FLUIDISATION OF LUNAR DUST LAYERS AND EFFECT ON OPTICAL POLARISATION OF THE DIFFUSE REFLECTANCE OR ALBEDO. G.F.J. Garlick*, G.A. Steigmann*, W.E. Lamb* and J.E. Geake**.

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We have shown previously(1) that the diffuse reflexion of lunar dust layers is much enhanced when the layers are fluidised and intergrain cohesion is removed. We have now extended measurements to a study of the effects of fluidisation on the polarisation of the light reflected from dust layers. The degree of polarisation varies in a unique way with phase angle (angle between incident and reflected light directions) and is related to the 'fairy castle' structure of the layers in their normal lunar regolith state. The vibrator unit of the previous experiments was used in combination with a Lyot visual fringe polarimeter(2) to measure the degree of polarisation (Intensity parallel minus intensity perpendicular divided by sum of intensities).

Typical data are given in figure 1. The degree of polarisation P is plotted as a function of phase angle for various samples. Without fluidisation the curves are in close agreement with those obtained previously(2,3) for roughened dust layers and the lunar surface. However, marked rises in P occur at phase angles greater than 20°. At smaller angles only small effects occur; if anything the value of P decreases. The relative increase in positive P values is more than the relative increase in albedo. Fluidisation causes a relative smoothing of the surface producing characteristics similar to those for pressed static dust layers. In these cases far fewer multiple reflexions occur and there is a closer approach to the polarisation effects associated with the Brewster angle conditions for smooth surfaces. Although the peak value of P falls with increasing wavelength (2,3) the % increase in Pmax due to fluidisation does not depend on wavelength in general but there are interesting exceptions. Apollo 15071,46 dust shows a marked drop in % change as the wavelength increases.

It would appear that observation of polarisation changes on lunar or planetary surfaces could provide a sensitive method of detecting the onset of dust disturbance or flow.

REFERENCES
Fig. 1(i) Effect of fluidisation of lunar dust samples on the degree of polarisation of reflected light from dust layers as a function of phase angle \( \phi \) (viewing direction at 40° to plane of sample surface).

(a) Curves for static, roughened layers.

(b) Curves for "fluidised" layers.

(The first two figures of the sample numbers shown are the Apollo mission numbers.)

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Fig. 1(ii). Variation in peak value of polarisation ($P_{\text{max}}$) with wavelength for two Apollo 15 samples.

(a) Static, roughened layer.

(b) "Fluidised" layer.

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