LETTERS TO THE EDITOR

ASTROPHYSICS

Polarization of the Light from the Magellanic Clouds

THE importance of studies of the polarization of starlight in galactic research has been recognized for some time, and interpretation of the results in terms of paramagnetic interstellar grains preferentially orientated in the galactic plane by a general galactic magnetic field appears well supported. The possibility of observing polarization of light from other galaxies has been investigated¹⁻³. Two extra-galactic systems which seem to have escaped attention in this respect are the Magellanic Clouds.

Fig. 1. Plane of polarization of the Large Magellanic Cloud for two field sizes drawn on the isophote map in blue light as determined by de Vaucouleurs (*Astron. J.*, **62**, 71; 1957)

In June–July 1961, during an expedition to a high-altitude observing site at Chacaltaya in the Bolivian Andes (16° 19' S., 68° 10' W.; 17,100 ft.) with the principal aim of making a detailed photometric study of the Zodiacal Light, the polarizations of the Large and Small Magellanic Clouds (LMC and SMC) were measured. Because of the very transparent skies experienced at Chacaltaya the extinction corrections in the photometry of extended objects such as the Zodiacal Light or the Magellanic Clouds could be reliably made. The instrument used was a photoelectric polarimeter with an electronically operated variable retardation plate as analyser and a piece of polaroid as detector. The instrumental and observational details will be described fully in a later publication. The observational results are summarized in Table 1.

	Field (deg.)	Position angle (deg.)	Degree of polarization (per cent)	Effective wave-length (Å.)	No. of observations
SMC	4 1/2	177	24 ± 5	5500	16
LMC	3 1/2	126	25 ± 5	4500	46
LMC	4 1/2	88	33 ± 7	5500	13

The position angle gives the orientation of the plane of polarization, here defined as the plane of vibration of the electric vector, measured east of north. The errors in the degree of polarization are due mostly to the variation in the intensity of the background light of the sky from night to night; this was because the night sky photometer records, from which the background correction was determined, were obtained on different nights from those on which the polarization measurements were made. This night-to-night variation amounted to ± 15 per cent. The difference of 38° between the position angle as determined in blue light for the LMC with a 3 1/2° field and the position angle in yellow light with a 4 1/2° field is not entirely understood but may possibly be due to the following cause.

The telescope was set using the circles and then adjusted by the slow motion to the Cloud centre using the rather sharp maximum on the meter recording intensity. This means that the field centre may have been different in the two cases because the yellow and blue isophotes will not coincide for the same field size; also the 4 1/2° field may introduce additional structural features which may further separate the centres of the two fields and also directly influence the orientation of the polarization plane. Fig. 1 shows an isophote map of the LMC for blue light with the planes of polarization for the two field sizes drawn in. Each observation consists of one determination of the degree of polarization at a given position angle. While there seems to be no obvious correspondence between any optical feature and the plane of polarization in the case of the Small Cloud, for the Large Cloud the polarization plane for the 3 1/2° field lies very close to the bright bar, shown as a dotted line in Fig. 1. The values found for polarization of the light from other

galaxies¹⁻³ lie between 4 and 12 per cent for 11 galaxies of either spiral or elliptical type; two other galaxies, NGC 3077 and NGC 4449, both of irregular type, were found by Vashakidze³ to have polarizations equal to 15 and 21 per cent, respectively. The latter is a Magellanic type irregular galaxy. Any interpretation of these results in terms of structural features, differing ratios of gas to dust and of magnetic fields is clearly premature; but it is likely that a detailed polarimetric study of bright nearby systems, particularly the Magellanic Clouds, will enable such an interpretation to be made.

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¹ Öhman, Y., *Stockholm Obs. Ann.*, **14**, No. 4 (1942).

² Elvius, A., *Stockholm Obs. Ann.*, **17**, No. 4 (1951); **19**, No. 1 (1956).

³ Vashakidze, M. A., *Bull. Abastumani Obs.*, **18**, 15 (1955).