluster centres, except for 3201 where additional bright stars were measured at the cluster centre, and for 6809, where there are additional bright stars taken from Lee (197z). Thus only for 288 and 4590 are the luminosity functions correct. For each cluster a theoretical Vandenberg line has been fitted. An age of 17Gyr with $Y=0.24$ has been used with reddening and metallicities taken from the literature. The adopted values were (0.00, -1.0; 0.21, -1.2; 0.07, -1.9; 0.08, -1.4). (I am indebted to S.P.Caldwell for the metallicities of 288 and 6809.) The only free parameter was the apparent distance modulus. As can be seen the fit is good. 288 is not very old as has been suggested, cluster ages differing by more than 3Gyr will not fit, and there is no sign of the discrepancy

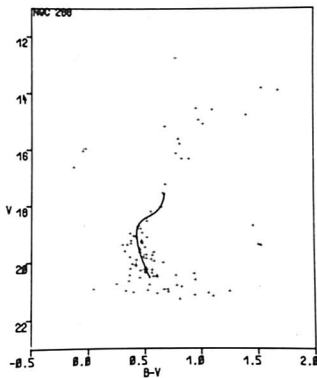


Fig. 1

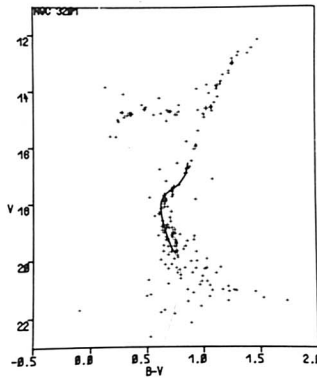


Fig. 2

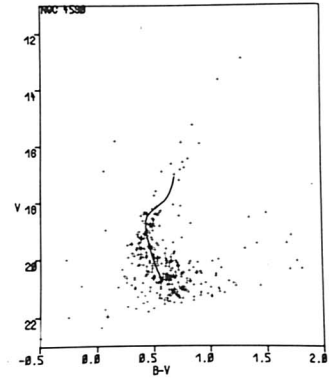


Fig. 3

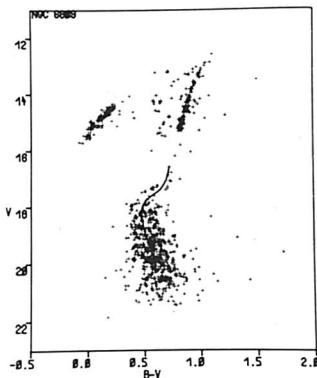


Fig. 4

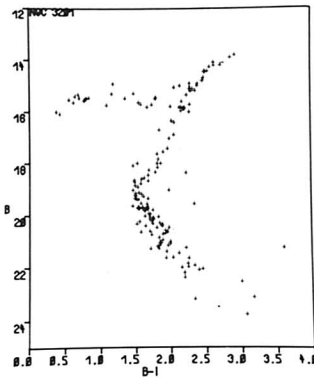


Fig. 5

at the faintest magnitudes with theory seen in some photographic CMDs.

Together with the horizontal-branch levels from previous studies, the vertical shift gives the respective H-B luminosities of (1.0;1.0;0.7;0.7) which are consistent with the relationship of Sandage (1982, Ap.J.252,553).

The B/B-I diagram of NGC 3201 shows how an extended colour baseline produces a more accurate CMD, and also illustrates the possibility of using other passbands, including the use of narrow-bands to investigate the main-sequence metallicities.