NOTES ON ATMOSPHERIC ELECTRICITY.

By Alexander McAdie.

In "Ciel et Terre," No. 10, July 16, 1899, p. 243, *M. H. Pellat* refers to the important part which water vapor plays in connection with atmospheric electricity. Both Peltier and Exner have held that the vapor carries a negative charge from the earth, but until very recently, experiments on the dissipation of the charge of negatively electrified vapor have not sustained this view. M. Pellat has attempted to show that the vapor rising from a water surface does carry a charge. He has studied the loss of an electrified brass reservoir insulated in paraffin and connected with a Bourdreaux electrometer. Comparative readings were made, one series with the reservoir full of water, and the other with empty reservoir. The initial charge, 116 volts, was the same in all experiments as well as the time interval, 85 to 105 minutes. The rate of loss was always greater in the case of the full reservoir. It follows that during the day, the vapor rising from the ground must carry with it a considerable portion of the earth charge, and we find this relation borne out in the mean curves, the minimum occurring during the heated hours. M. Pellat calls attention also to the electrification due to smoke and steam, and cites these as causes of the irregularities found in the curves where the observations are made in cities.

Diurnal Variation of Atmospheric Electricity. M. Chauveau, of the Bureau Central Meteorologique, communicates the results of experiments made for several years past at the top of the Eiffel Tower, upon the diurnal curve. At the Bureau during most of the year there is a double oscillation with the maxima from 6 P. M. to 8 P. M., according to the season, and from 7 A. M. to 10 A. M. The minima occur shortly after the noon hour, and during the night. The day minimum in winter is not well marked, neither is the morning maximum, and the curve approaches that of a single oscillation. The diurnal curve at the Eiffel Tower during the summer is entirely different from the corresponding curve at the lower station. The curve is a single one, with a maximum during the day and a minimum at night, and shows a decided resemblance to the winter curve of the lower station. These results, in view of the decrease of the potential during the warm weather, and its increase during the cold, bear out the view of Peltier as to the negative electrification of water vapor. The curves obtained at the College de France do not agree with those obtained at the Bureau Central. Especially during summer does the curve at the latter station show marked differences. The necessity of a free exposure is apparent. A register has lately been installed at Trappes, at the Observatory of M. Teisserence de Bort. Unfortunately, however, the steam and smoke of passing trains will doubtless influence the records.

Ernest Solvay in Ciel et Terre, September 1899, describes an experience during a snow-storm, on Monte Bianco, 3998 meters, which is of interest in connection with problems of atmospheric electricity. Whenever the metal points of the alpenstocks were driven through the snow, a soft hissing, evidently caused by the passage of a large number of sparks from the metal into the air, could be heard, even several meters away. It is thought that the snow crystals falling gently to earth and being formed practically at the same time had a high positive charge, and any compression or friction would cause a brush discharge into the damp negative air, which, too, is very much rarefied at this elevation. The author states his belief that the electrification was connected with the condensation of the water vapor under these unusual conditions.

In Ciel et Terre for January 1, 1900, *M. A. Chauveau* reviews the different theories of Volta, Peltier, Sohncke, Brillouin, Buisson, Lenard, and Edlund. He then gives the chief results of observations made at the summit of the Eiffel Tower. These have been already referred to.

Professor Selim Lemström publishes a small volume "On Earth Currents and the Electrical Currents in the Atmosphere and their relations to Earth Magnetism," which may be regarded as a continuation of the work begun in 1882 by Lemström, while in charge of the Finnish circumpolar stations. The author maintains that an electrical air current can flow without being detected by an electrometer. By means of a "point-apparatus," constructed on the mountains of Lapland, Lemström has attempted to study these aerial electric currents. A copper or iron wire, 2 mm. in diameter, provided with brass needle points 50 cms. apart, is carried on insulators of a modified Mascart type, mounted on wooden posts in rectangular spires, 1.5 of a meter from each other, and covering an area of from 300 to 400 square meters. By means of a conducting wire on similar insulators, this point apparatus is connected with a galvanometer in circuit with an earth plate of amalgamated zinc.

The author has also noted certain luminous phenomena in the form of high auroral beams. In November, 1871, this appearance was first observed above a small point-apparatus on the mountain Luosmavaara, latitude 68° 55′, longitude 27° 13′. This beam was observed a second time, December 29, 1882, at the top of Pietarintunturi. The author states that he had the impression that it would be very easy to produce these beams, but experience proved otherwise, and only twice during the following year was the beam seen on the same mountain, namely, on February 27th, and on March 2d. The phenomenon seems to require a clear sky, low temperature, and relatively low pressure.