## A Nebulous Oval in the Large Magellanic Cloud

*By E. M. Lindsay and Harlow Shapley*

In our cluster survey of the Large Magellanic Cloud we have found a nebulous oval at $\alpha = 6^h\ 44^m{\cdot}3$, $\delta = -74^\circ\ 12'{\cdot}0$ (1950), this being the position of an object at its "focus". It is readily noticeable on each of two 30-minute exposure 103a–O ADH plates (scale 68″/mm). It also appears on 60-minute exposure MF plates (scale 167″/mm). On a poor quality 103a–E ADH prism plate there appears to be faint nebulosity. The absence of emission lines would not be unexpected with so faint an object. No direct exposure on a red plate is yet available.

The oval is shown on the accompanying Plate VI. Most of the material is in the ring but there is some faint nebulosity inside. The object at the "focus" looks like a galaxy but the nebulosity may produce this fuzzy appearance. The region is rich in galaxies; at least four can be seen on the small area of the Plate. If it is a star it may or may not be associated with the nebulosity. It is too faint to classify with certainty on a 103a–O ADH prism plate but the faint continuum present gives the definite impression of an O or B type star. The oval is not uniform in density and there are at least two stars or stellar-like objects on its rim; these may of course also be field objects. It is in the neighbourhood but east of a number of Large Cloud clusters and two planetary nebulae (unpublished material) but far removed from any known cloud nebulosity. It seems therefore to be a member of the Large Cloud but near its boundary. The dimensions are 102″ by 48″ corresponding to 23 parsecs and 11 parsecs at the distance of the Cloud.

The object is very much smaller than that with co-ordinates $\alpha = 5^h\ 43^m{\cdot}4$ $\delta = -67^\circ{\cdot}9$, first reported by Innes and noted by Jenka Mohr, Evans and Thackeray and Lindsay[1]. Since this is almost certainly a Cloud member, its angular diameter of 420″ corresponds to a linear diameter of 94 parsecs. The object does resemble the oval-shaped nebulous arc of the Small Cloud[2] whose axes are 15 and 11 parsecs. The Large Cloud oval is however the better defined of the two and forms an unbroken ring.

A list of giant rings known in our own and other galaxies has been published by Gum and de Vaucouleurs[3]. They found that the upper limit of the sizes of these rings is nearly constant ($D = 85 \pm 5$ parsecs) and, from the small amount of data available, that the sizes of the second, third and fourth largest rings in any one system are about 90, 80 and 70 per cent respectively of the largest. They thus suggested their usefulness as distance indicators.

The appearance of the rings suggests the result of a supernova explosion. The effect of an expanding shell pushing ahead and compressing the surrounding interstellar matter into a ring has been examined by Oort[4] and by Öpik[5]. Öpik concludes that eventually a stage of star formation may be reached in the compressed dense ring. He shows that although earlier phases of expansion will be observed, the majority of observed cases will be large rings of fairly constant size because the later stages of expansion last longer than the earlier.

Certainly each of the ovals in the LMC and SMC is a less complicated affair than the known large rings and might well represent an early stage (Öpik suggests an age of about 23,000 years) in the expansion of the supernova shell. If this is so it is of interest to find an example of both a new and an

PLATE VI
Nebulous oval in the Large Magellanic Cloud
ADH telescope, 30-minute exposure, 103a–O plate.

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old ring in the Large Cloud. The condensations in the nebulous oval may be newly born stars similar to the three Orion runaways, AE Aurigae, $\mu$ Columbae and 53 Arietis[6].

We have of course two other interpretations, namely, that the object is a foreground planetary nebula or a peculiar background galaxy.

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## Note on a Southern White Dwarf

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The white dwarf L 145–141, $11^h\,42^m{\cdot}9$, $-64°\,34'$ (1950), $11^m{\cdot}5$, identified as such by Luyten[1] on the basis of its high proper motion and bluish colour, was one of the many high proper motion stars discovered by Innes in Johannesburg by the blink method[2]. Luyten[3] gives a proper motion of $2''{\cdot}68$ per annum in position angle 97°. The trigonometrical parallax[4] (mean of Yale and Cape determinations), is $0''{\cdot}203 \pm 8$. An identification chart is given by Luyten[5].

Three spectrograms, taken with the two prism spectrograph at the Cassegrain focus of the 74-inch Radcliffe reflector at a dispersion of 86 A/mm at $H\gamma$, on Kodak 103a-O emulsion, show an apparently continuous spectrum, over the range $\lambda$3800–4900 A. The limit of detection is probably about 10 per cent central depth. Some of the features in white dwarf spectra described by Greenstein[6] have central intensities less than this—for instance in HZ 29, a DBp star, and in +70° 8247, a $\lambda$4135 type. In the Radcliffe spectrograms of L 145–141 there is no sign of a line or blend at $\lambda$4471 (*cf.* HZ 29) nor at $\lambda$4135 (*cf.* +70° 8247). On one spectrogram a sharp $H\delta$ and possibly $H\zeta$ were suspected. These were not confirmed on further spectrograms. Weak $H\beta$ emission was also suspected but not confirmed. These apparent features are probably mere irregularities in the rather grainy 103a-O emulsion. A preliminary classification may therefore be taken as DC although the possibility of weak shallow features of central intensity less than about 10 per cent cannot be ruled out. (The apparent classification DA by Luyten[8] is probably a misprint as later publications by that author give merely a colour class "a".)

If this is so, then L 145–141 is one of the brightest DC stars observed. Photoelectric measurements at the Radcliffe Observatory have given $V = 11^m{\cdot}47$, $B-V = +0^m{\cdot}21$, $U-B = -0^m{\cdot}58$, whereas Greenstein's list[6]