

THE ELECTRONOGRAPHIC COLOR-MAGNITUDE DIAGRAM OF HODGE 11

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A program of electronographic photometry of star clusters in the Magellanic Clouds is being carried out using the McMullan camera on the Danish 1.5-m telescope at La Silla. The observations are being reduced using the Geneva microdensitometer and data reduction programs. Results are shown for the LMC cluster Hodge 11 (=SL 868), based on measurements of two exposures in both yellow and blue-light, each three hours in length, recorded on Ilford L4 emulsion.

In the reductions, areas of $250 \times 250 \mu$, $340 \times 340 \mu$ or $380 \times 380 \mu$ centered on each star were raster-scanned with a scanning aperture of 14 or 20μ . X-Y raster steps of 12, 16 or 18μ were used, producing a 21×21 -point matrix. For each area, the local sky background level was determined by fitting a third-degree polynomial. Standard star profiles were determined for each film using images of bright stars, fitted to modified Gaussian profiles having three shape parameters allowing for seeing and image elongation and orientation. A multiple-peak profile, capable of resolving up to nine stars per scan-area, was then fitted to each sub-field scan and the volume of the density solid of each star image found by numerical integration.

Measures were made of 413 sub-fields in and near the cluster. Volumes of the density solids of the measured stars were converted to the BV systems using a least-squares fit to the previous electronographic photometry by Walker (1979) for those stars of $V < 19.50$ in yellow and $B < 20.00$ in blue light. Analysis of other data indicates no significant divergence of the McMullan camera color system from B-V colors; color errors are $< \pm 0.02$ B-V/mag. Eliminating double stars and stars in badly crowded regions and considering only the 108 uncrowded stars measured on all four exposures and having radial distances of $38'' \leq R \leq 80''$ from the cluster center, the color-magnitude diagram shown in Figure 1 was obtained. This diagram, extending to $V \approx 22$, indicates that Hodge 11 is an old, metal-poor globular cluster, similar to M 92 and thus having $[Fe/H] \approx -2.1$, in agreement with the integral photometry by Danziger (1973) and by Searle, et al. (1980). Fitting the horizontal branch of Hodge 11 to that of M 92 and assuming $E_{B-V} = 0.06$, the

distance modulus of the cluster is $(m-M)_0 = 18.1$ if $M_V(\text{HB}) = +0.9$ in M92 as found by Sandage (1970) from main-sequence fitting, or 18.4 if $M_V(\text{HB}) = +0.6$ (Harris 1976).

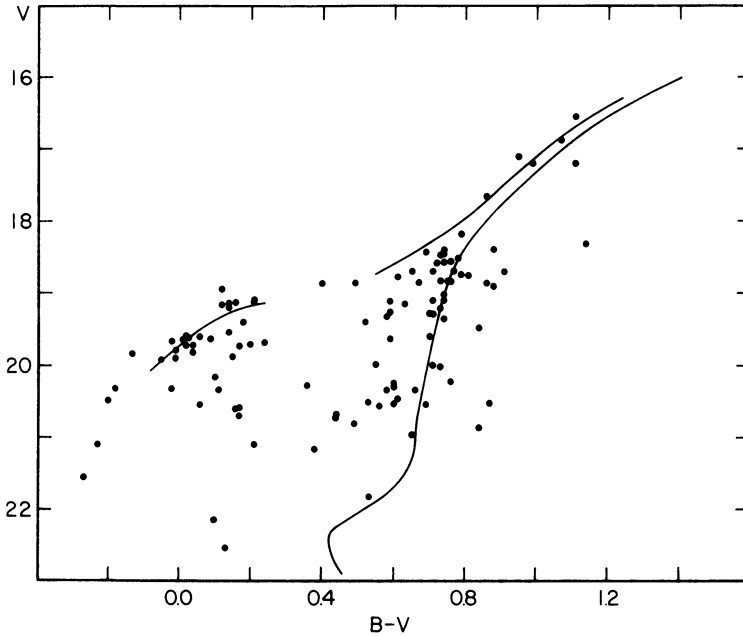


Figure 1. Color-Magnitude Diagram of Hodge 11. Line represents the diagram for M 92, superimposed as indicated in the text.

The observations of Hodge 11 have also been reduced at the Lick Observatory using: (1) scans of the star profiles with a Joyce-Loebl microdensitometer as employed by Walker in earlier studies (Walker 1979 and references therein) and (2) iris-diaphragm measures with a Sartorius astrophotometer using electronographically observed stars as standards and a calibration curve that varies with radial distance from the cluster center. These tests indicate that useful results can be obtained by these methods, though with larger random error than obtained with the Geneva system; for $21.00 < B < 21.99$, the standard deviation of a single measure is: Geneva, ± 0.26 mag; Joyce-Loebl, ± 0.33 mag; Sartorius, ± 0.36 mag.

References

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