

Day and Night "Seeing."

GENTLEMEN,—

The very kind reference to my work in Kashmir by the writer of the *Oxford Note-Book (Observatory, vol. xl. p. 282)* prompts me to make a few remarks in order to make clear what the results of my experiences really amount to.

My expedition to New Zealand was undertaken for the purpose of selecting a site for a solar observatory, and observations were confined to tests of daylight seeing. Similarly, in Kashmir the main purpose was to test the observing conditions as affecting

solar definition. The results in both cases are clearly against mountain top observatories, and in favour of sea coast sites or of stations near large areas of water-surface. But, to quote from the Oxford Note-Book, the mountain sites "Mount Wilson, Mount Hamilton, and Flagstaff are successful." Yet these are in a dry climate, and placed as high above sea level as possible.

I would like to point out that the success of these and other mountain observatories is not an argument in favour of mountain sites for solar work. So far as I know, Mt. Wilson is the only high level observatory, excepting Kodaikanal, where extensive solar research is carried out, all the others being organized for night work, which is also a very large item in the work at Mt. Wilson. But day seeing and night seeing depend on different conditions, and a site which may be good for one is not by any means necessarily good for the other. There can be no doubt that a mountain site in a dry climate offers very special advantages for night observation. The dust haze of lower levels seldom extends above 6000 ft., and the disturbing influence of the Sun being withdrawn at night, the atmosphere, if in a calm state, quickly settles down to a condition of uniformity, giving good definition. It is, however, a question to be decided by future experiment whether the definition at such stations is ever quite equal to that which would be found on an oceanic island situated in a region where calm and dry weather prevails. Prof. W. Pickering's experience in Jamaica, and the late Major Molesworth's in Ceylon, would seem to favour the island-site as against the mountain; but, however that may turn out to be, the result of all my tests of *solar* definition in different localities is quite clearly against a mountain site under any conditions of climate for solar research.

At Mt. Wilson, where I spent the month of October 1906, the definition was good in the early morning, fair in the evening, hopelessly bad near midday. Good photographic work is, of course, accomplished there, as at Kodaikanal, by taking advantage of the early hours when the night conditions of good seeing outlast the darkness, and the disturbances due to convection remain in abeyance. I believe that Prof. Hale would agree with me if I stated that very little can ever be made of the midday seeing on Mt. Wilson, even with the powerful aid of a Tower telescope.

The great advantage we enjoyed daily throughout the summer in Kashmir was in being able to obtain successful photographs of sun-spots and prominences at all times of day, and to follow in detail the changes going on from hour to hour. Such conditions have, I believe, seldom or never been known at a mountain station, certainly never at Kodaikanal.

But the Kashmir Valley, excellent as it proved to be for the Sun, would probably not equal Mt. Wilson as regards night definition, for I found that, although it might be described generally as good, there was nothing so superlative about it as

might have been anticipated from the excellence and uniformity of the day seeing, and there was a good deal of scintillation of stars at medium and low altitudes. The conditions generally for night work, however, were found to be greatly superior to those at Kodaikanal, mainly on account of the prevalence of clear skies.

As for Kodaikanal, I have, I fear, little to say that is good. If the success of the observatory is gauged by the number of days in the year when solar photographs are obtained, then we may class it as successful with the other mountain top observatories which have proved pre-eminently successful. Yet, although we maintain a yearly output of spectro-heliograms amounting to about 327 days, this is only maintained by the exercise of great vigilance during a large part of the year, when the Sun is seen only by glimpses, and any extended research is impossible. With 60 inches of rain annually, the climate is altogether too moist for the best astronomical work. It is also dominated by the monsoon currents, which bring thick cloud, if not rain, and night work is absolutely hopeless during, perhaps, three-fourths of the year. In the dry-season, January to April inclusive, good definition at night and in early morning is the rule, but this can never be depended on from day to day. This is not surprising, considering the immense masses of hot air a few miles away, and bathing north, east, and south slopes of the Pulneys. This tropical heat surges up in strong convection currents daily, ruining definition after 8 A.M., and forming billowy masses of cumulus cloud, very wonderful to look at, but not good for solar research. Occasionally in the dry season, a spell of really dry weather comes; the convection and bad definition continues, but with less condensation; then we may get the ideal deep blue sky without a trace of whiteness about the Sun, but this is all too rare.

It is interesting to note that our best midday seeing happens under conditions apparently the worst of all, when the steady westerly monsoon current has been blowing for days, with thick cloud covering the entire country to the west of us. If the Sun shows briefly through a break, the definition will usually be found to be quite tolerable, even at noon. I believe this is due to the fact that, excepting for the few hours' passage over 100 miles of cloud-covered land, the air comes direct from the ocean, where uniformity of temperature distribution is the rule. But even this is not to be depended on, for, if by some ill-chance this same wind should happen to churn up some of the tropical air of the valleys on the way, then we have the interesting spectacle of a contorted Sun jumping bodily about on the slit plate of the spectro-heliograph!

It would be of great interest to learn whether on an island site, far from continental land areas, the ideal condition of good definition both by day and by night might not be realized.

The Observatory,
Kodaikanal,
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I am, Gentlemen,
Yours faithfully,
J. EVERSEED.