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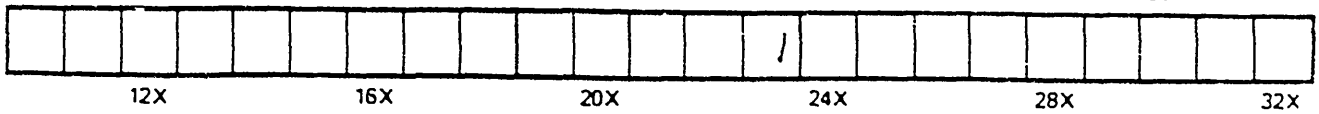

THE CANADIAN JOURNAL.

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NEW SERIES.

MEAN METEOROLOGICAL RESULTS AT TORONTO, FOR THE YEAR 1861.

BY G. T. KINGSTON, M.A.,
DIRECTOR OF THE MAGNETICAL OBSERVATORY, TORONTO.

Read before the Canadian Institute, February 22nd, 1862.

THE year 1861, with respect to its temperature, exhibited, as a whole, nothing extraordinary, the mean of the year differing from the average of twenty-two years to the extent of only 0°.10 in excess. The monthly means, moreover, did not differ in a marked degree from the means proper to the several months derived from twenty-two years, the average deviation, without regard to sign, being 2°.24; while the average deviation in the whole period of twenty-two years, and referred to the same standard, was 2°.44. If, however, the *signs* of the deviations be taken into account, it will be seen that the compensations by which the annual mean was maintained, were of the kind that may be styled *unseasonable*, being such as tended to weaken rather than to intensify the distinctive characters of the different parts of the year. Thus, from May to August—comprising the greater part of the year in which the temperature is *above* the yearly mean—the monthly means were relatively *low;* while in February

and December, the monthly means were relatively *high*. The depression (3°.9) in the temperature of May, was never exceeded in any May of former years, and was nearly approached only in 1849 and 1851, when in both cases the cold of May was succeeded by unusual warmth in June and July. The abnormal warmth of April served only to aggravate the evil, by hastening the vegetation that was thrown back by the frosts that followed in May. The bad effects of a generally low summer temperature may perhaps be modified, as regards some plants, by occasional bursts of heat, though they be necessarily balanced by unusually low temperatures at other parts of the season. No such mitigating circumstances occurred in 1861, as the warmest day and the absolutely highest temperature of the year were both considerably below the twenty-two years' average of these quantities.

The hygrometric condition of the summer was not favourable; the mean relative humidity of May, June, and July, being 70 against 74, the twenty-one years' average for these months. But as the temperatures were low, the foregoing numbers do not present so strong a contrast as do the tensions of vapour, which for the same three months were ·359 in 1861, and ·393 on the average of twenty-one years. The contrast in this respect between 1860 and 1861, was very conspicuous in May, the tension of vapour for this month being more than 41 per cent. greater in 1860 than in 1861.

May and June were 8 per cent. and 16 per cent. less cloudy than is usual in those months; while later in the season, when a bright sun is more in request, clouds were more than 20 per cent. in excess.

The depth of rain, which on the whole year was three inches in defect, was deficient in June and July to the extent of more than an inch and a half. In May, when rain is an hindrance to gardening and agricultural operations, it was rather in excess; while, as before stated, there was a want of that moisture *in the air* whose presence is favourable to the development of young leaves.

In the following summary, the chief meteorological elements relative to the year 1861, are compared with the average results derived from a series of years, as well as with extreme values that have occurred during the same series:

TEMPERATURE.

	1861.	Average of 22 years.	Extremes in 22 years.	
Mean temperature of the year	44°22	44.°12	46°.36 (in 1846)	42°.16 (in 1856.)
Warmest month	August.	July.	July1854	Aug1860
when the mean temp. of the month was	65°.48	66°.85	72°.47	64°.46
Coldest month	January.	February	Jan. 1857	Feb. 1848
when the mean temp. of the month was	19°.86	22°.98	12°.75	26°.60
Difference between the warmest and coldest months	45°.62	43°.87		
Mean of deviations of monthly means, from their respective averages of 22 years, signs of deviation being disregarded	2°.24	2°.44	3°.55 (in 1843 and1857)	1°.35 (in 1853.)
Month of greatest deviation without regard to sign	Decem'r.	January.	Jan. 1857	
when the monthly mean differed from the 22 years' average of the same month by	5°.0	3°.9	10°.7	
Warmest day	Aug. 3	July 20	July 12 (1845.)	July 31* (1844.)
when the mean of the day was	74°.20	77°.28	82°32	72°.75
Coldest day	Feb. 7	Jan. 24	Feb.6,'55 Jan 22'57	Dec. 22 (1842.)
when the mean of the day was	—7°.7	—0°.87	—14°.38	+9°.57
Highest temperature	87°.8	90°.4	99°.2	82°.4
which occurred on	June 9	July 22	Aug. 24 (1854.)	Aug. 19 (1840.)
Lowest temperature	—20°.8	—12°.3	—26°.5	+1°.9
which occurred on	Feb. 8	Jan. 25	Jan. 26 (1859.)	Jan. 2 (1842.)
Range of the year	108°.6	102°.7	118°.2 (in 1855.)	87°.0 (in 1847.)

There were twenty-seven days when the mean temperature of the day differed 12° and upwards from the normal mean of the day. Their distribution among the several months may be seen in the following table:

MONTHS	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
In excess ..	0	2	2	0	0	2	0	0	0	2	0	6	14
In defect...	6	2	3	0	0	0	0	0	0	0	0	2	13
Total....	6	4	5	0	0	2	0	0	0	2	0	8	27

* The mean temperature of the warmest day in the foregoing table, refers to the twenty-two years average of the warmest days in each year, irrespective of their dates, the average date being simply the arithmetic mean of the several dates measured from any fixed epoch. The same remark applies to the coldest day, and to the maxima and minima of the year. As regards the low temperatures, the averages are derived from the coldest days and lowest temperatures in successive *winters*,—December being considered to belong to the following year.

BAROMETER.

	1861.	Average of 18 years.	Extremes in 18 years.	
Mean pressure of the year	29.6008	29.6133	29.6679 (in 1849.)	29.5880 (in 1852.)
Month of highest pressure	December	September	June, 1849	Sept. 1860
when the mean pressure of the month was	29.7461	29.6629	29.8030	29.6733
Month of lowest pressure	November	June	March, 1859	Nov. 1849
when the mean pressure of the month was	29.5371	29.5624	29.4215	29.5868

	1861.	Average of 9 years.	Extremes in 9 years.	
Maximum pressure of the year..	30.330	30.372	30.552	30.245
which occurred	Jan. 22 7 p.m.	——	Jan. 1855	Dec. 1854
Minimum pressure of the year..	28.644	28.592	28.286	28.849
which occurred	May 6 10 p.m.	——	March, 1859	March, 1858
Range of the year.....	1.686	1.780	2.106 (in 1859.)	1.429 (in 1860.)

There were one hundred and three days when the mean pressure of the day differed 0.200 of an inch and upwards, from the adopted normal mean of the day. Their distribution through the year may be seen from the following table:

MONTHS	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
In excess...	5	4	5	4	5	1	0	3	2	5	3	9	46
In defect...	6	9	7	6	5	1	3	0	4	6	7	3	57
Total....	11	13	12	10	10	2	3	3	6	11	10	12	103

HUMIDITY.

	1861.	Average of 20 years.	Extremes in 20 years.	
Mean humidity of the year	78	78	82, in 1851	73, in 1858
Month of greatest humidity....	January	January	Jan. 1857	Dec. 1858
when the mean humidity of the month was.....	88	83	89	81
Month of least humidity.....	May	May	Feb. 1843	April 1849
when the mean of the month was	69	72	58	76

CLOUDS.

	1861.	Average of 9 years.	Extremes in 9 years.	
Mean cloudiness of the year ...	62	60	62, in 1861	57, in '53 '56
Most cloudy month.....	February	December	Dec '58 Dec. '60 Feb. '61	Dec. 1857
when the mean of the month was	83	75	83	73
Least cloudy month	June	July & Aug.	July, 1853	June, 1861
when the mean of the month was	45	45*	34	45*

WIND.

	1861.	Result of 14 years.	Extremes in 14 years.	
Resultant direction.....	N. 56° W.	N. 60° W.		
Mean resultant velocity in miles	2.11	1.82		
Mean velocity, without regard to direction	7.47	6.78	8.55 in 1860	5.10 in 1853
Month of greatest mean velocity	February	March	March, 1860	Jan. 1848
when the mean velocity was.	10.58	8.60	12.41	5.82
Month of least mean velocity...	August	July	Aug. 1852	Sept. 1860
when the mean velocity was.	4.21	4.91	3.30	5.79

RAIN.

	1861.	Average of 21 years.	Extremes in 21 years.	
Total depth in the year in inches	26.995	30.324	43.555 in 1843	21.505 in 1856
No. of days on which rain fell..	136	106	136 in 1861	80 in 1841
Greatest depth in one month fell in	November	September	Sept., 1843	Sept. 1848
when it amounted to	4.294	3.973	9.760	3.115
Rainy days were most frequent in	September	June	June, 1857	May, 1841
when their number was.....	17	12	21	11
Greatest depth of rain on one day	3.132	2.138	3.360	..
which fell on	Nov. 2nd	..	Oct. 6, 1849	..
Greatest depth in one hour	0.41	..	..	..
which fell between	1 & 2 A. M. Aug. 21st	..	..	..

* The average minimum of cloudiness in the second column, is the minimum of the twelve monthly means of nine years, and does not always include the lowest months of each year, as these fall differently in different years. This explains why the *highest* minimum in the fourth column should be numerically equal to the minimum on the average of nine years.

The distribution of rain through the day, both as regards depth and frequency, is given in the following Table derived from an hourly rain gauge in operation from April to November inclusive:

PERIODS	6 a.m. to 10 a.m.	10 a.m. to 2 p.m.	2 p.m. to 6 p.m.	6 p.m. to 10 p.m.	10 p.m. to 2 a.m.	2 a.m. to 6 a.m.	Total.
Per centage of depth.....	9.2	12.7	22.8	23.5	17.9	13.9	100
" " frequency..	14.0	14.0	17.0	17.7	18.0	19.3	100

SNOW.

	1861.	Average of 19 years & 22 years.	Extremes in 19 years and 22 years.	
Total depth in the year.....	74.8½	61.6	99.0 in 1855	38.4 in 1851
No. of days on which snow fell..	76	57	87 in 1859	33 in 1848
Greatest depth in one month fell in	February	February	Feb. 1846	Dec. 1851
when it amounted to.....	29.7	18.0	46.1	10.7
Days of snow were most frequent in	January	December	Dec. 1859 Jan. 1861	Feb. 1858
when their number was	23	13.0	23.0	8
Greatest depth in one day.....	8 inches	..	..	..
which fell on	Feb. 7th	..	..	..

RAIN AND SNOW (COMBINED.)

Where 10 inches of snow are considered as equivalent to 1 inch of rain.

	1861.	Average of 19 years & 22 years.
Total depth in the year.....	34.475	36.488
Number of days in which rain or snow fell.....	200	160*
Greatest depth in one month fell in	November	September
when it amounted to	4.614	3.973
Days of aqueous precipitation most frequent in	January	December
when their number was.....	23	18*

On February 7th, a heavy snow-storm occurred, accompanied by a strong gale and intense cold. At one part of the day, when the

* These numbers include the cases in which both rain and snow have fallen in the same day, and which have been reckoned both in the rain and in the snow tables.

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GENERAL METEOROLOGICAL REGISTER FOR THE YEAR 1861.

Provincial Magnetical Observatory, Toronto, Canada West.

LATITUDE, 43° 39' 4" North; LONGITUDE, 5h. 17m. 33s. West.—Elevation above Lake Ontario, 108 Feet; approximate Elevation above the Sea, 342 Feet.

	JAN.	FEB.	MAR.	APR.	MAY.	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.	Year 1861.	Year 1860.	Year 1859.	Year 1858.	Year 1857.	Year 1856.	Year 1855.
Mean temperature	19.86	26.06	26.92	42.02	47.50	61.29	65.37	65.48	59.07	48.74	37.14	31.13	44.22	43.32	44.19	44.74	42.73	42.16	43.96
Difference from average (22 years)...	— 3.67	+ 3.08	— 3.21	+ 1.04	— 3.89	— 1.07	— 1.48	— 0.54	+ 1.16	+ 3.22	+ 0.45	+ 5.02	+ 0.10	+ 0.20	+ 0.07	+ 0.62	— 1.39	— 1.96	— 0.16
Thermic anomaly (Lat. 43° 40' N.)...	—12.94	— 8.64	—13.18	— 8.18	—10.60	— 3.31	— 3.33	— 3.02	— 2.43	— 5.06	— 6.06	— 4.87	— 6.78	— 6.68	— 6.81	— 6.26	— 8.27	— 8.84	— 7.04
Highest temperature	37.0	46.0	47.4	67.0	73.0	87.8	84.5	85.2	78.8	71.0	52.4	55.2	87.8	88.0	88.0	90.2	88.2	96.6	92.8
Lowest temperature	—11.2	—20.8	— 5.2	23.8	28.0	41.6	47.0	47.0	37.1	29.0	23.0	5.5	—20.8	— 8.5	—26.5	— 7.3	—20.1	—18.7	—25.4
Monthly and annual ranges	48.2	66.8	52.6	43.2	45.0	46.2	37.5	38.2	41.7	42.0	29.4	49.7	108.6	96.5	114.5	97.5	108.3	115.3	118.2
Mean maximum temperature	25.14	32.37	33.53	49.71	55.69	70.36	74.67	74.30	66.38	55.34	42.39	37.03	...	...	...	...	...	...	...
Mean minimum temperature	13.93	18.54	20.71	35.35	40.04	51.26	56.23	58.15	51.80	41.62	31.99	24.23	...	...	...	...	...	...	...
Mean daily range	11.21	13.83	12.82	14.36	15.65	19.11	18.44	16.16	14.58	13.73	10.40	12.80	14.42	14.24	13.66	13.84	16.38	18.29	18.19
Greatest daily range	25.2	32.4	33.3	28.8	28.4	29.5	29.1	25.0	24.0	31.9	20.4	26.4	33.3	30.7	39.8	31.2	37.0	44.2	39.4
Mean height of barometer	29.6517	29.5441	29.6206	29.5640	29.5454	29.5698	29.5505	29.6530	29.6084	29.6191	29.5371	29.7461	29.6003	29.5923	29.6209	29.6267	29.6054	29.5999	29.6249
Difference from average (18 years)...	+.0183	—.0681	+.0383	—.0230	—.0392	+.0074	—.0509	+.0317	—.0545	—.0309	—.0768	+.0981	—.0125	—.0210	+.0076	+.0134	—.0079	—.0134	+.0116
Highest barometer	30.330	30.144	30.200	30.120	29.955	29.810	29.830	29.902	30.104	30.054	30 000	30 182	30.330	30 207	30.392	30.408	30.361	30.480	30.552
Lowest barometer	29.006	28.979	29.034	29.055	28.644	29.176	29.269	29.382	29.076	28.998	29.005	29.171	28.644	28.838	28.286	28.849	28.452	28.459	28.459
Monthly and annual ranges	1.324	1.165	1.166	1.065	1.311	0.634	0.561	0.520	1.028	1.056	0.995	1.011	1.686	1.429	2.106	1.559	1.909	2.021	2.093
Mean humidity of the air	.88	.84	.80	.73	.69	.69	.73	.78	.79	.82	.79	.79	.78	.77	.74	.73	.79	.75	.77
Mean elasticity of aqueous vapour	.102	.130	.127	.199	.232	.377	.467	.495	.400	.292	.178	.151	.262	.260	.249	.259	.254	.244	.263
Mean of cloudiness	.76	.83	.62	.61	.49	.45	.56	.54	.60	.61	.74	.62	.62	.60	.61	.60	.60	.57	.60
Resultant direction of the wind	N 86 W	N 77 W	N 54 W	N 37 E	N 47 W	N 39 W	N 74 W	N 8 E	N 71 W	N 61 W	N 46 W	N 72 W	N 56 W	N 60 W	N 61 W	N 41 W	N 74 W	N 71 W	N 62 W
" velocity of the wind	2.92	3.86	4.33	2.31	3.66	2.29	1.43	0.46	1.39	1.06	1·94	3.50	2.11	3.32	2.24	1.59	2.54	3.03	2.51
Mean velocity (miles per hour)	9.30	10.58	10.56	8.90	9.17	6.11	4.66	4.21	4.81	5.96	7.44	7.96	7.47	8.55	8.17	7.64	7.99	8.31	8.14
Difference from average (14 years)...	+1.44	+2.30	+1.96	+1.03	+2.55	+0.84	—0.25	—0.96	—0.59	+0.10	—0.05	—0.22	+0.70	+1.78	+1.40	+0·87	+1.22	+1.54	+1.37
Total amount of rain	0.685	0.815	2.125	1.619	3.380	2.329	2.635	2.953	3.607	1.993	4.294	0.560	26.995	23.434	33.274	28.051	33.205	21.505	31.650
Difference from average (21 & 22 yrs)	—0.722	—0.231	+0.577	—0.779	+0.139	—0.771	—0.855	+0.002	—0.366	—0.492	+1.154	—0.985	—3.329	—6.890	+2.950	—2.273	+2.881	—8.819	+1.326
Number of days rain	4	4	8	12	12	13	16	15	17	15	14	6	136	130	127	131	134	99	103
Total amount of snow	20.6	29.7	7.1	6.9	0.5	...	...	...	...	Inapp.	3.2	6.8	74.8	45.6	64.9	45.4	73.8	65.5	99.0
Difference from average (19 years)...	+ 6.97	+11.67	— 1.67	+ 4.39	+ 0.40	...	...	...	...	— 0.84	+ 0.10	— 7.86	+13.17	—16.03	+ 3.27	—16.23	+12.17	+ 3.87	+37.37
Number of days snow	23	17	14	4	1	....	...	...	...	1	8	8	76	75	87	67	79	69	64
Number of fair days	8	9	11	16	18	17	15	16	13	15	10	17	165	174	169	178	171	198	198
Number of auroras observed	0	3	6	6	5	2	1	4	5	6	1	4	43	58	53	59	26	35	46
Possible to see aurora (No. of nights).	9	8	16	17	18	18	17	17	16	17	11	16	180	190	199	198	189	212	204
Number of thunderstorms	0	0	1	4	3	3	8	6	2	0	0	0	27	30	30	19	28	25	38

temperature was 14°.3 below zero, the wind was blowing more than 33 miles an hour, with heavy falling and drifting snow. The temperature afterwards fell to 20.°8 below zero, but at that time the gale had subsided.

he accompanying table is a general abstract of the meteorological observations made at the Magnetic Observatory, Toronto, during the year 1861.

AN ATTEMPT AT A NEW THEORY OF HUMAN EMOTIONS.

BY WILLIAM HINCKS, F.L.S., ETC.,
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In a paper laid before the Canadian Institute on a former occasion, (*Journal*, Vol. IV., p. 396), I offered some explanation and defence of the Sensationalist Philosophy in relation to the human mind and its operations, which, altogether rejecting innate ideas and instinctive forms of thought, regards the first sensation as the commencement of its enquiries, and endeavours to ascertain the connection of mental states with the physical frame, and the laws according to which they combine and succeed one another. The grand fundamental law, called the law of association, is considered as sufficient to explain all the various intellectual states of which our nature is susceptible; and, according to Hartley, this law depends on *physical sympathy* between different portions of nervous matter acted upon simultaneously or in immediate succession. Assuming that the law of association has been well expounded by Hartley Brown and James Mill, and that Hartley has given, to say the least, an intelligible and highly probable explanation of its origin, I now propose to extend the application of the same principle so as to offer a consistent and rational explanation of the emotional part of our nature, of the real difference between intellectual states and emotions, and of the common relation between the various passions to which our nature is subject.

Writers on the *emotions, passions*, or *active powers*, have often given a long list of what they suppose to be different and independent simple mental states, incapable of definition, and only to be known by

being experienced or by observing their effects, but perceived to have such a general resemblance as properly to be referred to one class. These they have classified in what seemed to them a convenient manner with a view to considering their influences on our condition, and their moral qualities. Others have endeavoured by analysis to lessen the number of primary passions or emotions, shewing how different names really express the same emotion excited under somewhat different circumstances. With these I agree so entirely that I would carry out their principle to the utmost by admitting only an emotion belonging to pleasure and one belonging to pain, and defining all the others by naming one of these, and pointing to the kind of objects or the condition of things around us in which the peculiar form appears. Such analytical view of the nature and relations of the various emotions would form no unimportant part of a treatise on this branch of the philosophy of mind, but need not be examined in detail in the present connection. There is a very general agreement among philosophers that emotions, passions, or active powers differ essentially in nature from intellectual states, and are felt to have something common to them all as a class, in whatever degree they may differ from each other. This is not indeed a universal sentiment, for both Hartley and James Mill suppose that by due regard to the character of our sensations as pleasurable and painful, and a proper application of the law of association, all the varieties of emotions may be fully explained. I cannot help thinking, however, that the general feeling of those who reflect on the subject is that there is a real well marked difference between intellectual states and emotions, and fully admitting that this difference depends on pleasure and pain as actual sensations, or as ideas intermingling with sensations, I think it desirable, if possible, to ascertain the exact nature and causes of the phenomena. All sensations are commonly said to be pleasurable, painful, or indifferent. The truth seems to be, that every sensation, if not too intense—in which case it becomes painful—is naturally, before it has been affected by frequent repetition, a source of pleasure. Those which we describe as indifferent are such as we have frequent occasion to experience, which causes them to be familiar, and as are not now impressed with any peculiar vividness. The sensation which causes pleasure is either novel or unusually vivid, and if its vividness be in excess it becomes a pain. Thus pleasures repeated become indifferent, scarcely receiving from the mind any notice,

whilst a pleasurable sensation increased in intensity becomes painful, and a pain moderated may fall within the limits of pleasure. If we fix our attention on any single distinct pleasurable sensation, we shall observe that as it increases in intensity it is no longer confined to the nerve or organ in which it is excited, but by the inherent sympathy of like parts of our frame, diffuses itself so as to produce a general feeling of pleasure, a state distinguishable from, though dependent upon, the single pleasurable sensation. It is manifest that according to the supposed physical origin of the law of association in coexistent or immediately successive states acquiring sympathetic power each to revive the other, that ideas of pleasures and pains would be revived like any other past states, and that they would be equally revived in their *diffused state* as if they had remained perfectly simple. All those states, then, which are called the active powers, or the passions, but which I prefer describing as a general name by the term emotions, are, I conceive, correctly described as diffused pleasures or pains, present, or their ideas revived by association, and arising in various circumstances and in connection with various objects. The peculiar characteristic feeling which has caused most philosophers and mankind generally to distinguish these from purely intellectual states, consists in sympathetically diffused pleasure or pain, and consequently has a physical origin in close relation to that of the law of association itself. There is really only one pleasurable and one painful emotion, both arising in the same way; but it is highly convenient to have a number of names, inconsiderately regarded as implying the essential distinctness of the states, for the primary emotions separately excited by the presence or anticipation of various good and evil, or mingled together, as I believe them to be in some important instances. Thus the idea of any object or condition regarded as a cause of pleasure is attended by pleasing emotions which, if the object or condition be not immediately attainable, is mingled with painful emotions occasioned by privation of it, and this mixture constitutes *desire*. In the same way every other emotion respecting an unattainable good, whether as entirely beyond our own reach, or as possessed by another whilst we are deprived of it, is really of a mixed character. We can hardly be said to have any distinctive name applicable to those simple emotions of pleasure and pain, which are the elements of all this class of mental states, no doubt because, excepting in philosophical discussions, we have no occasion to make them the subject of discourse except when the

excitement is considerable. *Joy*, which means pleasurable emotion arising from the actual possession or immediate anticipation of good, with its direct contrast *grief*, are the simplest emotions for which we have names. If the pleasure or pain be actually present, and referable to a specific part of our frame, especially if its too great vividness does not confuse our perceptions, the transition from actual sense of pleasure or pain to pleasing or painful emotions is very perceptible. If the satisfaction is derived from the acquired command of the means of pleasure, the emotion depends on such complex associations that its nature is not discerned with any peculiar facility. Love expresses the simple pleasurable emotion, so associated with an object or person that has frequently excited it, or is believed capable of exciting it, as to be very readily called up by the presence, name, or recollection of that object or person. Gratitude, again, is the name we employ to express the same simple, pleasing emotion, strongly excited in connection with specific benefits received from an intelligent agent, with the corresponding desire of conferring pleasure on the object of our gratitude. We will add the analysis of a still more complex state belonging to this class, to which our attention is naturally led by the examples already brought forward. I refer to the filial affection. Scarcely any one would pretend that this is a simple emotion. Every thing which belongs to it is fully expressed by describing it as made up of love, gratitude, confidence, and reverence. We have seen the nature of the two former: confidence is the feeling with which an inferior and dependent looks up to a superior and controlling being, in whose knowledge of what is really good and desire to bestow it experience has taught him to trust. Reverence is only a certain amount of fear, the simple painful emotion associated with an object which has caused restraint, disappointment, or suffering of any kind, intermingled with the other emotions already named as entering into the filial feeling. We might in this manner examine any of the various emotions attributed to human beings, and we should find them all to be the emotion belonging to pleasure or to pain excited in certain circumstances, or the two intermingled in such a manner that convenience dictates the use for them of separate names, but I have also endeavoured to shew in what manner a mere pleasure or pain passes from the condition of a sensation to an emotion by its sympathetic diffusion so as to belong no longer to a particular nerve or organ, but to our frame generally. We have thus the elements of a

complete theory of human emotions, connecting itself naturally and easily with the theory of the intellectual powers, to which I have given in my adhesion, and of which, on a previous occasion, I sketched the evidence. The subject would admit both of detailed analyses of the various emotions which have been treated as simple independent mental states, and of copious illustrations of the effects of the views I have proposed; but if thus treated it would require a volume. On an occasion like the present it may suffice to indicate the effect or tendency of the views proposed, so as fairly to submit them to the judgment of inquirers. It will be seen that I rely first on the principle that all sound philosophy of the human mind has its foundation in a proper attention to the connection of the mind with the physical frame. This is a subject necessarily involving much mystery; yet it is well ascertained that all mental changes belong to the nervous system, and are dependent upon nervous action. The fact that states simultaneously existing, whether as sensations or as ideas and whether simple or complex, acquire the power of reviving each other when one of them is brought up again, is certainly established by experience. The explanation that this fact depends on what we call sympathy in the nervous matter being a property of its nature is, perhaps it is not too much to say, the only conceivable one; and assuming this property, the power of vivid mental states like pleasures and pains to extend their influence beyond the nerves in which they were excited to the whole frame is a natural consequence, whilst this diffusion of pleasure and pain exactly corresponds with the best notion we can form of emotion as distinguished from sensation or intellectual state. But I beg it may be observed to what extent this explanation, if worth anything, must go. It relates not to any single emotion of our nature, but to the whole, in all their variety. It equally explains what are termed affections—that is, permanent tendencies under certain circumstances to the prevalence and influence of certain emotions moderately excited—and of the strongest passions. It traces them all to the influence, direct or indirect, of pleasure and pain, thus shewing the great moving principle of the active part of our nature, and putting us in the proper track for discovering how it can be best regulated. It is commonly believed that moral sentiments constitute a distinct class, arising instinctively and independently, but the theory I have proposed applies to them equally with the other emotions, and their analysis is as easy as that of most others. I might hence attempt to

draw conclusions respecting disputed points in the theory of morals, but I have already gone as far as my present purpose requires, and must submit these speculations to your candid judgment. The Sensationalist Philosophy has not of late years had any fair chance of being examined, with a proper appreciation of its evidence, by students of this branch of science, because the most opposite doctrines have prevailed in the schools, and those who have undertaken to give general information, saving the trouble of consulting the original writers, have, writing in the spirit of an opposed system, and viewing everything in its light, grossly perverted and misrepresented both the evidence and the tendency of our views. I entertain a strong confidence that this state of things will in the progress of time remedy itself. Some free spirits will find their way to the sources of information. Arbitrary assumptions and bold assertions will not always be submissively accepted. The plan of declaring that to be simple which we have not taken the pains or possessed the ingenuity to analyse, will not always be accepted as satisfactory. The philosophy of mind is as truly as any other an inductive science, but in its earlier stages of progress (and it is naturally a science of slow growth) it is peculiarly liable to suffer from false theories, and the influence accidentally acquired by the Scotch and German Schools has for a time almost overborne opposition to their dogmas. I am content to record the results of my own inquiries, and to leave it to the future to decide on the real merits of antagonistic systems.

A POPULAR EXPOSITION OF THE MINERALS AND GEOLOGY OF CANADA.

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PART IV.

(Continued from Vol. VI. page 518.)

Molluscous Animals.—The forms of the sub-kingdom MOLLUSCA may be arranged under the following groups and classes:—*A. Coralliform Mollusca:* 1, BRYOZOA. *B. Acephalous (or headless) Mollusca:* 2, TUNICATA, (no fossil representatives); 3, BRACHIOPODA; 4, LAMELLIBRANCHIATA. *C. Encephalous Mollusca:* 5, PTEROPODA; 6, HETEROPODA; 7, GASTEROPODA; 8, CEPHALOPODA.

BRYOZOA.—The bryozoons (so named from the general moss-like aspect of their united cells) are minute animals of marine existence. They form cell-colonies after the manner of most coral animals, but present a higher organization than these latter. They possess a distinct oral and anal cavity, and assimilate in many other respects to the molluscous type. The compound cell-structure in some forms takes the shape of leaf-like expansions, and in others is either dendritic, plumose, rounded, or irregular. It is also either free, or attached by growth to shells and other sub-marine bodies.

Modern bryozoons abound in all seas. Fossil forms of this class are also exceedingly numerous, ranging throughout the entire series of fossiliferous rocks. Their separation from corals is in many instances, however, a task of much perplexity; and, as those found in our Canadian strata are of little importance as test-forms, we confine our illustrations to a single example, *Fenestella elegans*, (Fig. 87), from the Niagara Group of the Upper Silurian Series. Representatives of the class, it may be observed, occur as low down as the Calciferous-Sand-Rock (see PART V.); and Professor Dawson, on the other hand, has found a number of species identical with existing forms, in the Post-tertiary deposits of Eastern Canada. These are described in the 4th volume of the *Canadian Naturalist*.

Fig. 87.

The *Graptolites*, already described as a section of the POLYPIFERA or CORALS, (see Vol. VI., p. 503) are referred by some palæontologists to the present class.

BRACHIOPODA.—The brachiopods are marine, headless mollusks, provided with a bivalve shell. The valves of this shell are always of unequal size; and one is situated on the dorsal, and the other on the ventral side of the animal. The ventral valve is almost invariably the larger of the two, and without reference to the anatomy of the mollusk would be naturally taken for the dorsal valve. The valves, though unequal in size, are "equilateral"—*i. e.*, a vertical line drawn straight through the middle of each valve, divides the shell into two exactly equal parts. This serves to distinguish at a glance a brachiopod shell from the shells of other bivalves: or at least from the great majority of these, as some few, the *Pectens* for example,

have nearly equilateral shells. A depression or "sinus" frequently occurs down the centre of one valve, and a corresponding projection or "mesial fold" down the centre of the other. The sinus is almost invariably on the ventral, and the fold on the dorsal valve. The pointed upper extremity of the valve, is technically known as the "beak." In some forms the valves are close together; but in others, a closed space (often striated across) occurs between the two. This is called the "area." See Fig. 88 and accompanying explanation. In the centre of the area, or under the beak of the ventral valve, there is frequently (as in the *spirifers*, &c.,) a triangular or circular orifice, the "foramen." This opening, in the species which possessed it, served for the passage of the pedicel by which the animal was attached to the sea-bottom. The foramen is situated, at other times, upon, or near to, the ventral beak, as in *spirigera*, &c. In many species again, it appears to have become closed by age; and in others, it is altogether absent. The line of junction between the upper part of the valves is termed the hinge-line. It is straight in some genera, (*Orthis, Strophomena, Spirifer*, for example,) and arched or curved in others. (*Athyris, Rhynconella, Pentamerus, Terebratula*, etc.) In many brachiopods, the shell is traversed by minute pores or tubular prolongations. When this is the case, the shell is said to be "punctate;" and when the pores are absent, it is termed "impunctate."

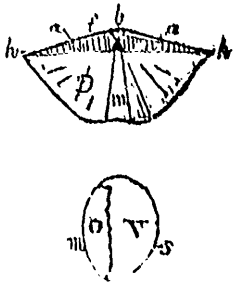

Fig. 88.*

The brachiopods possess, as their chief characteristic, a pair of long fleshy "arms," covered with delicate cilia, and either entirely confined in a coil within the shell, or capable of protrusion to a certain extent. In some genera, the inside of the dorsal valve carries peculiar spiral processes, or a shelly loop or other calcareous framework, for the support of these arms. A support of this kind is however wanting in many genera, or is otherwise merely rudimentary. The brachiopods differ essentially from the lammellibranchiate bivalves in the non-possession of distinct branchiæ or breathing gills. In existing seas the brachiopods are comparatively rare, the number of known species

* *D*=dorsal valve. *V*=ventral valve. *a*, area; *b*, beak of ventral valve; *f*, foramen; *h-h*, the hinge line; *m*, position of mesial fold; *s*, position of mesial sinus.

not exceeding fifty; whilst the fossil species discovered up to the present time, amount to over thirteen or fourteen hundred. They constitute moreover, at least ninety per cent. of the bivalve shells met with in the lower fossiliferous rocks.

The following are the more important genera of Canadian occurrence: *Lingula, Orthis, Strophomena, Leptæna, Spirifer, Athyris, Spirigera, Atrypa, Rhynconella, Pentamerus, and Strickelandia.*

Lingula :--Shell: horny, thin, oblong, and nearly equivalve. Black and shining in our examples, and consisting largely (as first shown by Prof. Sterry Hunt), of phosphate of lime. No internal calcareous appendages. This genus ranges from the Lower Silurian epoch into the present or existing period. Numerous species occur in our Silurian formations. *L. quadrata*, fig. 89, from the Trenton Limestone, Utica Slate, and Hudson River Group (Lower Silurian,) may be cited as a common example.

Fig. 89.

Orthis :—Shell calcareous. Bi-convex or plano-convex; with straight hinge-line, and punctate surface No internal supports, properly so-called. This genus ranged throughout the Palæozoic age, but was most abundant during the Silurian and Devonian periods. The species have usually a more or less circular outline, with the surface of the shell marked by fine or course radiating lines.

Fig. 90.

Fig. 91.

Fig. 92.

Fig. 93.

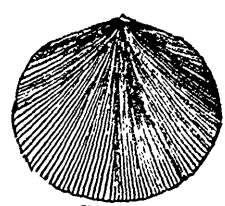

Fig. 94.

Canadian examples are exceedingly numerous; more especially those belonging to *O. testudinaria*, fig. 90, of the Trenton and higher divisions of the Lower Silurian series. Fig. 91 represents *O. trice-*

naria; fig. 92, *O. pectinella*, and fig. 93, *O. lynx*, all of common occurrence in the Trenton Group. *O. elegantula* of the Niagara Group (Upper Silurian) is closely related to *O. testudinaria*, and has the general form of fig. 90. *O. Vanuxemi*, fig. 94, is a Devonian species. The Lower Silurian form, *O. lynx*, fig. 93, has the general aspect of a spirifer, but its mesial fold and sinus are marked by several plications, a character not exhibited by any of our Canadian Spirifers. It was formerly called *Delthyris lynx*.

Strophomena:—Shell, concavo-convex; hinge-line, straight; no internal supports. This genus ranges from the Silurian to the Carboniferous formation. Canadian examples are very abundant.

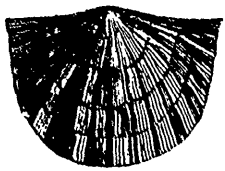

Fig. 95.

Fig. 96.

Fig. 95 represents *S. alternata*, a species of exceedingly common occurrence in the Trenton and Hudson River Groups (Lower Silurian.) *S. filitexta* is a closely related form. Fig. 96 exhibits another well-known species, *S. rhomboidalis* (=*Strophomena* and *Leptæna depressa*,) from the Niagara Group and other Upper Silurian strata, and also from the Devonian rocks of Western Canada. In these latter rocks a few species of *Chonetes* and *Productus*, (genera allied to *Strophomena*,) also occur.

Leptæna:—This genus (or rather sub-genus,) merely differs from *Strophomena* by the character and elongation of its muscular impressions. *L. sericea*, Fig. 97, of the Trenton and Hudson River Groups, is a species of common occurrence.

Fig. 97.

Spirifer:—Shell with internal calcareous processes in the form of two spiral coils pointing outwards. Hinge-line straight, long; area well developed, with triangular foramen. The genus ranges from the Silurian to the Triassic (or Jurassic) epoch, but is chiefly characteristic of Upper Silurian, Devonian, and Carboniferous rocks. Fig. 98 represents *S. Niagarensis* of the Upper Silurian, and Fig. 99, *S.*

Fig. 98.

Fig. 99.

mucronatus of the Devonian series. Both are of common occurrence. The hinge-line of the latter is sometimes shorter (as compared with the height of the shell,) than is shewn in the figure. In our Western Devonian rocks, several other species occur: as *S. duodenarius*, with eight or nine rounded ribs on each side of the mesial fold; *S. raricostatus*, with two or three coarse plications on each side of the fold; *S. gregaria*, a small species, &c. These are figured and described by Mr. Billings in the *Canadian Journal*, vol. VI. Another common species of the Upper Silurian series, is *S. radiatus*. This differs chiefly from *S. Niagarensis* by its finer and more numerous plications. A third Niagara species *S. sulcatus*, has about eight plications on each side of the mesial fold, crossed by the rough and strongly-pronounced edges of the layers of growth.

Athyris:—The shell in this genus has internal spires as in *Spirifer*, but the hinge-line is curved, and the area is absent or rudimentary. Species range from the Silurian to the Triassic formations. Several occur in our Devonian rocks. One of the most common of these, *A. clara*, (Billings,) is represented in fig. 100. *A. Maia* is a somewhat similar species, but with a more developed or longer mesial fold and sinus, and with a slight space or false area between the beaks. These and other Devonian species are described in detail by Mr. Billings, in the *Canadian Journal*, Vol. V.

Fig. 100

Spirigera:—This genus or sub-genus differs from *Athyris* in having a perforation or foramen in the beak of the ventral valve. *S. concentrica* of the Devonian rocks is shewn in fig. 101. The genus *Retzia* is nearly allied to *Spirigera*, but the shells are smaller and strongly ribbed.

Fig. 101.

Atrypa :—A good deal of uncertainty still prevails with regard to the proper limitation of this genus. In outward form it agrees with Rhynconella, see below, but appears to possess internal calcareous spires, the points of which extend into the hollow of the smaller or dorsal valve. Fig. 102 represents an exceedingly common species, *A. reticularis*, of the Upper Silurian and Devonian strata, but chiefly characteristic of the latter.

Fig. 102.

Rhynconella :—Shell, in general, strongly bi-convex. Hinge-line, curved; no area. No internal spires, but in the living species the arms are coiled spirally, the spires pointing downwards and inwards. The genus ranges from the Lower Silurian into the existing epoch. Fig. 103 represents a small form, *R. plena*, very common in the Chazy limestone of the Trenton Group, (Lower Silurian); and fig. 105, *R. increbescens*, a closely related species occurring abundantly throughout the Trenton limestone. In this latter species, the plications

Fig. 103.

Fig. 104.

Fig. 105.

on the shell are crossed by well-marked imbricating lines of growth. Numerous examples of this genus occur also in our Upper Silurian and Devonian strata. A modern species, found in the Post-Tertiary deposits of Eastern Canada, *R. psittacea*, is figured in the wood-cut 105.

Fig. 106.

Fig. 106 is a representation of the old *Rhynconella hemiplicata* of the Trenton Group, now referred by Mr. Billings to his new genus *Camerella*. It is characterized by a few broad plications on the lower part of the shell.

Pentamerus:—In this genus, the shell is prominently bi-convex, with arched hinge-line and large incurved beak. Internally it is divided by septa into several chambers. The genus ranges from the Silurian to the Carboniferous formations. *P. oblongus*, of the Niagara Group, is represented in fig. 107, the sketch 107 *a* showing a ventral view of the internal cast. *P. aratus*, of the Devonian rocks, is figured in 108. This latter form is closely related to the well-known typical species *P. galeatus*.

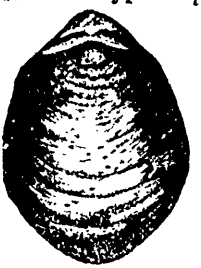

Fig. 107.

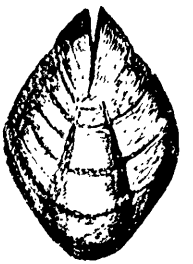

Fig. 107 *a*.

Fig. 108.

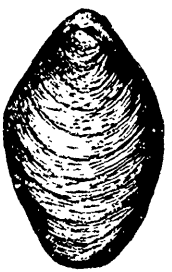

Fig. 109.

Stricklandia:—This genus has been recently established by Mr. Billings. It includes certain more or less oval forms with nearly equal valves, formerly referred to *Pentamerus*. *S. elongata*, a Devonian species, is shewn in fig. 109. Other species occur in these and in the Upper Silurian rocks.

Our Canadian formations do not appear, as yet, to have offered any examples of the well-known genera, *Crania*, *Calceola*, and *Terrebratula*.

LAMELLIBRANCHIATA (or CONCHIFERA.)—Lamellibranchiate mollusks are marine or fresh-water animals of the acephalous type. They are provided in the adult condition with laminated gills or branchiæ for breathing purposes, (as seen, for example, in the so-called "beard" of the oyster,) and they secrete a bi-valve external shell. The two valves in most genera (those of the *Ostreidæ* and some *Aviculidæ* are the only exceptions) are of equal size, but always more or less inequilateral. (See under the Brachiopods above). These mollusks are exceedingly abundant in the fossil state, though less numerous than the brachiopods in the older rock for-

mations. The known species obtained from the seas, lakes, and rivers, of existing nature, somewhat exceed three thousand, whilst nearly double that number of fossil species have been recognized. These latter, however, belong it must be remembered, not to one period, but to many successive epochs; although on the other hand, it is manifest that we see in them merely an incomplete record of the lamellibranchiate fauna of the Past.

In their classification, the lamellibranchiate mollusks fall into two leading sections and four groups, as follows:

(1) ASIPHONIDA

(1 *a*) *Pleuroconcha.*

(1 *b*) *Orthoconcha.*

(2) SIPHONIDA

(2 *a*) *Integro-Pallialia.*

(2 *b*) *Sinu-Pallialia.*

The animals of the first section are without the peculiar respiratory tubes possessed by the SIPHONIDA. These latter, for example, have a pair of short or long siphonal tubes, which assist in the process of respiration, and which admit in the *Sinu-pallialia* of extension beyond the shell.

The *Pleuroconcha*, (group 1), of which the oyster may be taken as a type, rest in their natural position with one valve *below*, and the other *above*, and thus approximate to the Brachiopods. They have in general but one large muscular impression in the centre of the inside of each valve. This forms a shallow pit, occupied by the muscle which keeps the valves closed. The common fossil known as *Ambonychia radiata* (fig. 110) may be cited, though doubtfully, for its true affinities are still obscure, as an example of this division. It is exceedingly abundant in the Hudson River Group of the Lower Silurian series.

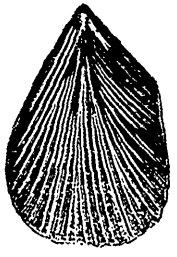

Fig. 110.

The forms of the second group, or *Orthoconcha*, (as restricted above*,) are also without siphonal tubes, but their

* The term *Orthoconcha*, it should be observed, is applied by some palæontologists to our groups, 1 *b*, 2 *a*, and 2 *b*, collectively—the forms of the two first of these being united under the subordinate group of *Integro-Pallialia*.

valves are *right* and *left*, instead of *upper* and *under*, as regards the normal position of the animal, and the muscular impressions are two in each valve. The fossil species known as *Modiolopsis modiolaris* fig. 111, so common in our Hudson River Group, belongs in all probability to this division. The genus *Cyrtodonta* of Billings, (with its sub-genus *Vanuxemia*), may also be referred to the *Orthoconcha* of this Section. Fig. 112 represents the *Cyrtodonta Huronensis* (var. *subcarinata*) of the lower part of the Trenton Group. Another and more remarkable species of this genus—widely known as the *Megalomus Canadensis*, of Hall—occurs in great numbers in the Onondaga Salt Group, (Upper Silurian), of Canada West, and more especially in the neighbourhood of Galt. It is found chiefly in the form of internal casts, as shewn in the figures 113 and 113 *a*.

Fig. 111.

Fig. 112.

The *lamellibranchs* of the third group, *Integro-Pallialia*, have the upright (or right and left) position of the *orthoconcha* of Section I., but, unlike these latter, they possess a pair of short respiratory tubes. The muscular impressions, two in each valve, are connected, as in the forms of the

Fig. 113.

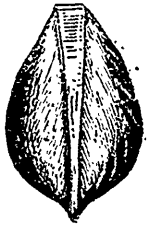

Fig. 113. *a*.

last group, by one uninterrupted shallow groove or "pallial impression,"—*i.e.*, a continuous line without any bend or sinus in it. The existing fresh-water genus *Cyclas*, species of which occur in our

Post-Tertiary deposits, and especially in those of Western Canada, may be cited as an example of the present group. (See PART V.)

Finally, the *mollusks* of the fourth group, *Sinu-Pallialia*, possess a pair of long siphonal-tubes, capable of extension beyond the shell; and their two muscular impressions are united by a more or less deeply sinuated pallial line. Many of these lamellibranchs burrow

Fig. 114.

Fig. 115.

in the sand of the shores on which they live, between the tide-marks, with their respiratory tubes extending to the surface; and fossil examples occupying this upright position, and thus shewing the animals to have been fossilized in their original burrows, are met with in certain strata. As examples of the group, we may refer to *Mya truncata*, fig. 114, and to *Saxicava rugosa*, fig. 115, both of which are of exceedingly common occurrence in the Post-Tertiary deposits of Eastern Canada.

Pteropoda:—The living pteropods are swimming or floating mollusks, frequenting the open sea. Some few are naked, but the greater number secrete a delicate external shell (univalve,) and all possess a pair of fins or wing-like appendages for natatory purposes. In the pteropods with shells, the head is more or less indistinct. The *Conularia* is the only form of Canadian occurence, referrible, and that doubtfully, to this class. Fig. 116 represents *C. Trentonensis* of the Trenton Group. The shell in this genus is more or less conical and four-angled, furrowed longitudinally, and marked transversely by numerous straight or zig-zag lines. These latter often resemble rows of minute punctures. The genus extends from the Lower Silurian division into the Lias formation of the Mesozoic rocks.

Fig. 116.

HETEROPODA.—The representatives of this class are regarded by many naturalists as forming simply an Order (*Nucleobranchiata*) of

the class GASTEROPODA. They constitute however a truly aberrant group, having affinities with the Pteropods on the one hand, and with both Gasteropods and Cephalopods on the other. Existing forms, like the pteropods, are of pelagic habit, swimming, by means of a fin-like appendage, in the open seas. The swimming organ is a modification of the gasteropod foot: see below. Some are without a shell, whilst others secrete one of a fragile and delicate texture,

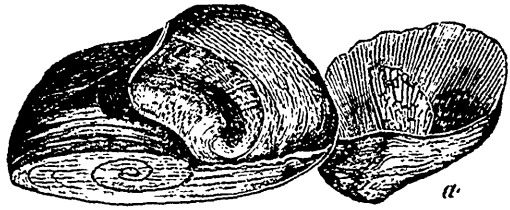

Fig. 117.

Fig. 118.

Fig. 119.

sometimes provided, as in many gasteropods, with a lid or "operculum," by which the opening of the shell is closed when the animal withdraws itself within it. The fossil genera *Maclurea*, *Bellerophon*, and *Cyrtolites*, from certain characters which their shells appear to possess in common with those of the modern genus *Atalanta*, are usually referred to this class; but much uncertainty still prevails with regard to the true affinities of these fossil types. The comparative solidity of the shell is opposed to their alliance with the *Atalantidæ*. Mr. Salter of the English Geological Survey, suggests, however, that *Maclurea* may have been a Heteropod with heavy shell, inhabiting the sea-bottom. Fig. 117, represents *Maclurea Logani* of the lower part of the Trenton Group; *a* is an inside view of the curious operculum often found detached. Fig. 118 is an example of *Bellerophon expansus*, and fig. 119 of *Cyrtolites ornatus*, of the Trenton and Hudson River Groups (Lower Silurian series.) By some palæontologists, the genera *Bellerophon* and *Cyrtolites* are considered identical.

GASTEROPODA.—The gasteropods have a distinct head; and all the typical species possess a fleshy expansion or foot on which they creep, and from which the class derives its name. The greater

number secrete an external and univalve shell, but some few, as the common slug, are "naked" or possess merely a rudimentary shell; and in the *chitons* the shell is composed of several pieces. Some gasteropods, as the common snail, are terrestrial. Others, as the *limnea, paludina,* and *planorbis,* species of which are so common in our lakes and streams, inhabit fresh-water; but the greater number inhabit the sea. The class may be subdivided naturally into two leading groups: *Branchifera* or water-breathers, and *Pulmonifera* or air-breathers.

The *Branchifera,* furnished with gills or branchiæ for breathing the air contained in water, include all the fluviatile and marine types. They fall into two sections: *Siphonostomata* and *Holostomata.* In the former, the opening or so-called "mouth" of the shell is more or less deeply notched at one or both extremities, or is otherwise lengthened into a kind of slit tube or "canal." The species are marine, and all are carnivorous. Comparatively few occur in the lower fossiliferous rocks, the place of the carnivorous gasteropods having been apparently supplied in great part, in the early geological epochs, by numerous predatory cephalopods. An example of this section is shewn in fig. 120, representing a species of *Buccinum* (closely allied to the existing *B. undatum,* if not identical with that species,) from the Post-Tertiary deposits of Eastern Canada.

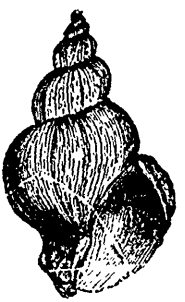

Fig. 120.

In the *Holostomata,* the aperture of the shell has an uninterrupted and more or less circular margin. The species are almost entirely vegetable-feeders. Representatives occur in all the fossiliferous rocks, and are numerous in existing Nature. The annexed figures

Fig. 121.

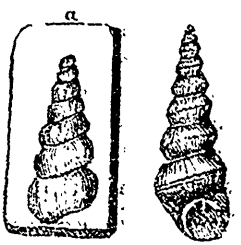

Fig. 122.

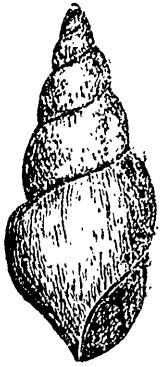

Fig. 123.

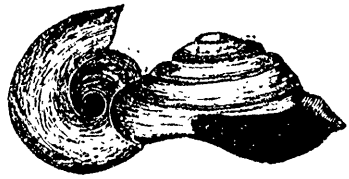

Fig. 124.

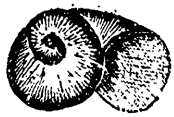

Fig. 125.

represent several of our more characteristic Canadian examples. Figure 121 is the *Ophileta* (formerly *Maclurea,*) *compacta* of the Calciferous-sand group (Lower Silurian.) Fig. 122 represents *Murchisonia gracilis, (a,* shewing internal cast); and fig. 123 exhibits a cast of *Murchisonia sub-fusiformis* of the Trenton and Hudson River Groups. *Pleurotomaria* (or *Trochonema*) *umbilicatula,* a common Trenton fossil, is shewn in fig. 124; and a cast of *Euomphalus rotundus* (?), a Devonian form, in figure 125.

The *Pulmonifera,* in place of branchiæ, possess a simple form of lung-structure by which they breathe air directly from the atmosphere. Some, as the snails, are terrestrial; others inhabit ponds, streams, and fresh-water lakes. All are vegetable-feeders; and the shell, in those forms which secrete one, is more or less light and thin. Our only fossilized examples, comprising existing species of *Helix, Limnea, Planorbis,* &c., occur in the higher Drift or Post-Tertiary deposits of Western Canada. These will be referred to, more particularly, in PART V.

The concluding part of this division of our subject, embracing the CEPHALOPODS, &c., will be given in a succeeding Number of the Journal.

REVIEWS, TRANSLATIONS, AND SELECTED ARTICLES.

NOTICES OF PAPERS IN FOREIGN JOURNALS.

1. *On the Existence of Dibranchiate Cephalopods of great bulk.*—The Cephalopods, the highest types of molluscous development, fall into two leading groups or orders. In the lower group, the animal possesses four branchiæ and numerous arms, and secretes an external many-chambered shell. The *nautilus* is the only remaining type of this group, so rich in representatives during the earlier and middle epochs of geological history. The forms of the second and higher group, have but two branchiæ, and but eight or ten arms; but these latter are provided with suckers, or organs for obtaining a powerful hold of their prey; and the animal is also furnished with a gland for the secretion of a dark fluid, which is ejected into the surrounding water when the creature is pursued or alarmed. These dibranchiate cephalopods inhabit a shell of a single chamber, as in the *argonaut*, or are otherwise "naked," as in all other types, including the sepia or cuttle-fish, the calamary, &c., genera unprovided with an external shell.

The known species belonging to the naked cephalopoda, vary in length, as a general rule, from two or three to eight or ten inches; although a few species, in warm seas, attain to a length of two or even three feet. From time to time, however, strange accounts of gigantic cuttle-fishes have obtained, as in the case of the fabulous sea-serpent, a wide notoriety, and even a certain amount of credence, though finally regarded as altogether unworthy of belief. Many of these narrations, as that of the celebrated *Kraken* of Denis de Montfort, are evidently gross exaggerations, if not absolutely imaginary; but, at the same time, the existence of dibranchiate cephalopods of large bulk, and of species as yet unknown to science, appears to be substantially true. The dead form discovered during the voyage of Quoy and Gaimard, and to which a weight of 224 lbs., was attributed—the huge arms and other portions of a cephalopod found by Professor Steenstrup—and the large speeies, estimated to measure six feet in length, seen during the voyage of Banks and Solander—

may be mentioned in support of this view. Quite recently, a living cephalopod of still larger dimensions than those just cited, was encountered by the French frigate *Alecton*, between Madeira and Teneriffe. A description of this sea-monster is published by M. Bouyer, the lieutenant commanding the vessel, and another by the French consul at Teneriffe, in a recent number of the *Comptes Rendus*, (*No.* 27, *tome* liii). We translate from these a few of the more interesting passages.

The lieutenant of the vessel, M. Bouyer, writes from Teneriffe, under the date of December 2nd, 1861, to the Minister of Marine, le Maréchal Vaillant, as follows:—"I have the honor to inform your Excellency, that, after a favourable run, I cast anchor yesterday in these roads. A somewhat singular incident characterised our voyage. On the 30th of November at 2 o'clock in the afternoon, when about forty leagues N. E. of Teneriffe, we encountered a monstrous animal, which I recognised as the *Poulpe géant*, a creature generally regarded as belonging rather to fable than to reality. Finding myself in the presence of so remarkable a species—of one of those strange forms which the ocean sometimes casts up from its depths as though to tantalize and defy science—I resolved to examine it more closely, and, if possible, to secure it. Unfortunately a strong sea was running at the time, and this impeded the evolutions of the frigate; whilst the animal itself, although almost always at the surface of the water, moved two and fro with a sort of intelligence,* and seemed anxious to avoid the vessel. After several attacks, during which the creature was struck by about a dozen musket balls, we succeeded in getting sufficiently near to harpoon it, and contrived to work the line of the harpoon around its body. Whilst preparing to strike it anew, the creature by a sudden and violent effort freed itself from the harpoon; but the lower portion of its body, around which the cord was twisted, became torn away, and a large mass weighing over twenty kilogrammes (about 40 pounds) was drawn on board.

"We obtained a sufficient view of the animal to make a good sketch of it. It was evidently a gigantic calamary, but the form of the tail seemed to indicate an undescribed species. It appeared to

* M. Bouyer, it will be perceived, has a somewhat crude notion of the proper characters of the group to which the the animal seen by him belongs. In another part of his letter, he calls the cephalopod in question, "*un être ebauché*, a viscous and colossal embryon." When he wrote his description, he had evidently in his recollection that amusing book, as regards matters scientific, the "la mer" of M. Michélet.

measure from fifteen to eighteen feet from head to tail. The head, in shape like a parrot's beak, was surrounded, by eight arms of from five to six feet in length.* Its aspect is frightful; its colour, brick-red. In a word, this rudimentary creature, this viscous and colossal embryon, presents an aspect at once repulsive and terrible.†

M. Bouyer then goes on to state, that his officers and men wished to lower a boat and renew the attack, but that he feared to expose them to so unequal a contest, and that, finally, the chase was abandoned. The description drawn up by M. Berthelot, the French consul at Teneriffe, agrees essentially with that of M. Bouyer, although differing in some of its details. The animal is said to have presented a fusiform body, five or six metres in length, with a pair of fleshy lobes or fins at its lower extremity. It is also stated, that when wounded by one of the musket balls, the creature vomited a large quantity of blood mixed with slimy matters of a strong musky odour. A species of *Eledone* is known to emit an odour of this kind; but there are two points here of a somewhat suspicious character. In the first place, the blood of the cephalopods, as that of other mollusca, is colorless; and secondly, is it not remarkable that no mention is made of any discharge of "ink," during the attack to which the animal was subjected? The supposed appearance of blood, however, may have been caused by a discharge of this kind.

To the observations recorded by the actual observers of this creature, M. Milne Edwards has added the following remarks:—"The animal described in these communications, belongs apparently to one of those species of gigantic cephalopods, of which the existence has already been announced on various occasions, and the remains of which are preserved in several museums: in that, for example, of the College of Surgeons in London. Aristotle speaks of a large calamary (Τευθις), five cubits in length; and without referring to the fables of Pliny, and the evident exaggerations of Olaus Magnus and Denis de Montfort, we may recall the discovery of Péron, on the coast of Tasmania, of a calamary with arms of six or seven feet in length, and seven or eight inches in diameter. More recently

* In the calamary the arms are *ten* in number. If the species really belong to the octopod division of the cephalopoda, it can scarcely be referred to any recognised genus. All the known octopods appear to possess a comparatively short and bursiform body, without "a tail" or expansion at the lower extremity.

† We here translate literally. It is perhaps needless to observe that the cephalopods are of comparatively high organization, or present, at least, nothing of an embryonic character. M. Michélet, we fear, has to answer for our author's zoology.

Messrs. Quoy and Gaimard found in the Atlantic Ocean, in the vicinity of the Equator, the remains of an enormous mollusk of the same family. They estimated the weight of the animal to which these belonged, to exceed 100 kilogrammes. Rang, also, saw in the same waters, a cephalopod of a red colour, and as large, according to his description, as a cask of the capacity of a tun. We are indebted likewise to Professor Steenstrup, of Copenhagen, for some very interesting observations on a gigantic cephalopod which was cast on the coast of Jutland in 1853. It is described by Professor Steenstrup under the name of *Architheuthis dux*. After the creature had been dismembered by the fishermen, and partly used for bait, its remains filled several barrows; and the pharynx, which had been preserved, is as large as a child's head. Finally, during the past year (1860) M. Harting described and figured various portions of an enormous animal of this family, preserved in the museum of Utrecht. We can scarcely imagine that these different observations refer to one and the same species. In all probability, therefore, several gigantic species of cephalopods, greatly surpassing in size all known Invertebrates, will be found to exist in the Atlantic and other oceans.

2. *On some Points connected with the Recent Eruption of Vesuvius*:—The same number of the *Comptes Rendus* contains some interesting communications on the late eruption of Vesuvius. During this eruption, an actual elevation of the district, to the height of several feet, is shewn to have taken place. The elevation appears to have gone on slowly during two or three days, and to have extended over a very considerable area. In a paper by Professor Guiscardi, the following statement is made with regard to this upheaval of the land:—"The next day [the 15th of December, 1861, the eruption having taken place on the 8th] I returned to Torre del Greco with Professors Palmieri and Napoli. M. Palmieri drew my attention to the inundated space around the public fountain. On the sea coast, carbonic acid was emitted through fissures in the lava of 1794, and also from the sea, causing in the latter a strong ebullition. M. Palmieri pointed out to me a long band of a whitish colour above the level of the water. We engaged a boat, and reaching the spot, found the height of this zone above the sea level to be 1·12 metre [=3 feet 8 inches]. It was covered with balani, patellæ, fissurellæ, oysters, &c., and with various bryozoons. There can be no doubt, consequently, as

to the upheaval of the shore. The raised band to which the balani, &c., were attached, was traced from Torre del Greco along the coast to Torre di Basano; but at the latter spot it had diminished in height to three decimetres [=11⅘ inches.] In connexion with this, we were assured that farther up the coast, as well as at Naples, the relative levels of land and sea remained unaltered. We crossed the place from which, with strong ebullition, the carbonic acid was constantly rising, and found the surface of the sea covered all around with a yellowish scum. At the bottom, there were many dead fishes and sepiæ." This phenomenon is fully confirmed by the observations of Messrs. Tchihatchef, Palmieri, and other geologists, as recorded in the same and other numbers of the *Comptes Rendus*. Professor Palmieri observes:—"The ground around Torre del Greco began to experience a movement of elevation at the first commencement of the eruption, and this movement continued during the two following days. The part of the town built on the compact lavas of 1794 suffered great damage; but the wells were not injuriously affected on this occasion. There was even an increase in the amount of water, accompanied by great ebullition, arising from the escape of carbonic acid. The emission of this gas from the sea bottom, destroyed a great number of fishes."

In a communication by M. Tchihatchef, the great similarity of the recent lavas to those of 1794 is pointed out. Both are remarkably free from leucite, but contain, in place of that mineral, a great abundance of pyroxene. M. Tchihatchef observes, however, that the one may be readily distinguished from the other, at least for a period of five or six years, by a simple botanical character: the older lava being covered by a thick growth of a lichen, *Stereocaulon Vesuvianum*, whilst the surface of the modern lava is quite bare. The lichen in question does not commence to grow on these rocks until after a lapse of several years.

Another fact of great interest, connected with this eruption, is the manifestation of combustible gases, consisting largely of carburetted hydrogen, and the simultaneous appearance of bituminous matters on the surface of the sea, at various points. An analysis of gas collected from the sea near Torre del Greco, yielded to Sainte-Claire Deville the following results; Carbonic acid, 59.53; combustible gas (nitrogen + carburetted hydrogen), 40.47. The same gas was observed to issue through crevices in the streets of Torre del Greco

itself. M. Tchihatchef observes:—"I am the more inclined to believe that carburetted hydrogen is mixed at this locality with the emissions of carbonic acid, since the presence of the former gas will alone explain a phenomenon said to have been witnessed by the inhabitants, and confirmed by Professor Guiscardi, namely the apparition of small jets of flame darting through the crevices with which the streets of Torre del Greco are fissured. The exclusive presence of carbonic acid would, of course, render this phenomenon impossible."

May not the very constant association of bituminous matters with volcanic outbreaks, and their occurrence in many regions along lines of volcanic disturbance, lead us in some respect to modify our views with regard to the origin of petroleum and allied products? The almost universal opinion, at present, regards these compounds as essentially derived from the alteration of entombed vegetable or animal matters. That organic bodies may be converted in many instances into bituminous products of this character, no one will of course deny; but when we find, as in Western Canada for example, such immense quantities of petroleum in rocks far below the coal beds, and destitute in themselves of vegetable forms beyond a few fucoids—whilst the corals, brachiopods and other animal remains which they contain, are not more numerous than those enclosed in other rocks in which no traces of petroleum occur—does it not seem a less forced explanation, to look upon that substance as an original mineral formation produced far down in the earth's crust, just as lead, copper, and other metals must primarily have originated there, (account for their after distribution as we will), than to consider it in all cases as a secondary product derived from the alteration of vegetable or animal bodies? Modern theory, it is true, is inclined to refer all forms of carbon, even the graphite of meteoric stones, to organic origin—but theory in this case may be pushed a little too far. The non-existence of Benzole in our Canadian petroleums, as shewn by Professor Croft, is apparently in itself an argument against the supposed derivation of these bituminous matters from coal or other vegetable accumulations.*

3. *On Parthenogenesis as Occurring amongst Silkworms*:—A tradition has long prevailed around Lyons and throughout the south of

* Although Canadian petroleum does not contain Benzole, it is quite available, according to Professor Hind of Trinity College, who has bestowed much attention on the subject, for the extraction of colouring materials of a similar character to those derived from coal oils.

France, as well as in Piedmont and Lombardy, that the most effectual means of restoring vigour to the silkworm stock, when this becomes deteriorated (as shewn by a poorer yield of silk, less numerous eggs, &c.), is to employ what is called "virgin seed," or, in other words, eggs laid by female moths that have been kept rigorously from contact with the males. Some researches made on this subject are published by M. Jourdan in the *Comptes Rendus* of December 16, 1861. Although placing no great faith in the statement in question, M. Jourdan determined to submit it to the test of experiment. Three hundred worms (of the *Briance* variety) were enclosed in separate boxes, each covered with a piece of guaze, of which the ends were closely sewed together. These worms yielded one hundred and forty-seven female, and one hundred and fifty-one male moths. The latter were removed, and the females were kept carefully imprisoned in their separate boxes. Out of the hundred and forty-seven moths thus preserved, only six yielded really fertile eggs. Two moths gave seven; two others, three; one, five; and one, two. These twenty-nine eggs, out of the whole number laid, and kept enclosed as above stated, were all that came to life. Some others, it is true, passed from the clear yellow into the greyish stage, after the manner of fertile eggs, but these finally proved abortive. The total number of eggs laid in this experiment, amounted to about 50,000: so that about one egg only in two thousand proved fertile.

In a second experiment, conducted in the same manner, but on another breed of silkworms (a Chinese variety), results of a much more striking character were obtained. Fifty cocoons were enclosed in separate boxes, as before. From these, twenty-three females and twenty-six males resulted. Of the former, seventeen produced fertile eggs. The most productive gave one hundred and thirteen, and the least productive yielded twelve. The proportion of fertile eggs to the total number laid, was about one in seventeen, or 530 in 9000.

The occurrence of *Parthenogenesis* amongst the Lepidoptera, appears, then, to be certainly verified; and this fact, as observed by M. Jourdan, cannot be looked upon otherwise than as one of great physiological interest, when we consider the advanced organization of the class in which it has been thus shewn to occur. An extension of these experiments, in order to test the duration of the peculiarity

in question, is now desirable. The Chinese variety employed in M. Jourdan's second series of observations, passes through its various stages in the course of a few months; but the phenomenon of parthenogenesis will be found limited, in all probability, to a single generation. E. J. C.

ON THE COMPARATIVE PROGRESS OF THE POPULATION OF ENGLAND AND SCOTLAND, AS SHEWN BY THE CENSUS OF 1861.

BY JOHN STRANG, LL.D.,
CITY CHAMBERLAIN OF GLASGOW.

(*From the Journal of the Statistical Society: December* 1861.)

If some distant and untutored foreigner happened to cast his eye over the map of the world, and were told by some enlightened bystander that within the comparatively small islands of Great Britain and Ireland there resided the elements of a first-rate political power, he would no doubt feel some little surprise at the intelligence; particularly were he, at the same time, informed that within the boundaries of Great Britain itself there was only a surface area of about 57 millions of statute acres. But the foreigner's surprise would be perhaps still greater were he further told that, while the southern portion of the island, called England and Wales—with a surface of little more than 37 millions of acres—had a population (as ascertained by the late Census, exclusive of the army and navy, and merchant service abroad) of 20,061,725; the northern portion, called Scotland—with a territorial surface of upwards of 20 millions of acres—contained only 3,061,329 inhabitants. Such, however, are the real facts of the case; and those like ourselves, who are acquainted with the distinctive physical peculiarities of the two portions of Great Britian, will feel little wonder about it.

There is, however, a subject connected with this territorial division of England and Scotland, and their distinctive populations, which is not so easily understood—we mean the fact, as shown by the Census returns of the present century, that there has existed for some considerable time, and particularly of late years, a marked difference in the ratio of the progress of the population within the limits assigned to the southern and northern portions of Great Britain respectively.

The following table will best exhibit this difference, by showing the annual progress of the population in England and Scotland since 1801, when the enumeration figures of both countries may be first truly relied on: —

Year.	England and Wales.	Scotland.
1801	9,156,171	1,608,420
'11	10,454,529	1,805,864
'21	12,172,664	2,091,521
'31	14,051,986	2,364,386
1841	16,035,198	2,620,184
'51	17,927,609	2,888,742
'61	20,061,725	3,061,329

From the foregoing table it appears that the population of *England and Wales* has, in the course of sixty years, increased to the extent of 10,905,554, whereas that of *Scotland* has advanced to the extent of only 1,452,909; exhibiting an increase on the part of England and Wales of 119·1 per cent., and on that of Scotland only 90·3 per cent.; and if we merely compare the progress of the populations of the two divisions of the island respectively during the last ten years, we find that while England and Wales show an increase of 12 per cent., Scotland only exhibits an advance of 5·9, or about 6 per cent.

The question then naturally arises, how can this great and important discrepancy between the rates of progress in England and Scotland, particualarly as existing between the years 1851 and 1861, be explained? Has it been occasioned by a different birth and death-rate ruling in the respective portions of the island? or is it to be found in a larger proportional rate of emigration on the part of the North to that of the South? And if the latter be the case, what may be the probable causes which have led to that higher emigrating spirit?

Let us, then, attempt to discover what has been the actual *natural increase* of the population in *Scotland*, as deduced from the excess of births over deaths, since 1851. And here a difficulty meets us on the threshold—the fact that before the 1st January, 1855, there was no public register of births, deaths, and marriages kept in Scotland—and it is therefore only from the latter period that we can obtain any

authentic figures wherewith to deal. Let us, however, see what these exact figures tell us, which will be best done in the following table:—

Annual Table of Births and Deaths in Scotland from 1st January, 1855, till 30th June, 1861.

Year.	Births.	Deaths.
1855	93,349	62,004
'56	101,821	58,529
'57	103,628	61,925
'58	104,195	63,532
'59	106,732	61,754
'60	105,704	68,055
'61(half year)	54,625	33,863
	670,054	409,662

From the foregoing table we at once discover that during the last six years and a-half the actual increase of the population from the excess of births over deaths amounted to 260,392 ; and, assuming that the average annual birth and death-rates then existing differed but little from those existing during the three and a-half years that preceded the passing of the Registration Act for Scotland—which rates were, say, birth-rate 3·41 per cent., death-rate 2·08 per cent.,—then it would follow that during that period of three and a-half years preceding 1st January, 1855, the births must have amounted to 346,115, and the deaths to 211,120, showing an excess of births over deaths of 134,995, and which, when added to the excess of births over deaths during the last six and a-half years, makes a *total natural increase* of the population in *ten years*, within the boundaries of Scotland, of 395,387, or at the rate of about 13·6 per cent. It is therefore quite evident, that had Scotland not been subject to the effects of a *serious emigration*, her population at last Census would have amounted to 3,284,129, instead of 3,061,251.

If such, therefore, may be taken as a proximate picture of the real natural progress of the population of Scotland, it necessarily follows, considering the immigration from Ireland into the West of Scotland, that the tide of emigrating Scotch to other countries must have been very great, especially during the last ten years ; seeing that in addition to all the Irish immigration—which, however, has

not been so large for these four or five past years—there must have gone out from Scotland no fewer than 222,878 persons, being the difference between the natural increase from the excess of births over deaths, and the increase as shown by the late Census.

According to the returns made to the Registrar-General by the Government Emigration Board, we find that during the last ten years the estimated number of Scotch who have *emigrated* with the knowledge of the said Board has amounted to 183,627, leaving 39,251 which must have left otherwise, either to recruit the army and navy abroad, to push their fortune in various parts of the globe, unaccounted for by the Emigration Commissioners, or, what is more likely have gone to swell the population of England. That the population of England has been greatly increased from immigration will at once appear evident, when it is stated that while in the ten past years the *English-born emigrants* have amounted to 640,210, the *natural increase* of her population only exhibits 136,460 more than her ascertained population by the Census, showing an unaccounted for deficiency of 503,740, for which she must have been mainly indebted to Scotland and Ireland. That an emigrating spirit has manifested itself on the part of the Scotch more than the English is certain, from the fact that, taking the mean population for the last ten years of each country, we shall find that, had Scotland only emigrated proportionally to England, the Scotch emigrants ought only to have amounted to about 100,000, whereas the numbers stated by the Commissioners are 183,627.

If the emigration from Scotland has thus been so disproportionately great, it may be asked from what particular quarter of the country has this spirit chiefly manifested itself, or, in other words, in what division of the country has the population absolutely shown a decline? The following table will at once answer the question:—

Table showing the Counties in Scotland where the Population was found TO BE LESS *in* 1861 *than* 1851.

Counties.	Numerically less by	Counties.	Numerically less by
Sutherland	585	Argyll	8,303
Ross and Cromarty	1,427	Bute	420
Inverness	9,065	Dumfries	2,246
Kincardine	137	Kirkcudbright	691
Perth	5,149	Wigton	1,351
Kinross	949		
Clackmannan	1,502		31,825

It appears, then, from the foregoing table, that in twelve out of the thirty-three counties of Scotland there has been, since the Census of 1851, irrespective altogether of the natural progress of the population by excess of births over deaths, a *diminution* of the inhabitants to the extent of 31,825 ; and as these counties are almost entirely agricultural and pastoral, the fact would seem to indicate that either manual labour was less wanted in these particular districts, or that a better remuneration for labour and industry was offered elsewhere.

For a striking contrast to this state of things in the agricultural and pastoral parts of Scotland, we have only to look to the Census figures of the commercial, mining, and manufacturing county of Lanark, where we find, in the course of the last ten years, an *increase* to the population of no less than 101,290! The fact is, the increase of the population is almost entirely limited in Scotland to *towns*, and to these of the largest kind—the increase in towns being 10·9 per cent., whereas the rural districts only show an advance of 0·9, or not 1 per cent. ; or, if Scotland be divided into three great divisions—viz., called *Insular, Mainland-Rural, and Towns*—the insular will show a decrease of 3·6 per cent., the mainland-rural an increase of 3·9 per cent., and the towns an increase of 12·9. But, to show still more forcibly the decline that has taken place among those residing in the *rural* portions of Scotland, it may be mentioned that the small increase stated as occuring in the mainland-rural district of 3.9 per cent., is owing almost entirely to the increased population of the smaller towns situated within the limits of that great division of the country. The leading deduction, then, to be drawn from these dry statistical details is simply this, that there has existed for some time a manifest tendency on the part of the inhabitants of the country districts, and particularly of those dwelling amid the Highlands and Islands, to quit a land where rural labour was little wanted, and pastoral care was poorly paid, for other countries where both were in good demand and highly compensated ; or for towns and cities, where the hardy and unskilled labourer is almost always sure to find employment. That this emigrating spirit in search of future prosperity has proved as yet as advantageous to Scotland as it has certainly been to Ireland, will scarcely be denied, seeing that it increases not only the value of the labour, and raises the condition of those who remain behind, but elevates the position and increases

the comforts of those who go away. And although there must ever be felt a pang on the part of a pilgrim family when abandoning for ever the cherished scenes of childhood, even when those are associated with nothing better than the comfortless home of the Highland cottar, still the mutual personal benefit that results from this separation has been generally found to be, to those gone and to those left, well worthy of the temporary pang.

Among the immediate causes which have led to the late depopulation of the Highlands and Islands, and the partial diminution of the inhabitants of the other rural districts of Scotland, we shall only allude first, to the great enlargement which has lately taken place in the sheep-walks and agricultural farms—particularly in the northern parts of the country—thereby diminishing a host of small master graziers, and even smaller agricultural tenants, each and all of them without energy and without capital; secondly, to the discouragement given to the continuance of unnecessary cottars and crofters idly occupying the country; and, thirdly to the effects and results of the late Highland famines, which have, alas, too sadly taught the poor and perishing denizens of a country that cannot maintain them, to flee for refuge to one more kind and hospitable.

If, however, from the returns of the present Census we have been told that the rural portions of Scotland have, with respect to population remained either stationary or have shown a tendency to decline, it is, at the same time, certain that in the great centre of trade, mining and manufactures—we mean in *Glasgow*—there has been a most marvellous increase in the amount of its inhabitants. For while at the commencement of the present century that city and its suburbs only contained 83,769 persons, the last Census revealed the fact that its population, with that of its increasing suburbs, amounted to 446,395, and which, when compared with the population residing on the same territory in 1851, showed an increase of no less than 86,357 during the last ten years, or a rate of 23·95, or nearly 24 per cent. That this increase has mainly arisen from a *constant immigration* from all parts of Scotland, and also from Ireland, is no doubt certain; for if we assume that the last year's birth and death-rates—which were, births, 3·87 per cent.; deaths, 3 per cent.—have been the average rates for the last ten years, which we believe is not far from the truth, and that the mean population during the same period may be fairly assumed to have been 403,000, it will then

follow that the natural increase, arising from the excess of births over deaths, could not have amounted to more than above 35,000, which, being deducted from the ascertained increase as shown by the late Census, proves that the increase of the city and suburbs must have been supplemented by an immigration of upwards of 50,000.

That Glasgow, indeed, has been chiefly indebted during the last half century to the immigration which an increase of capital and an active and multifarious industry have induced, cannot better be illustrated than from the facts which our lately-printed analysis of the Enumeration Returns of the Glasgow Census then exhibited. From these the fact may be gathered that, independent of the many thousand individuals that have been attracted to that centre of Scottish industry from all quarters of Scotland, there were found within the limits of its municipality alone, on the 9th of April last, no less than 10,809 native English, 63,547 native Irish, 827 foreigners, and 1,440 colonists, being about 20 per cent., of the whole of that population.

In conclusion, let us merely add, although it is quite true that the population of Scotland has only increased, according to the late Census, about 6 per cent., and consequently only in a ratio of half the amount of that of England, it is, at the same time, certain that this diminution of ratio has not arisen from any falling off in the natural increase of the people, that is to say, in a diminution of the excess of births over deaths, but wholly and entirely from a most extraordinary amount of emigration by persons belonging chiefly to the insular and rural portions of the kingdom—an emigration which, in the peculiar districts affected by it, has been thereby benefited, and has not in the least degree interfered, but rather accelerated the progress of those leading marts of commerce and industry in Scotland, which have hitherto so successfully kept pace with their worthy commercial and manufacturing competitors in England. In a word, while Scotland, from its improved, and still improving, system of agricultural and cattle rearing, may feel well content to part with her supernumerary and unemployed peasantry, either to add to the prosperity of her urban seats of industry, or to continue to fulfil the old adage that in every nook of the world where any good is to be got, there is to be found a Scot, a rat, and a Newcastle grindstone—she at the same time cannot but feel assured so long as her soil is daily becoming more productive, and her

manufactures, mining, and commerce are advancing, and her cities, harbours, and railroads are extending as they are at present found to be, that she is still on the pathway of prosperity, even although the Census has truly proclaimed that the progress of her population has only exhibited an increase of scarcely 6 per cent., during the last ten years of her history.

BRITISH WEST INDIA COLONIES IN 1859.

Abstract of the Official Reports by the Governors.

(From the "Standard" Newspaper: Oct. 1861.)

"JAMAICA.—In 1859 (which is the last year of the official returns throughout the whole report,) the total revenue of this island was £279,935, and the expenditure £262,142. If we take the three preceding years we observe some fluctuations, which are trifling, and accounted for by purely local circumstances—as buildings and roads, and repayments of floating loans; but these we omit to specify, considering it more acceptable to our readers to devote our space to information rather of an Imperial than of a strictly local character. There is an island debt of £852,000, but it is in process of annual liquidation. There is no return of the population, but a census is ordered to be taken in 1861; but it is inferred from an ecclesiastical enumeration that the number of souls may be about 360,000. Taking an average of the years 1857, 1858, and 1859, the value of the four great staples—sugar, rum, coffee, and pimento, with logwood and dyewoods—was £1,056,890; and of the minor articles, £46,609. It is the strongly expressed opinion of Governor Darling, that, on an average of seasons, the *export of sugar* will rarely exceed 30,000 tons, unless immigrant contract labour be more largely employed; and this leads to the subject of negro industry. The Governor sees no prospect 'of an augmentation of the effective strength of that portion of the native population who work *for hire* on the larger plantations,' because he doubts whether sufficient wages can be given for sugar cultivation to stimulate the negro, who is fonder of his ease than of money. His wants are few, and he is indifferent to hoarding. The available statistics of agriculture are however scanty, and quite insufficient to convey a correct and comprehensive view of industrial

occupations. But one remarkable fact appears well worthy of attention. If the African race cannot be roused to activity by high wages, they work diligently when they cultivate the *soil on their own account*; and these are now rising up as an independent, respectable, and trustworthy middle class. They are even becoming the employers of hired labour. The gratifying result is that the emancipated race evince a capacity for freedom when they can appropriate to themselves a fair share of the wealth they create. They properly value the possession of a leasehold or freehold property, and in due time we may hope to see labourers, animated by the example of their brethren who have achieved independence, more and more inclined to work for wages as the sole means, if accompanied by economy, of acquiring that capital which will place them in the position of becoming the owners of moderate holdings. Many years have elapsed since Mr. Carey, the American economist, expressed his conviction that what is now witnessed in Jamaica would prove the true solution of slavery in the Southern states. He predicts that a time will come when 'there will be seen to arise a class of free black men, cultivating for their own use their own land, bought from their old masters, who will find in the price of the land a compensation for the price of the labour.'*

"British Honduras.—Here the chief trade is *mahogany*, which has been entirely engrossed by four or five influential firms. Two of these failed in 1859, and the result was great distress at Belize. The resident importing merchants who used to sell goods to purchasers from the contiguous states of Central America have lost their customers by a change in the course of trade, because the facilities of steam packet navigation have induced foreigners to draw their supplies direct from British manufacturers instead of procuring them, as heretofore, through Belize. However, the staple trade in mahogany and dyewoods is maintained with vigour; and there is the prospect of easier communication with Guatemala. The trade of Honduras is, however, small. In 1859 the value of the exports was £288,000, and of the imports £175,000.

"Bahamas.—In 1859 the revenue was £30,727, net. This is a ridiculously small sum: but the value of the imports was £213,166, and of the exports £141,896. The staple produce of this colony

* "The Past, the Present, and the Future," p. 364. By H. C. Carey.

consists of *pineapples and oranges;* but there is another source of trade which will astonish most of our readers—that is '*wrecks,*' which in the very words of the report are described as 'the great and constant element of our trade and revenue.' Neither agriculture nor manufactures offer any profit compared to that derived from the wrecker's vocation. But this subject is so curiously infamous that we shall transfer to our columns the language of the report:—'This calling, which distributes prizes among blacks and whites alike, puts on a level and gives to both the opportunities of easy self-indulgence. As I often had to remark, it involves crime and the connivance at crime. But I doubt whether the treacherous plots which are so successfully laid for the destruction of vessels are generally known to any but the commanders of the wrecking vessels and the masters of the wrecked ships. The crews, I imagine, have a general rather than a special knowledge of the schemes which bring the merchant vessel and the parasitic wrecker close together near a reef. The general demoralization which the system engenders throughout every class in the colony will increase until American shipowners set the example of greater honesty, and American underwriters are more anxious to suppress the crimes which they condemn than to make their remonstrances against the English Government the vehicle of puffing their own resources and touting for fresh customers.' The negro in the Bahamas is not so favourably spoken of as the negro in Jamaica. The negro creole in the Bahamas is not devoid of ambition, but lacks persistent will and energy, both physical and mental. He is happier with his hominy and plot of ground than he would be if assured of a handsome independence on the condition of eight or ten years' hard work. He is a grumbler and a gossip. Such are the descendants of the ancient slaves; but the case is very different with those fresh from Africa and just rescued from Spanish slave ships. These are generally useful and energetic, and they perform the rougher work of the colony. The mulatto and his varied species are the best of this race; they have pride, ambition, and energy, and, when educated, are capable of the success to which they aspire. Such are the distinctions pointed out by Governor Bayley. There is little industry in the Bahamas group. The islands of Eleuthera and St. Salvador raise fruit for the English and American markets, but in the whole colony the culture of corn is trifling, and that of cotton is wholly neglected, while the Nassau market is supplied with meat from the

southern districts of the United States. It is recommended that steam navigation be established between New Providence and the out islands.

"TURK'S ISLANDS.—These are an appendage to the government of Jamaica. The chief source of revenue is derived from the salinas, an export duty on salt being levied of one farthing per bushel of 35 imperial quarts. The population is only 3,250 souls, and with that fact we may dismiss this little group.

"TRINIDAD.—Taking an average of three years, the customs and tonnage duties figure for about £74,000, and the local revenues, which are the receipts of the ward unions, average £25,000. Lord Harris divided the island into wards, for which he is highly praised. The expenditure on the fixed establishments of the island is put down at about £53,000 ; but the unfixed and contingent charges are very large in proportion, those for 1859, exceeding £120,000. The value of the imports in 1859, was £730,000, and of the exports, £820,000. As cotton now occupies the manufacturing mind, we may state that in the year 1859, Trinidad exported 295 bales. The financial balance sheet last forwarded shows the estimated revenue of the island at £176,000, and the expenditure at £180,000, but this excess is increased by some local items which we need not enumerate ; it is sufficient to state that the Governor proposes to make good the deficiency by an income tax of 5d., in the pound on all incomes of £100 and upwards, and he expects it will yield £8000 a year. Thus this bad fiscal principle, which all parties agree cannot be made practically equitable, is about to travel to the West Indies. The most interesting part of this report refers to *immigration*. It is known that most of the colonies must have perished, or returned to a state of weeds and jungle, had not labourers been procured from India and China after the Negro Emancipation Act had been passed. In 1858 the Indian population in Trinidad was 8,854; in 1859, it was 13,544, but this was not entirely due to fresh arrivals, but was partly attributable to the registration of many adults omitted in the former census, and principally to a more particular registration of children. In 1859 there were in the island 3,868 immigrants whose term of industrial residence had expired, and who are at liberty to work or not: but of these 1,360 renewed contracts with their employers, at a premium of from £2 to £4 per annum. This is a satisfactory proof that they have been well treated, and are content with their

bargain. Of the 3,868 who have thus terminated their industrial residence, all are entitled to return passages, except 750 who arrived since January, 1854, who are consequently under a contract of residence for ten years, of which one-half must be passed under written agreement and one-half not. This leaves 3,118 entitled *at present* to return passages. Of these 210 registered themselves as wishful to proceed to India, but before the period of their departure arrived the great majority changed their minds and entered into fresh contracts, so that out of the total number only 35 resolved to quit, and most of these had acquired comparative affluence in trade. These are highly gratifying facts, and silence the libel of those who have compared the immigration system to slavery in disguise. The Bengalee coolies are preferred to those from Madras on account of their superior docility; and the latter are said to be intemperate, idle, and desponding. In Trinidad there are orphan homes and training schools for Indian immigrants, and there is a well-balanced proportion between the children of both sexes, which augurs favourably for their social future.

"British Guiana.—The revenue for the year 1859 was £275,-618, and the expenditure £263,194. The import duties are said to show an improvement of £24,000, but the total amount is not stated. The debt of the colony was £449,802, of which £320,000 was due to Her Majesty's Government. The military defences of the port, abandoned for want of means in 1854, have been resumed. The batteries are nearly complete, and are deemed effective against privateers. This is all of general interest that can be gathered from the report of Governor Wodehouse, which is very scanty; nor is there a single appendix.

"Barbados.—The revenue for the year 1859 was £87,000; the expenditure £80,000; but on the four years ending with 1859 there was a surplus to the treasury of £32,000. During the last four years the debt of the colony has been extinguished, for though there remains an outstanding claim of £290, it cannot be called in. The imports for the year 1859 were £1,049,000; the exports £1,225,000. Barbados supplies *foreign manure* to the neighbouring British colonies and partially to the French. This inter-colonial trade in guano averages in value about £45,000 per annum. Governor Hincks, formerly Prime Minister of Canada, describes the condition of the island as prosperous.

"GRENADA.—The fixed revenue for the year 1859 was £13,500, raised to nearly £17,000, by additions accruing from taxes levied under a local money bill. Of this total about £9,500, are the proceeds of duties on imports. In consequence of the arrival of Indian labourers the duty on imported rice had risen from £297, to £517, and the abolition of tonnage duties is expected to give some stimulus to trade. The total value of imports was, in 1859, £124,000, and of exports £131,000. On both sides of this account some fractional deductions are made for goods imported and subsequently exported. Within the last three years agriculture has made considerable progress and it has been ascribed to the introduction of Indian labourers. By their industry seven large estates have been reclaimed in the last three years, these having been abandoned when the negro refused to work after his emancipation. They are now in a flourishing condition. The immigrants only number 879, but their presence and conduct are described as 'most telling on the Creole labourers.' So well contented are the labourers that they told Governor Hincks that they had no intention of returning home, but would settle in the island when their term of industrial residence had expired. This confirms the intelligence from Trinidad.

"TOBAGO.—Of this colony nothing is reported but what is strictly local. Everything is described as prosperous. In round numbers the population numbers 15,000.

"ST. VINCENT.—The information is very scanty. There is a great want of Indian immigrants. The island is highly fertile and well adapted to the sugar cane. It exports some hundred tons of pozzolani, which, mixed with two-thirds of lime, produce an excellent hydraulic mortar and cement for pavements. It is shipped at the rate of 8s. per ton. Here grow the bread-fruit trees most luxuriantly, as nutritious as the yam and potato. The cabbage trees are gigantic, and the palms are tall and stately. Some insect blight has killed the cocoa nuts. The bamboo cane is excellent.

"ST. LUCIA.—The population is put at 26,000, but this estimate is deemed below the actual amount. Some 1,200 Indian labourers have arrived, who do not appear to be enumerated, and many persons come to St. Lucia annually from other colonies, chiefly from Martinique. The coolies are reclaiming land thrown out of cultivation. Old buildings are repaired, and former activity and enterprise are being renewed.

"ANTIGUA.—The revenue for the year 1859 was £40,000; the expenditure, £39,000. There is a public debt due to Her Majesty's Treasury of £40,000. The last census of the population, taken in 1856, gave 35,408 souls. Five-sevenths of the population have ceased to reside on estates, but live in towns or villages. The average number of inmates to each dwelling in the towns and villages is nearly five and a-half; on the estates, scarcely three and a-half. Morality seems to have been almost exiled from Antigua. Out of 4,134 births registered in three years, 2,201 were illegitimate. This proof of vice, it is said, would be strengthened if the number of abortions and premature births could be ascertained. Here children are deemed an encumbrance to the mother; they are badly nursed, and badly fed, and are deprived of proper medical attendance. These are among the causes of declining population. Under slavery these evils did not occur; the planter provided the slave with everything needful. The imports of 1859 were £203,000; the exports £289,000. In the same year the exports of sugar were 13,706 hogsheads; of molasses, 675,000 gallons; of rum, 112,120 gallons. Formerly, in 1834, Antigua produced nearly 21,000 hogsheads of sugar; of late years it has rarely made 16,000. The soil is rich; the seasons very uncertain. Much land is still uncultivated. On the whole, the condition and prospects of the colony are considered by Governor Eyre as unsatisfactory. What is chiefly wanted is a large influx of the industrious coolies.

"MONTSERRAT, ST. KITT'S, NEVIS, DOMINICA, THE VIRGIN ISLANDS.—These are all under the Governor of Antigua, and with it constitute the group known as the Leeward Islands, as Barbados, Grenada, Tobago, St. Vincent, and St. Lucia constitute the group known as the Windward Islands. Of the first four in the list of Leeward Islands no information of any European interest is conveyed in the report, and not much of the last, or Virgin Islands. Of these the most valuable product is copper, obtained from the mines of Virgin Gorda. The general exports go to the Danish islands of St. Thomas and St. Croix, which are only valued at £11,000; to British North American and West Indian colonies, £460; to the United Kingdom, *nil*. The exports referred to are horned cattle, horses, firewood, charcoal, and building lime; and if we notice such trifles it is because we wish to give a complete statement of what is scarcely known. The copper mine at Gorda was

worked in 1839, and closed in 1842 for want of capital. In 1842 the copper raised from these mines, and sold at Swansea, yielded nearly 18 per cent. of marketable metal, and realised a price of £16. 1s. 6d. per ton. The works are resumed under favourable auspices, and the returns are said to be rich and abundant.

"MAURITIUS.—This Island is the most productive of the sugar colonies of the British Crown In 1859 the revenue amounted to £597,000 in respect of receipts within the colony alone, and was augmented by £12,000 received by agents in London for dividends and profits on investments. In the same year the expenditure was £553,000. The remittances to India on account of coolie immigration were £53,000. There are paper-currency notes in circulation which exceed £200,000 in amount. These are covered by cash in the Commercial and Oriental Banks, and by Consols which stand in the name of the commissioners of the currency. The savings' bank flourishes, and its utility is more appreciated as its operations are known. About one-third of the depositors are Indian coolies, who there hoard up the earnings which they take home when their term of industrial residence has expired. In 1858 these depositors drew £10,151, on their departure for India—a gratifying fact in a double sense, as it shows their wages to be liberal, and that they are a thrifty race. There can be no doubt of the readiness of the Hindoos to work the soil of Mauritius when they can realise such large emoluments, and it is clear that if the natives were proportionately remunerated in their own country the charge of laziness so unjustly preferred against them would disappear. Their employers will not invest capital unless they have the certainty of high profits; and why should it be expected that labourers will work for them unless they receive high wages? In 1859 the sugar crop exceeded 115,000 tons, chiefly sold in English, French, and Australian markets. The total value of goods imported was £2,025,890, and of specie £414,931. Total value of goods exported, £2,544,000; and of specie, £14,906. The declared value of sugar exported, the produce of the colony, was £2,346,427. The tonnage of vessels entered inwards was 304,616, outwards 308,642.

The general population of the island is computed at.....	96,526
Immigrant Indian population.....	201,979
Alien population, chiefly Chinese.....	6,541
	305,046

The population in 1859 was one-third larger than in 1851, when the census was taken. At Seychelles and the other dependencies of Mauritius there are 8,001 souls. This great increase is due to arrival of the coolies, whose contract term of residence is five years; and, as already stated, the treatment they receive and the wages they earn, ensure a continuous supply of Indian labour."

SCIENTIFIC AND LITERARY NOTES.

GEOLOGY AND MINERALOGY.

ON SOME ADDITIONAL REMAINS OF LAND ANIMALS IN THE COAL MEASURES OF NOVA SCOTIA.—BY J. W. DAWSON, LL.D., F.G.S., PRINCIPAL OF MCGILL COLLEGE, MONTREAL.

(From the Journal of the Geological Society of London, February, 1863.)

In the long range of rapidly wasting cliffs at the South Joggins, every successive year exposes new examples of erect trees and other fossils; and, as the removal of the fallen débris is equally rapid with the wasting of the cliff, it is only by repeated visits that the geologist can thoroughly appreciate the richness of this remarkable section, while every renewed exploration is certain to be rewarded by new facts and specimens. The present notice is intended to record the gleanings obtained in my last visit, in connexion with the presentation to the Society of a suite of specimens of the fossil Reptiles and other land-animals of the locality, which I desire to deposit in the Museum of the Society, that they may be more fully studied by comparative anatomists, and may remain as types of the species, accessible to British geologists.

In the bed which has hitherto alone afforded reptilian remains in the erect trees, two additional examples of these were exposed. One was on the beach, and in part removed by the sea. The other was in the cliff, but so far disengaged that a miner succeeded in bringing it down for me. In the first comparatively little was found. It afforded only a few shells of *Pupa vetusta*, and scattered bones of a full-grown individual of *Dendrerpeton Acadianum*.

The second tree was more richly stored; and, being *in situ*, was very instructive as to the mode of occurrence of the remains. Like all the other trees in which reptilian bones have been found, it sprang immediately from the surface of the six-inch coal in Group XV. of my section,* which is also Coal No. 15 of Sir W. E. Logan's section.† Its diameter at the base was 2 feet, and its height 6 feet, above which, however, an appearance of additional height was given by the usual funnel-shaped sinking of the overlying beds toward the cavity of the trunk. The bark is well preserved in the state of bituminous coal, and presents

* Quart. Journ. Geol. Soc. vol. ix. p. 58, and vol. x. p. 20.

† Reports of Geol. Survey of Canada, 1845.

externally a longitudinally wrinkled surface without ribs or leaf-scars; but within, on the "ligneous" surface, or that of the inner bark, there are broad flat ribs and transversely elongated scars. The appearances are precisely those which might be expected on an old trunk of my *Sigillaria Brownii*, to which species this tree may have very well belonged.*

The contents of the trunk correspond with those of others previously found. At the bottom is the usual layer of mineral charcoal, consisting of the fallen wood and the bark of the tree itself. Above this, about 2 feet of its height are filled with a confused mass of vegetable fragments, consisting of *Cordaites*, *Lepidodendron*, *Ulodendron*, *Lepidostrobus*, *Calamites*, *Trigonocarpum*, strpes and fronds of Ferns, and mineral charcoal; the whole imbedded in a sandy paste blackened by coaly matter. In and at the top of this mass occur the animal remains. The remainder of the trunk is occupied with grey and buff sandstone, containing a few fragments of plants, but no remains of animals.

Portions of six reptilian skeletons were obtained from this trunk. The most important of these is a large and nearly complete skeleton of *Dendrerpeton Acadianum*—by far the most perfect example, as I suppose, of any carboniferous reptile hitherto found. I shall not attempt to describe this specimen, and the new points of structure which it illustrates; but I send the specimen itself, in the hope that its details may be examined and described by the eminent naturalist by whom the species was originally named and characterized. Another specimen found in this trunk is a jaw of an animal about the size of *Dendrerpeton Acadianum*, but with fewer and larger teeth. I send this specimen, which may possibly indicate a new species. The remaining skeletons were imperfect, and belonged to a small individual of *Dendrerpeton Acadianum*, two of *Hylonomus Lyelli*, and one of *Hylonomus Wymani*. The dislocated condition of these and other skeletons is probably due to the circumstance that, when they were introduced, the matter filling the trunk was a loose mass of fragments, into the crevices of which the bones dropped, on decay of the soft parts. Most of the skeletons lie at the sides of the trunk, as if the animals had before death crept close to the walls of their prison. At the time when the reptiles were introduced, the hollow trunk must have been a pit four feet in depth.

A number of specimens of *Pupa vetusta* and *Xylobius Sigillariæ* were found, but nothing throwing further light on these species.

I found in this trunk, for the first time, indications of the presence of *Insects*. The remains observed were disjointed and crushed fragments, and as they did not include wings or elytra, I cannot give any decided opinion as to the orders to which they may have belonged. The most probable conjecture would be that they were *Neuroptera* or *Orthoptera* of large size. The most interesting fragment obtained is a compound eye, imbedded in coprolitic matter, along with obscure portions of limbs and abdominal segments. Its facets are perfectly preserved, and are lined with a brownish bituminous matter, simulating the original pigment. These remains are at least sufficient to prove that in Nova Scotia, as in Europe, Insects inhabited the coal-forests, and that they furnished

* Quart. Journ. Geol. Soc. No. 68, p. 523.

a portion of the food of *Dendrerpeton* or its allies. I may mention here that in other coprolites quantities of segments of *Xylobius* occur, and that there are some little groups of bones of very small reptiles, which are probably coprolitic.

The beds on a level with the top of this erect tree are arenaceous sandstones, with numerous erect *Calamites*. I searched the surfaces of these beds in vain for bones or footprints of the Reptiles which must have traversed them, and which, but for the hollow erect trees, would apparently have left no trace of their existence. On a surface of similar character, 60 feet higher, and separated by three coals with their accompaniments, and a very thick compact sandstone, I observed a series of footprints which may be those of *Dendrerpeton* or *Hylonomus*. The impressions are too obscure to show the toes distinctly. They are half an inch in length, with a stride of about 2 inches. On neighbouring layers were pits resembling rain-marks, and trails or impressions of a kind which I have not before observed. They consist of rows of transverse depressions, about an inch in length and ¼ of an inch in breadth. Each trail consists of two of these rows running parallel to each other, and about 6 inches apart. Their direction curves abruptly, and they sometimes cross each other. From their position they were probably produced by a land or freshwater animal—possibly a large Crustacean or gigantic Annelide or Myriapod. In size and general appearance they slightly resemble the curious *Climactichnites* of Sir W. E. Logan, from the Potsdam Sandstone of Canada

I have long looked in vain for remains of land-animals in any other situation than the erect trees of the bed above referred to; but on my last visit I was much gratified by finding shells of *Pupa vetusta* in a bed of 1217 feet below the former, in the upper part of No. 8 of my section, or about 15 feet below Coal No. 37 of Logan's section. The bed in question is a grey and greyish-blue under-clay, full of Stigmarian rootlets, though without any coal or erect trees at its surface. It is 7 feet thick, with sandstone above and below. The shells occur very abundantly in a thickness of about 2 inches. They have been imbedded entire; but most of them have been crushed and flattened by pressure. They occur in all stages of growth; but the most careful examination did not enable me to detect any new species. With them were a few fragments of bone, probably reptilian. This discovery establishes the existence of *Pupa vetusta* in this locality during the deposition of twenty-one coal-seams, and the growth and burial of at least twenty forests; and from the occurrence of numerous specimens at both extremes of this range, without any other species, it would seem as if, for this locality at least, this was the only representative of the shell-bearing Pulmonates.

I append a list of the specimens forwarded to the Museum of the Society, and which, with those formerly sent, constitute a complete collection of the air-breathing animals hitherto recognized in the Coal-measures of Nova Scotia.

List of specimens of Reptiles, &c., from the Coal-formation of Nova Scotia, accompanying this paper.

1. *Hylonomus Lyelli.* A nearly complete skeleton, and the maxillary bone and teeth of another specimen.

2. *H. aciedentatus.* Maxillary bone, vertebræ, ribs, scales, and foot.
3. *H. Wymani.* Lower jaw, vertebræ and other bones, and scales.
4. Jaw of a Reptile, supposed to be new.
5. Skin and dermal plates of *Hylonomus.*
6. *Dendrerpeton Acadianum*, Owen. A nearly complete skeleton.
7. *Pupa vetusta**. From a bed 1217 feet below that in which the species was originally recognized.

NEWLY FORMED VOLCANIC ISLAND IN THE CASPIAN SEA.

[Extract from a Report published in the "Russian Naval Review," translated by Lieut. LÜTKE, and communicated by Sir R. I. MURCHISON, V.P.G.S.]

On the 8th of August last, the steamer "Turkey," in going to Asterabad, stopped (in the middle of the Caspian) at a distance of several fathoms from a a newly formed island. We went to it in a boat and landed. The length of it is 23 fathoms, the breadth 12 fathoms, the height above the water 6 feet; the average depth of the sea at the distance of 5 to 6 fathoms off the island is also 6 feet. The ground is so loose yet, that the swell of the sea sweeps it away. It is very difficult to walk on the island, as the feet sink into the ground. The action of fire is to be observed all over the island. One may conclude that a short time ago it was yet in a liquid state; for the strong smell of petroleum indicates plainly a volcanic origin, and petroleum is to be seen on the stones mixed up with the earth, the whole having cooled and being now comparatively hard. In passing on the lee side of the island we also perceived the smell of petroleum.

It appears that this newly formed islet lies upon a continuation of the volcanic emanations which trend from the mud-eruptions near Kertch to the fires of Bakou, and in a line towards Asterabad.—*Journal of Geological Society*, 1, xviii.

PRODUCE OF BRITISH MINES FOR THE YEAR 1860.

The following summary, from the Government returns, shews the amount of coal, iron, copper, lead, silver, and tin, obtained from the mines of Great Britain and Ireland during the above year.

Coal.—English collieries, 2,024—products, 50,297,115 tons; Welsh, 443—pro-

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* I observe that Professor Owen proposes the name "*Dendropupa*" ("Palæontology," 1860, p. 79); but I have retained *Pupa* for the present, not being satisfied that there is any good generic distinction; though I admit that the form of the aperture suggests the possibility of affinity to *Bulimus* as well as to *Pupa*.

Mr. J. G. Jeffreys, F.G.S., who considers the shell to be a true *Pupa*, has kindly directed my attention to traces of ridges observable on the columella of one specimen, and which he regarded as corresponding with the screw-like plates in the young of *Pupa umbilicata* and *P. ringens*. This appearance I have observed in specimens now in my possession; and at one time I supposed that I had made out a distinct tooth, but, not finding this in other and less compressed individuals, I concluded that it was an effect of pressure; in which, however, I may have been mistaken, as Mr. Jeffreys states that these processes have no connection with the teeth in adult specimens, and that even the toothless variety of *P. umbilicata* is furnished with them.

ducts, 11,262,850 tons; Scotch, 413—products, 10,300,000 tons; and Irish, 73—products, 120,300. Total, 2,949 collieries—71,979,765 tons. Estimated value at the pits, £17,226,526, or $86,132,630. Of these products, London took 5,073,276 tons, of which 3,573,377 were carried by sea in 11,226 vessels, and 1,499,899 tons by railroad, canal, &c.

Iron Ore.—In England, 4,910,469 tons; in Wales, 736,830 tons; in the Isle of Man, 1,282 tons; in Scotland, 2,225,000 tons; and in Ireland, 3,000 tons—total, 6,796,581 tons, valued at £2,507,860, or $12,539,300.

Pig Iron Made.—In England, 1,740,084 tons; in Wales, 1,012,270 tons; and in Scotland, 960,550 tons—total, 3,712,904 tons, valued at £11,138,712, or $55,693,560.

Copper Mines and Ore.—In England, 151 mines, 211,504 tons of ore; in Wales, 9 mines, 10,673 tons; in Isle of Man, 1 mine, 354 tons; and in Ireland, 10 mines, 14,358 tons. Total, 171 mines—236,789 tons, valued at £1,500,535, or $7,534,175.

Fine Copper from above Ores.—In England, 13,946 tons: in Wales, 550 tons; in Isle of Man, 26 tons; and in Ireland, 1,246 tons. Total, 15,775 tons, valued at £1,734,700, or $8,763,500.

Lead Mines and Ores.—In England, 161 mines, 63,858 tons of ore; in Wales, 82 mines, 20,056 tons; in Isle of Man, 3 mines, 2,464 tons; in Scotland, 7 mines, 1,946 tons; and in Ireland, 11 mines, 2,457 tons. Total, 234 mines, 91,381 tons, valued at £1,256,641, or $6,283,205.

Metallic Lead from above Ores,—In England, 42,762 tons; in Wales, 15,620 tons; in Isle of Man, 1,880 tons; in Scotland, 1,347 tons; and in Ireland 1,624 tons. Total, 63,233 tons, valued a ,405,925, or $7,029,625.

Silver extracted from Lead Ores.—In England, 402,176 ounces; in Wales, 84,101 ounces; in Isle of Man, 56,974 ounces; in Scotland, 4,022 ounces; in Ireland, 13,898 ounces; and in places not accounted for, 346 ounces. Total, 561,617 ounces, to which add silver from British silver ores, 16,660. Total silver produced in 1860, 578,277 ounces, valued at £159,026, or $795,130.

Tin Mines, Ore and Metal.—In Cornwall and Devonshire, 128 mines, 10,180 tons of ore, valued at £738,488, or $3,692,440. From this ore, 6,497 tons of metal were produced, valued at £850,452, or $4,252,260.

Recapitulation.

	Mines.		Product.		Value.
Coal	2,949	....	71,979,765 tons.	....	$86,132,630
Iron ore	....	....	7,896,581 "	....	12,539,300
Pig iron	....	....	3,712,904 "	....	55,693,560
Copper ore	171	....	236,789 "	....	7,534,175
Fine Copper	....	....	15,775 "	....	8,673,500
Lead ore	264	....	91,381 "	....	6,283,205
Metallic Lead	....	....	63,233 "	....	7,029,625
Silver	....	....	578,277 oz.	....	795,136
Tin ore	128	....	10,180 tons	....	3,692,440
White Tin	....	....	6,497 "	....	4,252,260

PRIMORDIAL SANDSTONE OF THE ROCKY MOUNTAINS.

Dr. F. V. Hayden has sent us a very interesting paper, reprinted from a late number of the *American Journal of Science and Art*, on the "Primordial Sandstone of the Rocky Mountains in the North-Western Territories of the United States." The wide occurrence, in that region, of sandstones and conglomerates resting immediately, but unconformably, on rocks of Azoic age, and containing fossil types of the Primordial or Potsdam sandstone zone, as recognized in New York, appears to be fully established. We quote from Dr. Hayden's concluding remarks the following analytical summary of the various points discussed in his communication:—

"1. We have the most undoubted evidence of the existence of that division of the Primordial Zone which is the equivalent of the Potsdam sandstone of the New York series, in two important ranges of mountains, outliers of the great Rocky Mountain chain. All the fossils are well known Primordial types, and at least two species are identical with forms occurring at the typical localities of this period in the Eastern States. The others are forms closely allied to species found in the equivalent rocks both in this country and in Europe.

"2. This division of the Primordial Zone, as a rule, appears as an underlying formation when the conditions are such as to expose it to view, from the Atlantic coast to the crest of the Rocky Mountains, and probably farther. Localities doubtless do occur where rocks of more recent age than the Potsdam sandstone rest directly upon the Azoic or granitic rocks below, but these facts do not militate against the general rule. Having proved its existence in two important ranges of mountains from its organic remains, by means of lithological resemblance and stratigraphical position, we have, with considerable confidence, traced it by personal observations throughout the mountainous district comprised within lat. 40° and 49°, and lon. 103° and 112°. From these facts, and the observations of reliable explorers in different parts of the West, we think we are warranted in the belief that this rock is exposed all along the margins of the Rocky Mountain range when not eroded away or concealed by overlying formations. How far westward of the dividing crest of the Rocky Mountains it extended we have no data for determining, nor can we hope to have where eruptive rocks seem to predominate. As yet we have not known the Potsdam sandstone to be exposed except along mountains with a true granite nucleus.

"3. Wherever this rock occurs, we are struck not only with the singularity of the organic remains, but also with the remarkable uniformity in the nature of the sediments and the general lithological appearance, compared with its equivalents in more eastern localities. We do not believe this to be due to currents of water bearing the materials from far eastern lands, but that the sediments were obtained from the vicinity, and that the uniformity in their character arises from the nature of underlying rocks from which they were derived.

"The Potsdam sandstone is everywhere composed of calcareous and silicious matter, granular quartz, ferruginous material in great quantities, also pebbles of various kinds, worn and unworn, with now and then seams and layers of argillaceous material. We find in the Azoic rocks below an abundance of limestone,

clay slates, mica schists, seams of white quartz, granite composed largely of feldspar, and we can readily detect the source of the fragmentary masses which form the conglomerates. We also know that while nuclei of certain mountain ranges on the eastern slope are composed of a massive feldspathic granite, a great thickness of more recent or overlying rock, forming the lower and smaller ridges are composed of a kind of 'rotten granite,' which is so full of the hydrated oxyd of iron that it readily decomposes on exposure to the atmosphere. We therefore believe that the source of all the sediments composing the Primordial rocks in the West can be traced to the underlying rocks in the vicinity.

" 4. There are no indications of long continued deep water in the Primordial sea, so far as the West is concerned. If we examine the lower part of the Potsdam sandstone we find that the physical conditions which ushered in this period were quite violent, as shown by the conglomerate character of the rock. Passing upward, this conglomerate graduates into a rock composed of granules of quartz and small plates of mica cemented with calcareous matter, and about midway in the formation we have a fine, very ferruginous calcareous sandstone, in thin layers, filled with fossils in a very good state of preservation. The condition of the organic remains, the fineness of the sediment, and the perfect horizontality of the laminæ of deposition indicate a short period at least, of quiet water. As we continue upward the rocks begin to show the shifting nature of the currents, shallow water, and perhaps a proximity to land, by obliqne laminæ of deposit, ripple markings and fucoidal remains. The upper portion of this rock contains no fossils, nor were the physical conditions such as to have preserved them even if they had existed.

" 5. There seem to be evidences of a gradual thinning out of the Primordial sandstone in its far western extension, as also of all the Palæozoic formations. According to Dr. Owen, the Protozoic sandstones in Minnesota are at least 500 to 600 feet in thickness, and in Iowa, Professor Whitney estimates them at from 250 to 400 feet. In Tennessee, Prof. Safford finds several thousand feet of rocks, which he refers to this age, and in Texas, where they seem to be quite well exhibited and to yield a large number of fossils, Dr. Shumard gives them as only about 500 feet. In the Rocky Mountain district they are seldom more than 80 feet, and never over 200 feet. Indeed all the primary fossiliferous rocks are but thinly represented there, while the lower secondary formations begin gradually to increase in force until all along the eastern slope we have an enormous development of the upper Secondary and Tertiary, with an aggregate thickness of from 8,000 to 10,000 feet.

" 6. So far as we yet know, there is no unconformability in any of the fossiliferous sedimentary rocks of the northwest from the Potsdam sandstone to the summits of the true Lignite Tertiary. There are proofs of two great periods of disturbance which had a marked influence upon the physical geography of the West. The one occurred prior to the deposition of the Potsdam sandstone when the Azoic or granitic rocks were elevated into a more or less inclined position, and the other and most important period took place at the close of the accumulation of the great Lignite Tertiary deposits, when the great lines of fracture

were produced, and the massive nuclei of the mountain ranges were raised above the surrounding country.

" 7. What changes took place in the physical geography of the West during the long period which must have elapsed after the deposition of the Potsdam sandstone until the commencement of the Carboniferous age, we have very few data to determine. We are inclined to think that this portion of the West at least was elevated above the water level during the greater part of that period; the numerous indications of shallow water during the accumulation of the Potsdam sandstone, and the almost entire absence of rocks of intermediate age over so large an area, further strengthens that opinion. It is true, that in the far Northwest we have proofs that the hiatus is partially filled, but in the South and Southwest, the evidence is still more meagre. Near the Humboldt Mountains, in Utah, Messrs. Meek and Engelmann have detected proofs of Devonian rocks, but they are not known to be largely developed, and on the western declivity of the El Paso Mountains, Dr. G. Shumard found 'well marked strata of the inferior Silurian system corresponding in age to the Blue Limestone of Cincinnati and the Hudson River group of the New York series.' But so far as our present knowledge extends, rocks of intermediate ages do not form a prominent feature in the geology of the West."

MINERALOGICAL NOTICES.

Meteoric Stones.—Rammelsberg (*Chemisches Central Blatt*, No. 1, 1862, quoted from the *Bericht der Akad. der Wissenschaften zu Berlin*) has examined some aerolites and supposed meteoric stones from North America. An analysis of the celebrated aerolite of Bishopsville, South Carolina, yielded the following results: Silica, 57.52; alumina, 2.72; sesqui oxide of iron, 1.25; oxide of manganese, 0.20; Magnesia, 34.80; lime, 0.66; soda, 1.14; potash, 0.70; ignition loss, 0.80 = 99.79. This composition is considered to indicate a mixture of several substances, rather than a single definite compound. The supposed meteoric origin of the so-called aerolites of Waterloo, Seneca County, New York, of Richland in South Carolina, and Rutherford, North Carolina, is shewn (as already surmised by others) to be entirely fallacious. The first is merely a ferruginous clay; the second, in all probability, a fragment of brick or tile; and the third, an impure cast iron, containing 15.7 per cent. of silica.

Pholerite.—M. Pisani (*Comptes Rendus* 24, LIII.) has published an analysis of the pholerite of Lodève, obtained by M. Sæmann. The analysis yielded: silica, 47.0; alumina, 39.4; water, 14.4. This gives, according to the author, $3\,Al^2O^3, 4\,SiO^3 + 6\,HO$; better transposed into: $Al^2O^3, 2\,SiO^2 + 2\,HO$. The latter formula agrees exactly with that of the pholerite of Freiberg analysed by Müller, and it corresponds also (although M. Pisani makes no allusion to this) with the formula of the Pensylvanian pholerite examined by Dr. Genth.

Wagite.—Under this name (in honor of M. Waga, a naturalist of Warsaw,) M. Radoszkovski describes, in the above number of the *Comptes Rendus*, a hydrated silicate of zinc from Nijni-Jagust, in the Oural. It occurs in concretionary

masses, with an indistinctly crystallized surface, of a light greenish-blue colour. H. 5.0; sp. gr. 2.707; infusible. The analysis yielded: silica, 26.0; lime, 1.55; oxide of zinc, 66.9; water, 4.7—with traces of copper and iron oxides. This leads to the old formula 3 ZnO, SiO^3 + HO [modernized into 3 (2 ZnO, SiO^2) + 2 HO] which only differs from the formula of electric calamine by a little less water. Unless the crystallization be shewn to be really distinct, this substance can scarcely be separated from the latter mineral.

Dr. Genth's Contributions to Mineralogy.—In continuation of his investigations, communicated, under the above title, to the *American Journal of Science and Art*, Dr. F. A. Genth has published a further and valuable series of observations on various American minerals. These comprise, more especially, *Pseudomorphous gold* after Aikinite (Needle ore), from Georgia (?); *Antimonial Arsenic* from California; the Lake Superior arsenides of copper, *Whitneyite* (with which, it should be remembered, the so-called *Darwinite* of Forbes and Field is identical), *Algodonite*, and *Domeykite*; *Pseudomorphous copper glance* after Galena (the so-called *Harrisite* of Shepard); *Millerite* from the Gap mine, Lancaster county, Pennsylvania; *Automolite* from the Canton mine; *Pyrope* from Santa Fé, New Mexico; and other species. We regret that our limited space prevents us from referring more fully, at present, to these trustworthy and very able investigations.

E. J. C.

PUBLICATIONS RECEIVED.

Malcolm's Genealogical Tree of the Royal Family of Great Britain.

This ingenious chart of the direct and collateral descendants of the founders of Britain's Royal line, forms a tasteful and very appropriate addition to our Canadian school-room apparatus. The foreground represents a specimen of as rough a clearing as any of the newest of Canadian settlements could offer to the artist's eye; but the various stumps on more careful inspection are seen to be the emblems of the Saxon Heptarchy, chopped down at the dates specified on each, and superseded, so far as Saxon England is concerned, by the one vigorous trunk of Egbert of Wessex. The roots of such trees being, we presume, presumed to lie fairly out of sight, Egbert is stated to be the descendant of the apochryphal Hengest and Horsa; and alongside stands another robust trunk springing from Kenneth II. King of Scots; who is stated under the date of 843 to have been "first king of all Scotland;"—though if that means all that was embraced in the Scotland of the Bruces and the Stuarts, it is an anachronism. The third substantial tree begins with Rollo, Duke of Normandy, and his first wife Popa,—by mistake here called Topa,—from whom proceeds William I. the Conqueror; though the intermediate Dukes of Normandy are represented in a very maimed fashion, by three: "William," "Richard I," and then "Robert, who died on pilgrimage." A complete and accurate genealogy of the succession of the Dukes of Normandy would have been a useful addition to such a chart, and should either be complete, or else omitted. The three distinct genealogical trees, branching out, and frondent with leaves of oak, on which the various descents and alliances are blazoned, are represented as intertwining and uniting

their branches. In strict accuracy, a fourth trunk, for the Danish Sweno and his Royal descendants would have been required. Instead of this the Danish line is made to spring as a branch from the Anglo-Saxon trunk. But such earlier difficulties and complications got over,—the Norman and Anglo-Saxon trunks are at length seen to unite at the Conquest, and to shoot up a vigorous stem, with needful Lancastrian, York, and Tudor ramifications; while alongside of it flourishes the separate Scottish tree, until their branches also coalesce in the union of the Scottish James IV., with Margaret Tudor; and at length in their great-grandson the whole ramifications are seen concentrated in the line of the Royal Stuarts; and the later fortunate Hanoverian stem. Crowning the topmost branch of the flourishing Genealogical Oak-tree, appears our loved Queen Victoria's name, with the dates of her birth, accession, and marriage; and a branching series of leaflets, bearing the names of Albert Edward Prince of Wales, the Princess of Prussia, and all the other royal children. The chart is very creditably executed, and coloured so as to present an attractive appearance, well calculated to invite the attention of the youthful students of our schools, and so to engage their study, and pleasantly secure the acquirement of some important facts and dates in British History.

Descriptions of new Lower Silurian (Primordial), Jurassic, Cretaceous, and Tertiary Fossils, collected in Nebraska, &c., &c. By F. B. Meek and F. V. Hayden.

Descriptions of new Cretaceous Fossils from Nebraska Territory. By F. B. Meek and F. V. Hayden.

Descriptions of new Cretaceous Fossils from Texas. By B. F. Shumard, M.D.

On the Outline on the Head of the Comet of Donati. By Professor Bond.

Astronomical Notices: On the Proper Motion of Sirius in Declination. By T. H. Safford, Assistant at the Observatory of Harvard College.

Our restricted space will only allow us, at present, to give the titles of these latter publications.

CANADIAN INSTITUTE.

ANNUAL REPORT OF THE COUNCIL FOR THE YEAR 1861.

The Council of the Canadian Institute have the honor to present the following Report of the proceedings of the Society for the past year:

Since the last Annual Report twenty-seven new members have been added to the society; on the other hand there has been from various causes a loss of twenty-five; there has been therefore an increase of two in the total number at present on the books. This is a slight improvement on the statistics of last year, and the Council earnestly hope that the efforts of those who take an interest in the Society's operations, will be such as to enable a still more favourable report to be given at the close of the ensuing year.

The present state of the membership is as follows:

Members at commencement of Session, 1860-61		462
New members elected, Session 1860-61		22
By the Council during recess—1860-61		5
Total		489
Deduct—Deaths	5	
Withdrawn	14	
Left the Province	6	
	—	25
Total 30th November, 1861		464
Composed of Honorary Members		5
Life Members		34
Corresponding Members		6
Members		409
Junior Members		10
Total		464

COMMUNICATIONS.

The following list of Papers, read at the Ordinary Meetings held during the Session, will be found to contain many communications of value, and some of general interest:

1st December, 1860.

Rev. Prof. W. Hincks, F.L.S., "On Ferns."

8th December, 1860.

Prof. T. Sterry Hunt, F.R.S., Verbal communication "On the Laurentian System of Canada and Scotland."

Prof. D. Wilson, LL.D., "On some traces of Ancient Art and Civilization in the Valley of the Ohio."

15th December, 1860.

Prof. E. J. Chapman, "On some new facts regarding Stelliform Crystals, with special reference to the Crystallization of Snow."

12th January, 1861.

Walter Arnold, Esq., "On an inconvertible paper currency for Canada."

19th January, 1861.

Patrick Freeland, Esq., "On the Movements of the Diatomaceæ, with illustrations of living specimens under the microscope."

A. E. Williamson, Esq., "On some Fresh-Water Molluscs, collected in the neighbourhood of Toronto."

26th January, 1861.

J. F. Smith, Jr., Esq., "On a new species of Triarthrus (=T. Canadensis)."

Rev. Prof. W. Hincks, F.L.S., "On some additions to the Flora of Toronto, observed during the past year."

2ND FEBRUARY, 1861.

C. Robb, Esq., Civil Engineer, "On the Petroleum Springs of Canada West."

T. Sterry Hunt, F.R.S. "On the Theory of Types in Chemistry."

9TH FEBRUARY, 1861.

Rev. Prof. Hatch, B.A., "On the Gutturals in the Latin Alphabet and their Indo-European affinities."

Prof. D. Wilson, LL.D., (President), "Familiar notes and illustrations of the Hebridian Islands and their inhabitants."

16TH FEBRUARY, 1861.

Dr. W. Kerr, Galt, "On the efficacy of some Canadian plants in diseases of the Mucous Membrane."

Prof. G. T. Kingston, M.A., "The Meteorological Report for 1860."

23RD FEBRUARY, 1861.

T. C. Wallbridge, Esq., "On the Mound Structures of Southern Illinois and Ohio in the vicinity of St. Louis, Cincinnatti, and Newark."

Rev. Prof. W. Hincks, F.L.S., "An attempt at a new theory of human emotions.

Prof. T. Sterry Hunt, F.R.S., "On the Nature of Atmospheric Nitrogen and Ozone."

2ND MARCH, 1861.

Rev. Prof. Hatch, B.A., "On Arabian Metaphysics."

Sandford Fleming, Esq., Civil Engineer, "Notes on the Davenport Gravel Drift."

9TH MARCH, 1861.

Henry Palmer, Esq., "A new portable Voltaic Battery, invented by himself."

Prof. Croft, D.C.L., "Notes on Canadian Manufactures."

16TH MARCH, 1861.

Prof. E. J. Chapman, (1) "Some notes on the drift deposits of Western Canada," and (2) "Remarks on the Genus Orthoceras, in illustration of a remarkably large example recently obtained from the Trenton Limestone of Collingwood."

23RD MARCH, 1861.

Dr. Woods, Army Medical Department, "On Sanitary Science in connection with Human Progress."

Rev. Prof. W. Hincks, F.L.S., "Note on the Structure of the fruit in the Order Asteraceæ or Compositæ."

6TH APRIL, 1861.

Rev. Prof. W. Hincks, F.L.S., "An attempt at an improved scientific arrangement of Fruits."

The foregoing list will show that the range of subjects within the province of the Institute is sufficiently wide to give any one who has a speciality in either literature or physical science an opportunity of interesting others in his researches, and of communicating them to those whose acquaintance with the same or cognate subjects may throw light upon their value. The Council, therefore, beg again to

urge upon the members the importance of their active co-operation, in order that the weekly meetings may be a fair representation of the literary and scientific activity of the Province.

The following is the

REPORT OF THE EDITING COMMITTEE.

On the completion of the sixth annual volume of the New Series of the CANADIAN JOURNAL, the Editing Committee have the honor to submit the annexed Report to the Council of the Institute:—

The Committee trust that the favorable character won, both in Canada and in foreign circles, by the Journal in former years, will continue to be maintained by the volume now completed. In this volume, thirty original communications on various branches of scientific inquiry, have been laid before the Institute and the readers of the Journal. Nineteen of these communications, distributed about equally through the six numbers of the volume, refer to purely Canadian subjects, and thus serve to impart to the Journal a desirable character of nationality. In proof of the value attached to these and to the other articles of this department it may be observed that several have been thought worthy of a place in European scientific journals of long established reputation.

The Reviews, in the present volume, are less numerous than usual; amounting to only six in number. Their place has been in part supplied by the greater length of the original communications, and partly by a series of translated and selected articles. Amongst these, there will be found translations of several papers of much importance, chiefly from the *Comptes Rendus* of the French Academy of Sciences; and the selected articles, extracted from the Proceedings of the Royal Society and other less accessible sources, will add, it is thought, to the interest and value of the Journal. In making these extracts, care has been taken, as much as possible, to select articles of a readable and generally interesting character. Whilst the reviews, properly so-called, however, occupy but a small space, the volume contains a considerable number of critical notices and analyses of various publications, forwarded to the Journal by American and European writers. All the new publications received in this manner have been thus acknowledged.

The department of "Scientific and Literary Notes" continues to be kept up. In the present volume it contains, together with numerous extracts, several pages of original matter in the form of brief analytical notices of new announcements and discoveries. A more active co-operation on the part of the members of the Institute generally, is much to be desired in this, as well as in the other departments of the Journal.

During the preceding year, in addition to the Societies and Libraries previously in correspondence with the Institute, and enumerated in the last Report, the following have been placed upon the exchange list:—The Literary and Philosophical Societies of Liverpool and Manchester, and the Library of Trinity College, Dublin.

The cost of the Journal for the past year, including printing and engravings, as amounted to $1291. This sum is of about the usual average, as compared with the expenses of former years.

EDWARD J. CHAPMAN, *General Editor.*

The following is the Report of the Treasurer, from which it will be seen that the financial condition of the Institute continues to be satisfactory:—

DR.] *Statement of the Canadian Institute General Account for* 1861.

Cash balance from last year	£394	17	2½	
" received from Members	217	2	5	
" " for Journals, Old 2s. 6d., New £53 10d.	53	3	4	
" " for interest on loans	96	5	0	
" " Parliamentary Grant, 1861	250	0	0	
" Due by Members	395	1	1	
" for sale of old Journal, £28 5s., new £52 11s. 3d.	80	16	3	
				£1487 5 3½

CR.]

Cash paid on account of Journal, 1860..	£135	11	9	
" " " 1861..	250	0	8	
			385	12 5
" paid Library and Museum			63	17 2
" " on account of Sundries			263	18 5
" Due on account of Journal			72	14 0
" " " Sundries			31	10 8
" " " Library			17	7 1
Estimated balance in favor of Institute			652	5 6½
				£1487 5 3½

Statement of Building Fund.

Balance from last year	£1942	6	9	
Received interest on loans	96	5	0	
Subscriptions (uncollected)	534	15	0	
				£2573 6 9

DR.] *The Treasurer in Account with the Canadian Institute.*

Cash balance last year	£394	17	2½	
Securities	1425	0	0	
Interest received on securities	96	5	0	
Cash received from Members	217	2	5	
" on account of Journals sold	53	3	4	
" Parliamentary Grant, 1860	250	0	0	
" " " 1861	250	0	0	
				£2686 7 11½

Cr.]

Cash paid for Journal, 1860	£135 11 9		
" " " 1861	250 0 8		
		£385 12 5	
" " Library Museum		63 17 2	
" " on account of Sundries		263 18 5	
Securities		1500 0 0	
Balance		472 19 11½	
			£2686 7 11½

D. Crawford,
Toronto, 6th Dec., 1861. *Treasurer C. I.*

Compared vouchers with Cash Book, securities for investments exhibited, the balance in hands of Treasurer £472 19s. 1½d.

Samuel Spreull,
G. H. Wilson, } *Auditors.*

The number of volumes added to the library during the year is *one hundred and sixty-three.* Of these *sixty-seven* are donations, the rest have been obtained by purchase and binding periodicals. A detailed list will be found appended to this report.

At the close of the last Session, on April 26th, the Council invited the members and friends of the Institute to a Conversazione in the Masonic Hall, the use of which was kindly granted for the occasion. The attendance was such as to afford a gratifying proof of the general interest which is taken in the proceedings of the Society. The Council hope that it may be found possible to hold a meeting of a similar character in the course or at the close of the present session, and that the aid of those gentlemen, to whose efforts the success of the previous one was mainly due, may again be obtained, in order that its results may be equally satisfactory.

Two other subjects have engaged the attention of the Council during the past year. The one has been the endeavour to secure an adequate representation of Canada at the Universal Exhibition of 1862. For this purpose a Committee was appointed, but in the absence of any reply to the memorial which was addressed to the Government on the subject, it has been impossible to take definite action. The other has been the endeavour to find a more fitting local habitation for the Society. The Council beg to report, that after many fruitless attempts they have at last succeeded in obtaining the promise of rooms which, though still affording but temporary accommodation, will yet be more convenient, more commodious, and more suitable to the position of the Society.

The Council beg in conclusion to say, that a review of the past year leads them to the conclusion that the condition of the Institute is quite as satisfactory as the general state of the Province would lead them to expect. It may not exhibit year by year any definitely marked advance, but it is at least able to keep pace with the general march of science, and to maintain the high character which it has always held among the learned societies of the continent.

APPENDIX.

DONATIONS OF BOOKS, MAPS, &c.

Marked thus * not bound, or pamphlets.

Government Map of Canada, 1859. From the Red River to the Gulf of St. Lawrence; compiled by T. Devine, P.L.S., Head of Surveys, Upper Canada Branch Crown Lands Department, Nov., 1859. From Author ... 1

From Sir. J. B. Robinson, Bart.

Contributions to the Natural History of the United States of America; by Louis Agassiz. Vol. III..... 1

From W. Hay, Esq., Architect.

British Columbia and Vancouver's Island, with a Map; by W. C. Hazlett.... 1
Tales, Sketches, and Lyrics; by the Rev. R. J. Macgeorge 1

From Hon. G. W. Allan, M.L.C.

Gould's Trochilidæ. Parts 19 and 20..... 2

From The Hon. East India Company, London.

Magnetical and Meteorological Observations, made at the Government Observatory, Bombay, year 1858, under the Superintendence of Lieut. E. F. T. Fergusson, Indian Navy, F.R.A.S..... 1

From Rev. C. J. S. Bethune, B.A.

Pictorial Atlas of Fossil Remains; by G. A. Mantell, Esq., LL.D., F.R.S..... 1

From Superintendent of Education, Lower Canada.

Journal of Education, Lower Canada. 1860 1
Journal de L'Instruction Publique, Bas Canada. 1860 1

From J. D. Campbell, Esq., Toronto.

The North American Review. 1854 to June, 1860, in numbers.....13*

From the Royal Society of Edinburgh.

The Proceedings of, Session 1859-60. Vol. IV. 1859-60. No 50..... 1*
The Transactions of, Session 1859-60. Vol. XXII. Part II..... 1*
Appendix to the Makerstoun Magnetical and Meteorological Observations, being a supplement to Vol. XXII. of the Transactions of the Royal Society of Edinburgh (Continued from Vol. XIX.); reduced and edited by Balfour Stewart, M.A., Director of the Kew Observatory..... 1*

From the Literary and Philosophical Society, Manchester.

Memoirs of the Literary and Philosophical Society of Manchester. Vol. XV. 2nd Series; Vol. XX. old series..... 1

From James Bain, Jr., Esq., Toronto.

The Poor Laws and their bearing on Society, a Series of Political and Historical Essays; by Eric Gustaf Geijer, Professor of History at the University of Upsala 1
Acta Literaria Sveciæ Upsaliae publicata, Volumen Secundum continens. annos 1725, 1726, 1727, 1728, et 1729..... 1

FROM CAPT. MEADE, SUPERINTENDENT OF THE U. S. LAKE SURVEY.

Report of the Superintendent of the United States Lake Survey. 1860..... 1

FROM THE HON. J. M. BRODHEAD, WASHINGTON, D. C.

Patent Office Reports. 1859, Agriculture, 1; Mechanics, Vol. I. and II., 2.. 3

FROM THE SMITHSONIAN INSTITUTE, WASHINGTON, D. C.

Contributions to Knowledge. Vol. XII..... 1

FROM L. SCOTT & CO., NEW YORK.

Reviews—Westminster, Edinburgh, London, and North British Quarterlies, Blackwood's Magazine, for 1861.....

FROM BT. LIEUT. COL. GRAHAM, U. S. TOPOGRAPHICAL ENGINEERS.

Annual Report on the improvement of the Harbors of Lake Michigan, St. Clair, Erie, Ontario, and Champlain, for the year 1860 1

FROM THE OFFICE OF ROUTINE AND RECORD.

The Statutes of Canada. 1861..... 1

FROM THE UNITED STATES PATENT OFFICE, WASHINGTON.

Patent Office Reports. 1858. Mechanics, Vols. I., II., and III..... 3
" " " " Agriculture, Vol. I 1
" " " 1859. Mechanics, Vol. I. and II..... 2
" " " " Agriculture, Vol. I..... 1

FROM S. T. ABBOTT EVANS, ESQ., P.L.S., L'ORIGINAL, C. W., (AUTHOR).

A map of (Plan) of the United Counties of Prescott and Russell. Completed by order of the County Council. Scale, 30 chains or one mile to an inch.... 1

FROM THE SOCIETY, PER SMITHSONIAN INSTITUTE.

Proceedings of the Liverpool Literary and Philosophical Society, during the 49th Session, 1859-60. No. XIV..... ..... 1*
" " 1860-61. No. XV..... 1*

FROM H. G. BOHN, ESQ., LONDON.

Danish Fairy Tales and Legends; by Hans Christian Andersen, Translated by Caroline Peachey, &c. 1861..... 1
The Poetical Works of Henry Wadsworth Longfellow, including his translations and notes 1
Milton's Poetical Works. Vol. I., Paradise Lost, &c..... 1
" " " Vol. II., Paradise Regained, &c 1
The Philosophy of Manufactures, or an exposition of the Scientific, Moral and Commercial Economy of the Factory System of Great Britain; by Andrew Ure, M.D., F.R.S. 3rd edition..... 1
The Cotton Manufacture of Great Britain Investigated and Illustrated, &c., &c.; by the late Andrew Ure, M.D., F.R.S. Vols. I. and II..... 2
The Letters and Works of Lady Mary Wortley Montagu; by her grandson, Lord Wharncliffe. 3rd edition. 2 Vols., Vol. I..... 1
The Works of Virgil; translated by Charles Rann Kennedy..... 1

FROM THE GEOLOGICAL SURVEY OF INDIA.

Geological Survey of India. Vol. II., Part 2..... 1*
Annual Report of Geological Survey of India. 1859-60. 4th year 1*

FROM THE ROYAL GEOGRAPHICAL SOCIETY, PER H. ROWSELL.

Proceedings of May 25th, 1857, President's Anniversary Address, No. X..... 1*
" June, 1857, Vol. I. " " No. XI.... 1*
" January, 1858, Vol. II. " " No. I..... 1*
" March, " " " " No. II.... 1*
" June, " " " " No. III ... 1*
" July, " " " " No. IV.... 1*
" May 24th, Address at the Anniversary Meeting, No. V..... 1*
" October, 1858, Vol. II. " " No. VI..... 1*
" March, 1859, Vol. III. " " No. IV..... 1*
" June, " Vol. III. " " No. VI..... 1*
" Nov., " Vol. IV. " " No. I..... 1*
" January, 1860 " " " No. II..... 1*
" March, " " " " No. III..... 1*
" May, " " Anniversary Meeting No. IV..... 1*
" June, " " " " No. V..... 1*
" Nov., " Vol. V. " " No. I..... 1*
" Dec.. " " " " No. II..... 1*
" February, 1861 " " " No. III..... 1*
Journal, Vol. XXVII. 1857..... 1*
" Vol. XXVIII. 1858..... 1*
" Vol. XXIX. 1859..... 1*
" Vol. XXX. 1860..... 1*

FROM THE ROYAL ASIATIC SOCIETY OF GREAT BRITAIN AND IRELAND, PER H. ROWSELL, ESQ.

Journal, Vol. XVII. Part 1. 1859..... 1*
" " " 2. 1860..... 1*
" Vol. XVIII. " 1. 1860 ..... 1*
" " " 2. 1861..... 1*

FROM THE GEOLOGICAL SOCIETY OF LONDON, PER H. ROWSELL, ESQ.

The Anniversary Address of the President, Col. Portlock, R.E. 1857..... 1*
Quarterly Journal. Vol. XIII. Part 2. May, 1857. No. 50..... 1*
" " " 3. Aug., " No. 51..... 1*
" " " 4. Nov., " No. 52..... 1*
Abstract of Proceedings, No. 1 and 2, Session 1856-7. Pages 1-12..... 2*
Quarterly Journal. Vol. XIV. Part 1. February, 1858. No. 53 ..... 1*
The Anniversary Address of the President, Major General Portlock, R. E..... 1*
Quarterly Journal. Vol. XIV. Part 2. May, 1858. No. 54..... 1*
" " " 3. Aug., " No. 55..... 1*
" " " 4. Nov., " No. 56..... 1*

Quarterly Journal,	Vol. XV.	" 1.	Feb.,	1859	No. 57.....	1*
"	"	" 2.	May,	"	No. 58.....	1*
"	"	" 3.	Aug.,	"	No. 59.....	1*
"	"	" 4.	Nov.,	"	No. 60.....	1*
"	Vol. XIV., Part	5.	Feb.,	1860	(Supplement) No. 60	1*
"	Vol. XVI.	" 1.	Feb.,	1860	No. 61.....	1*
"	"	" 2.	May,	"	No. 62.....	1*
"	"	" 3.	Aug.,	"	No. 63.....	1*
List of the Geological Society, 1st September, 1860.....						1*
Quarterly Journal.	Vol. XVI.	Part 4.	Nov.,	1860.	No. 64.....	1*
"	Vol. XVII.	" 1.	Feb.,	1861.	No. 65.....	1*
"	"	" 2.	May,	"	No. 66.....	1*
"	"	" 3.	Aug.,	"	No. 67.....	1*

FROM THE AUTHOR.

Visit of His Royal Highness the Prince of Wales to Canada, 1860. By Eusèbe Sénéal. French, 1 ; English, 1 2

FROM HENRY G. BOHN, ESQ., LONDON, PER REV. E. RYERSON, D.D., TORONTO.

The Letters and Works of Lady Mary Wortley Montagu. Edited by her grandson, Lord Wharncliffe. Vol. II..... 1
The Life of Lord Nelson ; by Southey. New Edition. London: 1861 1
The Pirate and the Three Cutters; By Captain Marryat, R. N..... 1
Elements of Experimental and Natural Philosophy ; by Jabez Hogg, F.L.S., &c. 1
The Orations of Demosthenes. Illustrated by Charles Rann Kennedy..... 1

DONATIONS OF PAMPHLETS, SHEETS, &c.

FROM REV. S. HAUGHTON, M.A., DUBLIN (AUTHOR).

On Cyclostigma—a new Genus of Fossil Plants from the Old Red Sandstone of Kiltorcan, Co. Kilkenney 1
Fossils from the Arctic Regions brought by Captain Sir F. L. McClintock in 1859 1

FROM HARVARD COLLEGE, BOSTON.

Report of the Committee of the Overseers of Harvard College appointed to visit the Library, for the year 1860 1

FROM PROFESSOR JAMES HALL, ALBANY, N. Y.

Thirteenth Annual Report of the Regents of the University of the State of New York, on the Condition of the State Cabinet of Natural History, and the Historical and Antiquarian Collection annexed thereto 1

FROM GEORGE D. GIBB, ESQ., M.D., LONDON, (AUTHOR.)

On Canadian Caverns (Read before the British Association for the Advancement of Science, at Aberdeen, 16th September, 1859)..... 1

FROM GEORGE LAWSON, PH. D., KINGSTON, C. W.

On the Structure and Development of Botrydium Granulatum 1
Annals of the Botanical Society of Canada. Vol. I., Part II; March 8th to 28th, 1861 1

FROM BREVET LIEUT. COL. J. D. GRAHAM, U.S. TOPOGRAPHICAL ENGINEERS.

A Lunar Tidal Wave in Lake Michigan Demonstrated (with Plates.) 1

FROM B. DAWSON & SON, PUBLISHERS, MONTREAL, C. E.

Tables of Measures, English, Old French and Metrical, 1861..... 1

FROM PROFESSOR J. W. DAWSON, LL.D., F.G.S., &c.

On the Carboniferous Flora of New Brunswick, Maine and Eastern Canada... 1

FROM THE UNITED STATES PATENT OFFICE, WASHINGTON.

Patent Laws 1

Rules and Directions for Proceeding in the Patent Office 1

FROM THE SUPERINTENDENT OF EDUCATION, LOWER CANADA.

Rapport de l'Education Pour le Bas Canada, pour l'Année 1860..... 1

Report of Superintendant of Education for Lower Canada, year 1860..... 1

FROM EDITORS OF SILLIMAN'S AMERICAN JOURNAL.

The Great Comet, 1861. (Sheets in advance.) 1

FROM THE UNIVERSITY OF CHRISTIANIA—NORWAY.

Solennia Academica Universitatis Literariæ Regiae Fredericianæ ante LAnnos conditæ die, 11 Septembris Anne MDCCCLXI., celebranda Indicit Senatus academicus (sheets)..... 1

FROM T. O. WEIGEL, LEIPZIG, PER SMITHSONIAN INSTITUTE.

XI. Katalog Naturwissenschaftlicher Werke aus dem Antiquarischen Lager. Von T. O. Weigel, Leipzig..... 1

Kleine Schriften der Naturforschenden Gesellschaft in Emden, VI. and VII... 2

Fünfundvierzigster Jahresbericht der Naturforschenden Gesellschaft in Emden, 1840. Von Doct. H. Metger, Secretar..... 1

FROM B. QUARITCH, LONDON.

Catalogue Raisonné of rare and valuable Books 10

FROM THE HISTORICAL SOCIETY OF CHICAGO, ILL., U.S.

Memorial to the United States Government from the citizens of Chicago, Ill., setting forth the advantages of that City as a site for a National Armory and Foundry, Nov., 1861 1

FROM THE AUTHOR.

New Species of Lower Silurian Fossils. By E. Billings, F.G.S., &c. 1

FROM HENRY G. BOHN, ESQ., LONDON.

Catalogue of New, Valuable and most Important Books 1

IN EXCHANGE FOR JOURNAL.

The Journal of Education for Upper Canada, 1861, (Duplicate) 1

The Journal of the Franklin Institute, Philadelphia..... 1

The Artizan, London, 1861..... 1

The Journal of the Society of Arts, 1861 1

Silliman's American Journal, 1861 1

Canadian Naturalist and Geologist, 1861 1

Proceedings of the Boston Natural History Society, 1861 1

Journal of Education, Lower Canada, 1861 1

Journal de l'Instruction Publique, Lower Canada, 1861..... 1
The Journal of the Geological Society of Dublin, 1861..... 1
The Dublin Quarterly Journal of Science, 1861..... 1
The proceedings of the Academy of Natural Sciences, Philadelphia. Pages 517–597, with index, 1–48, with catalogue of fishes, 65–144..... 1
Proceedings of the Essex Institute, Vol. II., Part 2, 1857–1859 1
Historical Recollections " Vol. III No. 1, 2 and 3 1
Annales Des Mines, &c., France, Vme Serie:
Tome XVIII., 4th Livraison de 1860.....
" " 5th " " 1
" " 6th " " 1
" XIX., 1st " 1861..... 1
" " 2nd " " 1
The Journal of the Royal Dublin Society, Nos. 18 and 19, July and Oct., 1860, 1
Transactions of the Royal Scottish Society of Arts, Vol. V., Part 4..... 1
Proceedings of the American Antiquarian Society, Boston..... 1
Canadian Agriculturist, 1861..... 1
Annals of the Lyceum of Natural History, New York, Vol. VII., Nos. 4–9, April and May, 1860..... 1
Journal of the Board of Arts and Manufactures, Toronto, 1861..... 1

BOOKS PURCHASED.

VOLS.

Crania Britannica, &c. &c. By J. B. Davis. Decade IV..... 1
First Principles, No. 1. Number 1
The Works of Bacon. Vols. 11, 12, 13, 14, 15, and 1 6
Encyclopædia Britannica. 8th ed. vol. 21. T—Zwo..... 1
———————— Index to 8th edition..... 1
The Rise of the Dutch Republic. By J. L. Motley. Vols. 1, 2, and 3..... 3
The Life of Doctor Scoresby. By R. E. Scoresby Jackson, M.D., &c. 1
The Year Book of Facts, 1861 1
Memoir of George Wilson, M.D., F.R.S.E. By his sister, Jessie Aitken Wilson 1
Motley's History of the United Netherlands. Vols. 1 and 2 2
Archæology and Prehistoric Annals of Scotland. By Daniel Wilson, Honorary Secretary of the Society of Antiquaries of Scotland..... 1
Preadamite Man; or, The Story of our Old Planet and Its Inhabitants, told by Scripture and Science. 3rd edition. London; Saunders, Otley, and Co. 1860..... 1
Adventures in Equatorial Africa. By P. B. Du Chaillu..... 1
Hind's Narrative 2
Whewell's Plato. Vols. 1 and 2..... 2
Life of Lord Dundonald. Vols. 1 and 2..... 2
Memoir of Edward Forbes, F.R.S., &c. By George Wilson, F.R.S.E. &c..... 1
History of Civilization in England. By Henry Thomas Buckle. Vol. 2 1

Phillip's Life on the Earth 1
Kohl's Lake Superior 1
Phillip's Yorkshire 1
Farrar's Essay 1
Mediæval Scottish History. By Cosmo Innes 1
Early Scottish History. By Cosmo Innes 1
Mexico and the Mexicans 1
The Okavango River—Travel in Africa. By Charles John Anderssen 1

DONATION TO THE MUSEUM.

From H. Palmer, Esq.

Electro Voltaic Pocket Battery for Medical Use, patented 16th January, 1861. 1

BOOKS BOUND FROM PERIODICALS RECEIVED, &c.

Reviews, North British Quarterly. 1858-59-60 3
——— London Quarterly. 1858-1859 2
——— Edinburgh Quarterly. 1858-60 2
——— Westminster. Quarterly. 1860 1
Blackwood's Magazine. January-June, 1861 1
Hunt's Merchants' Magazine. July-December, 1860; January-June, 1861 ... 2
Mining Journal. Vol. 30. 1860 1
Illustrated London News. 1860, 2 vols.; 1861, 1 vol. 3
Silliman's American Journal. 1859, 2 vols.; 1860, 2 vols. 4
Civil Engineers and Architects Journal. 1860 1
Quarterly Journal of the London Geological Society. Vols. 15 and 16 2
Annales des Mines 4
London, Edinburgh, and Dublin Philosophical Magazine. 1860, 2 vols.; 1861, 1 vol. 3
Journal of the Franklin Institute. 1860 2
Edinburgh New Philosophical Magazine. 1857-60-61 4
Builder. 1859-60 2
Athenæum. July-December, 1860; January-June, 1861 2
North American Review. 1854-55-56-57-58-59, two vols. each; 1860-61, one vol. each 14
Canadian Journal. 1856-57-58-59-60, New Series, two vols. each 10
——— Vol. 2, Old Series 2
——— Vol. 3, Old Series 2
Journal of the Royal Geographical Society of London. 1857. Vol. 27 1
——— 1858. Vol. 28 1
Art Journal for 1860 1
Artizan for 1860 1

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—DECEMBER, 1861.

Latitude—43 *deg.* 39.4 *min. North. Longitude*—5 *h.* 17 *m.* 33 *s. West. Elevation above Lake Ontario,* 108 *feet.*

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Average	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't Direction.	Velocity of Wind.					Rain in inches.	Snow in inches.
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M	2 P.M	10 P.M	M'E'N		6 A.M	2 P.M.	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A. M.	2 P. M.	10 P.M.		6 AM.	2 P.M.	10 P.M.	Resul't.	M'E'N		
					°	°	°	°	°																			
1	29.476	29.320	—	—	27.0	28.4	—	—	—	.129	142	—	—	.88	.90	—	—	w b s	Calm.	W N W	w	0.2	0.0	2.5	1.91	1.87	...	3.0
2	.523	.564	29.643	29.5889	16.5	25.9	17.6	19.98	—10.50	.083	.107	.083	.090	.90	.76	.85	.83	w b s	W	W N W	N 75 W	3.2	12.0	2.8	5.47	6.41	...	Inp.
3	.777	.834	.851	.8268	13.2	20.8	10.7	14.25	—15.83	.066	.077	.064	.068	.83	.69	.92	.83	N w b N	N w b N	N	N 23 W	10.5	5.2	1.5	3.71	3.84	...	Inp.
4	.815	.635	.633	.7142	18.3	31.6	34.2	28.03	— 1.75	.093	.148	.152	.133	.94	.83	.77	.85	W N W	S W b S	S W	S 42 W	4.0	12.2	15.0	9 98	10.23	...	...
5	.741	.843	.960	.8622	30.6	38 3	36.7	34.63	+ 5.27	.141	.142	.179	.156	.85	.61	.82	.77	Calm.	Calm.	N E	N 72 E	0.0	0.0	3.5	2.31	2.37	Inp.	...
6	.994	.932	.902	.9373	38.8	45.4	42.1	41.92	+12.85	.220	.253	.249	.237	.94	.83	93	.89	E b N	E S E	Calm.	S 23 E	3.0	2.0	0.0	0.90	1.76	...	...
7	.818	.678	.560	.6740	45.7	50.4	48.9	47.92	+19.25	.278	.299	.329	.299	.90	.81	.94	.89	s w b w	s s w	s w	S 38 W	3.5	15.0	5.0	6.24	6.37	0.210	...
8	.556	.540	—	—	49.0	55.1	—	—	—	.326	.309	—	—	.94	.91	—	—	s w	S W	N E b E	S 54 W	0.4	1.0	0.5	0.42	0.77	...	...
9	.626	.529	.451	.5347	44.3	44.3	46.1	44.60	+16.45	.278	.283	.292	.279	.95	.97	.94	.94	E N E	E	N E b E	N 69 E	0.4	1.8	5.0	2.56	2.67	Inp.	...
10	.420	.300	.221	.3305	45.0	52.9	54.4	48.45	+20.60	.288	.381	.396	.329	.96	.95	.93	.95	N E b E	S W b S	S W	N 73 W	1.2	10.6	16.6	10.30	14.03	0.100	...
11	.674	30.024	30.142	.9305	32 0	28.4	20.1	26.23	— 1.42	.128	.077	.079	.092	.71	.49	.73	.64	N W b W	N W	Calm.	N 40 W	23.2	16.5	0.0	9.70	10.33	...	...
12	30.164	30.181	30.173	30.1730	24.8	35.6	31.6	30.68	+ 3.33	.120	.141	.140	.133	.90	.68	.78	.78	w b s	S W	S W b W	S 54 W	1.5	9.8	7.0	6.41	6.50	...	...
13	30.128	30.006	29.924	30 0075	32.0	40.1	33.4	35.15	+ 8.00	.143	.169	.134	.147	.79	.68	.70	.71	W s W	S W b S	W	S 55 W	7.5	6.5	1.6	4.29	4.35	...	...
14	29.765	29.664	.850	29.7612	36.3	43.5	36.0	37.75	+10.78	.157	.150	.172	.156	.74	.52	.81	.70	S W	W S W	W N W	N 76 W	5.0	4.8	8.6	5.79	7.04	...	...
15	30.113	30.058	—	—	29.8	34.9	—	—	—	.096	.131	—	—	.58	.65	—	—	N w b N	S W b S	S W b W	S 80 W	5.8	7.6	0.0	5.46	6.40	...	...
16	29.600	29.420	.724	.5905	33.1	50.0	40.7	42.45	+15.88	.213	.184	.180	.195	.93	.49	.70	.72	S W b W	W b S	N W b N	N 86 W	12.7	20.5	7.0	9.18	12.46	...	...
17	.856	.795	.504	.7017	30.2	38.5	37.0	35.78	+ 9.42	.128	.173	.167	.160	.76	.74	.75	.75	N b E	E S E	W b S	S 12 E	5.0	6.6	4.5	2.80	7.14	...	...
18	.646	.776	.837	.7648	34.2	43.2	30.9	35.67	+ 9.50	.160	.128	.127	.141	.81	.45	.73	.69	W	N W	N E b N	N 34 W	7.8	11.5	4.5	3.05	6.85	...	...
19	.690	.418	.475	.5205	37.8	47.2	41.7	41.78	+15 72	.208	.249	.218	.217	.91	.76	.82	.81	S	S W	W N W	N 84 W	3.3	6.6	10.5	8.56	10.83	Inp.	...
20	.607	.803	.998	.8172	29.8	21.2	16 1	21.95	— 3.93	.162	.072	.062	.092	.98	.63	.68	.73	N W	N W b N	W b N	N 44 W	23.5	21.5	15.0	13.27	15.04	...	0.1
21	30.057	30.066	30.085	30.0718	12.5	22.1	13.2	16.48	— 9.30	.055	.082	.060	.068	.73	.68	.75	.74	N b E	W b S	Calm.	S 86 W	5.0	11.0	0.0	5.33	6.26	...	...
22	30.037	29.879	—	—	15.4	27.1	—	—	—	.070	.120	—	—	.80	.81	—	—	N w b W	E b N	N E b E	N 50 E	10.0	7.0	9.2	7.58	8.52	...	2.5
23	29.271	.206	29.460	29.3332	25.9	26.2	21.2	23.73	— 1.83	.128	.103	.092	.107	.92	.73	.81	.83	N N E	N b W	N W b N	N 23 W	13.4	15.4	21.0	15.62	16.71	...	0.5
24	.664	.712	.801	.7407	13.6	16.5	8.5	11.68	—13.80	.072	.076	.060	.068	.90	.83	.93	.91	N W b W	N W b N	N	N 22 W	5.0	12.0	7.2	7.01	7.61	...	...
25	.833	.840	—	—	11.8	24.8	—	—	—	.063	.098	—	—	.86	.73	—	—	N b E	E S E	E b S	N 78 E	7.5	12.2	13.0	8.40	9.49	...	...
26	.736	.465	.242	.4675	28.0	34.3	35.6	33.03	+ 7.73	.131	.194	.193	.173	.86	.98	.93	.91	E b S	E b S	S S W	S 15 W	10.4	9.5	15.0	5.41	14.29	0.250	...
27	.523	.871	30.119	.8738	28.7	25.2	20.5	24.02	— 1.27	.116	.073	.093	.090	.73	.53	.85	.70	W S W	N W b W	W b N	N 64 W	23.5	36.0	5.5	18.33	20.27	...	0.1
28	30.177	30.105	29.958	30.0717	10.7	19.4	24.4	18.22	— 6.93	.059	.100	.089	.080	.82	.96	.68	.79	N b W	E b N	E S E	N 88 E	4.5	2.4	8.6	4.75	6.53	...	0.6
29	29.735	29.709	—	—	27.3	29.1	—	—	—	.118	.118	—	—	.79	.73	—	—	S E b E	N W	W b S	N 66 W	9.4	1.0	8.0	3.72	6.15	...	...
30	.883	.916	.888	29.9017	28.4	30.7	28.3	27.22	+ 2.05	.105	.106	.103	.105	.66	.62	.82	.71	N W b N	W b N	Calm.	N 76 W	10.2	5.0	0.0	3.38	5.24	...	...
31	.669	.392	.223	.4083	33.1	39.2	38.0	36.60	+11.42	.160	.165	.196	.175	.85	.67	.86	.80	S W	S W b S	S W b W	S 42 W	10.5	8.5	12.5	8.44	8.56	...	...
M	29.7530	29.7274	29.7450	29.7461	29.14	34.84	30.52	31.13	+ 4.04	.148	.157	.156	.151	.85	.72	.82	.79	.....	.....	.....	.....	7.45	9.41	7.10	.....	7.96	0.560	6.8

Highest Barometer . . . . . 30.182 at 8 a. m. on 12th. } Monthly range=
Lowest Barometer . . . . . 29.171 at midn't on 31st. } 1.011 inches.

Self-registering Thermometer: Maximum temperature . . . . 55°2 on p.m. of 10th } Monthly range= 49°7
Minimum temperature . . . . 5°5 on a.m. of 25th }

Mean maximum temperature . . 37°03 } Mean daily range=12°80
Mean minimum temperature . . 24°23 }

Greatest daily range . . . . . 26°4 from a. m. to p.m. of 4th.
Least daily range . . . . . 2.2 from a. m. to p. m. of 23rd.

Warmest day . . 10th ...Mean Temperature . . .=48°45 } Difference=36°77.
Coldest day . . . 24th ...Mean Temperature . . .=11°68 }

Maximum Solar Radiation . . . . . 70°2 on p. m of 8th } Monthly range= 72°.8
Terrestrial . . . . . —2°6 on a. m. of 25th }

Aurora observed on 4 nights, viz.: 1st, 4th, 20th, and 21st; Possible to see Aurora on 16 nights; Impossible on 15 nights.
Snowing on 8 days: depth, 6.8 inches; duration of fall, 30 0 hours.
Raining on 6 days; depth, 0·560 inches; duration of fall, 18.6 hours.
Mean of cloudiness=0.62; below the average, 0.13 Most cloudy hour observed 8 a.m.; mean=0.68; least cloudy hour observed, midnight; mean=0.55.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
2094.43	1300.98	929.21	3413.80

Resultant direction, N 72° W; Resultant Velocity, 3.50 miles per hour.
Mean velocity 7.96 miles per hour.
Maximum velocity 46.0 miles, from 9 to 10 a.m. on the 27th.
Most windy day 27th—Mean velocity 20.27 miles per hour. } Difference 19.50 miles.
Least windy day 8th—Mean velocity 0.77 miles per hour. }
Most windy hour, noon to 1 p.m.—Mean velocity, 9.90 miles per hour. } Difference
Least windy hour, 7 to 8 a.m.—Mean velocity, 5.93 miles per hour. } 3.97 miles.

Great Barometric Movement.

26th. 10 p.m. = 29.242 }
28th. 8 a.m. = 30.181 } Ascending range = 0.939 in 34 hours.
31st. Midn't = 29.171—Descending range = 1.010 in 88 hours.
Oscillations in 122 hours=1.949 inches.

5th. Dense Fog at 10 p.m.; dark and mild.—7th. Foggy at midnight; very mild day.—9th. Fog from 6 a.m. to 6.30 p.m.; very mild.—10th. Rapid descent of temperature from 10 p.m.; very stormy night; foggy from 7 to 8 a.m.—15th. Distinct lunar halo at 9 p.m.—17th. Lunar corona at 6 a.m.; lunar halo 8 p.m. to mid night.—18th. Lunar halo from 9 p.m. to midnight.—21st. Lunar corona at 6 a.m.—26th. Lunar halo at 6 a.m.—27th. Very stormy day; wind in violent squalls; bright meteor in N.W. about 10 p.m.—31st. Solar halo from 9 a.m. to 2 p.m.

The Resultant Direction and Velocity of the Wind for the month of December, from 1848 to 1861 inclusive, were respectively N. 69° W., and 2.97 miles.

COMPARATIVE TABLE FOR DECEMBER.

YEAR.	TEMPERATURE. Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	RAIN. No. of days.	Inches.	SNOW. No. of days.	Inches.	WIND. Resultant. Direction.	Resultant. Velocity.	Mean Velocity
	°		°	°	°							
1840	24.3	— 1.8	41.0	— 4.4	45.4	3	Inap.	18	...	...	...	...
1841	28.7	+ 2.6	45.5	+ 2.4	43.1	7	6.601	5	...	...	...	1.33lbs
1842	24.7	— 1.4	40.3	+ 3.8	36.5	3	0.880	17	...	...	...	0.61 "
1843	30.0	+ 3.9	41.1	+ 2.7	38.4	6	1.040	8	8.1	...	...	0.53 "
1844	28.2	+ 2.1	48.9	— 0.8	49.7	6	Imp.	6	4.2	...	...	0.40 "
1845	21.1	— 5.0	37.6	— 2.7	40.3	2	Inap.	12	4.7	...	...	0.70 "
1846	27.5	+ 1.4	49.2	+ 3.7	45.5	5	1.215	9	6.0	...	...	0.57 "
1847	30.1	+ 4.0	50.0	+ 6.6	43.4	7	1.185	8	6.8	...	...	0.35 "
1848	29.1	+ 3.0	49.1	+ 0.6	48.5	7	2.750	7	16.5	s 83 w	1.12	5.44ms.
1849	26.5	+ 0.4	41.3	— 5.2	46.5	5	0.840	12	9.6	N 82 w	2.56	6.23 "
1850	21.7	— 4.4	48.3	— 9.7	58 0	2	0.190	18	29.5	N 44 w	2.93	7.40 "
1851	21.5	— 4.6	43.8	—10.5	54.3	6	1.075	15	10.7	N 82 w	4.00	7.37 "
1852	31.9	+ 5.8	51.0	+13.9	37.1	7	3.995	10	20.1	s 69 w	1.03	6.54 "
1853	25.3	— 0.8	42.2	— 5.2	47.4	4	0.625	13	22.3	N 35 w	2.39	4.98 "
1854	21.9	— 4.2	41.8	— 5.9	47.7	5	0.590	12	17.2	N 44 w	4.30	8.56 "
1855	26.8	+ 0.7	45.9	— 2.1	48.0	6	1.845	10	29.5	s 88 w	5.29	11.38 "
1856	22.9	— 3.2	41.2	— 9.1	50.3	6	1.790	20	16 3	s 87 w	4.62	11.56 "
1857	31.9	+ 5.8	45.6	+ 5.7	39.9	7	3.205	14	9.0	N 89 w	2.51	6.84 "
1858	27.4	+ 1.3	43.6	+ 5.0	38.6	11	1.657	18	10.4	N 18 w	1.66	9.36 "
1859	17.9	— 8.2	54.8	— 3.3	58.1	3	1.035	23	37.4	N 53 w	4.29	10.77 "
1860	24.0	— 2.1	38.5	— 7.0	45.5	3	1.362	21	13.5	N 62 w	4.66	10.14 "
1861	31.1	+ 5.0	55.1	+ 5.7	49.4	6	0.560	8	6.8	N 72 w	3.50	7.96 "
Mean	26.11	...	45.26	—0 72	45.98	5.3	2.515	12.9	14.66	...	...	8 18
Diff from Av'ge.	+5.02	...	+ 9.84	+6 42	+3.42	+ 0.7	— 0.995	— 4.9	— 7.86	...	...	—0 22

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—JANUARY, 1862.

Lat .e—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Normal.	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resultant Direction.	Velocity of Wind.					Rain in Inches.	Snow in Inches.
	6 A.M.	2 P.M.	10 P.M.	MEAN.	6 A.M	2 P.M.	10 PM	M'E'N		6 A.M	2 P.M	10 P.M.	M'N	6 A.M	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P. M.		6 A.M	2 P.M	10PM	Resul't.	M'E'N		
					°	°	°	°	°																			
1	29.008	29.065	29.575	29.2485	41.4	32.0	22.6	30.68	+ 5.47	.232	.094	.062	.135	.89	.51	.52	.70	S W	NWbW	NWbW	N 70 W	9.0	42.0	33.0	24.91	26.31	Inp	0.1
2	.827	.899	.991	.9193	16.1	18.3	6.7	12.45	—12.75	.068	.056	.047	.054	.75	.55	.77	.69	N W	NWbW	N N W	N 31 W	8.0	18.5	11.6	14.43	14.56	...	...
3	30.000	.920	.839	.9085	—0.8	7.1	—0.1	2.42	—22.73	.037	.036	.032	.036	.88	.59	.72	.73	N W bN	N N E	N N E	N 3 E	14.0	6.0	8.0	8.87	9.07	..	...
4	29.775	.774	.796	.7883	3.1	10.7	6.0	6.25	—18.88	.033	.034	.043	.037	.63	.48	.75	.63	N b E	N b W	N W bN	N 5 W	11.7	5.0	5.5	4.09	4.30	...	...
5	.726	.726	—	—	1.0	11.8	—	--	—	.036	.058	—	—	.76	.77	—	—	N b E	E N E	E b N	N 56 E	0.5	0.8	9.0	7.18	7.52	...	1.0
6	.305	.417	.606	.4710	15.4	20.5	18 3	17.32	— 7.82	.083	.081	.087	.081	.95	.73	.87	.85	N E	N b E	N W bN	N 9 E	15.5	2.0	4.5	3.96	4.93	...	0.3
7	.756	.933	30.082	.9405	17.9	29.3	19.4	22.60	— 2.53	.085	.115	.093	.094	.87	.71	.89	.78	W b N	W	W N W	N 75 W	0.5	11.5	4.8	3.82	3.97	...	...
8	30.007	.695	29.603	.7447	26.2	29.5	34 2	30.20	+ 5.07	.110	.129	.177	.141	.77	.78	.89	.84	S b E	S b E	S W	S 7 W	8.0	9.0	9.0	6.43	7.77	...	0.5
9	29 605	.593	.660	.6257	34.2	36.7	34.9	35.32	+10.18	.185	.163	.186	.175	.93	.75	.92	.85	SW bW	S W	S S W	S 36 W	0.2	10.0	5.0	4.18	5.07	0.005	...
10	.442	.170	.585	.4088	36.3	42.8	25.9	34.10	+ 9.05	.02	.232	.072	.161	.91	.84	.61	.76	S E	W b S	N W	N 68 W	9.6	13.5	26.0	10.72	15.23	0.060	...
11	.849	.661	.290	.5830	14.0	19.7	13.6	15.85	— 9.20	.068	.090	.072	.078	.83	.84	.91	.87	N N E	E	E S E	S 85 E	5.5	12.2	9.0	7.53	9.10	...	3.0
12	.160	.084	—	—	27.3	32.4	—	—	—	.126	.153	—	—	.84	.83	—	—	S W	W b S	W b N	N 78 W	4.0	7 5	21.7	11.85	12.40	0.050	0.2
13	.815	30.101	30.189	30.0630	3.1	7.1	1.7	4.35	—20.73	.044	.042	.038	.042	.86	.68	.80	.78	W b N	N	N b W	N 20 W	23.0	8.0	4.5	7.21	8.40	...	...
14	30.240	30.235	30.033	30.1513	0.3	13.6	21.2	12.00	—13.10	.033	.055	.085	.061	.85	.67	.75	.76	N W	W	E b S	N 83 E	8.5	1.5	13.0	6.11	9.28	...	4.0
15	29.417	29.217	29.355	29.3293	23.3	32.7	27.3	27.60	+ 2.50	.116	.165	.139	.136	.93	.88	.94	.90	E b S	S W bW	W b S	S 64 W	19.5	14.8	18.5	10.57	14.94	...	2.5
16	.633	.957	30.105	.9388	18.6	19.0	8.5	14.12	—10.88	.083	.054	.052	.059	.82	.51	.79	.71	W	W	W N W	S 87 W	16.0	21.0	4.5	10.38	10.65	...	...
17	30.041	.920	29.963	.9737	12.9	21.2	21.9	18.78	— 6.23	.069	.099	.097	.091	.89	.87	.82	.87	N W bW	N E b N	N b E	N 13 E	1.5	5.0	4.5	4.71	5.20	...	1.5
18	29.751	.634	.663	.6803	23.0	25.5	24.4	24.43	— 0.53	.113	.118	.117	.119	.92	.86	.89	.91	N E b E	N E	N E	N 50 E	8.5	4.5	3.5	6.76	6.82	...	3.0
19	.503	.481	—	—	20.1	25.9	—	—	—	.105	.107	—	—	.97	.76	—	—	N E	N E	N E b N	N 42 E	13.0	5.5	5.8	6.53	6.56	...	1.5
20	.478	.504	.669	.5662	21.5	26.2	21.2	22.37	— 2.48	.095	.110	.085	.096	.82	.77	.75	.80	N N E	N	N E b N	N 8 E	9.8	9.0	2.0	7.97	8.04	...	0.5
21	.754	.751	.725	.7368	17.6	24.8	23.4	23.33	— 0.95	.088	.105	.134	.110	.92	.79	.86	.85	N b E	N E	E b N	N 55 E	11.0	6.2	10.0	7.56	8.23	...	0.5
22	.657	.652	.715	.6872	26.2	32.0	29.8	28.87	+ 4.10	.124	.162	.146	.139	.87	.89	.88	.87	N E b N	Calm.	W	N 79 W	6.2	0.0	7.0	2.01	2.90	...	0.2
23	.734	.734	.820	.7700	26.6	30.9	28.4	28.27	+ 3.60	.134	.141	.134	.133	.93	.81	.86	.86	W N W	W N W	Calm.	N 63 E	0.4	0.4	0.0	0.76	2.02	...	0.1
24	.788	.752	.652	.7188	29.5	30.9	28.3	29.35	+ 4.78	.144	.141	.129	.136	.87	.81	.81	.83	E b N	E b N	E b S	N 84 E	6.8	10.5	12.2	10.00	10.34	...	1.5
25	.445	.250	.304	.3307	23.0	29.1	32.0	27.80	+ 3.22	.093	.148	.121	.122	.79	.94	.66	.81	N E b E	S	W	S 86 W	10.4	0.5	22.0	4.67	10.07	...	5.0
26	.485	.693	—	—	23.3	24.4	—	—	—	.089	.075	—	—	.71	.57	—	—	W	W b N	W N W	N 84 W	24.0	25.5	2.9	12.98	13.01	...	...
27	30.090	30.127	30.169	30.1358	7.5	26.2	17.2	16.37	— 7.98	.054	.124	.081	.081	.88	.87	.84	.85	W	Calm.	N b E	N 66 E	1.4	0.0	2.0	2.46	3.46	...	...
28	30.047	29.772	29.519	29.7480	21.9	20.5	28.0	24.00	— 0.30	.105	.093	.139	.119	.89	.85	.90	.91	E	E b S	E S E	S 84 E	14.8	18.8	9.5	14.09	14.17	Inp.	2.0
29	29.361	.468	622	.5027	29.1	36.0	33.8	32.23	+ 8.03	.155	.181	.129	.154	.96	.85	.66	.84	E b S	S W bW	N W	N 57 W	2.4	3.5	13.5	3.31	3.98	...	...
30	.654	.706	.858	.7567	21.9	28 6	20.1	23.38	— 0.72	.084	.110	.091	.096	.71	.70	.85	.76	N W b N	W N W	N W bN	N 5 W	7.0	8.0	12.6	5.56	7.65	...	Inp.
31	30.020	.966	.740	.9072	10.0	24.4	27.0	21.30	— 2.68	.059	.103	.129	.097	.87	.78	.88	.82	N E b N	E b S	E S E	S 76 E	1.8	6.5	13.0	7.28	7.78	...	...
M	29.7242	29.6938	29.7457	29.7274	19.25	25.01	21.53	21.71	— 3.09	.100	.110	.101	.103	.86	.75	.80	.81					8.79	9.26	9.95		8.83	0.115	27.4

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR JANUARY, 1861.

Highest Barometer..... 30.300 at 10 a. m. on 14th } Monthly range =
Lowest Barometer ..... 28.965 at 8 a. m. on 1st } 1.335 inches.

Self-regist'ing Thermom.

Maximum Temperature ..... 41°5 on a.m. of 1st } Monthly range =
Minimum Temperature ..... —2°6 on a.m. of 3rd } 47°1

Mean maximum Temperature ..... 27°58 } Mean daily range =
Mean minimum Temperature ..... 15°03 } 12°55

Greatest daily range ..... 25°8 from a. m. of 14th to a. m. of 15th.
Least daily range..... 2°8 from a. m. to p. m. of 26th.

Warmest day..... 9th... Mean temperature..... 35°32 } Difference = 32°30.
Coldest day..... 3rd... Mean temperature..... 2°42 }

Maximum } Solar..... 52°2 on p. m. of 23rd } Monthly range =
Radiation. } Terrestrial.....—10°0 on a. m. of 5th and 13th } 62°2

Aurora observed on 4 nights, viz.: 1st, 2nd, 6th, and 29th.
Possible to see Aurora on 11 nights; impossible on 20 nights.
Snowing on 19 days, depth 27.4 inches; duration of fall, 88.9 hours.
Raining on 5 days,—depth 0.115 inches; duration of fall 7.2 hours.
Mean of cloudiness = 0.73. Above average 0.02.
Most cloudy hour observed, 4 p. m., mean = 0.82; least cloudy hour observed 10 p.m.; mean, = 0.62.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
2485.49	635.77	2047.01	2918.18

Resultant direction N. 26° W.; Resultant velocity 2.69 miles per hour.
Mean velocity..... 8.83 miles per hour.
Maximum velocity ..... 43.3 miles, from 5 to 6 p. m. on 1st.
Most windy day ..... 1st.....Mean velocity, 26.31 miles per hour. } Difference =
Least windy day.....23rd.....Mean velocity, 2.02 ditto. } 8.86 miles.
Most windy hour ..... 9 to 10 p.m.....Mean velocity, 10.06 ditto. } Difference =
Least windy hour ..... 2 to 3 a.m. .....Mean velocity 7.34 ditto. } 2.72 miles.

Great Barometric Movement.

12th. 2 p.m. = 29.084 }
14th. 10 a.m. = 30.300 } Ascent in 44 hours = 1.216
15th. 4 p.m. = 29.216—Descent in 30 hours = 1.084
Movement in 74 hours = 2.300 inches.

1st. Stormy day. Wind very high and squally. Rapid descent of temperature from a.m. of 1st to a.m. of 2nd = 30°6.—2nd. Bright meteor in N.E. at 5.49 a.m.—10th. Rapid descent of temperature from p.m. of 10th to a.m. of 11th = 30°2. Dense Fog 8 a.m. to noon.—12th. Rapid descent of temperature from p.m. of 12th to a.m. of 13th = 30°9.—13th. Imperfect Lunar Halo from 6 p.m.—14th. Imperfect Solar Halo at 4 p.m. Perfect Lunar Halo from 6 to 11.40 p.m.—16th. Lunar Corona 6 p.m. Perfect Lunar Halo from 10.15 p.m.—25th. Snowing and drifting heavily till 7.40 p.m. Wind squally. 27th. Imperfect Solar Halo at 2 p.m. Foggy at 7 p.m.

COMPARATIVE TABLE FOR JANUARY.

Year.	Temperature. Mean.	Diff. above aver'ge (23°5)	Max. observed.	Min. observed.	Range.	Rain. No. of days.	Rain. Inches	Snow. No. of days.	Snow. Inches	Wind. Resultant Direction.	Wind. Resultant V'y.	Wind. Mean Force or Velocity.
	°	°	°	°	°							
1840	17.0	— 6.5	40.6	—13.8	54.4	4	1.395	11	...	...	...	.....
1841	25.6	+ 2.1	41.7	— 4.1	45.8	2	2.150	14	...	...	...	0.36 lbs.
1842	27.9	+ 4.4	45.8	1.3	44.5	5	2.170	9	...	...	...	0.78
1843	28.7	+ 5.2	54.4	1.5	52.9	6	4.295	12	14.2	...	...	0.69
1844	20.2	— 3.3	44.6	— 7.7	52.3	7	3.005	11	24.9	...	...	0.70
1845	26.5	+ 3.0	43.0	— 3.4	46.4	5	Imp.	9	22.7	...	...	0.70
1846	26.7	+ 3.2	41.2	0.3	40.9	5	2.335	10	6.0	...	...	0.55
1847	23.3	— 0.2	42.6	— 2.2	44.8	7	2.155	5	7.5	...	...	1.09
1848	28.7	+ 5.2	51.5	—12.0	63.5	7	2.245	8	7.1	N 82° W	2.63	5.82mls.
1849	18.5	— 5.0	40.1	—15.2	55.3	4	1.175	10	9.2	N 63° W	3.06	6.71
1850	29.7	+ 6.2	46.3	10.6	35.7	5	1.250	8	5.2	N 37° W	0.69	5.80
1851	25.5	+ 2.0	43.2	—12.8	56.0	4	1.275	10	7.8	S 77° W	3.26	7.69
1852	18.4	— 5.1	37.3	— 7.0	44.3	0	0.000	19	30.9	N 68° W	3.14	7.67
1853	23.0	— 0.5	40.9	— 6.6	47.5	1	0.290	6	7.5	N 27° W	2.52	6.34
1854	23.6	+ 0.1	45.2	— 4.3	49.5	7	1.270	11	7.5	N 77° W	2.44	6.91
1855	25.9	+ 2.4	43.2	— 4.7	52.9	5	0 525	13	23.3	N 73° W	1.91	7.26
1856	16.0	— 7.5	33.1	—12.1	45.2	0	0.000	14	13.6	N 75° W	5.24	10.69
1857	12.8	—10.7	34.6	—20.1	54.7	3	Inap	16	21.8	N 70° W	4.96	10.31
1858	30.0	+ 6.5	45.8	7.5	38.3	6	1.152	11	4.0	N 71° W	2.33	7.40
1859	26.4	+ 2.9	41.5	—26.5	68.0	6	1.449	19	16.4	S 81° W	3.17	8.76
1860	23.4	— 0.1	45.4	— 5.1	50.5	6	0.740	16	8.7	N 89° W	6.09	9.37
1861	19.9	— 3.7	34 5	— 7.0	41.5	4	0 685	23	20.6	N 86° W	2.92	9.30
1862	21.7	— 1.8	42.8	— 1.9	44.7	5	0.115	19	27.4	N 26° W	2.69	8.83
Results to 1861.	23.53	...	42.80	—6.52	49.31	4.5	1.407	12.0	13.63	N 77° W	2.98	7.86
Diff. for 1862.	— 1.82	...	...	+4.62	4.61	+ 0.5	— 1.292	+ 7.0	+ 13.77	.....	.....	+ 0.97

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—DECEMBER, 1861.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M.D., LL.D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32°			Temp. of the Air.—F.			Tension of Vapour.			Humidity of Air.			Direction of Wind.			Horizontal Movement in Miles in 24 hours.	Mean of Ozone.	Rain in inches.	Snow in inches.	Weather, &c. A Cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M	6 A.M.	2 P.M.	10 P.M					6 A M.	2 P. M.	10 P. M.
1	29.774	29.670	29.514	16.4	28.1	25.4	.068	.120	.117	.75	.80	.87	S S E	N E b E	N E b E	122.60	4.0	...	1.60	Slight Snow.	Snow.	Snow.
2	561	617	719	19.6	26.2	16.5	093	105	068	92	75	75	W S W	W S W	W S W	338.50	3.0	...	0.57	Cu. Str. 8.	C. C. Str. 10.	Clear.
3	784	862	30.147	7.6	22.2	8.3	054	084	050	88	71	82	W S W	W	S W b W	151.30	3.0	...	...	C. C. Str. 10.	Clear.	Do.
4	933	962	29.874	— 3.2	24.0	24.2	030	083	100	80	66	81	W S W	S W b S	S b W	27.30	2.5	...	...	Clear.	C. C. Str. 4.	Cu. Str. 10.
5	952	30.147	30.030	20.0	34.0	29.2	091	162	140	85	84	86	W b S	W	S	16.20	3.5	...	...	Cu. Str. 10.	Cirr. Str. 10.	Do. 10.
6	30.329	244	256	21.2	31.6	32.0	096	149	162	85	84	89	N E b E	N E b E	E S E	154 70	4.0	Inap.	...	Do. 10.	Do. 10.	Do. 10.
7	039	29.917	29.824	36.2	39.2	39.0	191	216	223	90	91	98	S b W	S S E	S	18.50	3.5	...	...	Cirr. Str. 4.	Do. 10.	Rain.
8	29.681	754	815	39.1	46.9	37.8	220	262	211	92	84	91	S W	W S W	N	71.70	5.5	0.690	...	Fog.	Hazy.	Cu. Str. 10.
9	891	900	857	34.6	39.0	25.2	169	195	182	84	82	89	E	S W	S E b E	23.20	5.5	...	...	Cu. Str. 10.	Cu. Str. 10.	Do. 10.
10	800	744	594	34.0	36.0	36.1	182	177	191	95	85	90	N E b N	N E b E	S W	121.40	3.5	0.126	...	Do. 10.	Do. 10.	C. C. Str. 8.
11	747	30.000	30.259	34.2	38.0	15.0	175	079	061	89	65	76	N b W	W N W	N W	651.90	5.0	0.350	...	Rain.	Clear.	Clear.
12	30.341	331	372	15.2	26.0	19.1	069	128	071	71	87	69	S b E	S S W	S	60.10	3.0	...	Inap.	Cu. Str. 10.	Cu. Str. 10.	Clear.
13	149	187	101	28.9	37.3	31.1	123	192	155	77	88	89	S S W	W S W	S S W	47.00	4.0	...	...	Do 4.	Do. 10.	Cir. Str. L. H.
14	29.870	29.746	29.742	27.1	42.2	37.6	129	199	171	83	74	76	S S W	W S W	W	119.20	2.0	...	...	C. C. Str. 8.	Cu Str. 4.	Cl'r. I. h. A.B.
15	30.137	30.101	30.051	16.4	26.0	25.6	074	111	111	83	81	81	N W	N W	W	478.20	2.5	...	...	Cirr. Str. 4.	Clear. [H.	C. C. Str. 10.
16	29.600	29.714	29.820	24.1	30.1	29.1	110	130	129	86	78	82	S W	W	N N E	224.40	2.5	...	...	Cu. Str. 10.	C. C. Str. 6. S.	Clear.
17	30.191	30.100	847	10.7	25.7	26.0	048	110	123	69	80	87	S E b E	S W b S	E b S	74.70	3.5	...	...	Clear.	C. C. 4. Ip. H.	Cirr. 4. and H.
18	29.654	29.863	30.114	30.0	33.0	15.1	136	150	161	83	80	73	S W b W	N b W	N E b E	221.50	3.0	...	...	Cu. Str. 10.	Clear.	Clear.
19	987	684	29 611	9.0	19.8	26.3	051	081	118	77	77	83	E S E	N E b E	S S E	49.70	3.5	...	Inap.	Do. 10.	Snow.	Sleet.
20	667	914	30.054	20.0	10.0	0.0	191	089	052	85	57	70	W b N	W N W	W	247.20	4.8	...	...	Do. 4.	Cu. Str. 4.	Cl'r. Ft. A. B.
21	30.199	30.224	269	—10.0	4.1	8.1	022	041	051	78	74	77	W	S W	S S W	845.89	2.0	...	...	Clear.	Clear.	Cu. Str. 8.
22	257	162	114	12.0	28.0	21.0	051	123	096	70	81	95	S S W	S S W	E S E	85.80	3.0	...	...	Str. 2.	Cu. Str. 9.	Do. 4.
23	29.714	29.437	29.378	17.0	20.9	23.0	078	091	112	83	85	93	N E b E	N E b E	N E b E	240.50	5.5	...	2.50	Snow.	Snow.	Snow.
24	514	669	868	14.1	16.6	0.5	070	053	036	82	58	84	W	W b S	W b S	583.70	4.5	...	...	Cu. Str. 10.	Cu. Str. 10.	Cu. Str. 10.
25	30.026	30.079	30.226	— 7.3	10.0	0.6	020	045	036	64	68	84	W b S	W S W	S S E	69.90	2.0	...	...	Clear.	Do. 4. [F. H.	Clear.
26	220	045	000	— 9.1	11.0	26.3	024	042	123	79	59	87	N E b E	N E b E	S b E	55.80	4.0	...	...	C. C. Str. 4.	C. C. Str. 10.	Sleet.
27	29.502	29.560	29.984	34.0	25.0	9.1	175	100	051	74	77	83	S S W	W	W	582.10	4.5	0.210	...	Rain.	Do. 10.	Cu. Str. 10.
28	30.277	30.179	30.210	— 4.0	9.0	1.0	031	051	038	83	77	85	W S W	W S W	S W b W	420.90	2.0	...	...	Clear.	Clear.	Clear.
29	181	29.924	29.941	— 1.0	15.1	10.0	028	046	084	68	55	78	S E	E b S	S b W	17.40	2.0	...	...	C. C. Str 8.	Cu. Str. 8.	Cu. Str. 10.
30	29.736	953	30.051	8.1	22.2	5.0	048	084	041	77	71	74	W S W	W	S S W	162.60	2.0	...	0.50	Cu. Str. 10.	Do. 10.	Do. 10.
31	894	737	29.891	8.1	21.0	14.1	048	080	067	77	71	81	S b E	S E	N N E	6.10	4.0	...	3.10	Do. 10.	Snow.	Snow.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—JANUARY, 1861.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL.D.

Latitude—45 *deg.* 32 *min. North. Longitude*—73 *deg.* 36 *min. West. Height above the Level of the Sea*—118 *feet.*

Day.	Barom. corrected and reduced to 32°			Temp. of the Air.—F.			Tension of Vapour.			Humidity of Air.			Direction of Wind.			Horizontal Movement in Miles in 24 hours.	Mean of Ozone. (tenths)	Rain in Inches.	Snow in Inches.	Weather, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.					6 A.M.	2 P.M.	10 P.M.
1	29.482	28.863	29.268	19.1	26.0	10 0	.087	.123	.045	.84	.87	.68	N E b E	N w b w	w	230.80	4 0	In'p.	1.79	Snow.	Rain.	Cirr. Str. 10.
2	747	29.799	944	— 6.5	6.1	— 1.6	.026	.035	.034	.80	.61	.84	w b N	w N w	w N w	184.80	3.0	...	...	Clear.	Clear.	Cl'r. Ft. Au. B.
3	998	985	997	—11.4	2.3	— 7.0	.014	.034	.022	.53	.71	.69	w N w	w b N	w b N	136.80	2.0	...	...	Do.	Do.	Do.
4	903	840	918	—16.1	— 1.0	— 6.6	.019	.028	.026	.43	.68	.80	w b N	w b N	w b N	111.80	2.0	...	...	Do.	Do.	Do.
5	953	917	917	—11.5	3.0	— 2.9	.020	.042	.032	.76	.86	.83	w b s	w b N	w s w	95.30	2.0	...	...	Do.	Do.	Do
6	765	779	784	—10.5	4.7	3.7	.021	.044	.046	.77	.84	.87	N E b E	N E b E	s s E	0.00	3.0	...	...	Cu. Str. 6.	Cu. Str. 4.	Cu. Str. 8.
7	870	931	30.186	8.0	24.0	7.0	.048	.100	.048	.77	.79	.77	w b s	w	w	1.00	4.0	...	0 75	Snow.	Clear.	Clear.
8	30.317	30.101	29.824	— 8.0	22.2	24.4	.020	.084	.111	.66	.71	.86	w	s s E	s s w	37.00	4 5	...	...	Hoar Frost.	Cu Str. 10.	Cu. Str. 10.
9	29.804	29.797	811	30.0	37.0	36.0	.148	.164	.177	89	.85	.85	s s w	w b s	w b s	83.10	3.0	...	0.75	Cu. Str. 10.	Do.	Do. 10.
10	752	450	319	19.2	21.1	36.2	.087	.096	.191	.84	.85	.90	E b s	N E b E	w	177.90	3.5	In'p.	...	Do. 10.	Rain.	Do. 10.
11	30.088	30.028	30.007	— 9.4	1.3	— 3.6	.022	.036	031	.76	72	.83	w b N	N E	N E b E	147.30	2.0	...	...	Clear.	C. C. Str. 4.	C. C. Str. 8.
12	29.510	29.328	29.376	— 1.0	14.2	18.4	.034	.065	.093	.84	.79	.92	N E b E	N E b E	s w	139.20	4.0	In'p.	3.90	Snow.	Snow.	Cu. Str. 10.
13	925	30.188	30.410	— 1.0	— 1.2	—10.3	.036	.028	.015	.81	.68	.55	w N w	N w b w	w	429.60	3.0	...	...	Clear.	Clear.	Clear. Au. B.
14	30.561	565	568	—27.7	0.0	— 5.0	.009	.026	.025	.89	.56	.80	N E b E	N E b E	N E b E	3.90	3.0	...	...	Do.	Do.	C.C.Str.6.L.H.
15	651	29.774	29.510	— 2.0	15.4	17.0	.030	.065	.073	.80	.74	.83	N E b E	N E b E	N E b E	202.80	4.5	...	7.15	Snow.	Snow.	Cu. Str. 10.
16	29.698	749	30.025	19.0	17.4	— 0.6	.082	.072	036	.84	.75	.84	W	w	w	223.80	4.5	...	...	Cu. Str. 4.	Cu. Str. 4.	Clear.
17	30.367	30.278	296	— 2.0	17.4	12.3	.034	.072	.060	.84	.75	.80	s s w	s	s b w	0.00	3.5	...	In'p	Do. 10.	Do. 4.	C. Cum. 4.
18	228	054	036	15.1	21.2	16.1	.070	.093	.074	.81	.80	.83	s s E	N E b E	N E b E	13.10	5.0	...	6.14	Do. 10.	Snow.	Cu. Str. 10.
19	29.995	29.884	29.927	3.0	20.1	19.2	.041	.081	.087	.74	.77	.84	N E b E	N E b E	N E b E	205.40	5.5	...	1.01	Do. 10.	Cu. Str. 10.	Do. 10.
20	891	851	967	17.1	20.1	19.1	.098	.091	.091	.83	.85	.85	N E b E	N E b E	N E b E	366.10	5.5	...	7.00	Snow.	Snow.	Snow.
21	30.119	30.176	30.097	15.4	13.0	10.1	.070	.063	.054	.80	.81	.78	N E b E	N E b E	N E b E	194.20	1.5	...	...	Clear.	Clear.	Clear.
22	080	151	114	8.4	18.1	17.1	.048	.082	.078	.77	.84	.83	N E b E	N E b E	N E b E	48.40	3.0	...	0.75	C. C. Str. 10.	Snow.	Snow.
23	094	052	139	17.4	33.6	25.0	.074	.143	.117	.80	.79	87	s s w	s s w	N E b N	1.00	2.5	...	...	Cu. Str. 10.	C. C. Str. 4.	Cu. Str. 10.
24	241	019	174	8.4	23.1	10.6	.018	.084	.048	.77	.71	.69	s s E	N E b E	N E b E	0.00	1.5	...	...	Hazy.	Clear.	Do. 4. Ft. A.B.
25	29.946	29.741	29.618	14.1	24.1	18.2	.067	.111	.082	.81	.86	.84	N E b E	N E b E	N E b E	91.40	3.0	...	6.14	Cu. Str. 10.	Snow.	Snow.
26	571	647	867	20.0	25.2	17.2	.091	.117	.068	.85	.86	.75	w b s	w N w	w	223.40	3.5	...	I.47	Snow.	Cu Str. 4.	Clear.
27	30.184	30.314	30.666	12.1	12.8	0.6	.060	.054	.038	.80	.71	.85	w N w	w N w	w N w	476.44	1.0	...	...	Cu. Str. 4.	Clear.	Do.
28	414	274	253	—16.5	12.1	0.0	.014	.045	.032	.70	.60	70	w b N	w	w	100.80	1.0	...	...	Hoar Frost.	Do.	Cu. Str. 10.
29	29.886	29.814	29.574	3.0	17.1	16.0	.036	.078	.074	.72	.83	.85	N E b E	N w b w	w N w	133.70	1.8	...	In'p	Snow.	Sleet.	Do. 10.
30	954	967	30.050	16.1	32.1	23.2	.074	.143	.089	.85	.79	.72	s s w	w s w	w N w	1.30	1.5	...	...	Cu. Str. 10.	Clear.	Do. 10.
31	30.315	30.331	345	2.0	16.1	1.0	.032	.059	.032	.70	.65	.70	w N w	w N w	w N w	39.60	1.5	...	...	Clear.	Do	Cl'r. Zo. li't br't

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR DECEMBER, 1861.

Barometer	Highest, the 12th day	30.372
	Lowest, the 23rd day	29.378
	Monthly Mean	29.892
	Monthly Range	0.994
Thermometer ...	Highest, the 8th day	46°9
	Lowest, the 21st day	—10°0
	Monthly Mean	20°54
	Monthly Range	56°9
Greatest intensity of the Sun's rays		69°8
Lowest point of Terrestrial Radiation		—11°7
Mean of Humidity		.796

Rain fell on 5 days, amounting to 1.306 inches; it was raining 31 hours, and was accompanied by Thunder on 1 day.
Snow fell on 7 days, amounting to 8.27 inches; it was snowing 80 hours and 55 minutes.
Most prevalent wind, W. S. W.
Least prevalent wind, N.
Most windy day, the 11th day; mean miles per hour, 27.18.
Least windy day, the 31st day; mean miles per hour, 0.25.
Aurora Borealis visible on 3 nights.
Solar Halo visible on 3 days.
Lunar Halo visible on 3 nights.
The Electrical state of the Atmosphere has indicated high intensity.
Winter fairly set in on the 23rd day.
Encke's comet visible.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR J .UARY, 1861.

Barometer	Highest, the 27th day	30.666
	Lowest, the 1st day	28.863
	Monthly Mean	29.845
	Monthly Range	1.803
Thermom.. er.....	Highest, the 9th day	37°.0
	Lowest, the 14th day	—27°.7
	Monthly Mean	9°.48
	Monthly Range	64°.7
Greatest intensity of the Sun's Rays		45°.1
Lowest Point of Terrestrial Radiation		—29°.2
Mean of Humidity		.783

Rain fell on 4 days, inappreciable.
Snow fell on 13 days amounting to 36.85 inches. It was snowing 55 hours and 28 minutes.
Most prevalent wind, the N. E. by E.
Least prevalent wind, the S.
Most windy day, the 27th; mean miles per hour, 19.85.
Least windy day, the 17th; Calm.
Aurora Borealis visible on 3 nights.
Lunar Halo very bright on 1 night.
Zodiacal light bright (but Venus presents an early and well defined view.)
The Electrical state of the Atmosphere has indicated high intensity.

Postscript.—Mr. Chapman wishes to announce, for the information of correspondents and others, that, with the issue of the present Number, his connexion with the *Canadian Journal* as General Editor, is brought to a close. A projected visit to Europe, combined with the pressure of other work, has compelled him to place his resignation in the hands of the Editing Committee. He is happy to add, however, that the *Journal* will be carried on, at least for the present, under the able management of Professor Hincks of University College, Toronto.

March, 1862.