can Physical Society at its meeting on February 27, 1904. The following is quoted from Science, April 1, as a summary of that paper, "On the microphotography of fog particles and the photographic study of atmospheric nucleation."

The author gave a description of his apparatus and methods, and illustrated the results by a series of ten lantern slides and many positives showing the microphotographs of fog particles. Most of these were strikingly distinct, the water globules ranging in size from about 0.0002 centimeters to 0.002 centimeters, according as fogs of different degrees of fineness were precipitated. The most highly graded nuclei, as shown by the presence of fog particles of all sizes, were obtained by an exposure of dust free air to the X rays from one to ten minutes, depending on the intensity of radiation. Much greater uniformity in the series of the nuclei is shown in the cases of phosphorus and ordinary air nuclei.

The author described a number of curious phenomena observed with these water particles, among which their continued motion when caught on a film of liquid oil, simultaneously to and fro between edges of the film, is most noteworthy. Particles moving in swarms in opposed directions are often in the focus of the microscope together, and thus lie very nearly in the same plane. The author finally remarked that the coronal method had now been so far perfected that the nucleation increment produced by a single gas flame in a moderately large lecture room could be detected in about ten minutes, even in the air collected from near the floor. This favorable quantitative result may then be supplemented qualitatively by the photographic method, which will show the presence of exceptionally small or large particles, whose effect vanishes from the corona as they are relatively few in number.

THE WINTER OF 1903-4 AT THOMPSON, WINDHAM COUNTY, CONN.

It is well known that one of the longest temperature records in New England is that kept by Miss Ellen D. Larned for over fifty years at Thompson, Windham County, Conn. A short note from her states that the past winter has been the coldest within the last half century. "We have been less afflicted with high winds and severe snowstorms than in some sections, but had excellent sleighing from December 30 to March 3." The following is the temperature record:

December, 1903, mean	23.4°
January, 1904, mean	17.9°
February, 1904, mean	18.6°
Mean	20.0°

During the years 1852–1904, the coldest December was in 1872, mean temperature, 20.6°; the coldest January was in 1857, mean, 10.8°; and the coldest February was in 1901, mean, 18.1°. Although the general average of the present winter is the lowest on record, yet the individual months have been exceeded.

Other cold winters, according to Miss Larned's records, are as follows:

1856–57, mean	22.3°
1867–68, mean	21.4°
1872–73, mean	22.5°
1874–75, mean	22.0°
1892–93, mean	20.7°

The warmest winter was 1889–90, mean, 31.7°.

LOCAL STORM AT PORTLAND, OREG.

Mr. E. A. Beals, District Forecaster at Portland, Oreg., describes a windstorm, or incipient tornado, which passed through the eastern portion of that city on February 26. A low pressure area was central that morning off the northwest Washington coast. Therefore Portland was in the southeast quadrant of the cyclonic disturbance and about 400 miles from its center.

At 10:42 a. m., local time, a very black, low cloud was observed at the station, passing rapidly toward the east-northeast. The barometer rose suddenly .04 of an inch and then fell rapidly to the starting point. Wind and temperature, also, fluctuated rapidly, and heavy hail fell for about three minutes.

The greatest destruction occurred about 4 miles from the station, in what is known as Barretts Addition, where two houses were destroyed and others damaged. While the distribution of the débris did not positively indicate gyratory winds, the force exerted appeared to be greater than is probable in a straight line blow. The houses destroyed were not very substantially built. The trees prostrated varied in diameter from 3 inches to 1 foot. They were all coniferæ with bushy tops. Those that were broken off were small in size and where broken gave no indication of being subjected to a twisting force. The storm came from the west-southwest and moved toward the east-northeast. The tops of the trees to the right of the center of the storm track pointed a trifle to the east of north, and those to the left of the center pointed a trifle to the west of north.

Witnesses describe the cloud as very black and close to the ground; some of them noticed a single flash of lightning, but only one observed any whirling motion or funnel shape. They agree that the rain was very light before the storm, but quite heavy for about fifteen minutes after it had passed. Heavy hail began to fall just before the wind struck the buildings. It was oval in shape and about the size of marbles. One person saw *two* clouds, which approached each other from the northwest and southwest, and, after meeting, seemed to roll down almost to the ground and then move rapidly toward the northeast.

The width of the path of destruction was 200 feet and the length nearly ten miles. In the center of its path there were houses as well as trees that escaped injury, and the people living in them did not notice that the storm was uncommonly severe. There were no lives lost, but several people were slightly wounded. The damage to property amounted to about $5000.

BRIGHT METEOR OF SEPTEMBER 15, 1902.

Mr. E. L. Mosely, of Sandusky, Ohio, has made a special study of a remarkable meteor that passed northward over eastern Ohio about 5.42 a. m., September 15, 1902, and was seen by observers in Michigan, Ontario, Indiana, Pennsylvania, New York, and West Virginia. He desires as many additional records as possible. Will not all who read this paragraph kindly examine their old records, diaries and memoranda, scrap books, and local newspapers, and send Mr. Mosely whatever they find bearing on this meteor? The mere fact that it was seen or heard will be of value. Many times, when the sky is covered with clouds, the observer merely hears a great noise, like an explosion, and knows not the origin of the noise. Sometimes it is attributed to an earthquake; at other times to the blowing up of a distant powder mill or steam boiler; sometimes the windows rattle and it is spoken of as an earthquake. Whatever happened on the morning of September 15, 1902, over a region between western North Carolina and upper Michigan and Ontario, should be examined with reference to its possible connection with this meteor. To very distant observers it may have seemed merely like a bright shooting star.

HYPOTHESES AS TO THE CAUSE OF THE AURORA BOREALIS.

In the Bulletin of the French Society of Physics for 1903, pp. 184–220, Mr. Charles Nordmann, an employee of the Astronomical Observatory at Nice, reprints a thesis lately presented by him to the faculty of sciences at Paris. He develops arguments in favor of the hypothesis that the aurora, as observed on the earth, is the result of Hertzian waves that emanate from the sun, and that are registered regularly at the magnetic observatories, just as the ordinary electrical phenomena of the atmosphere are recorded at other observatories. He has tried to prove logically that the sun sends out such Hertzian waves of greater intensity from the regions, and at the epochs, of the greatest solar activity; that is to say, from the regions of spots and faculæ and at the moments of the maxima of solar spots. He finds that the form and orientation of the detailed struc-

ture of the aurora, its extension, frequency, and height, its spectrum, its diurnal, annual, and sun-spot periodicity, and its relation to the magnetic pertubations, all harmonize with this conclusion. Recent fundamental researches by Paulsen into the relation between cathodic discharges and optical appearances analogous to auroras have given rise to the two theories proposed by Arrhenius and Birkeland, respectively, which attribute a preponderating role to the cathode rays emanating from the sun, but these theories are not perfectly satisfactory and Nordmann suggests necessary modifications.

The theory of Arrhenius is based upon the hypothesis that the sun by reason of the Maxwell-Bartoli pressure (sometimes spoken of as the pressure of light) emits particles that are charged negatively, whose diameters are of the order of $\frac{1}{1000}$ part of a millimeter, namely, one micron; these arrive with their negative charges at the earth, and under the influence of the ultraviolet radiation from the sun they are discharged into the upper atmosphere and produce the cathode rays.

The theory proposed by Birkeland has some resemblance to the older theory of August de la Rive, which has been modified by many savants in order to adapt it to the demands of modern knowledge. Birkeland attributes the aurora to electric currents, but not to those circulating in the ground or in the lower atmosphere, but to those that are restricted entirely to the upper atmosphere and circulate there very nearly parallel to the ground. He also considers the sun the source of these currents, whereas other authors attribute them to causes that are exclusively terrestrial. In order to explain the diurnal and 11-year period of the aurora, Birkeland thinks that the electric currents are produced by the cathodic rays emanating from the sun.

If there be a rotation of the solar nucleus, there should be a corresponding periodicity in the magnetic perturbations and in the auroras, but Schuster has shown from the Greenwich observations for twenty-four years that there is no sensible period in these magnetic pertubations having a value anywhere between the limits 25.0 and 27.5 days at Greenwich. Hence, it would seem certain that there can be no solar magnetic influence. On the other hand, if we examine Birkeland's theory more carefully in view of the possibility of the production of auroras by electric currents in the upper atmosphere, we see that every time that an aurora is visible there should also be a magnetic perturbation due to the current that produces the aurora. But, on the contrary, in the regions where auroras are most brilliant and most frequent, they produce the least magnetic perturbation; hence, in place of these ordinary explanations Nordmann recalls that these Hertzian waves, such as we know ought to emanate from the sun, resolve all our difficulties. They have the power, exactly like the voltaic current, to make rarified gases luminous; an abundance of cathodic rays is produced in connection with the luminescence of the rarified gas produced by Hertzian oscillations; the atmospheric regions that are rendered conductive by solar Hertzian waves also have a movement with respect to the magnetic field of the earth by virtue of its induction. In general, the Hertzian waves from the sun explain the forms and orientation of the aurora and the details of its rays, the extension of the aurora over the globe, the frequency of the aurora, the time of maximum and minimum, the altitude of the aurora, the spectrum of the aurora, the diurnal and annual frequency; the 11-year period, the relation between the aurora and magnetic perturbations.

Professor Bigelow states that Nordmann's theory agrees with that which he has been advocating since 1890. The Hertzian waves from the sun are identifical with the "field of sunlight" of Professor Bigelow. The bombardment of the earth by ions from the sun, as is required by Arrhenius theory, requires too much of them.

Mr. Charles Chree, in the London, Edinburgh, and Dublin Philosophical Magazine for January, p. 77, states that the original doctorate thesis by Nordmann, in which the above theories are broached, while containing an abundance of references, and favorably reported upon by such eminent savants as H. Poincaré, Pellat, and Moissan, is yet quite unsatisfactory from some points of view. For instance, it is not logical to conclude that as sunspots increase, therefore the sun's thermal radiation must necessarily diminish. Nordmann's general law that the amplitudes of the diurnal variation of magnetic declination diminish as one retires from the equator is quite contrary to the general observations and belief of magneticians. In general he states that an intimate knowledge of all the subjects to which Nordmann applies his theories is perhaps rather too much to expect of any one man.

CORRIGENDA.

MONTHLY WEATHER REVIEW for January, 1904, page 10, column 2, line 19, for "oxygen" read "hydrogen;" line 20, for "hydrogen" read "oxygen." Page 16, column 2, line 16, change $\frac{\varpi}{\rho}$ to $\frac{P}{\rho}$.

MONTHLY WEATHER REVIEW, February, 1904, page 73, column 1, line 8, change 6.0377×180^{27} to 6.0377×10^{27}; line 26, change 29.80670 to 29 80670; line 29, change 9.77448 to 9.774448. Page 76, column 1, line 8 from bottom, change $0293r$ to $0.293r$. Page 83, column 2, line 8, for "Chart VII" read "Chart IV."

THE WEATHER OF THE MONTH.

By Mr. W. B. STOCKMAN, District Forecaster, in charge of Division of Meteorological Records.

PRESSURE.

The distribution of mean atmospheric pressure is graphically shown on Chart VIII and the average values and departures from normal are shown in Tables I and VI.

The mean pressure for the month was high on the Atlantic seaboard and low from southwestern Texas, New Mexico, and southeastern Arizona northwestward over the slope and Plateau regions to the coasts of Oregon and Washington.

The crest of the high pressure area overlay the Middle Atlantic States and North Carolina. The pressure was lowest over the north Pacific region, with a secondary low area over the southern Plateau, and western portion of the southern slope region.

The pressure was above the normal in the Atlantic districts, northeastern Florida, eastern portion of the east Gulf States, central and eastern Ohio Valley and Tennessee, lower Lake region, and northeastern portion of the upper Lake region. In the remaining districts it was below normal.

The greatest positive departures from the normal ranged from +.10 to +.12 inch and occurred over southern New England and the northeastern portion of the Middle Atlantic States. The negative departures were more marked and ranged from —.10 inch in the southern and middle Plateau regions, in an increasing degree in a northwesterly direction to —.20 inch on the Washington coast. Over western Oklahoma and the panhandle of Texas the departures slightly exceeded —.10 inch.

The pressure slightly exceeded that of February, 1904, on the coast of New England, in northwestern Montana, and northern Washington, the greatest departures, +.05 to +.07 inch, occurring over northwestern Washington; over the remainder of the country the pressure diminished from that of the preceding month and in a much more marked degree, the greatest variations, ranging from —.20 to —.24 inch, were reported from the upper Mississippi and Missouri valleys, North Dakota, and the eastern portion of the middle slope region.