

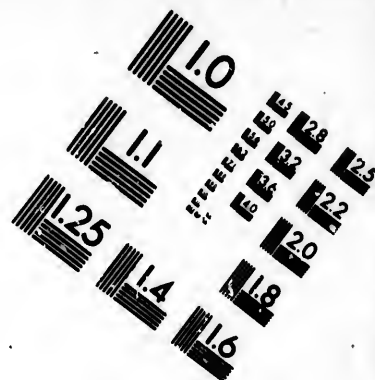
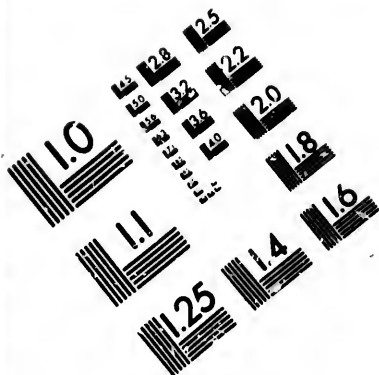
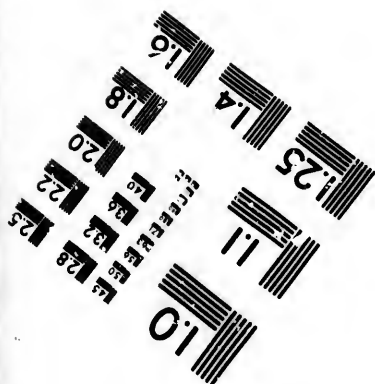
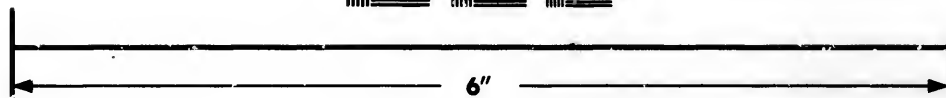
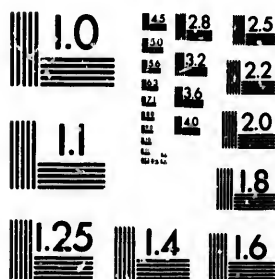


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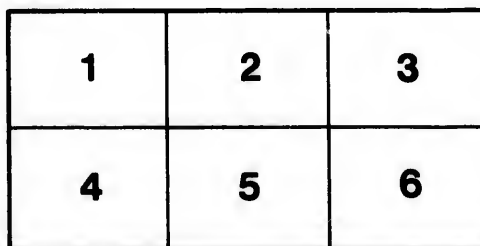
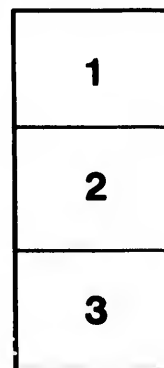
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*With the author's best & kindest
wishes*

CONTRIBUTIONS TO METEOROLOGY FOR THE YEAR 1861,

From observations taken at Isle Jesus, Canada East.

BY

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

(Professor of Meteorology in the University of McGill College, Montreal.)

The following observations are a continuation of the Annual Report of the results of the observations taken at the Observatory. The means are reduced from tri-daily observations taken at 6 a. m., 2 p. m. and 10 p. m. The whole of the observations are all reduced to the usual standards, and the necessary corrections depending upon any peculiar construction of the instruments have been applied. It may be further stated, that the instruments are in the same position that they were placed during a long series of years, and they are all subjected, at short intervals of time, to certain manipulations and corrections, so as to secure, as far as possible, accuracy; many of them are self-registering, and every means have been adopted to prevent either terrestrial, zenith or solar radiation on the bulbs of the thermometers; extra hours are set apart for observing any unusual phenomena, and a more particular attention has been directed to every sudden and great fall in the barometric column as indicating any unusual atmospheric wave, and also on the sudden fall of the thermometer indicating any extreme degree of cold as during our "*cold terms*," for the purpose of comparing observations here with those taken in any distant part of the world, and which may have a bearing on the theory of the formation of storms.

A seismometer has been added to the other instruments for the purpose of ascertaining the direction and amount of elevation of the earthquake wave. The more than usual frequency of late of earthquakes in this neighbourhood has led to the placing of the seismometer, so as to indicate and to estimate any such interesting phenomena.

Barometer.—The highest reading of the barometer during the year occurred at 9.30 p. m. on the evening of the 23rd of January, and indicated 30.687 inches; the lowest reading occurred on the 27th day of May at 1.45 p. m. and indicated 28.883 inches, giv-

ing a yearly range of 1.804 inches; several sudden and great changes occurred during the year both with a rising and also with a falling column. The first remarkable wave was on the 4th of March, when a very sudden fall took place, for at 6 a.m. the barometer stood at 30.454 inches, and it fell in 24 hours 0.780 of an inch and continued falling until 2 p. m. of the 6th day when it attained a *minimum* of 29.450 inches; it then continued to rise, and at 10. p. m. the 7th day attained a height of 30.398 inches, showing a sudden rise of 0.948 of an inch; on the 15th of March a rise of 0.342 of an inch took place in 8 hours, and a like sudden rise occurred on the 30th day of 1.230 inches in 24 hours; another sudden rise took place on the 28th of September at 6 a. m. The mercurial column indicated 29.276 inches, and in 24 hours it rose to 29.999 inches, showing a rise of 0.623 of an inch, and it continued rising until it attained a maximum of 30.315 inches; another sudden depression of 0.200 of an inch in 8 hours occurred on the 22nd of October, and a corresponding rise on the 24th day also in 8 hours of 0.409 of an inch. November was as usual subjected to several fluctuations; the highest crest of the wave occurred on the 1st, 10th, and 20th days, and a corresponding trough took place on the 3rd, 16th, 24th and 30th days. In December, from the 12th to the 21st day, the mercurial column indicated great fluctuations, falling from 30.341 inches to 29.746 inches, rising again to 30.137 inches and then again falling to 29.600 inches and again rising to 30.191 inches, again falling to 29.611 inches and attaining on the 21st a maximum of 30.269 inches; a sudden rise occurred on the 27th day, the column rising 0.293 of an inch in 8 hours. The mean barometric pressure for the year was 29.737 inches, showing a decrease of 0.046 of an inch compared with the mean of last year, but an increase of 0.061 of an inch when compared with a series of years. The following tables show the mean reading of each month and also the monthly range of the barometer in inches; the mean yearly range was 1.093 inches.

Monthly Means.

	Inches.		Inches.		Inches.
January.....	29.983	May.....	29.721	September..	29.849
February....	.750	June.....	.720	October....	.876
March.....	.878	July.....	.734	November...	.714
April.....	.882	August....	.353	December...	.892

Monthly Range.

	Inches.		Inches.		Inches.
January....	1.350	May	1.349	September..	1.023
February...	1.484	June.....	0.815	October....	1.014
March.....	1.401	July	0.637	November..	0.902
April.....	1.381	August.....	0.770	December..	0.994

The lowest range (or the least difference) was in July, and this held good for a series of years. January for a long period shows the greatest range, but the month of February 1861 shows a greater range than January; the mean range for a series of years has been found to be 1.032 inches, which is 0.060 of an inch less than the yearly range of 1861. January shows the highest mean of the year and June the lowest. The mean reading of the barometer for the Winter Quarter was 29.883 inches, for the Spring Quarter 29.827 inches, for the Summer Quarter 29.769 inches, and for the Autumnal Quarter 29.813 inches.

Thermometer.—The mean temperature of the air for the year varies but very slightly from the mean temperature of a series of years, but the mean temperature indicated 1°89 degrees less than the mean temperature of last year (1860), and 0°16 of a degree only more than the mean annual temperature of a long series of years; the mean temperature for the year 1861 being 41°72 E. The highest reading was on the 9th of June at 3 p.m. and indicated 99°7 degrees; the lowest reading was at 6 a.m. on the morning of the 8th of February, and indicated—37°1 degrees (below zero), giving a yearly range or climatic difference of 136°8 degrees.

The warmest day of the year was the 10th of June, the mean temperature of the day was 81°1 degrees; at 11 a.m. the thermometer stood at 87°8 degrees, and at 3 p.m. 96°0 degrees, and at 4 p.m. 95°8 degrees; at 10 p.m. it stood at 76°7 degrees and it fell to 60°3 in the night, which was clear and calm, the terrestrial radiator indicated 57° degrees. The coldest day of the year was the 8th of February, the mean temperature indicated—23°5 degrees (below zero); below is a record of the cold term of January and February.

January 11, 1861. 6 a. m.—23°.1 (below zero.)

8	"	—23°.0	"
9	"	—19°.1	"
Noon		—17°.0	"
2 p. m.		—10°.6	"
4	"	—14°.8	"

	6 p. m.	-17°.0	(below zero.)
	8 "	-20°.4	"
	10 "	-20°.6	"
January 12, 1861.	6 a. m.	-34°.9	"
	8 "	-34°.7	"
	10 "	-24°.6	"
	Noon	-14°.4	"
	2 p. m.	5°.1	"
	4 "	-7°.3	"
	6 "	-14°.9	"
	8 "	-17°.4	"
	10 p. m.	-17°.9	"
	Midnight	-20°.4	"
January 13, 1861.	6 a. m.	-26°.6	"
	8 "	-20°.8	"
	10 "	-12°.5	"
	Noon	5°.1	"
	2 p. m.	1°.6	"
	4 "	1°.0	"
	6 "	-11°.2	"
	8 "	-14°.3	"
	10 "	-16°.9	"
	Midnight	-19°.2	"
January 14, 1861.	6 a. m.	-13°.8	"
	8 "	-10°.4	"
	10 "	3°.1	"
	Noon	+ 2°.0	above.

The thermometer was 81 hours and 45 minutes below zero.
 The February cold term exceeded somewhat the above temperature,
 and was as follows:—

February 8, 1861.	10 p. m.	-21°.3	(below zero.)
	Midnight	-34°.6	"
	6 a. m.	-37°.1	"
	9 "	-32°.1	"
	Noon	-22°.2	"
	2 p. m.	-14°.1	"
	4 "	-19°.0	"
	6 "	-20°.9	"
	8 "	-19°.8	"
	10 "	-19°.5	"

Midnight—20°.4 (below zero.)

6 a. m.—24°.0 “

9 “ —20°.1 “

Noon +1°.1 “

The thermometer was for 56 hours below zero.

The following table shows the Mean Temperature for each month.

January....	10°.43	May.....	51°.86	September..	58°.06
February...	18°.25	June.....	65°.83	October....	46°.64
March.....	21°.94	July.....	67°.66	November...	33°.60
April.....	38°.99	August.....	66°.84	December...	20°.54

July was the warmest month, but was 6°92 degrees colder than the mean temperature of July for a series of years.

The temperature of the Winter Quarter was 12°28 degrees, for the Spring Quarter 34°29 degrees, for the Summer Quarter 66°77 degrees, and for the Autumn Quarter 46°10 degrees; the temperature for the same period of last year (1860) was Winter Quarter 12°39 degrees, Spring Quarter 45°55 degrees, Summer Quarter 67°63 degrees, and Autumn Quarter 46°49 degrees. A thermometer sunk 18 inches in the ground showed a temperature of, in May 49°9, in June 59°8, in July 60°0, in August 66°0, in September 58°0, in October 53°0, and in November 47°4. The range of temperature or climatic difference exceeded by 19°2 degrees the range of 1860; below is a table of the climatic difference for each month of 1861:—

January.....	66°.5	May.....	42°.9	September...	44°.6
February.....	90°.8	June.....	59°.6	October.....	42°.4
March.....	65°.5	July.....	51°.8	November....	28°.6
April.....	55°.3	August.....	43°.3	December...	56°.9

February shows an excessive range of temperature; this was owing to the excessive *cold term* of that month; November shows the least climatic change, and this is rather unusual for November; the range for November 1860 was 59°4 degrees, the mean range for November for a series of years being 61°1 degrees; the 1st frost of the Autumn occurred on the 5th of September; a sudden fall of temperature took place in March, at 2 p.m. on the 16th day the thermometer stood at 36°7 degrees, and in 24 hours it fell to—5°0 degrees below zero, showing a difference of 41°7 degrees in that short period; this sudden change was accompanied by a rise in the barometer and a high wind from the west; December showed a *cold term* but of short duration; the following table shows the temperature:—

Dec. 20th, at 9 p.m. 0.0
 Midnight—10.0 (below zero)
 21st, 6 a.m.—10.1
 11 " — 3.2
 Noon— 0.5
 0.20 0.0 this was the

1st cold term of the winter 1861-2.

Humidity of the Atmosphere.—The mean relative humidity for the year was 0.774, saturation being equal to 1.000.

The following table shows the relative humidity for each month :

January.....	.752	May.....	.770	September...	.804
February....	.755	June.....	.735	October.....	.843
March.....	.768	July.....	.763	November...	.787
April.....	.780	August.....	.736	December...	.796

June was the driest month of the year, but July has been the driest for a series of years. Complete saturation occurred only once during the year.

Rain.—Fell on 106 days, amounting to 46.701 inches; it was raining 531 hours and 14 minutes, and was accompanied by thunder on 16 days; the number of days on which rain fell exceeded by 13 the number of days of rain of 1860, and by 112 hours 14 minutes, but was 5 days less than the number of rainy days in 1859, but exceeded by 33 days the amount of days of rain compared with a series of years; the amount of rain which fell in 1859 was 50.035 inches, and in 1860 was 48.132 inches, and the amount of rain in 1861 exceeded by 3.697 inches the average amount compared with a series of years; a very heavy rain storm occurred on the 27th May, it began at 4.25 p.m. from

	h.m.	Inches.
the E.N.E. and at	4.45	the fall registered 1.700
	4.50	(wind veered to W.) 2.066
	4.53	2.333
	4.55	2.433
	5.00	2.483

and ceased at 5.10 and equalled 2.486 inches, which fell in 45 minutes. The Rivière des Prairies, a branch of the Ottawa, rose very high during May, and a like rise has not been witnessed since 1848.

The following table shows the monthly amount and the duration of fall :

	Amount.	Time.		Amount.	Time.
	Inches.	h. m.		Inches.	h. m.
January.....	0.100	4.10	July.....	10.188	79.49
February.....	0.761	17.25	August.....	1.950	12.31
March.....	1.756	52.35	September.....	4.816	66.50
April.....	2.921	60.42	October.....	5.370	69.30
May.....	8.642	49.32	November.....	1.023	32.52
June.....	4.869	56.18	December.....	1.306	31.00

July shows a very large amount of rain but is not the greatest amount on record here for July, but exceeds by 4.456 inches the amount of last July (1860), but is less by 2.026 inches the amount of rain which fell in July 1859, which was the most rainy July on record here; this was accompanied by a very heavy storm and showed an amount of rain equal to 6.374 inches, and the river in this neighbourhood rose at this time nearly 2 feet; the rain storm lasted 45 hours and 40 minutes.

Thunder and lightning occurred on 16 days, the yearly mean for a series of years is 14; last year (1860) thunder only occurred on 11 days; there were 43 cloudless days only during the year 1861, the average for a series of years being 57. The prevailing clouds were *Cumuli Stratus* and a rather larger amount of *Cirri Stratus*, giving rise to haloes; and there were but 123 nights suitable for astronomical purposes; this is less by 20 than the number of nights in the year 1860. Snow fell on 45 days amounting to 99.53 inches; it was snowing 365 hours and 54 minutes, which is less by 1.77 inches the average amount for a series of years, but is 38.20 inches less than the amount of snow which fell in 1860, and is 40.57 inches less than the amount which fell in 1859. The last snow of the winter 1860-1 fell on the 17th of April, and the 1st snow of the autumn fell on the 24th October. Winter did not fairly set in until the 23rd of December.

Evaporation.—The amount of evaporation from the surface of water during the 6 months which are recorded is 16.90 inches, which is nearly 1 inch less than the mean amount; the amount of evaporation also from the surface of ice was somewhat less than the average.

The greatest intensity of the Sun's rays was 104°3 degrees, which is less by 6°3 degrees than the intensity for the year 1860, and is 12°7 degrees less than the intensity for the year

1859. *The lowest point of the terrestrial radiation, was—39°4 degrees (below zero.)*

Dew.—The yearly amount of dew was below the usual mean or average; an apparatus has been used for a short time for the purpose of ascertaining the hour at which dew begins to fall and when it ends, and also the amount, and it is believed will lead to some interesting results in this department of research; the apparatus is self-registering and leaves a permanent impression.

Wind.—The most prevalent wind during the year was the N. E. by E. and the least so E by N; the next in frequency was the W. and W. S. W. and a good deal of S. E. winds prevailed; below is a table of the amount of horizontal miles of wind for each month:

Miles.	Miles.	Miles.
January... 6380.10	May 4989.20	September. 3447.48
February.. 5549.95	June 5067.93	October... 3664.29
March 5437.69	July..... 4499.68	November. 4142.30
April..... 3565.12	August.... 2736.05	December.. 5816.99

giving a total for the year of 55296.78 miles linear, which is 11083.28 miles more than the amount for the year 1860; the mean velocity for the year was 6.312 miles per hour, which shows an increased velocity of 1.270 miles per hour for 1861 over that of 1860; June was the calmest month last year and indicated only 2905.36 miles; a tornado passed over Montreal on the 9th of July, but was little felt here; on the 10th of August a very heavy hail storm passed near this place over St. Laurent and Montreal, doing considerable damage to crops and buildings; there were several storms of wind during the year preceded by rain and a low barometer.

The Aurora Borealis, was visible at observation hour on 42 nights; a bright display with considerable magnetic disturbance occurred on the night of the 1st of September, the same period that the splendid display which caused so much sensation over the world occurred last year.

The Zodiacal Light was frequently seen; it was generally bright and well defined.

Solar and Lunar Haloes have been more than usually frequent during the year. A remarkable solar halo occurred on the 12th of August, when the temperature had fallen considerably during the night. The thermometer at 6 A.M. stood at 46°07 degrees. The terrestrial radiator had indicated a temperature of 41°03

degrees. The wind at 10 A.M., (mean local time) was from the N.E. by E., with a clear sky, from which time light *cirrus* clouds began to form in the higher region of the atmosphere, passing from W. to W.S.W., in a direction contrary to the lower current of wind (N.E. by E.) At 10h. 38m. a slight halo was seen round the sun, and at 10h. 45m. it presented a very rare and beautiful spectacle. The sun, bright and *white*, was in the centre of a halo or circle of 44 degrees in diameter, its lower or southern limb being about 37 degrees above the horizon; this circle was a bright halo of light, white and bright at its outer edge, and which was shaded inwardly and towards the sun of a pale orange colour, and an occasional tint of blue and red ray nearly 2 degrees in breadth. Both the lower limbs of this halo on the edge next the sun were more broad than elsewhere, giving the appearance of a crescent on each side. This halo or bright circle was filled in as it were with a dark ground, consisting of *cirrus* clouds, which passed quickly and constantly across from a westerly direction.

Another circle of a white colour and less bright, was also seen. The circumference of the wheel was in the centre of the bright halo, or more properly in the sun itself; the ring extended beyond the zenith, and exceeded the brighter one considerably in diameter. Another smaller circle was enclosed between the bright northern limb of the halo and the last mentioned circle, which on approaching its periphery separated somewhat, and crossed each other from right to left, extending east and west for a short distance, and the breadth of these circles were from $1\frac{1}{2}$ to 2 degrees.

Lower down, nearer the horizon, on either side of the halo, were arcs or broken portions of an imperfect circle, somewhat resembling inverted rainbows, with distinct prismatic colours which varied both in brightness and extent. These appearances decreased and ceased at 12h. 40m. P.M. The wind veered in the S.E. by E. with an increase of temperature and a cloudy sky. The following day at 11 A.M., another halo appeared round the sun, but unattended with any of the peculiar appearances as above noticed.

The other solar and lunar haloes and coronæ, although more frequent than usual, offered no peculiarities.

Observations on the *Solar Spots* still form a part of the records at this place.

Ozone.—The observations have been continued by means of the calico ozoneometer, which is kept moving by clock work, so as to indicate the variable amount, and has furnished very interesting results, as also the action of the coloured rays of light and polarized light and its development.

Atmospheric Electricity.—The tri-daily observations have been taken with Pelletier's and Ramerhausen's apparatus as heretofore, but these observations are far too extended for a short notice.

Comets were seen, Thatcher's in May; a bright one 30th June, and a smaller one, October.

Earthquakes.—A smart shock was felt on the 11th of July at 9 hours 3 minutes P.M., local time, it lasted for 20 seconds. The wave passed from N.N.W. to E., and another slight shock was felt in October. A register will for the future be kept in connexion with the seismometer.

The Lunar Eclipse of the 17th December was not seen, being obscured by clouds.

Crows (*Corvus corona*), first seen on the 27th of February. The song sparrow (*Fringilla melodia*), first heard 4th of April. Wild geese (*Anser Canadensis*), first seen flying W. on the 29th April. Swallows (*Irundo rufa*), first seen 23rd April. Frogs (*Rana fontanalis*), first heard the 24th day. Shad (*Alosa prostrabilis*), first caught 30th May. Fire flies (*Lampyrus corusca*), first seen 19th June. Snow birds (*Plectrophanes nivalis*), first seen 17th of November. Crows left on the 7th day of November.

Currants and gooseberries in leaf on the 16th May. Wild strawberries in flower, 24th. Dandelion in flower, 23rd. Currants and gooseberries in blossom on the 24th. Lilac in blossom on the 3rd of June. Apples on the 4th. Chokecherries in blossom on the 6th of June.

The magnetic observations carried on at this Observatory, will form a separate paper for future publication.

Observatory, Isle Jesus, 22nd January, 1862.

Snow.—Snow fell on 45 days amounting to 99.53 inches; it was snowing 365 hours 54 minutes; this amount exceeds by 38.26 inches the amount which fell last year and by 23 hours and 9 minutes the duration of time of the precipitation.

The following table shows the amount and time for each month.

	Amount.	Time.		Amount.	Time.
	Inches.	h. m.		Inches.	h. m.
January.....	31.88	69.30	October.....	Inapp.	0.25
February.....	29.85	79.45	November.....	11.51	54.29
March.....	8.34	49.15	December.....	8.27	80.55
April.....	11.68	40.35			

