

ing the remarkable aurora of September 2nd, 1898, at the request of Mr. Arctowski, who described it as he saw it in Belgica Straits:

"At 7.50 a fine arch, large, exceptionally high. 8.00, a second arch forms within the first, becoming very intense. Color, green. Rapid movement of the rays from right to left. Fluctuations. Ribbands. Snake-like undulations, curling back on themselves. Homogeneous light, white or yellowish, mingles with the rest. 9.30, intensity renewed. Above, a great arch, a single band, clearly defined below, shaded off above, with large waves. 10.15, inside the arch, how much disorganized, is a broad, intense band, bow-shaped, recurved, undulating in the upper part. 10.30, double arch, the outside one whiter than the yellowish but higher one inside. The interior arch bent upwards at one end and fringed with rays. 10.40, the auroral sheen is intense. All the details of the aurora are in a way effaced by a spontaneous effervescence of light. The whole segment is luminous. 10.50, fading, rays distinctly green, distributed all over the part of the sky where it has been, seeming to start from a series of different bands."

The weather in North America was fine and clear on that September 2nd, all over the latitudes where aurora are to be looked for, except in the State of Maine and the adjoining Maritime Provinces. The observations available are 78, and they are thus distributed—

United States—Idaho, 1; North Dakota, 1; South Dakota, 1; Minnesota, 9; Iowa, 9; Wisconsin, 10; Illinois, 7; Michigan, 10; Indiana, 3; Ohio, 1; New York, 4; New Jersey, 1; West Virginia, 1; Maryland, 1.
Canada—North-West Territories, 5; South-West Peninsula of Ontario, 10; Muskoka and Northern, 4.

Thus the visibility of this aurora was localized in and just around the basin of the great lakes, with a secondary focus of excitation in the far west, on both sides of the boundary line.

Localization is to be noticed in the case, too, of the fine aurora of September 9th, 1898, also brilliant in both hemispheres. Arctowski tells of its "dark segments," "homogeneous arcs," "double arcs," and "rays," witnessed in extraordinary beauty in the Antarctic. Here we had 80 observations, the weather being clear all across the auroral belt of America, except in Nebraska and Iowa. There was a little patch of 16 observations in the North-Western States, and another of a dozen around Pembina and Quesnelle, some brilliant. Then there is a connecting belt of 7 sporadic observations between Winnipeg and Montreal, corresponding to those in Minnesota (4), Wisconsin (2), Illinois (1), and Michigan (1). A scattered single report comes from Kansas. And then comes the great outburst further east: Pennsylvania (3), New York (5), Rhode Island (1), Maryland (1), Vermont (2), Connecticut (2), Massachusetts (7), New Hampshire (2), Maine (5). In Quebec and around the Gulf of St. Lawrence (12), Maritime Provinces (6).

This aurora, then, had its chief American focus by the sea, and a secondary one two thousand miles to the west. It was particularly fine on the European side of the Atlantic.*

Eight descriptive accounts of the aurora of September 2nd have been sent to me from Washington. They are strikingly dissimilar, so much so that the discrepancies cannot arise from errors of observation. Thus, at Dubuque, Iowa, it is expressly said that no arch was visible, and none is mentioned from Duluth or Milwaukee, but there was an arch at Grand Haven, Green Bay, the Sault de Ste. Marie and Rochester, N. Y. At Milwaukee the aurora was highly coloured, green, yellow and yellowish green, at times a red tinge, the whole appearing to be covered with a silvery sheen. At Green Bay "the entire heavens would at times be illuminated with a variety of tints." At Duluth there were "well defined curtain folds and streamers beautifully coloured, constantly changing effects." On the other hand, at the Sault de Ste. Marie, while there was a fine arch and streamers reaching to the zenith, there were no colours noticed; at Grand Haven the arch only gave out faint streamers and no colours are mentioned. At Dubuque there was "a pale, diffuse light," no arch; slender, luminous beams of a pale yellow occasionally rose and suddenly disappeared. The account from Minneapolis differs from both the above classes. "About 9 p.m. two broad parallel bands of light were seen extending . . . across the sky. In the north-east the sky seemed somewhat overcast, and on the edges of what appeared to be clouds there were occasionally patches of bright light which came and went with some rapidity. Sometimes a suggestion of a vibratory motion, but the illuminations were all indistinct. Later in the evening the lights were much more brilliant, with curtain-like movements,

* Bulletin of the Astronomical Society of France, October, 1898.