pinnules laciniately divided into narrow teeth. Habs.—Mt. Uniacke, (Rev. J. B. Uniacke); New Germany, roadside between Barss' Corner and the LaHave, Lunenburg Co., (Rev. E. H. Ball.) The two varieties seem to be rare.

Art. VI.—The Semi Daily Fluctuation of the Barometer.

By Frederick Allison.

(*Read before the Institute, May 8th*, 1876.)

Before proceeding to an investigation of this phenomenon—well known to observers—I wish to offer a few remarks upon the weather of last year, a summary of which you have in the General Register before you.

In 1875 we had a cool year—the coldest at least since 1859, if not for a longer period. The normal temperature in Halifax is 42°. 66. This year was 40°. 23. We may notice here the very small difference in yearly mean heat. However great may be the ranges in the twelve months—last year they extended over 99° and sometimes they reach 104°, as in 1866—so well balanced are the several months and seasons that 4°. 27 will cover the means of the last 16 years. August was the only month which ran above its normal, and was much the hottest month of the year. The maximum heat also occurred in this month 85°. Many months were cold, but January was excessively so; its mean 14°. 99 being 7°. 7 below its normal, and this was the coldest month I ever experienced in Nova Scotia. February—mean 17°. 99 was also very cold; and then we touched the minimum—14°. The 15th of August was the warmest day; and the day exactly six months earlier, the 15th of February was the coldest. The 3rd of June was a very remarkable day in temperature. At 4 a. m., the thermometer was 34°. 5 and before noon had mounted to 72°. 8—giving the enormous range of 38°. 3 within 8 hours. The pressure was a little more than usual, slightly exceeding the normal in every month, but especially in August. The maximum was on the 23rd

of November, at 9 in the morning—30.666—clear with a light west breeze; and we had a snow storm from east that evening, and a S. E. gale with rain the next morning; the barometer falling an inch in 18 hours. 30.666 is a high barometer at any time of year in Halifax, but has frequently been exceeded. Notably when we passed under the enormous pressure of 30.956 at 6 p.m., of 15 January, 1873; and again last February 30.992 at midnight of the 5th. It is worth remarking that although we had a stiff S. W. wind and a little snow and rain on the 6th and 7th we got down from this great height without any serious storm. The least pressure of 1875 was 28.601 on the 17th November—only six days previous to the greatest. We have gone below this several times in the last few years; 28.455 on 30th January, 1870, being the lowest. The minimum of last November was in the midst of a rain storm and gale from S. E. to W. Thus we varied 2.065 inches of barometrical whole pressure in 1875, oscillating nearly equally on either side of the proper 29.779.

The mean pressure of vapour was .248 and relative humidity 80.71—elements too often omitted from the consideration of the weight of the atmosphere. The former of these two steadily increased to its maximum of .551 in August, and as steadily fell to the close of the year. The latter was greatest (as is also customary) in July—84.94—and the colder months were generally less—though May, with 76.70 was least of all.

The year was neither very cloudy nor very bright. The mean obscuration of sky was a little over one-half, viz., 5.58. The normal I find to be 5.95. October, with 6.34, was the most cloudy month; and June 4.57 the least so. The summer was more dull, both absolutely and relatively to the normal, than the winter.

The prevalent direction of our winds from the west quarter was almost constantly marked throughout the year, and the result was nearly due west. A wind east of south not obtaining the supremacy until July denotes the lateness of the spring. These winds from the cooler ocean generally assert themselves in May or June, but their season depends upon the rate at which the water takes in heat.

The velocity of the wind exceeded the normal rate in each

month excepting March and April; in the former of which it fell considerably, and in the latter slightly below the average. None of the excesses were large, and consequently the whole year's mean of 8.67 miles per hour was but .83 over the average mean. November was absolutely the most windy month in 1875; which result accords with my previous 13 years observations, although the normal of March approaches very closely. But last year as noticed that was comparatively a quiet month. August was, as usual, the month of least wind.

While from the large rain-fall of the summer 1875, may be remembered for its wetness, the total precipitation of the year was in reality very close to the average 52 inches of Halifax. The whole rain was nearly an inch deficient, owing to the abnormal scarcity in January, March, September and December, which the excess in June and July, and, remarkably, in October did not compensate. Snow, on the contrary was very plentiful in January and February, but scarce in March and notably wanting in December. The whole depth exceeded 87 inches dry, being 5. 5 above the normal; this when melted raised the total precipitation to 51.480. The number of days of rain was 134. Snow fell on 54 days, while 198 days were completely dry—a dry day is that on which the precipitated moisture does not reach; .01 of an inch is in fact inappreciable; of such days 204 is the normal annual allowance in Halifax, 10 days more than the average number in London, about the driest district of Great Britain.

The aurora borealis was seen much less frequently than usual. Since October, 1874, there has been a remarkable scarcity of these displays, which still continues. Several years ago I laid before this Institute what I believed to be the causes of the visibility of this phenomenon, noting that it was invariably accompanied by a fall in temperature, generally great and frequently sudden. Longer experience has confirmed this belief. I have said that the display is not simply electric; because, however, the existence of the aurora is due to electric force, we on this earth can only know of its existence—can only see it, in short—when a lately decreased temperature of our atmosphere brings the display to our vision. In how

far this wonderful power, which we call electricity, is the cause of every movement of our atmosphere I am not prepared to say to-night; nor do I feel sure that I know what electricity is; but I am convinced that there is a force, (call it electric, or magnetic, or what you will), continually controlling aud regulating [even perhaps originating] not only the life of the atmosphere, but similarly of the vegetable and the animal. I cannot now dwell on this important subject, which is beyond the scope and intention of this brief paper; but I wish not to be misunderstood to refer at all in the foregoing remarks to the knowledge of the origin and existence of the immortal soul of man and his responsibility as revealed to us by the one true God.

The total number of gales in 1875 was 19—thus distributed,—January 3, February 3, March 3, April 0, May 2, June, July and August 0, September 2, October 3, November 3, December 0—this is about the usual total, but the 2 in May were rather due to December. A gale in Canadian Meteorology requires 30 miles per hour of velocity—a pressure of 4½ lbs. per square foot; 52 Fogs were noted—the greatest number but one in ten years. July was particularly a foggy month. In other occasional phenomena I find nothing peculiarly remarkable. Though not a purely Meteorological point I note the number of days when runners are more suitable than wheels, as a matter of interest. In 1875 then we had 92 days sleighing, more than for many years; it being unbroken, with the exception of one day, from the new year to 29 March; and again having 5 days in December. 1872 is the only recent year to equal this; then we had 98 days sleighing, being half of January, all February and March, 4 days in April and 19 in December.

We now proceed to the more immediate matter of this evening, the double maximum and minimum of the whole atmospheric pressure, each 24 hours. But time warns that I must be brief. An observer watching the action of his barometer constantly during the day will always notice, should no irregular disturbance affect the atmosphere at his station, a steady rise, a fall, a second rise and again a gradual fall; the same movement continuing more or less while ordinary weather lasts. Beginning, say at midnight, some

clear steady night, at any time of year, he will see the column decline till about 3½ a. m.; about 4 a. m. a movement upwards from this minimum begins and continues till full 9 a. m. when a maximum height is attained. In 15 or 20 minutes again the column sinks till 3½ p. m., once more to ascend till 9. p. m., when the second fall sets in; which decline continues, as said above, until after 3 o'clock next morning. This action is certain and well known. Briefly we will discuss the reasons for it; and first I think we will find at the bottom of our investigations, the great controller of our atmosphere, heat. Indeed we need go no farther than this agency for the direct cause of the second minimum and maximum of the Barometrical column. A mere superficial glance at once leads us to a correct conclusion that as the heat increases during the forenoon, after 9 o'clock the air becomes lighter, and pressure is taken off the cistern, and this will continue till after 3 p. m., when the greatest heat of the day having been reached, the gradually cooling atmosphere grows more dense and presses the mercury up the tube.

But while the one wave is thus sufficiently accounted for, other causes must interfere about 9 o'clock in the evening, or the upward tendency would remain till the sun of the next day had restored the heat and lightened the atmosphere. In short if we look to direct heat alone, we have as an effect but one fluctuation during the whole day. I have been careful to use the phrase "direct heat" as I believe it may be proved that heat, though acting indirectly, is the root of the second wave also. Now we imagine ourselves at 9 p. m., on any day, and looking to the diminution of heat alone the barometer should still be rising; as, speaking broadly, cold air is more dense than hot air.

But the column has reached its greatest height for the present, and in a few minutes begins to descend. Why? Because in addition to the gradual cooling of the atmosphere above mentioned a force of descending vapour has been at work in the early hours of the night pushing down upon the cistern of the barometer, and greatly aiding in the elevation of the column thus doubly effected. And soon after 9 p. m. this second force ceases; the earth becoming cooled to equal the temperature of the air, or nearly so. This

fact is again shewn by the deposit of dew being greatest in the early hours of the evening, between sundown and 9 p. m., when the humid vapour of the atmosphere descends most rapidly and forms in drops of visible water upon the ground and other material substances as they cool. The most energetic force then being at an end, the mercury about 9½ p. m., again gradually retires down the tube till 3 a. m., or a little after. But why should this second descent not continue, at least till the rising sun rarifies the atmosphere by heat, when the downward tendency would be accelerated, as we have seen that it is after 9 a. m.? Because as daylight approaches, and the earth is at its coldest, the expansion of the vapour, which we have noted as condensing and pushing downwards at the beginning of night, re-commences. The earth which parts with heat less readily than does the atmosphere, is also more loth to take it in, and now about 3½ in the morning (as an average hour for the twelve months) is most cold. Then the layer of atmosphere immediately on the earth's surface is the next deficient of heat, and the higher strata (I speak within limits proximate to our planet) are the warmer. So the night vapour rises, but not only does it rise, but with its "quasi explosive force," as says Sir Henry James in commenting upon Professor James Espy's interpretation of this phenomenon, it presses upon the delicate barometer and the mercury rises, till our starting point of 9 a. m. is again reached, when the atmosphere being heated and dried and the ground warmed, the fluctuation again begins its diurnal career. This motion is known to be constant in regular weather, so much so as to be spoken of as "Diurnal Atmospheric Tide"; but while proved to take place on all the continents (which it will be remembered are chiefly inhabited on their shores, or at comparatively small distances from the oceans) it becomes very obscure in the interiors of large land tracts. This is well marked in our own country. Even in Ontario these tides are not so great as here beside the sea. In Manitoba still less. And when we have got a sufficient number of observations from that district, between Winnipeg and the Rocky Mountains, I shall not be surprised to find the double fluctuation almost obliterated; and but one well defined maximum and mini-

mum of pressure corresponding to the least and greatest heat of the day.

The point that I wish especially to urge, as bearing upon nearly all the inhabited portions of the globe, is the dynamic force of vapour affecting the atmosphere at fixed hours of the day, acting independently although it may be at times assisting the static density of the air. In storms and any atmospheric disturbances these regular tides disappear—shrouded by the greater temporary forces then at work —but at those periods they are of great use to the observer in his forecasts. For instance should they still be appreciable in bad weather, the disturbance is certainly local and short lived. On the other hand, should the barometer fall, even slowly and to a small extent during the morning—say between sun rise and 9 o'clock—a serious disturbance will surely ensue, while if the barometer rise during midday, between 9 a. m. and 3 p. m., you may count at least on a fine night, with the sole exception of the accompaniment of an east wind, which fair or foul raises our Atlantic coast barometers. This, in itself, is a subject worthy of investigation; but to-night I will not longer try your patience, but conclude with thanks for your attention.

Art. VII.—Notes on the Serpents of Prince Edward Island. By John T. Mellish, M. A.

(*Read May 8th*, 1876.)

Family-Colubridæ.

Genus—Eutænia

Eutœnia Sirtalis. Baird and Girard.
Coluber Sirtalis. Linn.

Garter Snake.

Genus-Bascanion.

Bascanion Constrictor. B. & G.

Black Snake.