

As stated above, Rayleigh's theory requires that the ratio of the intensity of the reflected ray to that of the incident ray shall vary as the fourth power of the wave-length, while Crova's measurements gave exponents varying between 1.61 and 6.44. From this fact, and further, since the author's observations often showed greater proportional intensity for the violet as compared with the red than for intermediate colors, he considers it probable that the blue color of the air itself and a blue or violet due to the fluorescence of ozone or other components of the atmosphere are to be regarded as possible factors in the production of the color of the sky, altho the data upon this subject must be considered incomplete and inexact.

The following is the author's summary:

1. That while there is good reason for regarding the sky as a turbid medium, the experimental study of the spectrum of sky-light affords evidence of a distribution of intensities which cannot be altogether accounted for by the assumption of an atmosphere conforming to Rayleigh's formula nor of a turbid medium containing coarser particles.

2. That the illumination of the atmosphere by selectively reflected light from the surface of the earth and from cloud masses and mist modifies the character of the light from the sky to an extent which, while perhaps not readily discernible with the unaided eye, is definite and unmistakable when the sky is studied with the spectrophotometer.

3. That the deviation of the observed distribution of intensities recorded by several investigators indicates a blue absorption color of the air or, since the preponderance in the violet appears to be variable in amount, the existence of fluorescence of some unstable factor of the atmosphere, such as ozone, or both.

The results of observations on the percentage of polarization of skylight at the point of maximum polarization made by me in Washington at the Weather Bureau may be summarized as follows:

1. Since the observations were made on cloudless days, the sources of illumination of the sky are considered to be (a) the scattering of light by particles in the atmosphere whose diameters are small as compared with the wave-length of light, (b) the scattering of light by relatively large particles, and (c) the reflection of both sunlight and sky-light from the surface of the earth.

2. When the ground is covered with snow there is a marked decrease in the percentage of polarization, due to increased reflection from the surface of the earth.

3. There is a diurnal variation in the measured percentage of polarization, the minimum occurring at noon, with a gradual increase as the sun approaches the horizon, and a marked increase during the first few minutes of twilight following sunset, which may be attributed to relatively less reflection from the ground than from the particles in the atmosphere as the zenith distance of the sun increases.

4. The percentage of polarization decreases as the general atmospheric absorption increases, but apparently not by a simple law.

These results, which will be published in full in Vol. 2, Part 2, Bulletin of the Mount Weather Observatory, appear to be in accord with the summary given by Nichols.—H. H. K.

#### DUSTSTORMS IN TEXAS.

A correspondent calls attention to the fact that it is commonly believed in southern Texas, that whenever duststorms occur with high winds moving eastward across the plains, then the regions to the northward in Oklahoma and east Texas suffer from tornadoes. The following reply to this letter has been sent by the Acting Chief and sufficiently explains the reasons for this:

You will find by reference to daily weather maps issued by the Weather Bureau that the duststorms of western Texas occur in the south quadrants of well-marked low barometer areas, or general storms, the centers of which are moving eastward over the States to the northward. On January 27 and 28, the dates to which you refer, the center of a severe storm moved from Colorado eastward over Kansas. The westerly gales experienced in western and northern Texas obeyed the law of the cyclonic

circulation of winds. As air moisture is considered essential to the development of tornadoes, the dry air of the plains region does not present the tornadic elements that are found in more eastern districts. To this fact may be ascribed the greater frequency of local storms in eastern Texas and Oklahoma as compared to western portions of Texas.

It is proper to add to the above that, from the beginning of forecasting work, it has always been recognized that tornadoes occur in the southern quadrant of an area of low pressure, so that the forecast that "conditions are favorable for severe local storms" has frequently been published. Thunderstorms also occur most frequently in this quadrant, and so also the hot winds that injure the crops in the region between Texas and Iowa. It is scarcely proper to say that the duststorms of Texas literally change into tornadoes; but it is more proper to say that the conditions favoring the formation of duststorms in Texas will, as they advance eastward, favor the formation of tornadoes in the moister air farther east.—C. A.

#### THE AURORA POLARIS.

In a previous number of the MONTHLY WEATHER REVIEW<sup>1</sup> we have given a brief synopsis of the researches of Prof. Kristian Birkeland and Carl Störmer on the newest views with regard to the nature of the aurora borealis. We are now glad to announce the publication of the first part of two volumes by Birkeland, entitled "The Norwegian Aurora Polaris Expedition, 1902-3, Vol. I. On the cause of Magnetic Storms, and the Origin of Terrestrial Magnetism. First Section."<sup>2</sup>

Being in English we doubt not that this volume will be read by many of the readers of the MONTHLY WEATHER REVIEW, and we can not resist the temptation to reproduce the following clear statement by the author, of the present state of his investigations.—C. A.

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By Prof. K. BIRKELAND.

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The knowledge gained, since 1896, in radio-activity has favored the view to which I gave expression in that year, namely, that magnetic disturbances on the earth, and aurora borealis, are due to corpuscular rays emitted by the sun.

During the period from 1896 to 1903, I carried out, in all, three expeditions to the polar regions for the purpose of procuring material that might further confirm this opinion. I have, moreover, during the last ten years, by the aid of numerous experimental investigations, endeavored to form a theory that should explain the origin of these phenomena. It is the results of these investigations that are recorded in this work, the first volume of which treats of terrestrial magnetic phenomena and earth currents, this section forming the first two-thirds of the volume. The second volume will treat of auroras and some results of meteorological observations made at our stations.

The leading principle that I have followed in this work has been to endeavor always to interpret the results of the worked-up terrestrial-magnetic observations, and the observations of auroras, upon the basis of my above-mentioned theory.

Thus, the magnetic storms, for instance, have been studied in such a manner that on the one hand we have formed from our observation-material a field of force which gives as complete a representation as possible of the perturbing forces ex-

<sup>1</sup>Monthly Weather Review, May, 1908, 36:129-131.

<sup>2</sup>This "First Section" is a Royal 4to., 315 pages, 139 figures, and 21 plates.