

map, with whatever data concerning brilliancy and colors are available, the conclusion seems plain that the northern stations across the continent show the most variety in color. Reports from northern Michigan, Hector, B. C., and Glacier Bay indicate brilliant and varied colors, and these are the farthest north of stations reporting in their respective longitudes. Four others report less striking color effects: Ephraim, Wis., Lake Minnetonka, Minn., Beartooth Mts., Mont., and possibly Teton Co., Mont.; and all of these speak of pink or rose. All of those reporting from farther south mention or imply lack of color except the usual pale green. It appears therefore that variety of coloring increased northward. Another interesting point is that the display began everywhere at approximately the same hour, local time: that is, in the neighborhood of eight or nine P.M., or soon after sunset. Apparently then it moved westward across the continent, though it is barely possible that it merely became visible in each case with oncoming darkness. One or two of those reporting mention a streaming movement from east to west, which may or may not be of importance.

It is perhaps worth mentioning that during the week following August 26 two other auroras were visible, on August 30 and September 2. The latter was a very fine one—a bright greenish glow covering the whole northern sky almost to the zenith.

WILLIAM S. COOPER

MINNEAPOLIS, MINN.,
November 16, 1916

It seems worth while to place on record the fact that the auroral display of August 26, 1916, recorded in so many parts of the continent, was especially brilliant at Juneau, Alaska. I noted it from about eight until after ten P.M. and was told by others that it continued until nearly midnight. It was the first one that I noted last summer, but I can not recall any of its details except that it was one of unusual brilliancy.

ALFRED H. BROOKS

WASHINGTON, D. C.,
November 13, 1916

I HAVE read with great interest, in the issues of October 20 and November 10, the letters recording the auroral display of August 26. I notice that the most western record, as given in *SCIENCE*, is from Collins, Washington, and the most northern one, in western North America, from the Selkirk Range in British Columbia. It may interest you to know that the auroral display on August 26 was a most magnificent one on the coast of Alaska. I was at the time a few miles south of Skagway, Alaska, and had an opportunity to witness the phenomenon in all its splendor. The display of all the colors of the spectrum rushing together from all directions into a gigantic whirlpool in zenith and then dispersing, lasted for at least half an hour. I may add that for a few days before the auroral display the electric conditions in the air were such as to render it almost impossible to use wireless telegraphy between points in Yukon and Alaska.

My colleague, Mr. H. T. Gussow, Dominion botanist, informs me that he witnessed a most brilliant auroral display on the 26th of August in the Straits of Georgia, between Vancouver Island and the mainland of British Columbia.

M. O. MALTE

CENTRAL EXPERIMENTAL FARM,
OTTAWA, CANADA,
November 13, 1916

THE AURORAS OF 1859

So much has been said about the aurora of August 26 of this year that I have been thinking it might be well to make a note on the similar displays of August 28 and September 1, 1859, which few of the present readers of *SCIENCE* probably saw, but which seem to have been more splendid and remarkable. In both of these the streamers covered the whole sky, north and south, east and west, as seen from the Atlantic coast, in about latitude 43, where the present writer was then located, and converged to a point south and a little east of the zenith, indicating that they were in fact parallel to the dipping compass needle, the variation of which was a little west, for the north end.

In the display of August 28, they were of various colors; in that of September 1 they were of a uniform red. The brightness seemed to be about the same in both cases, and sufficient for one to read a printed page with ease. There was no moon. The southern streamers, especially, were very changeable; having continually many of what were then called "merry dancers," or rapidly changing clouds of light, among them. These displays, as it was noticed in the papers at the time, were visible as far south as Cuba; though of course they were not there so brilliant. They were accompanied by magnetic storms, and interference with telegraphic work.

The present writer was then engaged in astronomical observations, which had to be suspended during these illuminations.

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INFERENCES CONCERNING AURORAS

TO THE EDITOR OF SCIENCE: I was much interested in the vivid description of the aurora of August 26 given by Dr. C. C. Nutting, followed as it was in the next issue of SCIENCE by a number of letters from different localities concerning the same, and I find in the last issue of SCIENCE, that of November 17, a most interesting account of this aurora, with general considerations respecting this phenomenon, given by Professor C. C. Trowbridge, of Columbia University.

Inasmuch as I had some time ago prepared a paper entitled "Inferences Concerning Auroras" for presentation at the meeting of the National Academy of Sciences in Boston, where the paper was read on November 14, it may be of interest to make a few brief statements concerning the inferences presented. In an address at the opening of the Palmer Laboratory of Physics at Princeton, entitled "Atmospheric Electricity" which appears in SCIENCE, N. S., Vol. 30, No. 781, pp. 857-869, December 17, 1909, I took occasion to state some opinions based upon the observation of auroras for many years, particularly as to the general relation of the auroral streamers to the earth. I quote the following statement:

I have come to the opinion that the auroral streamers often extend in a general direction outwardly from the earth, sometimes for very great distances relatively to the known extent of our atmosphere. The effects observed appear unaccountable on any other supposition, while they are consistent with the idea of outwardly directed streams of great extent.

The evidence furnished by the recent aurora of August 26 confirmed the inferences which I had made many years ago, and added considerably to the possibility of applying certain ideas in explanation of auroral phenomena generally. In the paper before the National Academy I have, I think, established with a fair degree of certainty that the auroral streamers are in reality vertical or approximately vertical to the earth's surface. These vertical streamers appear in bands, more or less wide, in the general direction of parallels of latitude forming belts or zones in which the streamers extend upward, somewhat like trees in a forest. I find an explanation, also, of those auroras which appear to be limited to a narrow belt, and appear as a single narrow streak of light across the sky from east to west. There may be, of course, in any aurora, a number of such belts occupying different latitudes. I have endeavored to show, and I think successfully, that the curvature of the so-called auroral arch is a purely optical effect of perspective, increased somewhat by the curvature of the earth, and that the appearance of folded curtains of streamers merely means that the lower ends or feet of the streamers which are, with relation to the observer, of varying altitude, or are of varying latitude as in a belt which is of a winding nature.

It is pointed out, also, that the convergence of long streamers towards the zenith seen in the great auroras is purely an optical effect of perspective, and that the so-called zenith crown is, in reality, due to bundles of streamers nearly vertical like the others, but seen on end overhead.

There are a number of other inferences which are supported by the observations of Carl Störmer and others, among which is the probable existence of a conducting layer at a