1930

Skyshine and Sunshine at Ames

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SKYSHINE AND SUNSHINE AT AMES

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As an initial step toward determining the amount of ultra violet light in skyshine and in sunshine it was deemed desirable to determine the ratio of skyshine to sunshine in the visible spectrum. Accordingly readings were taken on a horizontal plane on top of a tall building, once with the test plate of a Macbeth illuminometer exposed to the entire dome of the heavens including the sun and again when the sun was blocked out by an opaque disk. Observations were made every hour on perfectly clear days only.

The ratio of skyshine to total intensity is unity at sunrise and sunset, and decreases during the middle of the day. At noon at the winter solstice the light coming from the sky is approximately 27
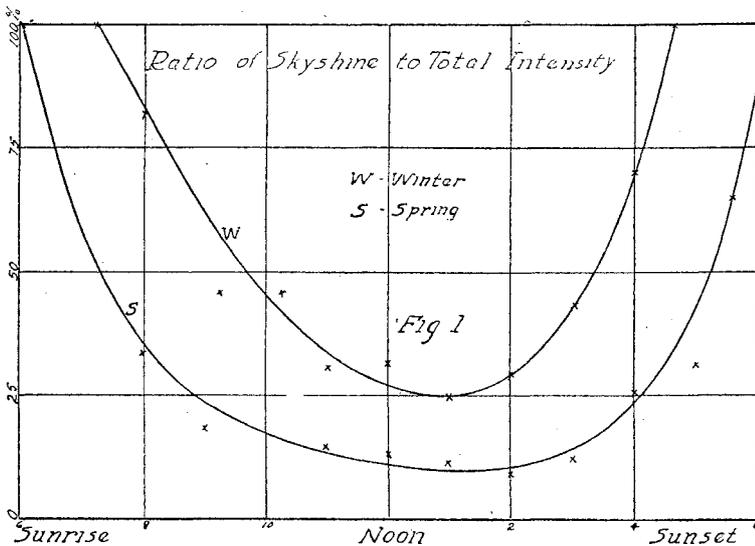

Fig 1

percent of the total and at the vernal equinox it is approximately 13 percent of the total. In summer at noon the per cent coming from the sky may be expected to be still less. The curves in Fig. 1 show the ratio of skyshine to total at two seasons of the year and various hours of the day.

For the entire day near the winter solstice the average ratio of

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skyshine to total is approximately 50 percent; *i.e.*, there is just as much light reaching us from the sky as from the sun direct. For the vernal equinox the average ratio is 28 percent and for the summer one may expect a still smaller ratio of skyshine.

This signifies that our natural lighting system changes from completely indirect at sunrise to a combination of direct and indirect at noon and again to indirect at sunset. The indirect system at sunrise and sunset is a blessing to mankind because that system is characterized by softness and a lack of all glare.

It further signifies that natural lighting is of the semi-direct kind in winter and spring when vegetation is tender, and it is
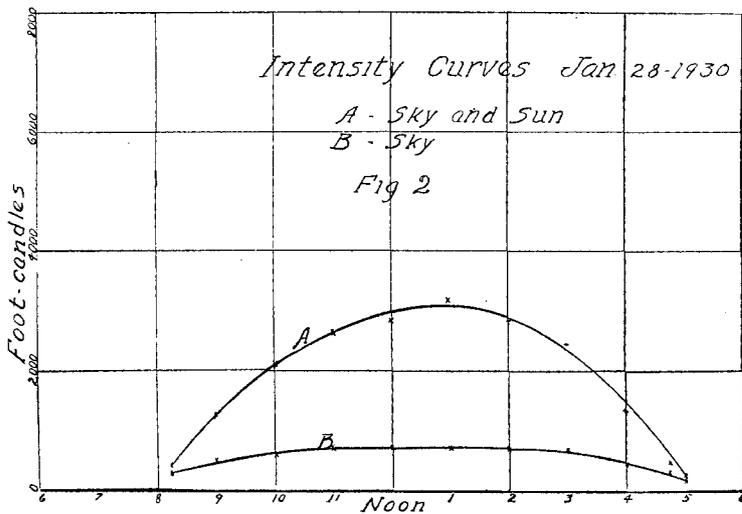
much more completely direct in summer at the time of ripening grain and harvest.

The actual readings in ft. candles on a horizontal plane due to the sun and sky combined and also those due to the sky alone for a typical day are shown in Fig. 2. At noon of December 21, we get only 45 percent of the light we might get were it not for the atmosphere, and for an entire day at that season it is only 36 percent. It is much less in early morning than at noon and thus again it favors plant and animal life on earth in that the intense light of the sun does not come upon it suddenly. It is of interest to note that at sunrise and sunset a beam of light has to traverse forty times as much atmosphere to reach the earth as when the sun is at the zenith.

This work thus enabled us to determine what part of the light

in the visible spectrum is transmitted by the atmosphere at this location. It was found that over the period from November 22 to March 19 the average transmission coefficients were as shown in Fig. 3. This curve shows the per cent transmitted when reduced to zenith distance. The candlepower of the sun here used was 2.4×10^{27} and the formula for the transmission is

$$I = I_o\alpha^y$$

where I_o represents the illumination intensity at the outer confines of the atmosphere, α the transmission coefficient for any one layer,

Fig 3.
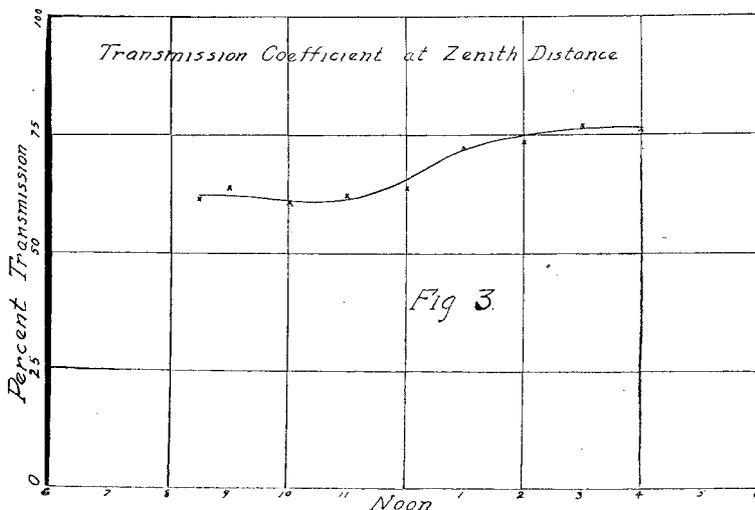
and y the number of layers. I is then the illumination intensity read on the surface of the earth.

It is our plan to continue this investigation throughout the year for the visible spectrum and to extend it to cover the near ultra violet especially the vital spectrum of the sun which seems to lie between 2910 Å and 3130 Å. Below that the atmosphere cuts off all radiations and above that the therapeutic effects seem to be greatly reduced if not entirely eliminated.

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