CCD OBSERVATIONS OF YOUNG STELLAR ASSOCIATIONS AND MULTIPLE SYSTEMS IN THE MAGELLANIC CLOUDS (1)

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1. Introduction

The nebular and stellar observations were carried out by G. T. at the Cassegrain focus of the Danish 1.50m telescope at the ESO La Silla Observatory in August and September 1984, using a RCA CCD (512 x 320 pixels) with a pixel size of 0.47". The frames were reduced using the VAX/MIDAS software at ESO Garching and Meudon Observatory (INVENTORY automatic program).

2. The brightest stars : single stars or tight clusters ?

One of the most remarkable results of CCD imagery is its ability to point to multiple stars. A number of double or mutiple stars were found.

Table 1 is a list of stars for which our observations definitely indicate a multiple system. We also include the integrated magnitudes and colours of two of the clusters first imaged with the electron camera in N 157C (Lortet and Testor, 1984). These are to be compared with V = 11.14 to 11.90, B-V ~ -0.03 to -0.08 for young (poor) clusters in N 51 and N 59 (LH 51, 55, 88, Vuillemin, 1985) in the LMC and V = 11.2 for R 136a (diaphragm 1"), indeed comprised of at least 8 stars (Walborn, 1986). Similarly in SMC (which distance modulus is ~ 0.5m larger than for LMC), several clusters have integrated magnitudes between 12.0 and 13.3 (Gordon and Kron, 1983).

4. Conclusions

The implications of recognizing multiple systems among the brightest stars of an association or a galaxy bears on several important problems :

- nature of the so-called transition stars Of/WN and WN/WC : are they rather always two separate stars ?
- existence of supermassive stars. Though it is now clear, after the resolution by speckle of R 136a into 8 components, that the concept of supermassive star is lost, yet it is up to now not at all known how frequent are tight clusters (or cluster remnants) of hot stars : appropriate observations should first detect and then discover their detailed content, up to the less massive stars.

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(1) Based on the observations obtained at ESO La Silla, Chile.

C. W. H. De Loore et al. (eds.), Luminous Stars and Associations in Galaxies, 401–402.

Table 1 : Multiple Systems among Bright Stars

Identification	V	B-V	Spectral Type	Estimated number of stars	Ref., Note
LMC					
N11B : star α	12.00	- 0.25	04 - 5[a]	6 in 9" x 6"	b
N11B : BI 42	13.5[c]		0B	5 in 10" x 8"	b
N11B : Sk-66°33	11.9[c]		03 - 4[a]	> 2 in 3" x 2.6"	b
N11C : Sk-66°41	11.4 pg		05[a]	4 in 6" x 5"	1
N158C : Sk-69°249	11.13	- 0.26	09 or B0.5I[e]	3 in 4" x 3"	2
N159A : DD 13	13.84	- 0.01	early 0	2 in 3" x 2.6"	d, 3
	13.19	+ 0.53[d]			
N157C : Cluster β	10.71	- 0.26		14 in 12" x 10"	f, 4
N157C : Cluster δ	11.07	+ 0.02		15 in 12" x 12"	f
SMC					
N66 : star 2	12.59	- 0.32	08.5[a]	>2 in 3" x 2.6"	5

The B-V measurements except otherwise specified, are the present measurements (preliminary)

a) V. Niemela, 1985, private communication

b) Heydari-Malayeri and Testor, 1983, Astron. Astrophys. 118, 116

c) Brunet et al., 1975, Astron. Astrophys. Suppl. 21, 109

d) Dufour and Duval, 1975, P.A.S.P. 87, 769, field of LMC X-1

e) Nandy et al., 1984, M.N.R.A.S. 210, 131

f) Lortet and Testor, 1984

1 The star Sk-66° 41 = HD 268743 is among the "candles" selected as the brightest stars in LMC (Humphreys, 1983). It is a multiple system (at least 3 stars) embedded in a nebular condensation.

2 4" apart is the WR star Brey 91, with V = 12.68, B-V = - 0.40.

3 Contamination by nebulosity may explain that Dufour found this star to be so red.

4 This cluster contains the WN7 star Brey 65, with V = 13.12, B-V = - 0.18.

5 The second brightest star in NGC 346, as designed by Walborn, 1978, Ap. J. Lett. 224, L134. Outside NGC 346 though in the same nebula N66 are the two bright stars HD 5980 (binary, OB ? + WN3, V = 11.77, B-V = - 0.20) and Sk 80, a candle in SMC (O7Iaf, V = 12.36, B-V = - 0.21).

- **blue stars as distance indicators. The frequent occurrence of multiple systems among the brightest blue stars may partly explain why problems arise as to their ability as extragalactic distance indicators (Humphreys, 1983).**

References

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