ART. X. EXTREMES OF PRESSURE DURING THE WINTER OF 1869-70. BY FREDERICK ALLISON.

HAVING just passed through a season remarkable in several features, I propose this evening to look at the winter of 1869-70, particularly with respect to the violent—and sometimes sudden—disturbances of the atmosphere, which were marked in this neighbourhood by most extraordinary barometrical readings. To discuss this winter fully it would be necessary to bring together the results of all classes of observations. Those of the barometer, and of its attendant or partner the hygrometer, which tell of the changes taking place in the higher and more distant regions of the atmosphere, before they are otherwise felt by the observer; as well as those of the thermometer and of the wind which denote a present influence; and those of the rain guage which record accomplished facts. Also to mention the whole train of non-instrumental observations, which are very useful in registering various atmospheric, animal, and vegetable phenomena.

But it is not the aim of this brief paper to go farther than to record the more striking of the abnormal pressures during the period mentioned; with an occasional description of some of the most intimate of the accompanying events. All my barometric readings here given are reduced to 32° of temperature, and corrected to sea level.

December, 1869, was a month of peculiarly high barometers, but the readings of 9th and 10th, and of 21st and 22nd stand up prominently even there. At 9 p. m. of the first mentioned day 30.535 inches were marked; and the notation of 7 a. m. of the 22nd was 30.524. At these hours the elastic force of vapour was .070 and .061, respectively. It was not to be expected that so great elevations of the barometric column would be merely local; and we consequently find the mean pressure on the 8th at Toronto, in 5h. 17m. 33s. W., to have been 30.083, (not corrected for altitude) which had declined slightly on the 9th. The grade in this instance was comparatively gentle on a long slope. Nor was the rise sudden in the second case; extending here from the evening of the 19th over a period of about 60 hours. Looking westward again we see the culmination of this wave at Toronto early on the 21st;

and at St. John—in 66° 03′ W. longitude—during that night. A high barometer is popularly connected with fine weather and frost, and there is enough truth in this superficial belief to give it a fair foundation. But it would be difficult to reconcile with this creed the mild December of 1869, when rain measured 5.14 inches, besides .63 of melted snow; and whose wet days numbered 14. Both for abstract science, and the ordinary pursuits of men, greater attention should be paid to the rising and falling of the mercurial column than to the fignre at which it may stand on a particular occasion.

The very finest weather lasted during the rising barometer from the night of the 7th to that of the 9th without any great cold for the season; the mean temperature of the 8th being 21°.75; that of the 9th 21°.00; and that of 10th 26°.77. Again on 12th and 13th, when the barometer stood high with little fluctuation, the mean temperature of the 48 hours was exactly 30°.00, and snow fell between 2 p. m. of the former day and 4¼ p. m. of the latter to the depth of 1.7 inches. The afternoon of 21st and morning of 22nd, with the enormous pressure noted, were very fine, but the mean temperature of the one was 22°.67 and of the other 24°.33, and there was no constancy in the fair weather. A storm of snow and rain began on the latter afternoon and continued at night with a very high wind from S. S. E. to S., 1.67 inches of water were precipitated in less than 12 hours, the pressure decreasing rapidly during the night. The attempt to forecast changes, in the existing state of meteorological knowledge, is to be generally deprecated; but, were it otherwise prudent, the action, rather than the position of the column of the barometer should be carefully watched. It n ıst also be always remembered that the barometer marks the whole density of the atmosphere, and that we need the hygrometer to tell us the dew-point, and the elastic force of vapour, preparatory to understanding the amount of dry pressure, and what may be here called the dampness of the atmosphere. Every inquirer will agree with me that as he observes the complex nature of the various meteorological elements at any one place, and the inter-dependence of the relative values at different stations, he discovers that he knows comparatively nothing of the laws, actions, and quantities of this portion of the Divine Creation.

Examples of low barometers, confirmatory of the above remarks will be taken from later in the winter. Meanwhile let us turn to the peculiar pressure of 14th January and following days. The 14th opened in the middle of a snow storm and strong N. N. E. breeze, but the barometric column was striding upwards, and the snow and wind ceased early. The storm had begun the preceding afternoon with a high barometer. The pressure increased much during the 14th till it reached 30.609 at 11⅔ p. m. when the cold was intense. At 4 a. m. of 15th the temperature was — 3°.3 in Halifax and much lower at several other points; and the mean pressure of the day was 30.354. But this whole pressure was a decreasing one, while the pressure of vapour was vastly augmented, and the relative humidity quadrupled itself within 15 hours. Snow fell lightly in the afternoon. A rain storm commenced at 6½ p. m. The wind blowing a gale from the southward at night. I notice here that the crest of this wave of pressure which reached Halifax on the night of the 14th at the hour above mentioned, passed Toronto at 10 a. m. of that day, Montreal at 2 p. m., and St. John at 10 p. m. True, this maximum was marked at Quebec earlier than at Montreal, but the greater north latitude of Quebec must be taken into consideration. At 5½ a. m. of 16th the thermometer read 48°. 1—or a rise of 51°. 4 in 25½ hours, and the barometer at 7½ a. m. 29.585, or a fall of 1.024 inches in less than 32 hours. What conclusions would have been drawn by a superficial observer, paying regard only to the position of the barometer on the 14th; and not considering its action, nor the movements of other instruments and elements. Certainly he could not have guessed that a heavy rain and gale were at hand.

The great atmospheric disturbances which prevailed at the end of January and beginning of February cannot pass unnoticed. During the forenoon of the 29th we find the barometer again above 30 inches. A temperature rather low. The force of vapour not great, but increasing very much as the day progressed. An average humidity; a sky almost cloudless; and gentle airs from N. E., veering towards S. E. In short, a morning with the atmosphere apparently in equilibrium. That night a great decrease of pressure was noted; and at 8¼ next morning it had diminished to the extent of 1.69 inches in 20¼ hours. The wind

had backed to E. from nearly S., and a strong gale was blowing. Rain began in showers about 4 a. m. but soon changed to snow, which fell fast until noon. The wind was working up to N., which it finally reached. Quickly as the barometer had descended, it rose as suddenly during the afternoon of 30th, while the wind lulled, and the clouds rolled off soo rapidly. But this was only one inequality surmounted; one toss of the wave heaved over us by conflicting currents. Again on the last night of January the barometer was rushing downwards, falling 1.103 inches in 20 hours at Halifax; which decline was attended by a heavy snow storm with high wind backing from S. E. to N. N. W.; and the corresponding rise of the 2nd was marked by one of the finest days of this winter. But while nearly 7 inches of level snow fell on the 3rd, the column of mercury stood high and comparatively steady. So on the 13th, when there was but little oscillation, and a mean pressure as low as 29.507, a remarkably fine day was enjoyed, with a temperature—24°. 03—within .54 of the mean of the month. A scanty force of vapour and extremely dry atmosphere, giving only 18 per cent of relative humidity at 9 p. m. These examples alone are sufficient to prove that the absolute height of the barometer by itself betokens nothing.

In any consideration of atmospheric pressure a note should be made of the extraordinary 9th of February last. There was a fall from 8th, 9. a. m., to 9th, 7. m. of 1.423 inches—28.617 being the reading at the latter hour—and a rise till 12th, 4 a. m., of 1.264 inches. Snow lasted from 7.40 p. m. of 8th to 5 a. m. of 9th, and again from 5 to 9½ p. m. of the latter day. An E. gale blew that morning. At noon wind was S. W. but scarcely perceptible. During afternoon it backed to S. S. W., and once more came up to W. with much force at night. These struggles in the air, resulting in frequent precipitation, and differing currents, could not but be marked on the thermometer also; and we find the mean of this instrument on the 10th, 11°. 27 lower than that of the 9th.

From the 24th to the end of February occurred a repetition of disturbed pressures, widely felt, at least through British North America. Here on the first day of this term we had a descending column till 9 p. m., when the low figure of 28.825 was reached.

A little snow fell early, but torrents of tain accompanied this descent, and the gauge at midnight held 3.10 inches. The movements of the wind were very interesting. The preceding day had closed with a gentle S. W. breeze, but it was strong from S. S. E. at 4 a. m. of 24th; backed to E. before 7 a. m.; veered E. S. E. and reached a gale at 8 a. m. This soon fell, however, and the force gradually lessened for over 8 hours; the direction meanwhile changing to S. Again the wind rose after 5 p. m., and was very high in early evening, shifting between S. and S. E. Soon after 8 p. m. it settled in S. and blew a strong gale, which lasted a couple of hours, but the wind was very high all night. It may be seen here that the strength of this gale was divided into two portions; coincident in the first place with the greatest pitch of the downward gradient—.120 inch between 7 and 8 in the morning,—and in the second with the first turn to rise between 9 and 10 in the evening. From the lowest point mentioned the barometer rose for 24 hours, continuously though slowly. Should the very slight pressure of the 25th have been regarded by itself alone, an error as to the probable weather would have been made as important as that alluded to on the 14th January, for although clouded this day was by no means unpleasant. On the 26th the barometer continued very low, but rose more quickly after 10 a.m., temperature was lower, and the air almost calm; but cloud was unsettled in quantity and appearance. The double maximum and minimum of the barometer due to our geographical situation, are already plainly distinguished in Nova Scotia; though until more systematic observations in longer series be collected, I object to fixing positively the hours of these events. Nevertheless it may safely be said that a barometer rising fast during the middle of the day, when it should be declining to its second minimum, deserves to be looked upon with great suspicion. The rise just noticed was suddenly checked in the evening, and during the 27th but little variation took place till late in the afternoon. A gentle snow fall of less than half an inch occupied four hours in the morning. The mean pressure of the day was only 29.502; but the temperature was pleasant, while a very moderate polar current drew over the surface of the earth. On the last day of February, the barometer once more sank to a very low reading; which was accompanied by a

considerable precipitation in the form of snow, and a light breeze, moving at first from N. N. E. to E. S. E., but afterwards to E., E. N. E., and still farther towards north. Nor was this remarkable depression recovered during this month, as March came in with a barometer far below any approach to the normal.

It is, however, needless to follow farther this movement at this point, while it may be instructive to view the pressure during the same days in other localities. At Glace Bay, Cape Breton, in Lat. 46°. 12′ N.; Long. 59°. 57′ W., the barometer was falling continually from the evening of the 23rd to the afternoon of the 25th, when it marked only 29.028, and a S. E. gale on the night of 24th blew with a force of 12 lbs. per square foot, or a velocity of 49 miles per hour. The temporary rise and subsequent renewed fall were also very evident there. The Windsor readings in 44°. 58′. 30″ N., and 64°. 7′. 30″ W., were also at this time in conformity with the usual law. 28.970 was there reached at 9 p. m. of 24th, and after ¾ inch of snow that morning, rain fell all day with a heavy S. gale.

It is not intended to describe here the low barometers of the middle of March, as I have so recently detailed them with their attendant storms, stretching over this and the neighbouring Provinces with more or less severity for several days; but the repeated fact is again noticed that the disturbances took place while the column was in motion; while, on the 20th in Halifax for example, when the pressure was almost steady though decidedly low, we experienced very fine weather and a cloudless sky. I am here reminded of the peculiar light, of a green tint, which on the previous evening was thrown over the earth. The clouds had broken just before sunset. In the east rose-tipped grey cumuli drove over a dark blue background. In the west was light blue sky, yellowish green at the horizon, and cirro-cumuli curiously folded were rising from that direction, tinged with the red light of the setting sun. But on the earth itself these red colours were completely absorbed in the greenish hue above mentioned. The temperature was 29°. Wind very high from N.; and the atmosphere had a relative humidity of 72 per cent.

The last instance of pressure to be brought forward in this winter is the high barometer of 26th and 27th March. On the

night of the 25th the sky cleared with a rapid increase of pressure. The 26th was bright and clear, with still a rising barometer. Next day there was scarcely any variation in the pressure, and the mean, 30.382 was remarkably high; but the day was not so fine as the preceding one. The temperature was more chilly. Cloud was much more plentiful; and a close observer might have detected the gale which was very near. At Glace Bay the barometer remained above 30 inches for the six closing days of March, but we cannot point to that period as one of fair weather by any means. Cloud was abundant during four days of the six. A strong gale from N. blew on the 26th at the rate of 43 miles per hour from 8 a. m. to 6 p. m.; and brisk breezes and high winds characterized the remainder of the month. The temperature was not unseasonable. At St. John, N. B., the indicated pressure, corrected for temperature only was 30.514 at 8 a. m. of 27th, and "a fierce easterly gale" with "the heaviest rains of the month" was recorded there on 28th and 29th. At Windsor the same features were observed, though more moderately than elsewhere.

Mr. Buchan makes some remarks on the distribution of pressure, which are not inapplicable here. In Chapter VII. of his admirable handybook of Meteorology he tells us that the current of air is from the regions of high to those of lower pressure, and illustrates his position by some striking examples. This fact may be farther exemplified by the occurrences of last winter in this Dominion. The more recent of which will suffice for our present purpose, without wearying my audience with too numerous details. At 8 a. m. of the 17th February the barometer in St. John, N. B. stood at 30.504; in Halifax at 30.301; in Glace Bay at 30.225. A N. W. wind prevailed over Nova Scotia. At 2 p. m. of the 1st March the barometer at the same place stood respectively at 29.250, 29.058 and 29.103. At Halifax, as might be expected, we again find the wind N. W., and the same at stations to the west of us. But down in Cape Breton a more variable disposition is manifested, and as the barometer at this date never fell so low there as here, a N. E. current was apparent that evening. Probably, could an observation have been had off this coast, about 50 miles to the southward, a still lower pressure would have been obtained. The same rule holds good when the pressures are

declining from east to west. Thus on 22nd March at 2 p. m., the barometer at Glace Bay marked 29.784, with a breeze light from E. Here the reading was 29.529; gentle breeze shifting between E. and S. E., and general S. E. currents through the Province, stronger at the more northern points. It must be borne in mind that in revolving storms, or cyclones, the direction of wind is also always to the area of least pressure, or in other words towards the centre of the storm; but these directions are purely local, and not to be taken into account when an extended surface of the earth is considered.

Another interesting feature in these differences of pressure is the amount of rain or snow by which they are accompanied. It would be well now for the inhabitants of the eastern slope of America to disabuse their minds of the idea forever that east winds in their country are the cold dry and raw currents which render western Europe so disagreeable at some seasons. An east wind in England and an east wind in Nova Scotia is an influence as different as land and water in the more substantial world. As before alluded to, the elevation of the barometer about 9th December, 1869, was surrounded by very fine weather. The great pressure of 22nd of that month was followed immediately by snow, and violent rain; and although a rapid decrease took place during that night, it never fell much below the normal, and the mean of 23rd was 29.677. In the first instance the wind moved regularly from west to north west between 8th and 9th and was afterwards variable and light from E., N. E., N. and W., shewing a probable high pressure on all sides, sufficient to bring into play the local and minor influences. In the second case the wind had been N. W., veering N. also; but a storm with a direction here from S. E. and afterwards with more force from S. rushed in suddenly, upsetting any theory founded solely on a high barometer. The rain in this storm was due to the customary condensation of the equatorial current on meeting with colder strata. But a noteworthy instance of precipitation with a great and slightly increasing pressure is that of 3rd February. On that day the barometer read 30.092 at 7 a. m.; 30.116 at 2 p. m.; 30.194 at 9 p. m.; and there remained with scarcely perceptible change until next morning at 7 a. m. when it rose a little farther. The temperature of the air was low,

varying from 14°.6 about 2½ p. m., to 4°.7 at midnight and falling to 3°.1 at 8¼ a. m. on 4th. Wind was gentle from N. E., growing brisk at night, and veering N. next morning early. Flurries of snow were falling during the day till 4 p. m., when they settled into a fast fall till 11½ p. m. Nearly 7 inches of snow fell during these 7½ hours. In western Europe where a high barometer generally accompanies eastwardly winds under any circumstances, the N. E. direction might sufficiently account for this pressure with a heavy snow fall. But not so in Nova Scotia. We must look to other causes; and find them in the fact that a still greater pressure was being exerted on either side of us. Halifax, though itself occupying, as it were, a high position, was in a depression between great elevations both westward and eastward. Air flowed down upon us, until our only relief was in the mentioned snow fall. Had the earth been stationary the wind's direction would have been north and not north east. After the precipitation, the very high barometer, the severe cold, and N. wind inclining to N. W., of 4th and 5th were in accordance with theory and observation.

I will here close the main subject of this paper, asking the lenient consideration of the more experienced for deficiencies, which have been apparent to myself while endeavouring to deal with most important matters. I must, however, occupy still a few moments that I may conclude a discussion of the interesting phenomenon of the Aurora Borealis, which I began in 1868, and which on several occasions I have been requested to continue. I think I have established the fact, based upon a record of twenty observations, impartially selected from a much larger number, that the Aurora Borealis is not a constant precursor of southwardly gales or rain, as it has been sometimes considered to be. Does any change of weather accompany this phenomenon; and, if so, what may be its nature? In answer to these questions I think it may be proved that this Polar illumination is never visible except with a decrease of temperature; and that this change is generally sudden and considerable. That such change renders precipitation imminent is also undoubted, and hence it is that an equatorial indraught and rain frequently follow an observation of the Aurora Borealis. But again they are often absent, and by no means a consequence of this

METEOROLOGICAL REGISTER, CALEDONIA MINE, LITTLE GLACE BAY, CAPE BRETON, 60FT ABOVE SEA, LAT. 46°, 12 NORTH, LON. 59° 57′ WEST.

1869.	Barometer. Mean corrected to 32°.	Correc. for Vapor & 60 ft. above Sea	Highest corrected.		Lowest corrected.		Thermometer. Mean.	Mean Night.	Mean Day.	Coldest. Night.		Coldest. Day.		Hottest. Night.		Hottest. Day.		Force of Vapour in Inches.	Relative Humidity.	Force of Vapour in Millimetres.	Revolutions of Wind.	Miles per hour.	Rain. Inches.	Rain. Days.	Snow. Days.	Snow. Inches.	Nights of Frost.	Degrees of Frost.	Below Zero.	Rimy Frost.	Hail.	Silverthaw.	Fogs.	Light Thunder.	Rainbows.	North Lights.	Halo r'd Sun.	Halo r'd Moon.	Corona.	Wind. Turned With Sun.	Wind. Turned Against Sun.	Wind. True North. S. to W.	Wind. True North. W. to N.	Wind. True North. N. to E.	Wind. True North. E. to S.
January	29.7657	29.7182	30.455	1st	29.210	20th	19.65	14.3	25.2	−9	23rd	1	23rd	46	10th	51	10th	.1075	78.7	2.7319	636500	17.08	3.610	11	8	12	29	526	3	5	1	2	.	.	.	1	2	1	2	.....	2	10	12	7	2
February	29.7610	29.6804	30.559	26th	28.886	4th	23.50	18.2	28.8	−1	15th	9	15th	35	17th	40	27th	.1406	72.0	3.5675	559320	16.64	5.820	12	8	22	27	374	1	4	2	2	1	.	.	5	3	2	. .	3	2	7	9	7	5
March	29.8508	29.7547	30.505	23rd	29.004	2nd	23.60	16.0	31.2	−4	6th	13	6th	32	28th	46	11th	.1561	68.0	3.9680	711000	19.11	6.005	12	10	26¼	31	507	2	7	1	1	.	.	.	5	6	.	. .	2	....	7	14	5	5
April	29.6961	29.5288	30.181	24th	29.305	26th	34.32	29.3	39.3	22	12th	29	14th	41	22nd	62	21st	.2273	70.3	5.7716	637800	17.72	4.420	15	8	19	29	103	...	2	1	1	8	.	.	4	2	.	. .	3	1	6	11	10	3
May	29.6928	29.5377	30.059	31st	29.059	20th	40.15	35.0	45.3	25	1st	36	3rd	48	12th	63	24th	.2251	69.6	5.7167	632320	17.00	7.400	13	2	1	11	25	...	2	1	...	15	.	...	4	6	1	..	4	..	4	10	11	6
June	29.8862	29.5950	30.115	23rd	29.630	16th	54.30	45.9	62.7	38	10th	45	10th	60	16th	76	6th	.3512	64.9	8.9264	577640	16.09	3.300	11	...	.....	....	.....	...	...	...	...	4	2	. .	2	3	.	. .	6	.....	14	7	4	5
July	29.8100	29.4164	30.087	20th	29.230	1st	59.80	50.0	69.6	43	6th	49	1st	66	27th	86	29th	.4535	65.9	11.5191	539570	13.67	6.400	8	...	.....	.....	.....	...	...	2	...	2	2	1	1	.	.	.	.	2	....	18	4	6	3
August	29.8704	29.5107	30.245	1st	29.501	27th	61.33	53.3	69.33	42	18th	56	24th	62	4th	78	5th	.4197	67.6	10.6591	472540	12.70	2.725	11	...	.....	.....	.....	...	..	..	..	.	1	2	5	1	. .	1	4	....	9	8	5	9
September	29.9713	29.6183	30.343	18th	29.683	20th	56.95	50.7	63.2	38	23rd	50	21st	69	9th	78	8th	.4130	71.2	10.4810	562730	15.63	2.870	8	...	.....	3	0	...	3	..	...	2	.	. .	7	1	. .	.	5	....	14	4	9	3
October	29.9090	29.6430	30.256	2nd	28.927	27th	48.55	43.3	53.8	22	29th	36	28th	63	5th	75	4th	.3260	75.5	8.2809	677320	18.04	7.220	14	3	3	9	15	...	5	...	.	3	.	3	4	.	. .	.	3	1	11	8	4	8
November	29.8577	29.6878	30.539	20th	29.156	8th	37.45	33.6	41.3	22	20th	34	12th	47	7th	53	6th	.2299	77.7	5.8395	635180	17.64	5.065	12	3	1	22	47	...	3	...	...	3	.	. .	1	2	.	. .	3	2	11	9	7	3
December	30.0250	29.8990	30.590	11th	29.260	1st	30.00	23.6	36.4	15	25th	21	4th	45	29th	55	1st	.1860	76.0	4.7245	713210	19.17	5.655	9	6	7½	25	197	...	6	...	. .	4	. .	1	. .	1	2	. .	1	1	13	8	6	4
Mean	29.8413	29.6325	.....	...	...	...	40.80	34.43	47.17	..	.....	..	.....	..	....	..	.....	.2696	68.1	6.8488	612927	16.8	5.041				.....	.....	.....	..	..	..	..	..	..	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Extreme	.....	.....	30.590	Dec. 11.	28.886	Feb. 4.	.....	.....	.....	−9	Jan. 23.	1	Jan. 23	69	Sep. 9th.	86	July 29th	.....	.....	. . . or	7355130 147102	miles	60.490	92 140	48	91¾	186	1794	6	37	8	6	41	6	7	39	27	6	3	36	9	124	104	81	56

COMPARED WITH THE ABOVE.

1867.																																													
Mean	29.8524	29.6704	.....	....	.....	....	40.06	34.17	45.95	..	...	..	....	..	....	..	.....	.2438	72.87	6.194	643534	17.6	4.841	12	..	. .	...	....	..	..	..	..	..	..	..	..	..	..	..	....	....	.....	.....	.....	.....
Extreme	.....	.....	30.768	Feb. 11	28.676	Sept. 30	...	.....	.....	−10	Jan. 31	1	Dec. 31	67	Augt. 25	85	Augt. 8	.....	...	.....	2722414 or 154448	..... miles	58.090	147	52	125	172	2171	7	23	5	5	25	9	6	26	16	3	..	36	17	122	114	54	75
1868.																																													
Mean	29.8854	29.6924	.....	....	.....	....	39.29	33.64	44.84	..	..	..	....	..	....	..	... ..	.2454	74.30	6.233	675908	18.5	4.975	12½	..	....	....	.	..	..	..	..	..	..	..	..	..	..	...	....	....	....	....	....	....
Extreme	.....	.....	30.611	Mar. 6	28.809	Feb. 6	... .	.....	.....	−13	Feb. 4	4	Feb. 22	66	July 2	89	July 5	.....	...	.....	8110903 162218	... . miles	59.750	152	65	94½	193	2486	15	18	6	3	28	12	6	35	23	7	2	35	5	129	107	76	54

CLIMATE OF ALBION MINES, NOVA SCOTIA, LAT. 45° 34′ 30″ NORTH, LON. 62° 42′ WEST, 120 FEET ABOVE THE SEA.

Ten Years.	29.7137	... ...	30.757	....	28.505	....	41.97	33.11	50.91	−22 23	1851 Jany. 7 1853 Jany. 13	..	....	..	....	98	1842 July 14	.....	....	.....	.....	.....	44.967	173	63	111½	189	2470	19	..	..	..	..	..	..	19	..	..	..	..	...	....	112	126	66	61

HENRY POOLE.

display. The fact seems to be that this electrical phenomenon,—for as such it must be classed—only becomes apparent under certain conditions of the atmosphere, which are brought about by a rapid withdrawal of heat. A few thermometrical readings, coincident with Auroral observations, may be quoted in proof of this position. For convenience, these are all taken from recent months :—

1870.	January	1.	Temp. 3 p. m.	33° 9 ;	Midnight	22° 1.	Fall in	9 hours	11° 8
"		7.	"	1 p. m. 44° 5 ;	8th, 6 a. m.	17° 2.	"	17 "	27° 3
"		26.	"	1 a. m. 48° 6 ;	11, p. m.	35° 9.	"	22 "	12° 7
"		28.	"	2 p. m. 30° 5 ;	29th, 7½ a.m.	14° 4.	"	19½ "	16° 1
"		30.	"	9 p. m. 27° 6 ;	Midnight	20° 5.	"	3 "	7° 1
Febr'y		1.	"	2 p. m. 31° 6 ;	"	19° 5.	"	10 "	12° 1
"		11.	"	3 p. m. 28° 8 ;	"	17° 5.	"	9 "	11° 3
March		1.	"	3½ p. m. 42° 2 ;	"	32° 5.	"	8½ "	9° 7
"		5.	"	2½ p. m. 30° 7 ;	6th, 7½ a.m.	10° 3.	"	17 "	20° 4
"		19.	"	3 p. m. 35° 7 ;	11, p. m.	24° 9.	"	8 "	10° 8
"		20.	"	4½ p.m. 40° 6 ;	Midnight	29° 2′.	"	7½ "	11° 4
"		23.	"	3 p. m. 39° 7 ;	10 p. m.	31° 2.	"	7 "	8° 5
"		25.	"	3 p. m. 36° 5 ;	9 p. m.	28° 9.	"	6 "	7° 6
"		30.	"	2½ p.m. 52° 4 ;	Midnight	33° 2.	"	9½ "	19° 2
"		31.	"	2½ p.m. 52° 0 ;	"	27° 1.	"	9½ "	24° 9

A marked decrease in temperature is noted on each of these fifteen occasions accompanying the Aurora Borealis.

Art. XI. On the Laminariaceæ of the Dominion of Canada and adjacent parts of British America.

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Alaria esculenta, Grev.—On rocks about low water mark, extending south to Cape Cod. Found also on the N. W. Coast, according to Harvey. Fucus esculentus of Turner. To this species Harvey refers the Laminaria musæfolia and L. linearis of De la Pylaie's Flora of Newfoundland.

A. Pylaii, Grev.—On rocks near low water mark, Newfoundland, De la Pylaie. Distinguished from the preceding by the form of the pinnæ, which are obovate-spathulate, not linear nor cuneate. Laminaria Pylaii, Bory.