

The Moon in Daylight.

GENTLEMEN,—

Referring to Mr. Whitmell's letter (*Observatory*, June 1919, p. 249) I may state that the apparent whiteness of the Moon seen in daylight was discussed by me in a letter to *Nature* (xcvi. p. 369, 1915) and by H. N. Russell in the *Astrophysical Journal* (xliii. p. 195, 1916). As seen in the clear skies of Kashmir at an elevation of 5000 feet the nearly full Moon rising over the Himalaya appeared exactly like snow, and in the strongest contrast with the browns and greys of the sunlight rock surfaces. Twenty years ago, also, I compared the daylight Moon, high in the sky, with a sunlit chalk-pit and concluded that the Moon must be made of chalk!

There can be no doubt that the superposed blue light of the sky tends to whiten the Moon, and, as pointed out by Russell, when the Moon is at low altitudes the intensity of skylight is considerably greater than that which comes from the Moon itself, so

* *Observatory*, vol. xlii. p. 88.

that we may easily be deceived as to her true colour and reflective power.

I have tried Mr. Whitmell's experiment which consists in observing the half Moon through a polarising prism, but so far I have failed to see any noticeable change in colour with the half Moon at an altitude of about 60° , and when the prism is made to give minimum transmission for the polarised skylight. I have also tried cutting out the whole of the blue and violet light with a yellow absorbing screen, using the polarising prism in addition. In this way I have compared the Moon directly with various substances held in the sunlight. The best match I could get with regard to colour and intensity was a piece of aluminium ground to a fine surface with emery. This seemed to approximate fairly well with the darker maria, but the brighter areas near the limb seemed as white and perhaps as bright as white clouds floating near.

A piece of finely-ground glass will also give nearly the same tint as the brighter parts of the Moon, and the intensity may be adjusted by altering the inclination of the glass to the Sun's rays, but, curiously enough, with or without the yellow screen the Moon persists in looking whiter than the glass, which must reflect all rays equally. This is not due to difference in atmospheric absorption, since it is seen with the Moon and Sun each at about 45° altitude.

The ingenious experiment devised by Mr. Whitmell with the blue paper and a yellow Moon seen through a sheet of glass reflecting the blue light, serves to indicate the amount of change in colour to be expected from the superposition of blue skylight on the Moon; but I have entirely failed by this means to reproduce the pure whiteness of the actual Moon when small pieces of rock of different shades of colour are used to represent the Moon. It is true that faintly tinted paper, such as the cover of the *B. A. A. Journal*, may be made to look as white as the paper inside, but rocks in general are much darker than this.

My experiments with the yellow screen would appear to show that the Moon must be composed of rocks of a blue-grey shade, and the brighter parts must be white or nearly so. I admit, however, that this is difficult to reconcile with estimates of the general albedo and colour index of the Moon. Also if the Moon at night is reflected from a silvered lens of white glass or quartz it looks like a yellowish star; but the selective reflection of silver may account for this.

According to Russell the colour index derived from J. Herschel's visual estimate of the Moon's star magnitude, and King's photographic results is $+1^m.18$. But the Sun would have an index of about $+0.7^m$ if it is similar to α Aurigæ and α Centauri, so the difference after all is not very great; a change of only 4 per cent. in Herschel's estimate would make the colour index the same in Moon and Sun, which, of course, would mean that the Moon is white in colour.

A new and independent determination of the colour index of the Moon seems to me to be called for, and it might easily be determined from the star-like image reflected from an unsilvered lens.

I am, Gentlemen,

Yours faithfully,

Kodsikanal,
1919, July 22.

J. EVERSEED.
