

group, but too small to be of any consequence. It had disappeared by the 19th. * * * on the morning of the 17th telegraph operators noticed a disturbance.—*E. D. Roe, jr.*²³

Mr. Owen Bryant reports that the "aurora was bothering the wires again on the morning of April 20 [at Calgary]," but the weather did not permit him to observe any display. Auroras were reported as seen in New England on the nights of April 14, 16, 17, 18, 19, and at Jericho, Vt., only, April 20-22. The aurora of the 16th was also seen at Ottawa, Canada, that of the 17th at Plainfield, N. J., and that of the 19th extensively throughout New England, and, possibly, through a rift in the clouds at Washington, D. C.

On the following presentation, a faint aurora was observed at Washington, D. C., on the night of May 9, and another by Mr. W. A. Bentley at Jericho, Vt., and by Prof. G. R. Wieland at New Haven, Conn., on the night of May 15-16. Other auroras have not been reported, and from the waning character of the displays at successive rotations of the sun it appears that the unusual solar activity has ceased.

We shall be fortunate if we ever see the equal of this marvelous aurora. Such are rare indeed anywhere in middle latitudes. (See Table 1.) Four potential auroras

TABLE 1.—A list of the principal auroras from 1914 to 1920, inclusive.¹

Year.	Greatest.	Great.	Unusually brilliant.
1914....	None.....	None.....	None.
1915....	June 16-17.....	None.....	{Oct. 6-7 (Iceland.) {Nov. 14-15 (Iceland.)
1916....	Aug. 26-27.....	None.....	None.
1917....	{Aug. 9-10..... {Dec. 16-18.....	{Jan. 4.
1918....	Mar. 7-8.....	Aug. 15-16.....	May 15-17.
1919....	Aug. 11-12.....	Oct. 1-3.....	{Feb. 27-28. {May 2.
1920....	March 22-23.....

¹ Many of these displays are described in the MONTHLY WEATHER REVIEW for the years indicated.

may pass unnoticed in the daytime, in the latter half of night, or behind the clouds, for each one that a person can see on a clear evening. We can count only five such great world-wide auroras during the past five years embracing this unusual sunspot maximum. Our turn is not likely to come again for 20 years.

NOTE ON THE HEIGHT AND LOCATION OF THE AURORA SPOTS AND BELT OF MARCH 24, 1920.

By CHARLES F. BROOKS and C. LeROY MEISINGER.

[Weather Bureau, Washington, D. C., May 10, 1920.]

In comparing the notes of various observers of the aurora of the night of March 24-25, it appears that some of the spots and patches observed in various places were identical, but that they appeared in various parts of the sky to the various observers. This makes it easily possible to calculate the altitude of the aurora and determine its location. For example, a certain spot was simultaneously seen from South Hadley, Mass., Concord, Mass., Rochester, N. Y., and Washington, D. C. Prof. Anne S. Young at South Hadley saw it in the southwest at an altitude of about 15°, Mr. Milroy N. Stewart at Rochester saw it in the southeast at about the same elevation, and at Washington it was observed in the northeast-by-north at an elevation of 35° to 40°. While Mr. Fred A. Tower at Concord certainly saw the same spot, the reported elevation seems to have been estimated

somewhat too large, it being reported as 40°. These lines meet in an area over southeastern Pennsylvania and central New Jersey, and trigonometrical calculation shows that its height was about 140 kilometers (87 miles).

Again, the May, 1920, issue of *Popular Astronomy*, pages 307-312, gives some interesting photographs and reports. One of these photographs, taken about midnight, March 24, in Brooklyn, N. Y., shows an auroral spot in the southeast together with several star trails, among which the most conspicuous were those of Mars and Spica. This spot was observed in Washington, between east by south and east-southeast within a few degrees of the horizon. Measuring on the photograph made at Brooklyn it is possible to determine with fair accuracy the angular altitude of the auroral spot at that place, and its center is found to be about 13°. If lines are drawn toward the southeast from Brooklyn and toward a point between east-by-south and east-southeast from Washington, it is found that they intersect in the ocean about 320 km. from Brooklyn and 470 km. from Washington. Using the Brooklyn elevation, we find the altitude of the spot to be about 120 kilometers (73 miles).

Another case, taken in part from the reports in *Popular Astronomy*, is that of an observer in Ann Arbor, Mich., reporting a bright patch in the south about 20° above the horizon at 11 p. m. 90th meridian time. From Washington, this spot appeared in the west-by-north about 7° above the horizon. Calculation shows it to have been about 330 km. south of Ann Arbor, and 610 km. west-by-north of Washington at a height of about 130 kilometers (81 miles).

All these values being in very good agreement, it is reasonable to assume that the display was taking place at that general elevation; or, to take the mean of the three calculations, 130 kilometers (81 miles). Making this assumption as to the altitude, it is possible to locate other spots which were observed from Washington. Such a one was seen in the northwest to northwest-by-west or west-northwest at about 9:45 p. m., appearing as lenticular in form with its lower edge at an elevation of 18° and its upper at 23°. Assuming this to have been actually a flat base and its elevation 81 miles, we find that the more distant edge must have been 400 km. from Washington and its nearer edge about 300 km. This would place it over east central Ohio and western Pennsylvania. Mr. H. D. Pallister, writing from eastern Kentucky, says:

"I also saw the aurora on March 24 about 9:30 p. m. (C. S. T.?) at Wolfpit, Pike County, Ky., and watched it for over one-half hour. As seen here it consisted of undulating flashes of white light radiating from a general northerly direction. The flashes would occur at intervals growing brighter and then die out for a time."

The two spots over eastern and western Pennsylvania early in the evening, grew into a belt stretching from a few hundred miles out to sea, across northern Virginia to southwestern Ohio. Although the belt seemed to move slowly, it was traveling southward at about 60 miles an hour.

THE PHYSICS OF THE AURORA.¹

By W. J. HUMPHREYS.

[Abstract.]

We are fortunate in having collected in one book practically all that is known concerning the aurora:

²³ Science, May 14, 1920, p. 486.

¹ Presented before American Meteorological Society, Washington, D. C., April 22, 1920.