

COLOR-MAGNITUDE DIAGRAM MORPHOLOGY OF THE OLDEST STAR CLUSTERS IN THE
LARGE MAGELLANIC CLOUD

James E. Hesser and Robert D. McClure
Dominion Astrophysical Observatory
Herzberg Institute of Astrophysics

William E. Harris
McMaster University

We summarize B,V imagery results from the CTIO 4-m telescope and two electronic detectors: (1) The SIT vidicon at the R-C focus yielded 0".19 pixels in the 0.82 or 1.1 arcmin² frames (Harris, Hesser and Atwood 1983). (2) KPNO's P-F CCD (used by McClure and Hesser) gave 0.6 pixels in 3x5' fields. (The latter data are being analyzed in cooperation with Stryker and Nemec, who observed some of the same objects.) Zero points for the CCD data are set by observations of E region standards and of giants in Galactic star clusters. Our results from point-spread-function profile fitting are:

NGC2210 (~4° E):. SIT data to $\underline{V} \sim 21.5$ support previously noted similarities to Galactic globular cluster color-magnitude-diagram (CMD) morphology (Hesser, Hartwick and Ugarte P. 1976). CCD data are being reduced.

H11 (~4° E): CCD data to $\underline{V} \sim 22.5$ presented elsewhere in this volume (Stryker, et al. 1984) resolve the controversy surrounding the interpretation of the CMD in favor of its similarity to Galactic globulars with pronounced blue horizontal branches.

LW4 (~5° SW): Hodge (1983, private communication) suggested that this cluster might be an overlooked member of the sparse "red globular" group; but CCD photometry (Fig. 1a) reveals a CMD strikingly similar, except for the lack of blue stragglers, to that of NGC7789, a Galactic cluster a few billion years old.

NGC2203 (~6° SSE): Gascoigne (1978, private communication) suggested this as another candidate for the "red globular" group. Alas, SIT data reaching $\underline{V} \sim 22.5$ also resemble those of NGC7789. Deeper CCD data are being reduced.

NGC1466 (~8° SW): SIT observations to $\underline{V} \sim 21.5$ support Gascoigne's (1965) and Penny's (1975) conclusions that the CMD morphology is similar to Galactic globulars. NGC1466's membership in the Clouds remains problematical, however.

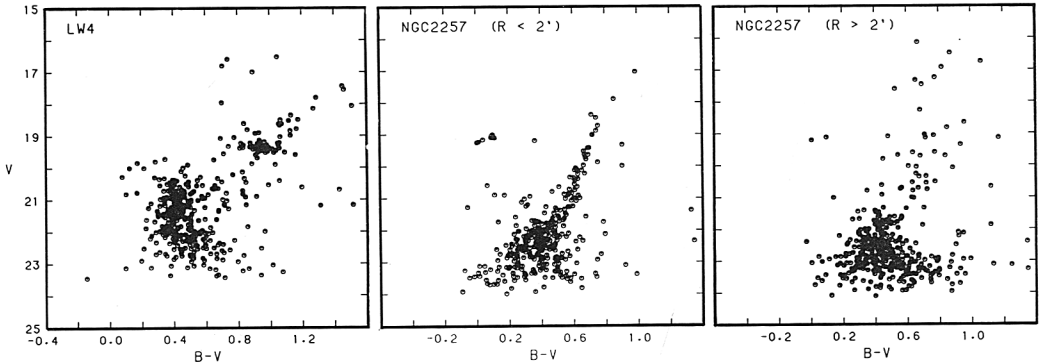


Fig. 1: Preliminary CMD's for LW4(left); NGC2257, $r \lesssim 2'$ (center); and NGC2257, $r \gtrsim 2'$ (right).

NGC2257 ($\sim 8^\circ$ NE): Extensive SIT and CCD data define a CMD like that of the metal-poor Galactic globular, M92. The CCD data reveal (Fig. 1b) the upper 1.5 mags of the main sequence for the first time in an extragalactic globular. The turnoff appears at $V \sim 22.4$, and $\Delta V(\text{horizontal branch to turnoff}) = 3.3 \pm 0.1$ mag is similar to Galactic globulars, thereby confirming and extending Stryker's (1983a) inferences from a photographic plate pair. Fig. 1c shows the CMD of the region beyond $\sim 2'$, i.e., outside the cluster region of Fig. 1b. There is again a cluster-like turnoff at $V \sim 22.4$. Although these are undoubtedly LMC stars, a large and puzzling spread in color exists among the giants (see also Stryker 1983b). It seems unlikely that the spread can be accounted for entirely by differences in age, since the turnoff stars indicate a very old population with few, if any, stars younger than 10^{10} years. Perhaps in the NGC2257 direction the LMC halo has a spread in metal abundance comparable to that seen in the Galactic globular cluster system.

REFERENCES

- Gascoigne, S.C.B.: 1966, *Mon.Not.Roy.Ast.Soc.* 134, p.59.
 Harris, W.E., Hesser, J.E. & Atwood, B.A.: 1983, *Pub.Ast.Soc.Pac.*, submitted.
 Hesser, J.E., Hartwick, F.D.A. & Ugarte, P., P.: 1976, *Ap.J.Suppl.* 32, p.283.
 Penny, A.J.: 1975, *Mon.Not.Roy.Ast.Soc.* 172, p.65P.
 Stryker, L.L.: 1983a, *Ap.J.* 266, p.82.
 _____: 1983b, *ibid.*, submitted.
 Stryker, L.L., Nemeč, J.M., Hesser, J.E. & McClure, R.D.: 1984, this vol. p. 43.