the glacial materials are older than the last ice advance and are stained by limonite derived from interstadial or interglacial weathering.

There is thus evidence over large areas in New England that an interval of time characterized by intensive frost action and accompanied by deposition of loess has intervened between glacial deposition and the beginning of soil formation. In the Highlands of the Hudson, Denny[9] has shown that during this interval most of the original glacial forms were destroyed, and the warp differs materially from the underlying till not only in texture but also in lithology and hence in chemical composition. The soils, therefore, have a C-horizon quite different, and a course of development unlike what they would have if developed merely by the weathering of the local till.

Fortunately the drainage of New England soils is largely determined, not by the character of the soil horizons which are quite immature, but by the underground. Hence soils developed on till are generally ill-drained and "cold" and those on outwash are generally well-drained and "warm." The existing soil maps which are virtually mere maps of till and outwash have utility in spite of the erroneous theory of soil formation on which they are based.

The perception that many of the minor details of our existing topography in the Piedmont and in New England date back to processes conditioned by a periglacial climate of Pleistocene time represents a great advance. In geomorphology and in soil science the bounds of this advance can not be easily predicted.

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DIRECTION FINDING AT 1.67-METER WAVES

SINCE direction finding at ultra high frequency is drawing more interest, I should like to give a brief report on the direction finding work at 1.67-meter waves which has been done in this laboratory.

Up to about two years ago we had been working on a radio-meteorograph[1] sent up with balloons to get the atmospheric temperature, pressure and humidity at various levels from the ground up into the stratosphere. This instrument was developed in this laboratory, and it has been used successfully by the United States Weather Bureau in securing data for weather forecasting.

Different antenna systems were tested for both horizontal and vertical directivity on this wave-length at distances of from seven to thirty miles. The antennas used in these experiments included parabolic antenna, V-type, double V-type, Adcock antennas, etc.

Using an Adcock antenna the azimuth of the incoming electromagnetic wave can be defined within one half degree accuracy, and with a slight modification of the receiving elements to form a horizontal H antenna, the vertical angle of the incoming wave can also be obtained with the same degree of accuracy. The former antenna can be converted into the latter by mechanical means within a few seconds and thus both vertical and horizontal angles can be measured with the same antenna set-up.

With the antenna one and a half wave-lengths above the ground and with the ground surface homogeneous in the immediate vicinity of the receiving antenna, the direction of the incoming electromagnetic wave coincides with that of the transmitter emitting the wave, within the same accuracy of one-half degree.

Since the frequency used is so high that there is no reflection from the Heaviside layer, this eliminates the erroneous directions experienced with longer wave-lengths.

The main difficulty of this experiment seems to lie in the surface conditions of the ground in the vicinity of the receiving antenna. When the ground is wet, and especially when the moisture is not uniformly distributed, deviation of the incoming wave from the true direction of the transmitter arises. Attempts are now being made to overcome this difficulty.

The receiver used for this experiment is a superheterodyne receiver specially designed for this purpose using a resistance-coupled intermediate-frequency amplifier. It is very stable in operation and has ample sensitivity.

The main purpose of this experiment is to apply the directional effect to get wind velocities using the same type of radio-meteorograph and balloons as mentioned above.

The work is being continued in this laboratory and the complete details will be published later.

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COLOR FLICKER IN FLUORESCENT LAMPS

MESSRS. Scull, Grosscup and Witting, in their letter published April 12 on the "Apparent Splitting of Light from Fluorescent Lamps into Component Parts by Moving Objects," approximated but did not fully describe what we consider is the explanation of the phenomenon which they describe.

As noted in a paper by Thayer and Barnes,[1] in fluorescent lamps, "the light from the low-pressure mercury discharge is extinguished completely every half cycle on AC operation, but the light from many phosphors decays slowly enough to furnish appreciable light in the interim." Therefore, any inspection by

[9] C. S. Denny, Black Rock Forest *Bull.*, 8, 70 pp. 1938.

[1] O. C. Maier and L. E. Wood, *Jour. Aero. Sci.*, August, 1937.

[1] *Jour. Optical Soc. Amer.*, 133–134, March, 1939.