LETTERS TO THE EDITOR

ASTRONOMY

Anomalous Fraunhofer Line Profiles

DURING the spring of 1961 we made observations of the H line of Ca(II) in the spectrum of moonlight, with the view of detecting any luminescent radiation which might have been present. The observations were made with the 50-in. reflector of the University of Padua's Observatory at Asiago.

The method adopted was that described by Link[1] in 1951 and used later by Kozyrev[2] and Dubois[3]. It consists of comparing the profiles of Fraunhofer lines in moonlight and sunlight: if there is any luminescent radiation from the moon, then the profile in moonlight will be shallower and narrower than that in sunlight.

We have described elsewhere[4] a high-resolution $f/5$ photoelectric grating spectrometer which we used to obtain such profiles and our observations have disclosed a luminescence of typically 5 per cent of the mean continuum-level at various points on the Moon's surface, including Aristarchus, with a fractional error of about 1/20 (these results, which are the first to be obtained using a photoelectric system, will be described in more detail in a later publication). Our results are thus considerably more accurate than previous ones.

In the course of these experiments, it was (as indicated above) necessary to obtain solar comparison spectra. For obvious reasons it was not possible to point the telescope directly at the Sun and so we took spectra of the daylight scattered from clear blue sky and also from cloud.

Fig. 1 shows the characteristic features (indicated by the letters $A, B, C \ldots$) of the H line profile obtained with our instrument, and Table 1 gives the intensity ratios between these features for Mare Serenitatis, cloud and blue sky.

It will be seen that the line is increasingly filled in as one proceeds from Mare Serenitatis to blue sky, indicating that, in addition to scattered sunlight, there is some extra light reaching us from the sky.

Vallance Jones[5] and Dufay[6] have detected some H and K emission in the upper atmosphere at twilight, and such an emission, if unresolved by our instrument, would, of course, have the effect of raising the deepest part of the line without affecting the other features. However, a check of the ratios between points not

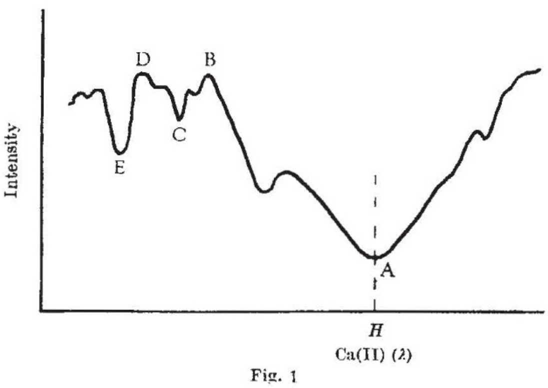

Fig. 1

Table 1

Source	Ratios (× 1,000) A/B	A/C	A/D	A/E
Mare Serenitatis (mean of 17 scans)	223 ± 1	295 ± 2	223 ± 1	327 ± 2·5
Cloud (Asiago) (mean of 4 scans)	259 ± 1·5	336 ± 2·5	257 ± 3·5	366 ± 7
Cloud (Manchester) (mean of 4 scans)	256 ± 2	327 ± 4	251 ± 1	349 ± 2·5
Blue sky (Asiago) (mean of 4 scans)	279 ± 1·5	355 ± 2·5	280 ± 1	386 ± 1
Blue sky (Manchester) (mean of 5 scans)	280 ± 6	352 ± 5	277 ± 6	377 ± 7

including the deepest still shows the same effect between the three sources, which suggests that the additional light is not in the form of a sharp emission but rather a broad band.

We have since repeated our experiments with the instrument set up at the University of Manchester and the results are consistent with those obtained at Asiago and again show this change in profile with source. We have performed high-resolution (0·17 Å.) scans at twilight of the deepest portion of the line, but have so far failed to detect any emission component.

We feel that this behaviour of the profile of the H line may possibly be indicative of the presence of a daylight airglow. However, we propose to carry out more sensitive tests for the presence of an emission component and also to investigate the profiles of other lines. We hope that we shall shortly be able to make absolute measurements of this excess light and to observe its behaviour as the Sun rises and sets.

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Stresses around Lunar Craters

THE formation of a lunar crater will be accompanied by stresses set up in the lunar surface in the vicinity of the crater. Critical telescopic observation demonstrates the existence of systems of nearly radial fractures and valleys around certain craters. The departure from radialism is, however, significant and we interpret the fractures as being the surface expression of the relief of stresses in the rocks close to the surface at the time of formation of the craters.

The morphology of the fractures indicates that the lunar surface as a whole was also under stress at the time when the craters were being formed, and that these stresses were the same as those producing the lunar grid system.

We have developed a theory of how these fractures formed; an immediate conclusion of this theory is that the general lunar surface stresses were tensions, on which were superimposed the tensile stresses indigenous to the craters themselves. By consider-