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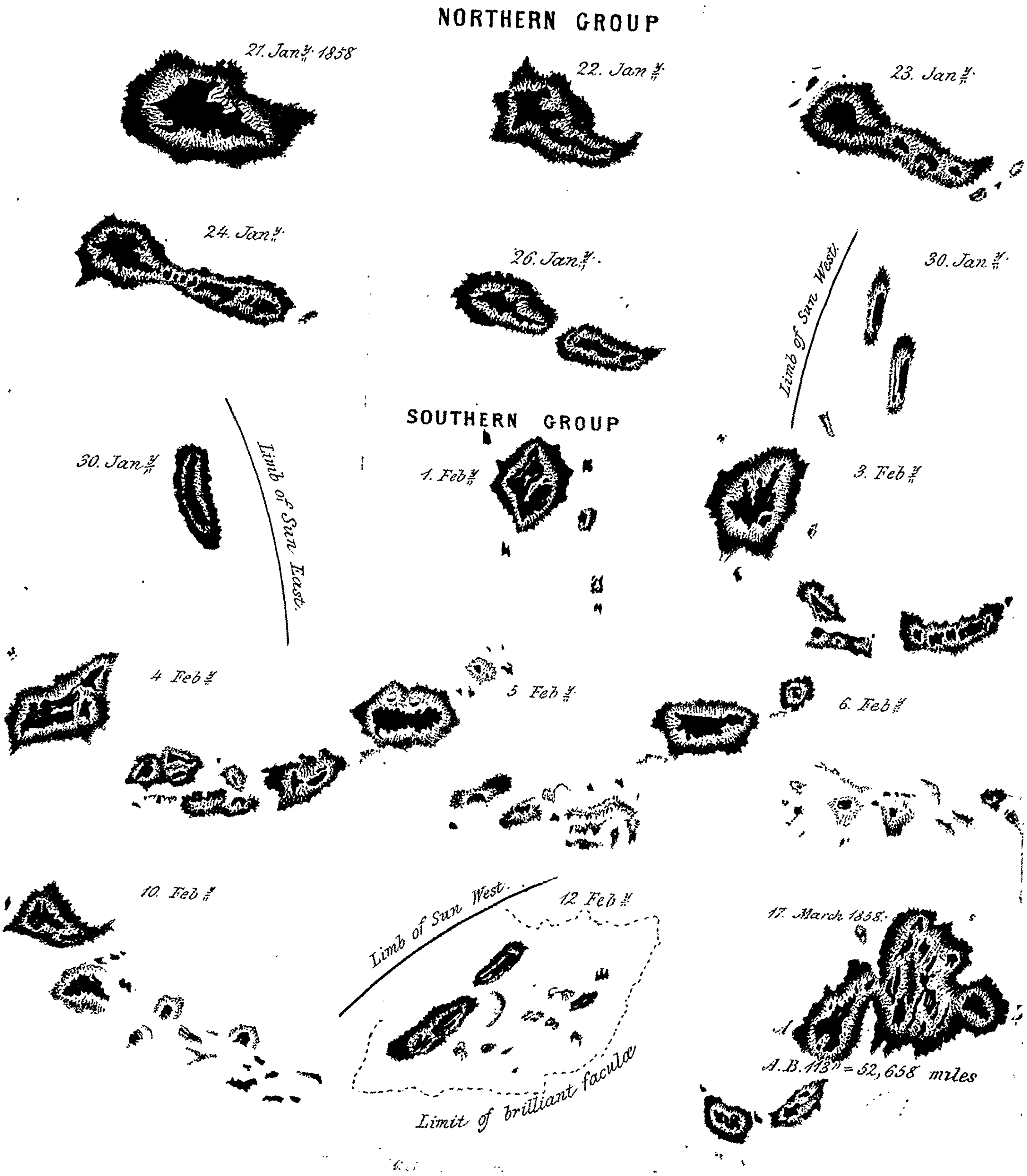
NORTHERN GROUP
21. Jany. 1858
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Limb of Sun West.
SOUTHERN GROUP
30. Jany.
Limb of Sun East.
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4 Feby.
5 Feby.
6. Feby.
10. Feby.
12 Feby.
Limb of Sun West.
Limit of brilliant faculæ
17. March 1858.
A
A.B. 113" = 52,658 miles

A. [illegible]

THE CANADIAN JOURNAL.

NEW SERIES.

No. XVI.—JULY, 1858.

THE OBSERVATORY AT ST. MARTIN, ISLE JESUS, CANADA EAST.

FROM NOTES BY PROFESSOR CHARLES SMALLWOOD, M. D., LL. D.

Read before the Canadian Institute, 20th February, 1858.*

The following sketch of the general appearance of the building and instruments, from the pen of Dr. Hall, of Montreal, furnishes a very suitable introduction to Dr. Smallwood's account of the Observatory established by him at St. Martin, Isle Jesus.

A small wooden building, distant about twenty yards from the dwelling house of Dr. Smallwood, contains the whole of the apparatus which has for many years furnished such valuable results. A short distance from it, and on a level with the ground, is the snow gauge. Immediately in front of the entrance to the small building is a dial, with an index to point out the course of the clouds. Contiguous to the building again may be seen four erect staffs. The highest of which—80 feet—is intended for the elevation of a lighted lantern, to collect the electricity of the atmosphere, the copper wires from which lead through openings in the roof of the building to a table inside, on which a four-armed insulated conductor is placed. The lantern is made to ascend and descend on a species of railway, in order to obviate all jarring. On another pole is placed the wind vane, which, by

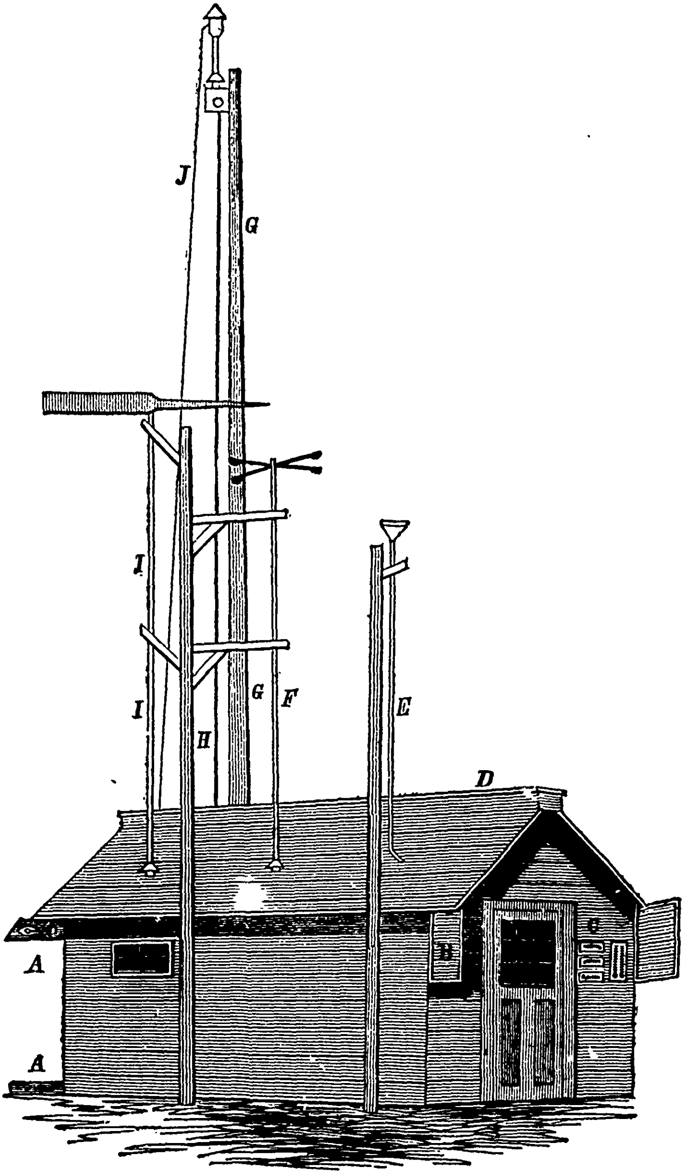
* For the wood-cuts which illustrate this paper, the Council of the Canadian Institute are indebted to the liberality of Professor Henry, LL. D. of Washington, U. S.

a series of wheels moved by a spindle, rotates a dial inside the building marked with the usual points of the compass. Another staff, about 30 feet high, contains the anemometer, or measurer of the force of the wind, which, by a like arrangement of apparatus, is made to register its changes inside. The last pole, 20 feet in height, contains the rain guage, the contents of which are conducted by tubing also into the interior of the building, in which, by a very ingenious contrivance, the commencement and ending of a fall of rain are self-marked.

At the door entrance on the right side is a screened place, exposed to the north, on which the thermometer and wet bulb thermometer are placed, four feet from the surface of the earth. A similar apartment on the left contains the scales with which experiments are conducted throughout the winter to ascertain the proportional evaporation of ice.

On entering the door, in the centre of the apartment is a transit instrument *in situ*, for the convenience of using which openings are made in the roof, usually kept closed by traps. This apparatus is not the most perfect of its kind, but is amply adequate for all its uses. On the left is a clock, the works of which, by means of a wheel, are made (while itself keeps proper time,) to move slips of paper along little railways, on which the anemometer by dots registers the velocity of the wind; the rain guage, the commencement and end of showers; and the wind vane, the continually shifting currents of wind. This is effected by a pencil, kept applied by a spring to a piece of paper on the dial previously alluded to, and as, by the clock-work, the dial and the two previously mentioned slips of paper move at the rate of one inch per hour, so it is easy to determine, in the most accurate manner, the direction and force of the wind at any hour of the day, or any period of the hour. With the exception of the clock, the whole of this miniature railway work, with all its apparatus, wheels, &c., &c., is the work of Dr. Smallwood's own hands, and exhibits, on his part, a mechanical talent of the highest order.

At the extreme end of the room is a table, beneath which is an arrangement for a heating apparatus, and on which is the four arm conductor previously alluded to. To the two lateral and *front arms* hang, respectively, two of Volta's electrometers, and one of Bennet's, while beneath the knob on the anterior, there is a discharging apparatus, with an index playing over a graduated scale, to measure during thunder storms the force of the electric fluid, by the *length* of



DR. SMALLWOOD'S OBSERVATORY.

its spark. On this subject we cannot avoid a reflection on the *fate* of the unfortunate Richman. In this case such precautions are adopted as will obviate any casualties whatever; great precaution, however, is required in these experiments, and Dr. Smallwood, fully aware of it, has the whole placed in connection with the earth by means of a brass chain and iron rod. As another proof of Dr. Smallwood's ingenuity and mechanical skill, we may notice that the whole of this apparatus, even to the electrometers, is the result of his own handicraft; and the whole arrangements in the little room are a signal proof how much a man may do unaided, and how well he can effect an object if thrown entirely upon his own resources.

On the right wall of the apartment are suspended the barometers, of which there are three. 1. A standard of Newman's; 2. Another of Negretti's, but of different construction; and 3. One of Dr. Smallwood's own construction. The means of the three observations is the measure adopted for the observation.

The only other instrument deserving of notice is the one to determine the terrestrial radiation; and this also has been made by Dr. Smallwood. It consists of a mirror of speculum metal, (composed of copper, zinc, and tin,) of six inches in diameter, and wrought into the form of a parabolic surface, in the focus of which, at the distance of eight feet, a self-registering spirit thermometer is placed. The construction of this was a labor requiring great nicety in execution, and involving the sacrifice of much time; but perseverance even here conquered the difficulties, and we witnessed a mirror whose reflecting powers would not have disgraced Lord Ross' telescope. In fact, placed in a telescope, it has, we are informed, proved itself capable of resolving those singular stellar curiosities—the double stars.

Dr. Smallwood certainly deserves great credit for his perseverance in a favorite study, under the most unpromising circumstances; but in nothing is he so remarkable as in that peculiar ingenuity which has led him to overcome difficulties in the prosecution of scientific enquiry, which, to most minds, would have been utterly discouraging.

The Natural History Society of Montreal have petitioned the legislature for a grant of money to enable them to publish Dr. Smallwood's tables of observations for the last twelve years. This is a measure, on which no difference of opinion can be anticipated, and must meet with the support of every man who has the welfare of science and Canada at heart.

DESCRIPTION OF THE OBSERVATORY BY DR. SMALLWOOD.

The observatory is placed in the magnetic meridian, is constructed of wood, and has an opening in the roof, furnished with sliding shutters for taking observations by means of the Transit Instrument, of the passage of a Star across the meridian for the purpose of obtaining correct time.

It is also connected by the Montreal telegraph with the principal places in the United States; the wires being laid into the Observatory. It has also a seven-inch achromatic telescope, 11 feet focus. The object glass, by Frauenhofer of Munich, is mounted equatorially and possesses right ascension and declination circles; and observations are taken on the heavenly bodies as often as there are favourable nights.

Observations for the purpose of Meteorology, are taken by the usual instruments, at 6 and 7 a.m. 2, 9 and 10 p.m. daily, besides, extra hours, on any unusual occurrence. Constant tri-daily observations are also taken on the amount and kind of atmospheric electricity, also on the amount of Ozone, and likewise particular attention is directed to the phenomena of thunder storms—all of which observations are regularly recorded. Besides these daily observations, record is kept of the temperature of springs and rivers and the opening and the closing thereof, by ice; also on the foliation and flowering of plants and trees, and the periodic appearance of animals, birds, fishes and insects, besides the usual observations on auroras, haloes, meteors, zodiacal light, and any remarkable atmospheric disturbances.

Many of the instruments, are self-registering and to some the photographic process may be applied, being constructed for that purpose.

The Observatory is furnished with four barometers. 1. A Newman standard, 0.60 of an inch bore; the brass scale extends from the cistern to the top of the tube, and is adapted for registration by the photographic process. 2. A Negretti and Zambra's tube, 0.30 of an inch bore; another of a small bore, and also an Aneroid. The cisterns are all placed at the same height (118 feet,) above the level of the sea and are read at each observation.

Thermometers of Sixes, Rutherford, Negretti, &c., the readings of which are corrected, with the standard instruments of the new observatory, and most of the scales are engraved on the stem of the tubes. Care is taken to verify them twice a year, they are placed four feet from the ground, and have occupied the same position for some years, being placed free from radiation, and carefully shaded from the sun and rain.

The *Psychrometer*, consists of the dry and wet bulb thermometers, the scales of which are coincident, and have been carefully read together. There is also a Saussures' hygrometer. In winter the wet muslin is supplanted by a thin covering of ice which requires frequent renewal.

For *solar radiation* a maximum Rutherford's thermometer is used, with the bulb kept blackened with Indian ink; the tube is shaded by a piece of glass blackened also with Indian ink, which prevents the index from adhering to either the tube or the mercury, as is often the case when not shaded.

Terrestrial radiation, is indicated by a spirit thermometer of Rutherford, which is placed in the focus of a parabolic mirror, 6 inches in diameter and of 100 inches focus.

Drosometer or dew measurer.—One is of copper, like a funnel, the inside of which has been exposed to the flame of a lamp and has been coated with lamp black; the other is a shallow tin dish painted black and ten inches in diameter.

Rain-gage.—The reservoir is thirteen inches in diameter, and is placed 20 feet above the soil. It is self-registering, and is attached to the anemometer and shews the beginning and ending of the rain and the amount of precipitation in inches on the surface.

The *Snow-gage* presents 200 square inches of surface, and is placed in an open space. The surface of the snow requires to be lightly levelled, before taking the depth, which is recorded in inches. A tin tube, 3 inches in diameter aud 10 inches long, is used for obtaining snow for the purpose of reducing the amount to the relative amount of water. The tin tube fits in another vessel of tin of the same diameter, and the snow is easily reduced and measured.

The Evaporator exposes a surface of 100 inches; and is carefully shaded from sun and rain. It is made of zinc and a glass scale, graduated in inches and 10ths, is well secured in front of it, a strip of the metal being removed the glass scale supplies its place, so that the amount evaporated can be easily read off. Its place is supplied in winter by a pair of scales, upon one of which is placed a disc of ice, and the amount of evaporation from the surface is estimated by being very accurately weighed.

The *Ozonometers* are Schonbien's and Moffat's. The solution consists of one drachm of starch, boiled in one ounce of distilled water, to which is added when cold 10 grains of the Iodide of Potassium—this is spread on *sized* paper which is found to answer better than bibulous or *unsized* paper, for the solution is more equally distributed over the surface, whereas on bibulous paper it is very difficult to spread the solution equally. It is cut into slips of about 3 inches long and 5 inches wide—having been previously dried in the dark. it is also requisite, to keep it dry and free from light. When required one of these slips is placed 5 feet from the ground and shaded from the sun and rain,—another of these slips of ozone paper is elevated and exposed at an altitude of 80 feet, for the purpose of comparison. It is also well to place slips of this prepared paper in the vicinity of any vegetables, which may be affected with disease, for instance during the prevalence of the potatoe rot.

A *Microscope* and apparatus for the examination of snow crystals and also obtaining copies by the chromotype process, is also provided.

The Electrical Apparatus.—This consists of three parts: a hoisting, a collecting and a receiving apparatus.

The hoisting apparatus consists of a pole or mast 80 feet high. It is in two pieces, but is spliced and bound with hoop iron, and squared or dressed on one face for about six inches. It is dressed in a straight line to receive cross pieces of two-inch plank, 8 inches wide and 12 inches long, which are firmly nailed to the mast or pole about three feet apart; this serves as a ladder to climb the pole in case of necessity. Each of these cross pieces is *rebated* to receive pieces of inch board 4 inches wide, and placed edgeways in the *rebate*, extending from the top to the bottom of the pole, and forms a sort of vertical railway; these pieces are also grooved or rebated to receive a slide, which runs in these grooves and carries the receiving apparatus. From the top of the sliding piece passes a rope over a pulley fixed at the top of the mast, and from it to a roller and windlass, by which means the collecting lantern is raised or lowered for trimming the lamps. It has also been used for the purpose of placing the ozonometer at that height (80 feet.) The lower part of the mast or pole is fixed into a cross piece of heavy timber, and is supported by four stays. These cross timbers are loaded with stones, and are thus rendered sufficiently firm.

The collecting apparatus consists of a copper lantern 3 inches in diameter, 5 inches high. (See top of mast G, fig 1.) The bottom is moveable and the lamp is placed in it by the means of a small copper pin passing in a slit, which is a very easy method of fixing it. This lantern is placed on top of a copper rod of ¾ inch thick and 4 feet long: the bottom of the lantern having a piece of copper tube fixed to it, a very little larger than the rod, and is thus easily removed and replaced. To the lower end of the copper rod is soldered an inverted copper funnel, a *parapluie*, for protecting the glass insulating pillar upon which it is fixed by means of a short tube firmly soldered to the underside of the *parapluie*. This glass pillar passes into and is fixed firmly in a wooden box, and is freely exposed to the heat of a second lamp, which is placed in this box. It is trimmed at the same time as that in the collecting lantern, and keeps warm and dry the glass pillar, by that means securing a more perfect insulation. From this upright rod and collecting apparatus descends a thick copper wire which serves to convey the accumulated electricity to the receiver which is placed in the observatory.

The receiver consists of a cross of brass tubes (*gas tubes*), each about 2 feet long, and is screwed into a large tube fitting upon a glass cone, which is hollow, forming a system of hollow pipes for the passage of the heat internally, and keeping up a certain amount of dryness and consequent insulation. The glass cone is fixed upon a table over an opening made in it, fitting to the hollow part of the cone. Immediately under this table is placed a small stove of sheet-iron, about 8 inches in diameter, made double, the space of about 1 inch being left between the two chambers; and this plan has been found to effect a good insulation by keeping the whole of the apparatus warm and dry. Charcoal is used as fuel, and is, I think, preferable to a lamp. A coating of suet or tallow is applied to the glass cones or pillars. Care must be taken not to rub or polish the collecting apparatus as it seems to deteriorate its power of collecting and retaining atmospheric electricity; and I have found that its collecting powers increase with its age. Suspended from these cross arms hang the *electrometers*. 1. *Bennet's electroscope* of gold leaves; this scarcely needs a description. 2. *Volta's electrometer*, No. 1, consisting of two straws, two French inches long: a very fine copper wire passes through these straws, which are suspended from the cross-arms. This electrometer is furnished with an ivory scale, the old French inch being divided into twenty-four parts, each being 1°; this forms the standard scale for the amount of tension. 2. *Volta's electrometer*, No. 2, is similar to the No. 1, but the straws are five times the weight of No. 1, so that one degree of Volta's No. 2 is equal to five of No. 1. *Henly's electrometer* is a straw suspended and furnished with a small pith ball: each of the degrees of Henly's is equal to 100° of No. 1 of Volta's. These electrometers are all suspended from the cross-arms. *A discharging apparatus*, furnished with a long glass handle, measures the length of the spark, and serves also as a conductor to carry the electricity collected to the earth, and is also connected by a chain and iron rod passing outside of the observatory for about twenty yards, and buried under ground.

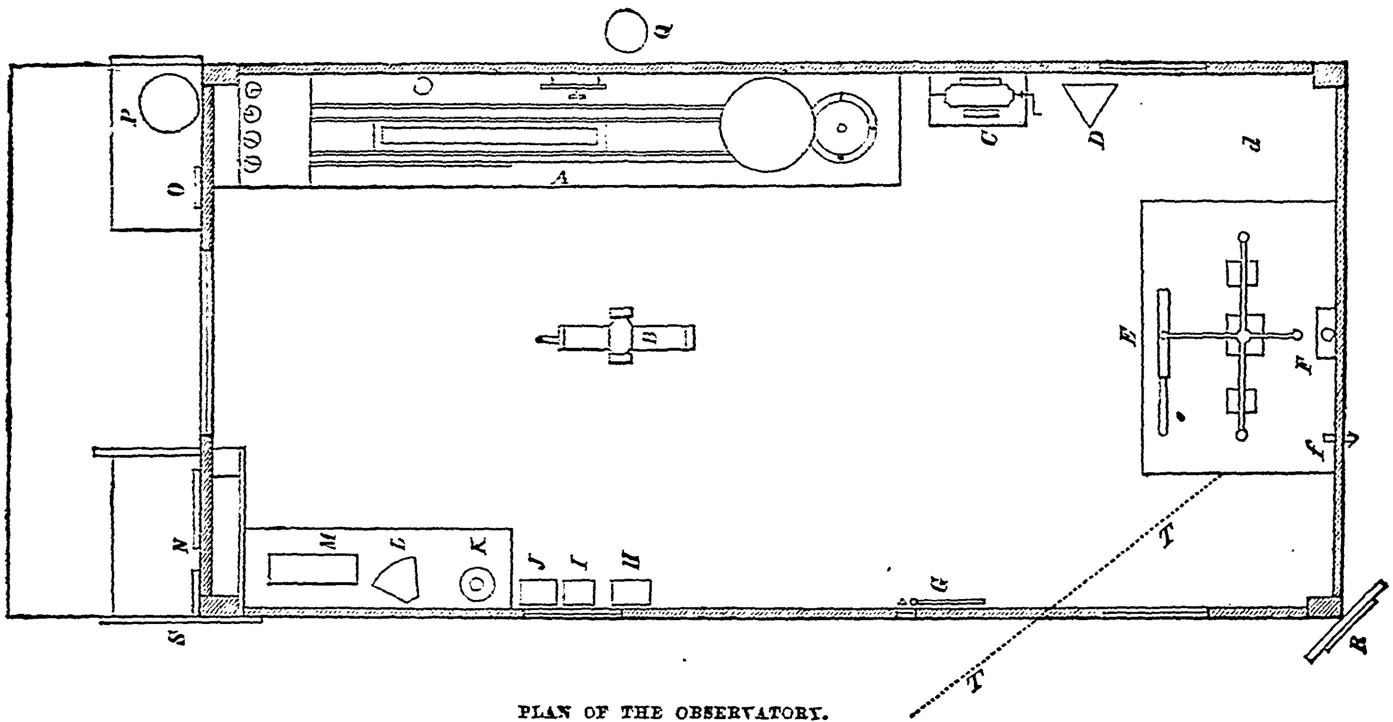
Various forms of *Distinguishers* are used to distinguish the kinds of electricity. The Volta's electrometers may be rendered self-registering, with great facility, by the photographic process. By placing a piece of the photographic paper behind the straws, and throwing the light of a good lens upon them, the expansion is easily depicted, and serves well for a night register. There is also a Peltier's electrometer, and another form of electrometer, consisting of two gold leaves suspended to a rod of copper two feet long; the upper end being furnished with a wire box, in which is kept burning some rotten wood (touch-wood.)

The *Anemometer* consists of a *direction shaft* and a *velocity shaft*: to the top of the direction shaft is placed the vane, which is eighteen feet in length. The shaft is made of three pieces, to insure lightness and more easy motion: each piece is connected by means of small iron-toothed wheels. The two shafts are six feet apart, and work on cross-arms from a mast firmly fixed in the ground. The vane passes some six or eight feet above the velocity shaft, and does not in any way interfere with the other movements. The lower extremity of these shafts are all furnished with steel points, which work on an iron plate or a piece of flint, and pass through the roof of the Observatory; the openings being protected by tin parapluies fixed to the shaft, and revolving with them. Near the lower extremity is placed a toothed-wheel, eight inches in diameter, connected to another wheel of the same diameter, which carries upon its axis a wooden disc, thirteen inches in diameter, upon which is clamped a paper register (old newspapers answer very well) washed over with whiting and flour paste. Upon the surface of this register is traced by a pencil the direction of the wind. This register is renewed every twelve hours.

The *velocity* shaft is in two pieces, connected by means of the toothed wheels and steel pivots, as in the direction shaft; and, practically, the friction is *nil*. At the top of the velocity shaft are fixed three hemispherical tin or copper caps, ten inches in diameter, similar in construction to those of the Rev. Dr. Robinson of Armagh, and are firmly rivetted to three iron arms of ⅝-inch iron. These caps revolve always in the same direction, and one revolution is found to be just one-third of the linear velocity of the wind. I have no reason to doubt Dr. Robinson's formula for this calculation. At the lower extremity of the velocity shaft is fixed a one-toothed wheel, 2⅜ inches in diameter; this moves a second, or ten-toothed, wheel, which also gives movement to a third wheel. This marks a hundred revolutions of the caps, which are so calculated that each one hundred revolutions are equal to one mile linear; and whenever one hundred revolutions have been accomplished, a small lever is elevated by means of an inclined plane, fixed upon the edge of the last wheel, and which gives motion to the lever. The other extremity of the lever is furnished with a fine steel point, which dots off, upon a paper register, the miles as they pass. This register is of paper, one and a quarter inch wide, and is removed every twelve hours.

Between the two shafts, at the lower extremities, are placed two runners of wood, *rebated*, to receive a slide or train, which carries the register. To the underside of this slide is fixed a rack, and it is moved by a pinion, the movement of which is communicated by a clock,—the cord of the weight being passed over a wheel and pulley,—and advances one inch per hour, and the lever before described dots off the miles as the register advances under the steel point. In this manner it shows the increase and decrease of the velocity, and also the moment of its change. Attached to this moveable train is a rod of wood carrying a pencil, which passes over the disc connected with the direction shaft, and there traces, as it advances, the direction of the wind, the moment of its changes, and the point from which it veered. The extreme height of the vane is forty feet, but this might be increased if required. The clock is wound up every twelve hours, which brings back the train to its starting point.

There are also a polariscope, prisms, and glasses of different colors, for experimenting on the different rays of light, in connexion with the germination of seeds, and the art of photography. The Observatory possesses a quadrant and artificial horizon, which serves for measuring the diameter of halves, and altitudes of auroral arches, &c.; also a dial for the indication of the direction and course of the clouds; and other minor instruments.



PLAN OF THE OBSERVATORY.

EXPLANATION OF EXTERNAL VIEW OF THE OBSERVATORY.

A. Thermometer for solar radiation.

B. Screen of Venetian blinds.

C. Thermometer.

D. Opening in ridge of the roof, closed with shutters, to allow use of transit instrument.

E. Rain guage with conducting pipe through the roof.

F. Velocity shaft of the anemometer.

G. Mast for elevating apparatus for collecting electricity.

H. Cord for hoisting the collecting apparatus.

I. Copper wire for conducting the electricity into the building.

J. Direction shaft of the anemometer.

EXPLANATION OF THE PLAN OF THE OBSERVATORY.

A. Anemometer.

B. Small transit for correcting time.

C. Electrical machine for charging the Distinguisher.

D. Peltier's electrometer.

d. Space occupied by Drosometer, Polariscope, &c.

E. Electrometer. e. Discharger.

F. Distinguisher.

f. Small stove—sometimes used in damp weather.

G. Thermometer placed in the prismatic spectrum for investigations on light.

H. Nigretti & Zambra's barometers and cisterns, 118 feet above the level of the sea.

I. Small-tube barometer.

J. Newman's barometer.

K. Aneroid barometer.

L. Quadrant and artificial horizon.

M. Microscope and apparatus for ascertaining the forms of snow crystals.

N. Thermometer, psychometer, &c., 4 feet high. A space is left between the two walls to insure insulation and prevent radiation.

O. Ozonometer.

P. Evaporater—removed in winter and replaced by scales for showing the amount of evaporation from the surface of ice.

Q. Post sunk in the ground, and 40 feet high, to carry the arms of support for the Anemometer.

R. Solar radiator.

S. Venetian blinds.

T. Iron rod beneath the surface of the ground connected with the discharger to insure safety.

SOLAR SPOTS OBSERVED AT TORONTO, IN JANUARY, FEBRUARY AND MARCH, 1858.

BY COLONEL BARON DE ROTTENBURG, C. B., F. R. A. S.

Read before the Canadian Institute, 13th March, 1858.

The following remarks may not possess any novelty—the forms of the Solar Spots recorded in this paper and its accompanying drawings having, in all probability, been often seen by others. But the subject is one of the greatest interest, and the observations of amateur astronomers, on the Solar Spots, may possibly be of essential service to those laborious men who make the nature and constitution of the Solar Atmosphere the business of their lives. Thus, for example, observations made here on any particular day, may supply a link in a series of observations which the systematic observer was unable, from unfavourable atmospheric conditions, to ascertain; and tend possibly to elucidate some general law or conclusion. At any rate, I believe this is the first attempt made to record the daily changes in the Spots on the Sun, by any member of the Institute, for the purpose of communicating them at its meetings, and I offer the following abstract of the phenomena, taken from my Register of Observations, with the accompanying drawings,—which furnish very feeble and inadequate representations of the original,—in the hope that others will be induced to join me in this attempt to give a more prominent place in the records of the Journal of the Institute to familiar natural phenomena.

Extract from Register.

January 21st, 12 hours 15 minutes, apparent time. A large spot seen near the Sun's north-eastern limb, with a well defined Nucleus and Penumbra—two small spots on each side of the Penumbra, the small spot towards the Sun's centre being darker than the one towards the limb—the smallest part of the Nucleus being towards the limb. The definition excellent—air calm—prominent faculæ seen between the spot and the north-eastern limb.

January 22nd. Spot observed again about the same hour as yesterday. Nucleus had materially changed its form—having become much more elongated—shewing a probability of its breaking up into several spots—definition indifferent—Sun's limb tremulous—strong wind blowing from east—the two small spots could not be seen, nor were the Faculæ so well seen as yesterday—the Penumbra fainter to-day, probably on account of haze in the atmosphere.

January 22nd, 12°–20′, apparent time. Definition good, with a slight haze—Penumbra darker to-day—the Nucleus has broken up into four portions, with some smaller spots towards the limb and centre of the Sun—the general shade of the Southern part of the Penumbra darker than the Northern part—a faint Penumbra round small dark spot near the limb—very strongly defined Faculæ seen close to the opposite or north-western limb—observed granular appearance of the body of the Sun.

January 24th, 12°–15′, apparent time. Main body of Nucleus has nearly separated from the other parts, and formed a distinct spot surrounded by a Penumbra—there being three small Nuclei separating the larger spot from the other two—one of the spots seen on the 22nd having either disappeared or merged into the others—the Penumbra smaller at the part between the principal spot and the others, shewing a tendency to isolate the principal spot—Faculæ on opposite limb very brilliant and strongly defined—definition very good—Sun's disc granular—Penumbra generally darker than previously observed—no other spots visible on this or on previous days, besides those referred to.

January 25th. Cloudy, and no observation.

January 26th, 1°–30′ apparent time. The separation between the principal spot and the others complete—the Nucleus of the principal spot extending to the edge of the Penumbra, on the side towards the Sun's north-eastern limb—one portion of the Penumbra round the spots nearest the limb, very much more brilliant than the other parts—Penumbra much striated round Eastern spots—a small spot to the South of the ones nearest the limb, with cloudy looking streaks between it and the Penumbra, not exactly Penumbra, but more resembling cirrhous clouds—about ten or eleven new spots observed on the south-eastern limb, not far removed from the Equatorial regions of the Sun, a faint Penumbra apparently round one of them—strongly marked Faculæ around these new spots. The spots originally observed are approaching the western limb, having, I consider, passed the centre of the Sun about the 24th instant.

I may here observe that the Telescope used was an Equatorial Refractor of excellent quality, made by Henry Fitz of New York, of sixty-two and a half inches focal length, and a clear aperture of four and half inches, very firmly mounted, surrounded by a circular wooden building, with a revolving dome; the eye-piece used was a positive or

Ramsden's eye-piece, magnifying about ninety times; the shaded screen used from the 21st to 24th inclusive, was a compound one, composed of one dark purple glass, and one green glass, giving a greenish yellow image, the yellow predominating. On the 26th the screen used was made of three green glasses, giving a greenish image; the full aperture of the Telescope was used on every occasion, and with these appliances the observations were made with perfect safety and comfort. The shaded screens were supplied to me by Mr. Potter, Optician, of this city.

I regret that, in consequence of my not having a Micrometer attached to my Telescope when these observations were first made, I have been unable to give correct measurements of the dimensions of the spots, and of their distances from the limb of the Sun. I resume the extracts from my register.

The 27th, 28th and 29th were cloudy days, and no observations could be made.

On the 30th. This day, at 12°–20′, apparent time, definition bad—Sun's limb very tremulous—strong wind blowing, and atmosphere very much disturbed. The spots first seen on north-eastern limb are now close to the North-Western limb, parallel to it. Penumbra seen above and below Nucleus of each spot, and also on the side next to the limb—no Penumbra on side next the Sun's centre—these spots are much diminished in size—the small spots advanced towards the Sun's centre—four Nuclei enclosed in a common Penumbra, which is very faint—observed a very large spot close to South-Eastern limb, with a well defined Nucleus—the Penumbra broad towards the limb, and just visible only towards the Sun's centre—the upper and lower parts of the Penumbra of this spot much darker than the central parts—the spot parallel to the Sun's limb. This spot is marked No. 7, in the accompanying drawing.

South-Eastern Group.

February 1st. Definition only tolerably good—fringed look of Nucleus, which is lighter towards the Sun's centre; whilst the Penumbra is darker towards the limb of the Sun—the Nucleus separated by a light kind of band—brilliant Faculæ around the lower spots.

February 3rd. Definition good—ragged look of Nucleus—light colored arch in it—Nucleus not equally dark—some parts much lighter than others—small spots much increased in size and number.

February 4th. Light clouds at intervals—definition good—the same ragged or streaky look of the Nucleus observed.

February 5th. Spots are now near the centre of the Sun—remarked two bright spots, with dark circles towards the Nucleus, in the Southern Penumbra—Penumbra generally had a jagged look.

February 6th. Definition indifferent—light scud passing over Sun, the Penumbræ of small spots forming angles towards the centre of the Sun—the Penumbra surrounding the small spots lighter than the Penumbra of the principal one.

February 10th. Definition very indifferent—heavy wind and scud flying over Sun—prominent Faculæ near north-eastern limb, as if a spot was about to appear—large spot much diminished in size—only a little larger than the lower one.

February 12th. Definition indifferent—new spot appeared in north-eastern limb, in position indicated by the brilliant Faculæ on the 10th instant—most brilliant Faculæ all round the spots in the western limb, their extent marked by dotted line in the accompanying drawing.

February 13th. Spots still on the sun, but the definition so vile that no drawings of them could be made—from edge to edge of Penumbra=75 seconds. Observed same spots again on 13th and 17th of March (see drawing appended), extent of edges of Penumbræ of both spots, A A,=113 seconds, or 52,658 miles on the 17th March. The appearance of portions of the Penumbra between the Nucleus of the spots gave some impression of a vortex, the Penumbra being stretched, and the streaks parallel to its edges generally—observed some small spots near Sun's centre, and spots also going off and coming, in the western and eastern limbs.

March 12th. Observed two large spots on south-eastern limb; these spots to my vision had all the appearance of cavities when I first saw them near the Sun's limb on the 8th instant. On the 12th I measured the diameter of the two principal spots with a parallel wire Micrometer, from the exterior edges of the Penumbra which enclosed both Nuclei of the two spots—the diameter was 75 seconds. I measured the same again on the 13th, when the spots were near the Sun's centre; the extent from edge to edge of the Penumbra was 2 minutes. Since communicating the results of these observations to the Canadian Institute, I have continued to note the changes which occurred, and especially observed those affecting the dimensions of the spots measured on the 12th and 13th. On the 17th I again measured the distance from edge to edge; it then was 113 seconds, which is equivalent to 52,658 miles. The appearance of the spots on the 17th March is given in the accompanying diagram. There were several other spots observed near the eastern and western limbs of the Sun, and the general characteristic of the Solar Atmosphere, during the month of March, has been one of great disturbance. On one occasion I counted no less than fifty spots, with well defined Penumbræ.

The Eclipse of the Sun, on the morning of the 15th March, could not be observed at Toronto, on account of a dense fog which prevailed at the time of the Eclipse. The occultation of these large spots by the Moon's body, it was conceived, might probably offer some valuable facts with regard to their nature, and also the constitution of the Solar Atmosphere, at those localities where the Eclipse could be favorably observed. The condition of the atmosphere, which precluded all possibility of observing the occulation, was therefore a source of considerable disappointment to me.

SOCIAL AND WARLIKE CUSTOMS OF THE ODAHWAH INDIANS.

BY F. ASSIKINACK, A WARRIOR OF THE ODAHWAHS.

Read before the Canadian Institute, January 23rd, 1858.

I purpose in this paper to give a brief statement with reference to the habits, social and warlike customs of the Odahwah Indians, which may likewise apply in some respects to other tribes that did not differ widely from them in language and manners. In doing so I shall commence with the young.

Some time after the birth of a child, the parents, or rather grandparents, prepared a feast, to which the principal men of the tribe were invited. At the commencement of the banquet one of the old warriors was requested to name the child, upon which he left his seat and began to sing as he danced slowly round the fire-place in front of the guests, and when he arrived at the door he called out the name he intended to give the child. On hearing the name the guests gave a hearty cheer in token of their approbation. During the performance of the dance round the hearth some of the party busied themselves in giving the appropriate responses, while others uttered encouraging words with becoming gravity.

With regard to the manner of bringing up Indian children nothing can be more erroneous than to suppose that the young were allowed to grow up without any sort of discipline. So far from this having been the case, in addition to the ordinary way of correcting children, there were many other restraints imposed upon the young. The Indians knew in their primitive state, apparently as well as civilized communities, that children too much humored and neglected in moral training when young, as they grow up are apt to become turbulent and bad members of society. As one of the most effective means for training and forming the character of the Indian youth, fasting seems to have been established and practised from time immemorial, and prevailed, I am led to believe, universally among the Indian tribes of this continent. As soon as children were thought capable of reasoning they were required to practise fasting, until they were married. Besides their regularly abstaining from food for so many days successively, at different parts of the year, they were obliged to fast before they were allowed to take any of the wild fruits of the earth, at the different seasons as they became ripe. The same rule was observed with regard to the produce of the farm.

The Indians were most exact in enforcing their rules of fasting. With young children it lasted the whole day, and if a child put anything in his mouth during the day, as, for instance, snow or a piece of icicle,—which children are very apt to do when playing in the open air in winter,—that day went for nothing, the child was then permitted to eat, with strict injunctions to renew his fast the next day. It was also imposed as a punishment upon those children who manifested a disposition to be disobedient and disrespectful; and was found an excellent means of discipline to make children sensible of their duties, and exercised a wholesome restraint upon the youth. With young men from sixteen to twenty-five years of age it was no longer necessary to remind them of the practice. It was looked upon as a duty by every young man, who had too much honorable feeling to submit to the sneers of his companions as a worthless glutton. They, moreover, believed gluttony to be highly displeasing to the Great Spirit; and that, in order to obtain special favors from him, it was absolutely necessary to restrain the appetite. The young men frequently spent one or two months during the winter in fasting, taking only one meal in the day after sunset. In summer less time was spent, but the fast was more severe; it lasted from two to four and even five days, according to the strength of the individual. On these occasions it was usual for the young men to withdraw from the family residence to a retired spot, under the shade of a tree, where they passed their time in fasting and contemplation. To this spot the mother sometimes repaired with a small bunch of wild, unripe berries, which she suspended from a twig about a foot and a half from the ground, so that the young man might have the poor consolation of fixing his eyes occasionally upon them. The sight of these berries had the effect of watering the mouth in the same way as we feel before tasting any unripe fruit, especially when we have reason to suspect its being sour. The dreams of the last night which terminated their regular fasting days at any time of the year, were considered the most important, and were carefully studied as revelations from the Great Spirit. In the evening small wigwams were put up at a little distance from the family residence, each just big enough for the accommodation of one person. The youths who were practising the rite of fasting had to take up their quarters in these lodges for the night, using, if possible, only new furniture. Next morning it was the duty of the grandmother, or some other elderly female, to visit the young fasters by daylight. The first thing she did was to make a very thin corn soup, or some kind of broth, after which she went to ask them one by one of their dreams. She congratulated those who had favorable dreams upon their good fortune; but for those who had unlucky dreams she threw a piece of fur of some animal on the fire, in order to avert the consequences of such ill-omened visions. The longest fast practised among the Indians lasted ten days, during which time it was indispensable that the candidates for the special honors which it secured should neither taste anything nor sleep. They were made to dance every night, and sometimes were put in small cribs suspended from the ground, which were moved sideways, like a cradle, for the purpose of inducing sleep. Those who yielded, and fell asleep, were dismissed forthwith as unworthy. Most frequently all the candidates failed; but on some rare occasions one or two succeeded in completing the time. Even with these, however, this severe undertaking seems to have exceeded the powers of nature, as those who were successful—though regarded ever after with a certain degree of superstitious veneration—never fully recovered from the effects of it. Besides fasting, the young people had to abstain from certain kinds of animal food, and from certain parts of animals, for instance, the head, the meat near the bone, and the marrow. They were also strictly prohibited from eating blood until after they were married, when they were no longer subject to restraint. Girls were considered marriageable at fifteen, but it was customary for a young man to remain single until he was twenty-five years of age, after which he might take a wife if he liked, or rather if his parents chose.

Young girls when fasting rubbed clay on their temples, whilst the young men partially blackened their faces, or occasionally painted them with one or two other colors. This custom can scarcely fail to recall a similar one recognized among the Jews, as the disfiguring of faces on fasting days is distinctly noticed in the New Testament. Like the Jews, also, the Indians regarded several animals as unfit to be eaten; in fact, they had strong prejudices against their flesh. Among the feathered tribes, I may mention the raven, the crow, the blue jay, the owl, and many others, and amongst quadrupeds the fox, the mink, the wolf, &c.

With regard to matrimonial affairs it may be remarked that the Indians do not seem to have much appreciated what is called "keeping company" nowadays, as the choice of a wife was entirely left to the parents. The young bridegroom may never have seen, spoken to, or been acquainted with the girl until she was introduced to him as his bride. Generally speaking, when the eldest brother died, his younger brother was required to marry his widow; in all other cases it was not thought lucky for a young man to marry a widow; and in case the woman should die first her younger sister had to supply her place, provided the parties were not already married. The degrees of relationship extended a great way among the Indians; and it was prohibited by custom to contract marriage within the forbidden bounds. To give an idea of the operation of this usage, suppose that an Indian A. had a cousin B., the son of A. and the grand-daughter of B. would be placed within the forbidden degrees of kindred, and should marriage take place between the parties, the son of A. would be considered as marrying his niece. In the English language, it has often appeared to me, there is a great want of words to express the various degrees of relationship. Instead of using different words, the Englishman says my first, second, third cousin, and so on. In Indian there are appropriate terms to express the different degrees of consanguinity; even in speaking to, or of, female relatives, the same terms are not used as when speaking of the men.

Another discipline to which the young people were subjected, in addition to that of fasting, constituted a useful training for future life. They were required to bathe at daybreak every morning for about a month in the spring, whilst the water was cold. This was done with a view to render them hardy, robust, and capable of standing all sorts of weather. Unhappily the ancient discipline by which the Indian youths were thus trained to hardihood and self-denial, is no longer practised. It is a matter of regret that the young Indians of the present day have almost entirely lost the virtues of sobriety and self-respect practised by their predecessors. Self-indulgence of the grossest kind has taken the place of self-denial. Too often they frequent the low grog-shop, where they lose all sense of shame, and are rendered mean and beggarly, as well as useless members of society. It is scarcely necessary to remark that there were good speakers among the Indians formerly; but I have too much reason to believe, that there are no such speakers to be found among them at the present day. In my opinion it was chiefly owing to their deep contemplation in their silent retreats in the days of youth, that the old Indian orators acquired the habit of carefully arranging their thoughts; when, instead of the shoutings of drunken companions, they listened to the warbling of birds, whilst the grandeur and the beauties of the forest, the majestic clouds, which appear like mountains of granite floating in the air, the golden tints of a summer evening sky, and all the changes of nature, which then possessed a mysterious significance, combined to furnish ample matter for reflection to the contemplating youth.

Having made these remarks on the youthful training of the Indians, I proceed to speak about their warlike customs, and the regulations by which they were governed in their military expeditions. In the first place it was customary for the warrior who was to be the leader to give a banquet, about six months before, at his lodge, to which those who were to form the expedition were invited. On this occasion they went through the preliminary ceremonies, such as singing songs, inviting the crows to follow and feast upon the bodies of their enemies, walking or dancing around the fire place carrying the head of some animal on their shoulder, and impregnating their food with some sort of powder. Whether this was prepared from root, mineral, or animal substance, I cannot say; but, at any rate, after the food was impregnated with it, by the principal warrior, with strange invocations, great care was taken to prevent women and dogs from tasting it, as it was said to be ruinous to their health. After this feast all remained quiet, and the leader commenced to fast from day to day until the time for their departure arrived. In commencing their journey, if by land, the leader put himself at the head of his party, consisting generally of from thirty to forty warriors. If they had to perform a part of their journey by water, he took his seat about the middle of the canoe, where he had to stand up and sing a war song as they started, with a rattle, or medicine ball, in his right hand, made of hide, about the size of a cricket ball, having a small handle, and containing a few dry bones. When shaken it made a sharp sound, something like the noise of a rattlesnake. From the day of their setting out the war party fasted every day until noon. Their rules of war required them to be in perfect harmony with each other, never to make use of an expression which might wound the feeling of any of their party; and to abstain from all conversation about women and personal enemies at home. They were not to kill a bird, fish, or any other animal, unless required for food. Although the leader was foremost in rank, he had but little to do with the arrangements of the camp or their journey during the day. These were under the management of two other warriors of some experience. They ordered the men to rest when they thought proper, and directed them to proceed again. It was also their duty to remonstrate with the men in the evening, if any difficulty arose during the day. Many of the rules of war were of a singularly arbitrary character, in their minute requirements for averting ill-luck. It was against their rules to sit upon a log when they took rest: every man was obliged to sit upon the ground. If any one took his seat on a log, without thinking, down he went upon his back before he knew where he was, as there were men appointed to the duties of the provost marshal, with strict orders to watch and punish every one they saw transgressing the articles of war. When they came to a fallen tree they might creep under, otherwise they had to go round, as they were not allowed to go over it. They were not to take fuel or bark from the side of a tree in the direction of their journey, but only in the direction where they came from. If, sometimes, on a rainy day, they wished to take the bark from the dry side of a tree that stood towards their journey, one of them took an axe, and two others, each holding a dish filled with mud, the axe-man gave a war-whoop, and all the three ran to the tree, and as he removed the bark with haste, the other two were busily engaged in plastering the stripped portion of the tree with the mud. It was the duty of the cook to give the word to rise by daylight every morning, which all were expected to obey instantly; any man, who thought proper to wait for a second warning, was favored with it by upsetting a kettle full of cold water over his head, when he had to rise, whether he liked or not. Before they set out in the morning they fixed their hair in a military style. In taking their meals they all commenced, and were expected to finish at the same time. On their quitting, the chief's messenger came round with a kettle of cold water, and poured some into the dish of every man. All the meat he found in them he threw towards the direction where they came from the previous day. The expedition was generally accompanied by two magicians, clairvoyants, who were supposed to be acquainted with some secret craft, by means of which, with the assistance of demons, they were enabled to discern objects at the distance of at least a day's journey all around the camp.

The practice of scalping appears to have been adopted in the first instance by the warriors in order to convince their people on their return that they had actually killed the enemy; and, to dispel all doubts, they exhibited the scalps as the best proof of their success. After the war party had accomplished their purpose, the rules were not so strictly observed, and travelling homeward the leader walked behind instead of at the head of his men. If they took any prisoners they generally brought them home, to be put to death afterwards. There were various ways of getting rid of their prisoners. One plan was to make a nest, say about ten feet from the ground, of small sticks, covered with straw. The prisoner was brought to the foot of the tree. If he was a brave warrior he gave a war-whoop, went up and placed himself in the nest. A man of less courage sometimes fainted at the foot of the tree, and the bystanders were obliged to put him in the nest. The next thing was to set fire to the nest, and as it was composed of light materials, when the prisoner fell on the ground, he was only partially burnt; his wrists were then cut about half way, and in that state he was let loose upon the crowd, and it was believed that every one he struck was doomed to die soon. Another way was to dig a hole in the ground about ten feet deep and five paces in diameter, at the bottom of which a large fire was made. In the meantime one of the crowd was sent into the woods to bring in a sapling. This was stripped of its bark and laid across the crater. The prisoner was then ordered to walk upon it, if he missed his steps he was of course plunged at once into the fiery gulf beneath his feet; but if he succeeded in reaching the other side he was immediately liberated, admitted into the community, and was from that time considered as a member of the tribe.

As to their secret societies, I believe it has been remarked by some American writer, in speaking of the Rocky Mountain tribes, that there are freemasons to be found among the Indians. I am aware that there were, and there are still, among the Pagan Indians, secret societies; but I am not informed of the particular objects of any of them. One of these societies is called "*Wahbahnoowin,*" a word signifying the east; and it would appear, from what has transpired of their proceedings, that they had something to do with fire. It was asserted that the *Wahbahoog*, when fully instructed in the secrets of their order, could hold a burning coal in their hands, or plunge their fingers into boiling water, without receiving any injury; that it was one of their ceremonies to introduce red hot stones into their temporary wigwam, and pour water upon them, for the purpose of enjoying the steam, the heat of which was enough, it is said, to suffocate any one not used to such operations.

Another system was called *Tchissahkiwin*, and another *Gosahbahndahnwin*. But the most important society was called *Medaowin*. Although there might be members throughout the whole tribe, still each particular lodge or section consisted of eight brothers or members. Its votaries had some secret to keep; and they were said to have secret signs and words which no one could understand but themselves. There is no doubt that they practised great deceptions upon the multitude. Still the old members were feared, as they were believed to be well acquainted with the mysteries of their order, which knowledge furnished them with means of getting rid of their private enemies whenever they pleased. Of their proceedings in their assemblies, at which only members were allowed to be present, I believe nothing was known positively. But in their open assemblies, which took place in a large wigwam, and sometimes in the open air, they went through some of the ceremonies. If in the open air, the place for operations was about fifty feet long, and about fifteen broad, around which the members sat dressed in their fineries, each holding in his hand some stuffed animal. Whilst some of them kept dancing in the middle, the old fellows ran round the space, holding before them stuffed birds or other animals. From the appearance of some of these articles they may have been handed down through successive generations among the forefathers of the performers. Many of the quadrupeds had scarcely any hairs upon them, and the birds were quite destitute of feathers. Yet the excitement became so great during the ceremonies that many of them, as it appeared to the onlookers, began to revive, and the bystanders could plainly hear the squeaking of the hawk and the whistling of the otter. The *medawahg* sometimes put small bones in the mouths of their animals, and shot them into the mouth of one of their brothers, or into that of some spectator. These and other performances were looked upon as great wonders by the uninitiated.

But, unfortunately for the brotherhood, in course of time, the unconquerable industry of the curious succeeded in discovering the secret which caused the animals to revive and sing. This was none other than a small whistle, so fixed in the stuffed animal as to send forth noise through the mouth when pressed between the fingers and the thumb. But the trick of making bones fly in any required direction, though seemingly more simple, was never fully detected. Some pretended it was done by the influence of a powerful medicinal root, perhaps mineral, which possessed the property of driving out with force any small substance when brought into contact with it. It was reported that when the *medawahg* of a particular section got rid of a personal enemy, one of them visited the grave on the eighth night, disguised as a wolf or bear, dug up the body, cut off one of the little toes, the little fingers, and the tongue, and also took out the heart. At their next meeting the tongue was divided into eight shares, and eaten by the brothers. The other parts they made use of in preparing their medicine and deleterious drugs. The practice of mutilating their victims has been proved by examining the body, when there were strong grounds of suspicion of foul play, and by relatives occasionally inflicting a deadly wound upon the Meda, whilst in the very act of mutilating the dead. It has been noted as somewhat strange that he always managed to get home before he expired.

Notwithstanding their imperfect idea about the future world, the Indians believed in the existence of the soul, and there are words in their language signifying "resurrection" from the dead. They also believed that there was a place in the west, — a place of delightful climate, having beautiful trees, flowery meadows, limpid streams, and rich hunting grounds, where the virtuous people went after death to enjoy the good things of the land. There they had nothing to do but to amuse themselves in the midst of plenty. From this region the wicked were excluded. They had to wander about this world in poverty and misery ; but, in order to gratify their unrelenting malignity, they were sometimes transformed into mosquitoes, or other noxious insects, that they might annoy the living, as it was their pleasure to do in their own lifetime. I think, also, there is a shadow of the doctrine of transmigration in some of their ideas. They thought that the dead could partake of the good things of this world. Hence some were in the habit of throwing meat, sugar, or pouring whisky in the fire for their departed friends.

Some of my readers are no doubt aware that *Manido* is the term applied by the Indians to a superhuman being; but more especially to the Supreme Being. The last syllable of this word should be "*do*," not "*to*." If the vowels are pronounced according to the English alphabet it would be necessary to write the word *Mah-ni-do*, in order to enable any English reader to pronounce it properly. In adopting the French pronounciation of the vowels it is not, of course, necessary to make use of "h" in writing the word, and it would be *Ma-ni-do*. The English word "God," I believe, signifies "good." But our Indian word "*Manido*," denotes terror and irresistible power. And it appears to me rather a remarkable circumstance, by no means to be overlooked by the inquirer into the origin of the Indians of this continent, that the Seiks in the northern part of Hindostan, — in fact, all the Hindoos, if I am not mistaken, — call their Supreme God, *Mahadeo*, when viewed in the light of Destroyer. That these two important words, *Mahnido* and *Mahadeo*, should resemble each other in sound and in signification, is, in my humble opinion, not altogether the result of chance.

I would further state that I have often been asked by white people to explain the meaning of the word *Manitoulin*, the name of the large island on the north-west side of Lake Huron, and said to be so called by the Indians, according to geographical writers. As far as I know, there is no such word in the languages spoken by the Odahwahs, Ojibwas, or any of the surrounding tribes. *Manitoulin* may be a Huron word: but, not being acquainted with the Mohawk, which, I understand nearly resembles the Huron or Iroquois language, I cannot say positively, but so far as I can see by their alphabet, and printed books in their language, they never make use of the letter L, which is also wanting in the Odahwah and Ojibwa alphabet, besides F, R, V, and X. It is true there is a bay towards the south-east end of this island which we call *Manidowaning*. Of the meaning of the word *Manido* I have already endeavored to give an idea. The other part of the word, viz. *waning*, signifies a hollow or cavern, because there is a certain part of the bay of which the Indians say they never could find the bottom. They often made the trial in winter, by letting down their decoy fish, — which is made of wood and loaded with lead, so as to cause it to sink, — to reach the bottom of this mysterious abyss; and in accordance with their simple ideas they thought it was a hollow, inhabited by some Manido or sea-god. From this circumstance they called that particular spot *Manidowaning*, which name was afterwards applied to the bay itself. Had the island been called Manido Island, the name would be perfectly intelligible, and in my opinion it was so called originally by the white people; but the word Island was afterwards contracted into the syllable "*lin*," and by adding another island after it, the name was completed, and rendered more harmonious by the intrusion of consonants between the initial letter of the second word and the final vowel of the first.

The Indian name of this Island is *Odahwah-minis*, that is to say, Odahwah Island, because it was occupied by the Odahwah Indians about the time that America was discovered in the fifteenth century; and according to their tradition, it was from this place the tribe sent a party of their warriors to Montreal, when they heard that extraordinary people had arrived at that place, who had many things to sell, for all who wished to trade with them. When the party came back, their canoes were loaded with all kinds of articles they got from the French, or *Wamitikgoshe*, as they called the first white people they met with, from the circumstance of their keeping their things in wooden boxes. The word *Wamitikgoshe* is applied to all white people, but more particularly to the French. It is derived from "*mitig*," a tree, or a piece of wood, and "*wahsh*," a hole in the ground where foxes burrow or squirrels deposit their provisions. So the first Indian visitors to the French, in endeavoring to give a description of the people they saw, on their return, explained that the wonderful beings they met with, kept their goods and provisions in hollow places, but instead of digging holes in the ground like squirrels, they took the trouble to put several pieces of wood together, in the shape of a hollow tree sometimes, fastened with hoops, where they kept their provisions. The Odahwahs continued to reside on this island until they conquered the *Mushkodenj*. Why they attacked that tribe I will explain in a few words. The Odahwahs were at war with the Winibigoes at that time, who then occupied the region north-west of Lake Michigan. One time they were unfortunate, and on their way home they called at the Mushkodenj village, and, as it was customary, they sang a mournful song as they approached the village, to let the people know that they had been defeated. Some thoughtless youth, when he heard them sing, called out that they were served right, they had no business to go to the place where they had been defeated. These words went to the heart of the leader. They landed and enjoyed the hospi tality of their friends for two or three days, then proceeded homeward. When the war chief got home he told secretly to a few of the chiefs what had occurred at the Mushkodenj village. They labored together until they gained a majority of the war chiefs to their side. They then informed the whole tribe of their determination to make war upon the Mushkodenj in the following summer. The Civil Chiefs did everything in their power to prevent the war, but their efforts were useless. The Odahwahs have never relinquished their claim to Manitoulin Island, and their right has been always acknowledged by other Indians. It will, therefore, be easily understood why a portion of them removed to that Island, the h·me of their ancestors, when their territory was sold to the Government of the United States. There is a branch of the Indian Department on the west side of the Manidowaning Bay, established about twenty years ago, it is said for the purpose of promoting civilization, education, and industry among the Indians; but, in consequence of a blunder made at the very commencement, it was apprehended by impartial observers that it would not be attended with success, and I understand the establishment has almost entirely failed in its object.

Saugeen, or Suggeen, as some people would have it, I believe, professes to be an Indian word. If so, in order to make sense of it, the letter *g* should be added at the end of the word, and it would be more proper to write and spell the name *S a h g i n g*, and the length of its pronunciation should be about the same as that of the word "sea-king." It may be rendered in English, the "outlet," or the "mouth of a river," though it is not the correct translation. The word is derived from *Sahkum*, which in Odahwah signifies to come out. In Ojibwa the *k* is changed into *g*, and another syllable added, and the word is written and pronounced *Sahgahum*. *Sahging* is a participial noun, and implies motion as well as an open space, and every river has its *sahging*, or outlet.

The word Nottawasaga should be written *Nahdowa-Sahging*. It is a compound word and means a place where the *Nahdowag*, viz. the Mohawks or Iroquois used to come out. The Odahwahs were also at war with the Nahdowag or Iroquois during their stay at Manitoulin Island, and the Nahdowag, in their hostile expedition against the Islanders, used to go out into Lake Huron or Georgian Bay, by the

Nahdowa Sahgi-River, until they got two or three severe defeats in the vicinity of the Blue Mountains, by Sahgimah, the most celebrated warrior of the Odahwahs at that time. Instead of waiting for the Mohawks at the Island, he used to come and meet them at the Blue Mountains, hence that place is called to this very day, *Sahgimah Odahkahwahbewin*, viz., Sahgimah's watching place. The last time he met the enemy there he found them occupying his watching place. In the evening he went to view their camp alone, he saw their arms piled about the camp as if they suspected no danger, whilst their warriors were feasting and dancing. He then went for his men, and on his return he found the Mohawks had retired to rest. Having placed his men in order, ready for attack, he entered the camp alone, and removed the arms of the slumbering enemy. The Mohawks being without arms were, of course, slaughtered, except a few who were spared on purpose. The Odahwahs cut off the heads of the slain, and fixed them on poles, with the faces turned towards the Lake. Sahgimah then selected a canoe, which he loaded with goods, provisions, and ammunition, put the survivors in and told them to go home and never to come there again; he also desired them to say when they got home that they had met Sahgimah on the top of the Blue Mountains, where he fixed the heads of their companions on poles, with the faces turned towards the Lake, and that he declared his determination to fix in a similar manner, the head of every Mohawk that he might fall in with in that quarter.

SCALE FOR THE COMPUTATION OF AREAS OF IRREGULAR FIGURES.

BY THOMAS HECTOR, C. E.

Read before the Canadian Institute, January 30th, 1858.

Having been frequently called upon in the routine of that branch of the Crown Lands Office to which I belonged in the year 1842, to calculate the quantities of land contained in irregular figures, it struck me that a set of transparent scales subdivided into parallelograms and squares, accurately framed, to correspond with the usual scales upon which the Government maps are drawn, would facilitate the operation of computation, and be much less liable to inaccuracy. I drew the scales upon tissue paper, and laying them over the island or broken frontage, of which the contents were required, I had only to count the acres covered by the squares, adding parts of acres where the lines intersected the squares.

Long use of this instrument has proved not only to myself but to others in the office, that the eye in judging of the parts of acres, in this method, is more to be relied upon than in the usual manner of computation by square and compass.

I am induced to lay this communication before the Canadian Institute for the purpose of its being more generally known, as I believe it would be found highly useful to engineers and surveyors in their general operations; and I am led to think that the idea has not occurred to others from the fact, that upon sending to New York and subsequently to England, for the purpose of the scales being made in horn, it was not without difficulty that the execution of the order was obtained. A short time, since a gentleman who has attained to very high honors in the Mathematical sciences in Paris, M. Coulon, informed me that the head engineers in France verify the calculation of the area of irregular figures, by cutting out the figures in paper of a known weight. He at once admitted the superiority of this scale, both in accuracy and celerity of calculation.

I have lately been informed that all the computations of irregular figures in the surveying and drawing branch of the Crown Lands Department have been effected, for some years past, through the instrumentality of this scale.

Since offering this communication to the Institute, it has been stated to me, for the first time, that a similar instrument to that which forms the subject of this paper was, about thirty or forty years since, used in the Government trigonometrical survey of Ireland.

But I have yet to learn that it is now in general use, notwithstanding its great advantages: the law for its construction allowing of illimitable enlargement and divisibility in regard to scale.

CONSIDERATIONS RESPECTING ANOMALOUS VEGETABLE STRUCTURES.

BY REV. WILLIAM HINCKS, F. L. S.

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Read before the Canadian Institute, March 6th, 1858.

The rational interest belonging to the abnormal forms which occasionally offer themselves to our notice in the vegetable kingdom, and the possibility of applying them to the detection or illustration of important general principles are now generally recognized, and we could scarcely open any recent Botanical work without finding some attention bestowed upon the subject; yet it appears to me that justice has hardly been done to it, either by the simplicity and clearness of its treatment, or by exhibiting it as affording one of the most striking and attractive aspects of Botanical science. Having had my thoughts turned to the subject, soon after it was first brought into notice; having diligently collected vegetable anomalies for a series of years, and having at one time possessed a very remarkable assemblage of them, some of which I have from time to time described in communications to the British Association and the Linnæan Society, I propose to lay before the Institute a summary of the results of my studies in this department. I have not neglected any aids to be derived from the labors of others, but I have endeavoured to look into nature for myself, and to form my conclusions by careful induction from recorded and observed facts. Some little novelty there may be both in my method of treatment and in the theories proposed, and where I agree most closely with others, I do so as one who has watched the progress of opinion on these points almost from the beginning. I have collected evidence for myself as well as weighed what was produced by others, and rest my belief on my own acquaintance with the facts, not on any authority howevever respectable.

All intelligent study of abnormal structures proceeds on the assumption that they are not mere random and insulated facts, but exemplify the operation of some force or tendency which belongs to the being, and is constantly active, but in ordinary cases is either kept in check by other influences, or allowed to manifest itself more fully than in the special instance. Hence the anomaly is not unmeaning, but may be made to unfold a hidden truth respecting the parts, at least rudimentally, present in a particular structure, or an important general law respecting the influences which modify outward forms, and the circumstances which are common to them through all variations.

Every specific type essentially consists in a certain association of organs, constructed on a fixed plan, disposed in a definite order, nourished equally or unequally, as the case may be, and subject to different degrees of pressure on each other from causes which can, often at least, be understood. Such elements, as the number of *phytons*—whether one or two—forming the plant, the mode of provision for its early nourishment, with or without albumen in the seed, the natural order of the leaves, their peculiar *venation*, and mode of folding in the bud, with the consequences of these, are constant and unchangeable, but it is easy to conceive that from abundance or deficiency of nutriment, and from various causes, internal as well as external, the equal development of the organs, and their nearness to each other may be greatly affected. Now we certainly know that parts greatly deficient in nutriment although rudimentally present, remain undeveloped and are either not seen at all or present an altered appearance, and we know that whenever two vegetable organs are brought close together, whether at their edges or by their whole surfaces, they become connected by cellular tissue so as to form apparently one part. Again, the whole of every vascular plant is made up of root, stem and leaves, with their modifications. Flowers are only buds in which the internodes are suppressed and the leaves are developed in a peculiar manner to suit a special function. As therefore, in a great many plants the extent to which leaves continue to be produced from one bud is uncertain, we see the reason why the number of circles of parts in a flower may vary, and it is obvious that increased or diminished pressure of the circles on each other must affect both their magnitude and their connection or separation, whilst peculiar pressure must tend to reduce the number of parts in a circle, and an unequal distribution of the nutriment to enlarge some at the expense of others. There are cases in which two or more buds originating near each other may be united from their first production, and have their parts combined so as to produce a composite branch or flower, the cause being the same which produces the coherence of adjoining organs in one circle of a flower. The distinction between the several parts of a flower is only a difference of development, every leaf being in its origin capable of assuming any of the forms. Of course when the whole or any portion of one circle of parts assumes a different character from that which it usually presents in the species an anomaly or monstrosity is produced. These principles will, I believe, be found sufficient for the explanation of all vegetable anomalies excepting those of colour, which are as yet imperfectly understood, and they show that all, however apparently differing, amount to variations of development of the organs belonging to the specific type, there being a tendency characteristic of the species to full or diminished, to equal or unequal development, and the anomaly being an alteration in the individual case from some cause acting peculiarly upon it. Sometimes we perceive the cause, frequently it is hidden from our view, and we only know it by its effect, but a little experience guides us safely in its determination. In an earlier state of the science abnormal forms either only excited a vague wonder, or were even regarded with some dislike as interfering with the characters of species or the rules laid down for their examination, whilst the fondness of mere cultivators for some of them on account of their rarity or beauty was considered as a proof of their ignorance. Yet no objects can be contemplated more rich in instruction, more fruitful of suggestions for improving our acquaintance with the real structure of plants than these occasional deviations from their natural characters. We inquire what the change really is which has taken place, and how it may be brought within the range of a law as real and as uniform as those on which the ordinary appearance depends, but usually less exposed to our observation and therefore the more interesting. Take for example the case, of not very uncommon occurrence in cultivation, of a Fuchsia, whose regular number of parts in the flower is four in each circle, being found to have five parts in each. We readily apprehend that an unusual supply of nutriment has produced the phenomenon, but how or why? Is number in the circles of flowers variable without rule, or would the abundance of nutriment cause the production of additional parts having no relation to the symmetry of the flower? All our experience is against such suppositions. Let us, however, recollect that five is the normal number of parts in each circle in Exogenous plants, and that when in such plants the number four or a less number habitually occurs, botanists attribute the reduction to a degree of pressure causing abortion of one or more parts rudimentally existing. We might then confidently anticipate that in a regular flower with only one part deficient an increased supply of nutriment would sometimes restore the missing part as well as enlarge the others, and the law of alternation being constant in such structures as this, we should expect that one circle having five parts all the others would follow the same rule. Thus, the anomaly is an illustration and confirmation of a law, known by other means and of essential importance for the right understanding of the plan of a flower.

For affording striking proofs of the general laws of structure, for overcoming peculiar difficulties attending the explanation of particular cases, and, with the aid of the study of embryonic development, and of the homologous parts of other, more especially of kindred, species, for unfolding obscure, but most interesting theoretic principles, we have no method so efficient as the study of anomalies; and it is not too much to say that much of the philosophic interest communicated to botanical science of late years is derived from it. The variety of anomalous forms is so great, that without a clear arrangement, we cannot hope to take a comprehensive view of their nature, and the applications of which they are susceptible. In conformity with the views I have given of the causes of anomalous developments, I think they may all be reduced to three classes, the first consisting of cases in which the development is diminished, the second of those in which it is increased, and the third, of those in which its direction is altered; a fourth class would include those which depend on internal changes in the contents of the cells, producing unusual modifications of colour, but these I shall not further notice at present. The first class may be subdivided into 1. Suppression of organs, 2. Degenerescent transformations, and 3. Separations of parts. In the second class we have, 1. Reappearances of parts rudimentally existing, but which are normally suppressed in the species; 2. Comparative enlargement of particular circles; 3. Transformations due to increased development; 4. Coherences and adherences; 5. Multiplication of circles; 6. Production of extraneous appendages to particular organs. In the third class we have: 1. Cases of irregularity where the usual structure is regular; 2. Cases of return to regularity in species usually irregular. All these secondary divisions may be further subdivided according to the part affected, and we have thus a view of the whole subject, exhausting the possible cases, and presenting them in an order of mutual relation such that the mere reference of each case to its proper position implies the attainment of much valuable knowledge.

To give by description and figures examples of each class and subdivision would occupy too great space, without the objects brought forward being generally new. I rather select a few examples illustrative of the importance of anomalies in suggesting or confirming theoretical truths, or explanations of structures otherwise unintelligible.

The difference between regular and irregular flowers was once thought much more fundamental than it is now known to be. The study of abnormal examples aided by the consideration of analogies, has opened to us the true view of the subject. Thus I cultivated for years a variety of the checkered tulip (Fritillaria meleagris), which instead of the regular bell usually presented by the flower, had the stamens declinate, and the perigonium with one piece above two pairs lateral, much modified in size, and one piece below, so as to approach the shape of the flower of the Jacobæan lily; finally, the rich soil of the garden caused the bulbs to produce flowers of the ordinary type. It is very common for particular flowers of Pelargonium, (the greenhouse geranium,) whose flowers are known to be usually irregular, to return to the regular type, thus losing the peculiarly coloured upper petals and the nectariferous tube attached to the pedicel, and, instead of the seven unequal stamens usually seen, perfecting ten equal stamens, as is done by an ordinary wild geranium. Again, Linaria or toad-flax presents a remarkably irregular flower, the stamens being in two pairs, as in the Linnæan class Didynamia, the corolla forming two lips, in the manner termed personate, and the lower part having a single pointed tail, but there is a well known variety of this flower, called by Linnæus, peloria, (the wonder) in which the corolla is regular with five equal parts, has five smaller tails, and contains five equal stamens. I have had in my own possession peloria varieties of several species of Linaria, and in one instance the compound spike of flowers had all the terminal flowers peloria, the lateral ones of the usual irregular structure, obviously because the terminal flower, was favourably situated for the fullest and most equable nourishment. I may with advantage refer to one other example, interesting from the unusual character of the deviation. We all know the remarkable irregularity of the flowers of the orchis tribe, in which only one of the stamens is perfected, and that in close adherence on the column formed by the united styles, and one of the petals called the lip, receives a remarkable development, often assuming very fantastic forms. Now there has been a case described and figured by Richard of a flower of Orchis mascula, which was actually completely regular, with three equal petals, three stamens bearing anthers, and the whole flower symmetrical and perfect, as complete an interpretation of the meaning of irregularity as could well be conceived of. These facts are sufficient, without my dwelling on a series of curious analogies, to prove that regular and irregular flowers differ only in the equal or unequal distribution of the nutriment, as affected by internal or external causes, and that while some natural families have an exceedingly strong tendency to irregularity, and others hardly ever indulge in it, there are some of intermediate character, in which a change is easily effected, and abnormal conditions often occur, fully explaining the nature of the phenomenon.

The origin of all the parts which unite to form the flower from leaves is now a well established principle, and the student is from the first led to regard a flower as a bud modified as to its mode of development, in order to its application to a special purpose; but abnormal examples, in which all the floral circles are converted one into another and to leaves, afford the readiest and most convincing proofs of the principle, and illustrate it most pleasingly.

I have had an anomaly in which the leaves were half transformed into the several floral organs irregularly intermixed, carpels being formed near the exterior. I have had cases of the whole of the floral circles being converted into leaves while retaining their position in crowded circles; I have had petals changed into stamens, as well as stamens into petals, and exhibiting all intermediate states; I have had stamens with imperfect anthers at their sides, terminating in a true stigma, and enlarged below for the production of germs, carpels changed into green leaves, and into petaloid processes; I have had abnormal approaches of ordinary leaves to the figure of a carpel, and the production of germs; and finally, instances of growing buds in the axes of the petals, and various degrees of elongation of the axis between the circles, and of its passing on to produce leaves and buds beyond the flower. Such a series of examples establishes beyond question the whole theory of the floral organs.

I have referred without hesitation to the principle as being well established, that organs, distinct in their origin and perhaps in their functions, when brought near each other, either by their margins or their surfaces, will unite so as to assume the appearance of a single organ. This explains the nature of such flowers as convolvulus, campanula, and innumerable others, as well as of such fruits as the apple, orange, &c., hence the old terms *monophyllous* calyx, *monopetalous* corolla, are discarded by all accurate botanists, as conveying a wrong idea. De Candolle has proposed *gamosepalous* and *gamopetalous*, as terms to take the place of these. I prefer, as simpler and more directly conveying the idea, *synsepalous*, *synpetalous*, *syncarpellous*. But, however well established the theory of coherence of parts may be, it will not be uninteresting to refer to some of its proofs afforded by anomalies, some of these common enough, others of rare occurrence. There can be no proof of the nature of a synpetalous corolla equal to that of our occasionally seeing it resolved into its several parts. Observation on the different degrees of the union in different flowers will go far, but there is no resisting the sight at one time of a Convolvulus, at another of a Campanula with five distinct petals; yet both of these have occurred to myself, as well as various incidental connections in the foliage. Among the latter, one deserving of notice occurred in a coherence of two leaves, normally alternate, but in this case becoming *opposite, of Polygonatium multiflorum* (the *common Solomon's* seal) which together formed a sort of bag around the stem, so checking the further growth that only a feeble shoot protruded at the narrow opening, a bent and contracted portion being easily traced within the bag. Another instance may admit of useful application. It occurred in the common tulip, the usual leaf on the stem cohering by its edges so as to envelope the flower completely. With the progress of growth the force of vegetation directed upward burst the enveloping leaf as completely as if it had been horizontally cut by artificial means, carrying with it the upper portion like an extinguisher over the flower, and leaving the lower as a cup-shaped leaf surrounding the stem. Whether the upper piece would have stifled the flower, or the latter would have finally burst it open and thrown it off cannot be known, as I was so fortunate as in this condition to obtain possession of the specimen. It beautifully illustrated the nature of the calyx of Eschscholtzia, in which it is a union of *two* sepals, and in Eucalyptus in which it is composed of *five*; it explains likewise, the calyptra of mosses, and perhaps the opening of the fruit in Anagallis and Lecythis. Its application in the latter case depends on the assumption that the central column retains its power of progressive growth after the outer wall of the capsule which has the calyx adherent on the carpels has lost it. In this case the force of vegetation must produce a horizontal separation exactly in the place where it actually occurs.

I shall only add one other illustration at present. It is received as a principle, that though modified in particular instances, by effect of pressure or irregularity, the number three prevails in the circles of parts of monocotyledonous or endogenous plants; five in those of dicotyledonous or exogenous plants. Some learned botanists contend that the monocotyledonous structure proceeds from a single plant element (named a phyton), whilst two of these are combined in the dycotyledonous structure. Assuming this view, which is highly reasonable and probable, an observation made on a series of abnormal forms enables me to give a reason for the curious numerical relation in the circles of parts in the two great series of plants, already as a fact determined by observation. If each phyton tends to produce circles of three, and two are combined in the dycotyledonous plant, we consider that there are six parts to be accounted for in each circle of a dycotyledon, and we ask for an explanation of the actual number being only five. I have examined a great many cases of two, and one of even four flowers so adhering together as to become one, and attending particularly to the number of parts in the circles, as compared with that of a single flower of the kind, I have found occasionally under peculiar pressure two parts lost in the union, one at each point of junction, but much more usually, so as to give a general rule, one part lost in each united circle. Thus, in monstrous Irises formed by a union of two flowers, five parts appear in all the circles, or reduced to four in the inner circle of the perigonium; in monstrous Oenotheras, there are found seven parts each in the calyx, corolla and carpels, and fourteen in the stamens. If then the natural course is for a union of two circles into one, to be accompanied by the extinction of one part, we at once derive from the union of two phytons, each giving three parts to a circle, the number five, as the normal number for dicotyledonous plants, while the occasional loss of two parts in the united circle, under greater pressure, explains the commonness of the number four in this class of plants. Hence, the number of parts characteristic of the great divisions of the vegetable kingdom, is no longer a mere empyrical observation, but a principle traced to its cause, and accompanied in its announcement by a rational explanation. I am withheld by the fear of occupying undue space from extending these remarks, which I can only state are few and short, compared with the materials which present themselves.

NOTE ON EUCLID, PROPOSITION 5, BOOK I.

BY REV. E. K. KENDALL, B. A.
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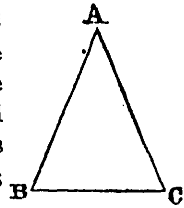
Read before the Canadian Institute, 20th February, 1858.

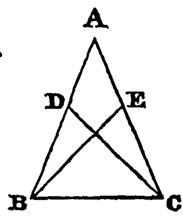
The 5th proposition, proving the equality of the angles at the base of an isosceles triangle, admits of the following immediate deduction as a corollary to the 4th proposition.



Let A B C be a triangle having the side A B equal to the side A C. Then the angle A B C shall be equal to the angle A C B. For because A B is equal to A C, the two sides B A, A C are equal to the two, C A, A B, each to each, and they contain a common angle; therefore the angles are equal to which the equal sides are opposite; therefore A B C is equal to A C B. Q. E. D.

The only objection which I can imagine to be raised against this proof is that we cannot compare a triangle with itself by superposition, and consequently this method of demonstration is a departure from Euclid's *method.* For of necessity the question could only be one of *method* not of abstract truth.

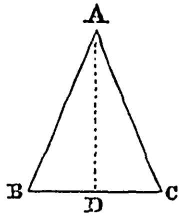
I would submit that Euclid himself by no means restricts the application of the 4th proposition to triangles capable of superposition, in fact the ordinary proof twice compares triangles having a *common part,* and which could not possibly be superimposed, and propositions 6 and 7, &c. afford instances of the same—proposition VI a remarkable one.



The demonstration given above is a particular case of one given by Proclus in his commentary, he takes the points D E in A B, A C, and the proof follows the same order as that given by Euclid. It will be at once evident that if D and E coincide with A, the angles A C D, A B E vanish, and it is no more a departure from Euclid's method to prove the equality of A B C to A C B than of E B C to D C B since the triangles D B C, E C B could not be proved equal by superposition; or more simply still we may consider it to be what both Euclid's and Proclus' constructions become when D, E are coincident with B, C. Not that we are to suppose that they anticipated any such pushing of their constructions to the limit, all we wish to infer is, that *they considered their case proved whenever they had two respectively equal sides containing equal or common angles,* whether these sides could be superimposed as in proposition IV or not, as in most other cases.

The following elegant proof of the proposition, which is *logically* true, is liable to serious objections as a real departure from Euclid's method. I know not to whom it was originally due, but it is published in a slightly different form in the edition of Euclid in Messrs.

Chambers' course. Whether it be possible or not, imagine a line drawn bisecting the angle A, then applying the 4th proposition to the triangles B A D, C A D, the angle B is at once shewn equal to the angle C. But the equality of B to C does not in the least depend on the possibility of drawing A D, and it would be just as much equal if A D were erased, i. e., if it had not been drawn.



This proof could not be admitted because Euclid commences with three postulates, and does not allow any line to be drawn, or supposed drawn, without having two points to draw it through. Another proof also published by Messrs. Chambers, is obtained by imagining another triangle equal in all respects to be compared with the original one, but this also is not admissible, because we have as yet no means of drawing such triangle; if, however we consider such triangle to be merely a *back view* of the original one, or the hole out of which the triangle has been cut, there may be no objection to it as a *proof*, although as a *method* we prefer the demonstration given above, which does not involve rotation or other mechanical artifice, or effecting of geometrical construction in a manner not admitted by Euclid.

REVIEWS.

Geological Survey of Canada. Report of progress for the years 1853-54-55-56. Printed by order of the Legislative Assembly: John Lovell: Toronto, 1858.

Notwithstanding the dearth of dramatic incidents and matters of striking or adventitious interest connected with the Province during the last ten years, it is patent to all who have reflected upon the subject, that a much larger share of European thought has been accorded to Canada during that period, than at any previous epoch within the present century. This, of course, has arisen from a combination of various causes; but amongst these, it may be safely asserted, that the labors of our Geological Survey have played no unimportant part. The references that have been made to these labors by various leading authors in Great Britain, France and Germany, more especially, and the extracts and quotations from the Reports which one continually sees both in home and foreign journals, are sufficient to establish this, without allusion to the place of honor held by Canada in the great exhibitions of London and Paris: a place, be it remembered, mainly due to the merit of her mineral collections as developed by Sir William Logan and his able coadjutors. Owing to the pressure of extraneous work, occasioned by the engagements of the Director of the Survey in connexion with the more recent of these exhibitions, the Reports of four years (1853–54–55–56) are published collectively in the present volume. The Report for 1857, we are glad to learn, is already in the printers' hands, and will shortly be issued. The goodly volume before us, containing five hundred pages of closely printed matter, comprises a long Report from Sir William Logan; four Reports from Mr. Murray, accompanied by a collection of large and carefully constructed maps; valuable Reports from Mr. Richardson and Mr. Billings; and four Reports of much interest from Mr. Hunt.

The report of Sir William Logan relates chiefly to the distribution of the crystalline limestones in the Laurentian Rocks of Grenville, Harrington, Wentworth, Chatham, and some adjacent townships. The accurate delineation of these limestone bands is not only of importance in an agricultural and economic point of view, but it is also of essential moment in enabling us to obtain a correct knowledge of the structural peculiarities of Laurentian districts in general. As Sir William observes, "the Laurentian rocks, stretching on the north side of the St. Lawrence, from Labrador to Lake Superior, occupy by far the larger share of Canada; and they have been described in former Reports as sedimentary deposits in an altered condition, consisting of gneiss interstratified with important bands of crystalline limestone. The gneiss proper, when it approaches the surface, yields but an indifferent soil, while the soil derived from the limestones, which are usually in a disintegrated condition, is of a most fruitful description. The farms which have been established on the Laurentian formation, run almost wholly on the limestones and their associated strata, and afford a pretty distinct proof that the distribution of these calcareous bands being once known, it would not be difficult to determine in what direction it would be most judicious to push settlement. It is also in contact with these limestones, or near them, that the iron ores are found, which so prominently characterise the Laurentian series, as well as the lead-bearing veins belonging to it; and as the limestones possess external and internal characters which render them more conspicuously distinct from the gneiss than any of the component members of the gneiss are from one another, they afford the least difficult means of tracing out the physical structure of the Laurentide district."

The more important details of this Report, have already appeared in the *Canadian Journal*, in the form of separate papers communicated by Sir William Logan ; * but the following additional remarks on the economic capabilities of the limestones and lime feldspars of the gneissoid rocks, will be read with much interest:

The crystalline limestones of the Laurentian series are quite as good for all the economic purposes to which carbonate of lime is applied, as the earthy limestones of the fossiliferous formations. It is from the latter, however, that is obtained nine-tenths of the material used throughout the country, for the very good reason that more than nine-tenths of the works of construction, both public and private, are raised upon the fossiliferous rocks, and for such present works, these rocks therefore afford the nearest sources of supply. Thus the inhabitants are well acquainted with the aspect of the fossiliferous limestones, and can easily recognise them, but very few of them understand the nature of the highly crystalline calcareous beds of the Laurentian series. Hence it is that settlers in the back townships, who have dwelt many years upon these rocks, have been accustomed, when in want of lime for the manufacture of potash, or the construction of their chimneys, to send to the fossiliferous deposits for it—the distance being sometimes thirty miles—when it might have been obtained at their own doors. In following out the calcareous bands of the gneiss district, in 1853, therefore, especial pains were taken to point out their character to the settlers, whereever exposures were met with; and in visiting some of the same localities last season, I had the satisfaction of finding lime-kilns erected, and lime burnt in four of them.

The fossiliferous rocks, in a large part of Canada, maintaining an attitude approaching horizontality, give a much more even surface than the corrugated series coming from beneath them, and this, combined with a generally good soil, renders them more favorable for agricultural purposes. It is over them, too, that the River St. Lawrence maintains its course, affording an unrivalled means of exit for the produce of the land, and of entrance for the materials that are to be received in exchange. It is only a natural result of these conditions that the area supported by the fossiliferous rocks should be the first settled. This area, however, constitutes only between 60,000 and 80,000 square miles, while the whole superficies of Canada comprehends 330,000 square miles, or about five times the amount.

Four-fifths of Canada thus stand upon the lower unfossiliferous rocks, and it becomes a question of some importance, before it has been extensively tested by agricultural experiments, to know what support this large area may offer to an agricultural population. An undulating surface, derived from the contorted condition of the strata on which it rests, will more or less prevail over the whole of this region; but the quality of its soil will depend on the character of the rocks from which it is derived.

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* See ante, Vol. II. p. 439, Vol. III. pp. 1, 107.

These rocks, as a whole, have very generally been called granite, by those travellers who with little more than casual observation have described them, without reference to geological considerations. The ruins of granite are known to constitute an indifferent soil from their deficiency in lime, and hence an unfavorable impression is produced in respect to the agricultural capabilities of any extended area, when it is called granitic. Such soils are however never wanting in those essential elements the alkalies, which are abundant in the feldspars of the granite.

In the Reports of the Survey, the Laurentian rocks have been described in general terms as gneiss, interstratified with important masses of crystalline limestone. The term gneiss, strictly defined, signifies a granite with its elements, quartz, feldspar and mica, arranged in parallel planes, and containing a larger amount of mica than ordinary granite possesses, giving to the rock a schistose or lamellar structure. When hornblende instead of mica is associated with quartz and feldspar, the rock is termed syenite, but as there is no distinct specific single name for a rock containing these elements in a lamellar arrangement, it receives the appellation of syenitic gneiss.

Gneiss rock then becomes divided into two kinds, granitic and syenitic gneiss, and the word gneiss would thus appear rather to indicate the lamellar arrangement than the mineral composition. Granitic and syenitic gneiss were the terms applied to these rocks in the first Reports; but as granite and syenite are considered rocks of igneous origin, and the epithets derived from them might be supposed to have a theoretical reference to such an origin of the gneiss, while at the same time it appears to me that the Laurentian series are altered sedimentary rocks, the epithets, micaceous and hornblendic have been given to the gneiss, in later Reports, as the best mode of designating the facts of mineral composition, and lamellar arrangement, without any reference whatever to the supposed origin of the rocks. When the general term gneiss therefore is used, it may signify both kinds, or either; and the epithets micaceous and hornblendic are applied to the rock to indicate that the mica greatly preponderates or excludes the hornblende; or the hornblende the mica.

In no part of the area included in this Report is hornblende completely absent from the gneiss, and sometimes it predominates over the mica; hornblende contains from ten to fifteen per cent. of lime, so that the ruins of the rocks of the area, such as they have been described, whether gneiss, greenstone, syenite, or porphyry, would never give a soil wholly destitute of lime. Of this necessary ingredient, the lime-feldspars would be a more abundant source. Different species of them from andesine to anorthite, may contain from about five up to twenty per cent. of lime, and the range of those Canadian varieties which have been analyzed by Mr. Hunt, is from seven to about fifteen per cent. The personal exploration which is the subject of the present Report, has shewn, for the first time, that these lime-feldspars occur in this Province, and probably in other regions, in mountain ranges, belonging to a stratified deposit, and not in disseminated or intrusive masses. The breadth of these displayed in the district examined, demonstrates their importance; and the fact that the opalescent variety of labradorite was ascertained by Dr. Bigsby to exist, *in situ*, on an island on the east coast of Lake Huron, while the name of the mineral reminds us of its existence at the eastern extremity of the Province, sufficiently points out that the lineal range of the lime-feldspars will be co-extensive with Canada. We may therefore anticipate a beneficial result from their influence upon the soils, over the whole breadth of the Province.

The ruins of the crystalline limestone constitute a most fruitful soil, so much so that the lots first cleared in any settled area of the Laurentian country, usually coincide with its range. In these limestones phosphate of lime is sometimes present in great abundance, and there is scarcely ever any large exposure of them examined, in which small crystals of the phosphate are not discernable by the naked eye. Mica and iron pyrites, are present, to furnish other essential ingredients, and the easily disintegrating character of the rock readily permits its reduction to a soil. The effects of these limestones and lime-feldspars are not however confined to the immediate localities in which the beds are found, for boulders of them are met with transported to southern parts, even far on the fossiliferous rocks beyond: and there can be little doubt that their fragments are very generally mixed with the soils of the Laurentian country. Thus while the diversity of minerals in the different rocks of the series furnishes the ingredients required to constitute good soils, the agency of the drift has mingled them, and considering the resistance to disintegration offered by most of the rocks, with the exception of the limestone, the deficiencies that may exist will rather be in the quantity of soil covering the rocks in elevated parts, than its quality where the materials have been accumulated.

Mr. Murray's explorations during the period embraced in these Reports, were carried on principally in the wide and little-known tract of country between the north shore of Lake Huron, east of Spanish river, and the upper part of the Ottawa. Besides a general geological investigation of this district, Mr. Murray has communicated a large amount of important topographical information, illustrated by a series of no less than twenty-two maps of various lakes and rivers, laid down, from his own measurements, on a scale of an inch to the mile. Labors of this kind, unknown to the geological surveyor of old countries, serve to shew the difficulties with which our Canadian survey has still, in great part, to contend. Large districts must be mapped by the explorer, before the results of his explorations can be worked out; and hence, the skill of the practised surveyor has to be combined with that of the geologist proper. It is not every geologist, however, who is capable of responding to this additional demand.

With the exception of a few outlying patches of Lower Silurian strata in the islands of Lake Nipissing, and in the valley of the Bonnechère, the rocks of this district, as determined by Mr. Murray, belong to the Laurentian and Huronian series, overlaid in places by drift clay and sand, with occasional boulders; and traversed at many points by intrusive and intercalated masses of greenstone, and dykes of trap and compact feldspar. The principal economic minerals of these rocks, comprise crystalline limestone, specular iron ore, magnetic iron ore, workable slates, and quartzites: the white varieties of the latter being apparently available for glass-making purposes. At Iron Island, on Lake Nipissing, the specular iron ore appears in force. "Small masses are common to most of the rock in the island, and in the crystalline limestone there is a very great display of it. For a breadth of about forty yards along the cliff on the east side, the rock holds masses of the ore of various sizes, sometimes running in strings of an inch thick or upwards, and at other times accumulating in huge lumps, some of which probably weigh over half-a-ton. The beach near the outcrop is strewed with masses of all sizes, from great boulders weighing several hundred pounds, to small rounded pebbles not bigger than marbles. The limestone with which the iron ore is associated, is frequently quite cavernous, and the crevices and smaller fissures are thickly lined with crystals of blue fluor-spar and red sulphate of baryta." The following is Mr. Murray's interesting sketch of the general features of Lake Nipissing:

Above the Chaudière Falls, the lower portion of Lake Nipissing takes a general bearing north-east, with an average breadth of from one to two miles, till it expands to the east and west, at the distance of about eight miles into the main body. The west side of this southern arm is deeply indented by a succession of long narrow bays, lying for the most part nearly east and west, and crowds of islands are scattered along the channels and off the shores. From the most southern of these bays, which falls back to the westward for upwards of seven miles, there are two outlets in addition to the one at the Chaudière, the waters of which appear to unite in their course to the southward, and flow in a single stream into the French River, above the Rapide du Pin, falling in a fine cascade of about twenty feet, close to the junction.

The southern shore of the main body of the Lake trends in general very nearly due east and west, forming in the last twenty miles of the west end, the south side of a great western arm, which alternately contracts into narrow straits, in some cases only a few chains wide, and opens again into wide expanses, generally crowded with islands. Measuring from the north-east end of the southern arm to the extreme end of the great western bay, the distance is somewhat over thirty-two miles, and from the extreme east end of the lake to the same place, the total length is a little over fifty-three miles, the western extremity reaching longitude by account 80° 30′ 54″ W. This great western bay was called Bear Bay, and between it and the north-west arm, where the survey terminated in 1854, there are two other large westerly bays, divided by a bold rocky promontory jutting out nearly due east, with a multitude of islands in continuation of the strike, stretching far into the lake. In addition to these main features the whole coast is deeply indented by a succession of marshy bays and coves, separated by bold rocky points, and a number of small streams add their tribute to the waters of the lake.

The general aspect of the western end of Lake Nipissing is bleak and desolate in the extreme. In many parts the coast is entirely bare and barren, and in no instance does the soil afford a better quality of forest timber than a scanty growth of red pine. Vast marshes, overgrown with tall reeds or wild rice, stretch far into the interior, beyond the bays or along the mouths of the tributaries, affording shelter to incredible numbers of wild fowl. Were drainage practicable, these marshes may become available as grass land, but being scarcely at any part above the level of the lake, they are not readily susceptible of artificial improvement.

While the coast presents this wild and desolate appearance, there are many spots not very remote from it where the character of the country is much less forbidding. On the banks of several of the tributaries of this end, all of which are small however, and only accessible to canoes for a short distance, there are good flats of land, in somes cases yielding hard-wood mixed with large-sized white pine; and spots repeatedly occur between the rocky ridges which might be rendered available for the purposes of cultivation. About two miles and a half up a stream which falls in on the south side, near the entrance to the great west bay, the flats extend over a considerable area, and many very large trees of white pine were observed on them, together with maple, elm and birch. Red pine abounds wherever there is soil enough to support a growth at all; and in many parts, especially in the vicinity of the large western bays, it is of good size, straight, and apparently sound.

Like the coast of the main land, the islands for the most part, are rocky, barren and worthless; but this is not without exceptions. As an example, I observed on this occasion, on a second visit to Iron Island, that a large proportion of it, especially towards the southern end, has an excellent soil, yielding a stout growth of maple, basswood, elm and birch, and provided the surface be not too stony, there can be no doubt it is capable of being converted into good farm land. The superior quality of the soil of this island is doubtless due to the calcareous nature of the rock beneath, and this good soil, together with the specular iron ore and its associated fluor-spar, as well as the sandstone and limestone mentioned in last year's Report, seem to indicate the position as one worthy of attention when settlement shall at some future time reach the shores of the lake.

Among the various wild animals which inhabit the country surrounding the lake, I more especially remarked the presence of numerous bears and deer. Reindeer were by no means uncommon, while wild fowl of many descriptions flock in myriads, at certain seasons, to the marshes. The fish of the lake are also very abundant, of unusually large size and excellent quality: the varieties consisting of white fish, maskinongé, pike, bass, pickerel and sturgeon.

As observed in my report of last year, the Indians of Lake Nipissing derive a very considerable profit from the sale of cranberries, which grow in vast quantities on the numerous marshes; but as it is probable that not one-tenth part of the whole area where the fruit abounds is ever visited by the few scattered families inhabiting the country, it appears to me that the produce might be turned to much greater account, and become a tolerably good source of recompense to a settlement. I was informed by an Indian that he and his family, which consisted of his wife and two small children, could easily gather from four to five barrels of cranberries in a day, for which they were paid, on delivery at Shi-bah-ah-nah-ning, at the rate of $5 the barrel; and that the only difficulty which they had in making the trade a very profitable one, was the small amount their canoes were capable of conveying at a time, together with the shortness of the season previous to the formation of the ice.

The geology and physical characteristics of the Island of Anticosti constitute the subject of Mr. Richardson's Report. The skill with which the structural details of this island—previously all but an unknown land—have been traced out, and the energy shewn by Mr. Richardson in the collection of an almost unparelleled series of fossils in the short space of three months, cannot be too highly praised. Up to the date of this exploration, Anticosti, in geological maps, has been invariably referred to the Niagara group of the Upper Silurians. Its northern portions, however, as shewn by Mr. Richardson's stratigraphical researches, combined with the fossil evidence worked out by Mr. Billings and Professor Hall, belong to the upper part of the Lower Silurian division; whilst its central and southern portions appear to constitute a series of beds of passage between the Lower and the Upper Silurians. Six sets of conformable strata, with a slight dip to the south or south-west, and a general strike, consequently, parallel to the direction or greatest length of the island, have been made out by Mr. Richardson. Beginning at the north shore, the two lower beds, A and B, are referred to the age of the Hudson River group. Even here, however, the transitional character alluded to above, begins to shew itself; as amongst a considerable number of already recognised Hudson River types, with many new forms, we meet with three species previously looked upon as peculiar (in the geology of America) to the Upper Silurian division. One of these, the celebrated chain coral (*Halysites catenulatus*=*Catenipora escharoides*) has hitherto been considered eminently characteristic of the Niagara and Clinton group. It is also in these lower divisions that the curious tree-like fossils, to which Mr. Billings has given the generic name of *Beatricea*, first occur. Of the real nature of these perplexing forms, we are still in ignorance; but they will probably turn out to be corals. The succeeding divisions, passing towards the south or southwest, are denoted respectively by the letters C, D, E, and F. Division F is probably synchronous with the Clinton group, whilst the other divisions represent the Oneida conglomerate and Medina sandstone; but it is proposed to consider them for the present as members of a Middle Silurian series, under the general name of the "Anticosti Group." Respecting the soil and vegetation of Anticosti, and the native denizens of the island and its surrounding waters, we extract the following remarks:

In respect to the soil of the Island, the plains on the south side, as has been stated, are composed of peat; but the general vegetation of the country is supported by a drift composed for the most part of a calcareous clay, and a light grey or brown colored sand. The elements of the soil would lead to the conclusion of its being a good one, but the opinion of most persons, guided by the rules derived from the description of timber which grows on it, would not be favorable, as there is almost a complete absence, as far as my observation went, of the hard-wood trees supposed to be the sure indication of a good settling country.

The most abundant tree is spruce, in size varying from eight to eighteen inches in diameter, and from forty to eighty feet in length. On the north coast, and in some parts of the south, it is found of good size in the woods close by the beach, without any intervening space of stunted growth; the stunted growth was occasionally met with on the north side, but it is only on the tops of cliffs, and other places exposed to the sweep of the heavy coast winds, where spruce, or any other tree on the island is stunted. In these situations there is often times a low, dense, and almost impenetrable barrier of stunted spruce, of from ten to twenty feet across, and rarely exceeding a hundred feet; beyond which open woods and good comparatively large timber prevail.

Pine was observed in the valley of the Salmon River, about four miles inland, where ten or twelve trees that were measured gave from twelve to twenty inches in diameter at the base, with heights varying from sixty to eighty feet. White and yellow birch are common in sizes from a few inches to two feet in diameter at the base, and from twenty to fifty feet high. Balsam-fir was seen, but it was small and not abundant. Tamarack was observed, but it was likewise small and scarce. One of our men, however, who is a hunter on the island, informed me he had seen groves of this timber north from Ellis, or Gamache Bay, of which some of the trees were three feet in diameter, and over a hundred feet in height. Poplar was met with in groves, close to the beach, on the north side of the island.

Of fruit-bearing trees and shrubs, the mountain-ash, or rowan, was the largest; it was most abundant in the interior, but appeared to be of the largest size close on the beach, especially on the north side, where it attains the height of forty feet, with long extending and somewhat slender branches, covered with clusters of fruit. The high cranberry (*Viburnum opulus*) produces a large and juicy fruit, and is abundant. A species of gooseberry bush of from two to three feet high is met with in the woods, but appears to thrive best close to the shingle, on the beach, where strips of two or three yards across and half-a-mile long were occasionnally covered with it; the fruit is very good, and resembles in taste the garden berry; it is smooth and black colored, and about the size of a common marble; the shrub appeared to be very prolific. Red and black currants are likewise abundant; there appear to be two kinds of each, in one of which the berry is smooth, resembling both in taste and appearance that of the garden, the other rough and prickly, with a bitter taste.

Strawberries are found near the beach; in size and flavor they are but little inferior to the garden fruit; they are most abundant among the grass in the openings, and their season is from the middle of July to the end of August. Five or six other kinds of fruit-bearing plants were observed, some of which might be found of value. The low cranberry was seen in one or two places in some abundance, but I was informed that it was less abundant than in many other past seasons. The raspberry was rarely met with.

The most surprising part of the natural vegetation was a species of pea which was found on the beach, and in open spaces in the woods. On the beach the plant, like the ordinary cultivated field-pea, often covered spaces from a quarter of an acre to an acre in extent; the stem and the leaf were large, and the pea sufficiently so to be gathered for use; the straw when required is cut and cured for feed for cattle and horses during the winter.

But little is yet known of the agricultural capabilities of the island; the only attempts at cultivation that have been made are at Gamache Bay, South-west Point, and Heath Point. South-west Point and Heath Point are two of the most exposed places in the Island; and Gamache Bay, though a sheltered position, has a peat soil; the whole three are thus unfavourable.

On the 22nd July potatoes were well advanced, and in healthy condition at Gamache Bay; but a field under hay, consisting of timothy, clover and natural grass, did not show a heavy crop. At South-west Point, Mr. Pope had about three acres of potatoes planted in rows three feet apart; he informed me he expected a yield of 600 bushels, and at the time of my arrival on the 5th of August, the plants were in full blossom, and covered the ground thoroughly; judging from the appearance they seemed the finest patch of potatoes I had ever seen. About half-an-acre of barley was at the time commencing to ripen; it stood about four feet high, with strong stalk and well filled ear. I observed oats in an adjoining patch; these had been late sown, being intended for winter feed for cattle; their appearance indicated a large yield.

Most of the streams and lakes swarm with the finest brook trout and salmon trout, and large shoals of mackerel were almost daily observed all around the island. But in my tour I saw no appearance of schooners employed in fishing, with the exception of one at South Point. The only operations I heard of connected with the trade, were carried on at the mouth of a few of the larger streams on the south side, and at that of Salmon River on the north, by men under Mr. Corbet the lessee of the island, and they were entirely confined to the taking of salmon and salmon trout. Seals were extremely abundant, and but for a few Indians who come over from Mingan in July and August, and take a few of them on the north side of the island, they would be wholly undisturbed. In the bays and more sheltered places round the island these creatures are met with by thousands. It was not uncommon to stumble across one asleep on the beach, when generally it was despatched with a blow or two of our hammers.

Several species of whale were observed to be abundant towards the west end of the island. This must be a favorite resort, as they were either seen or heard at irregular intervals day and night. One of them about sixty feet in length, and about fifteen feet above the water's edge was found grounded on the reef in Prinsta bay when we passed on the 3rd September.

The only fishing schooners I saw, with the exception of the one mentioned, were at the Mingan Islands, where twelve or thirteen came to the harbor for shelter during a storm. I was informed by Mr. Henderson, the gentleman in charge of the Hudson's Bay Company's post at Mingan, that they were all from American ports.

The wild animals met with on the island as far as I am aware, are the common black bear, the red, the black, and the silver fox, and the marten. Bears are said to be very numerous, and hunters talk of their being met with by dozens at a time; but on my excursion I only observed one at Ellis Bay, two near Cormorant Point, and one in the neighbourhood of Observation Cape. I came upon the last one on a narrow strip of beach at the foot of a high and nearly vertical cliff. Seen from a distance I took the animal for a burnt log, and it was only when within fifty yards of him that I perceived my mistake. He appeared to be too busily engaged in making his morning meal, on the remains of a seal, to pay any attention to me, for although with a view of giving him notice to quit I struck my hammer upon a boulder that was near, and made other noises which I conceived might alarm him, he never raised his head to show that he was aware of my presence, but fed on until he had finished the carcase, obliging me, having no rifle, to remain a looker-on for half-an-hour. When nothing of the seal remained but the bones, the bear climbed in a leisurely way up the face of the naked cliff, which could not be many degrees out of the perpendicular, throwing down as he passed considerable blocks of rock, and disappeared over the summit which was not less than a hundred feet above the sea.

Foxes and martens are very abundant; the marten was frequently heard during the night in the neighbourhood of our camp, and foxes were seen on several occasions. Of the silver grey fox, the skin of which frequently sells for from twenty-five to thirty pounds currency, from four to twelve have been obtained by the hunters every winter. Mr. Corbet, the lessee of the island, employs several men during that season to hunt these animals for their fur, and I understand he makes some profit by the trade.

I heard of no animals of any other description, with the exception of wild fowl; and I saw no frogs nor reptiles of any description, and I was informed by the hunters that there were none.

In the first part of the Report by Mr. Billings, we have a very able analytical review of the palæontological relations of the Anticosti rocks. This is succeeded by detailed descriptions of a great number of newly-determined forms, embracing not only new species, but many new genera. Scattered through these descriptions, we find the germ of much new thought, although so unostentatiously brought forward, as very easily to escape detection on the part of the casual reader. It is only to be regretted, for the sake of our palæontological students, that it was found impossible to give illustrations of the various fossil species here described. This want will be gradually met, however, by the re-publication of the more characteristic forms with ample illustrations, in the series of Memoirs about to be issued by the Geological Commission, on the plan of the well-known Decades of the British Survey. By the kindness of Sir William Logan, we have already seen a few of the lithographed plates recently printed in England for this series, under the personal superintendance of Mr. Billings, and we can speak most highly of their execution.

Following Barrande, McCoy, and other naturalists, Mr. Billings discards the genus *Ormoceras*, and places all the straight forms of the *Orthoceratidæ*, whether with simple or with beaded siphuncles, under the single genus *Orthoceras*. Until the publication of this Report, we confess to have held an opposite view. Our objection to this union was chiefly founded on the following consideration, *viz.:* — that amongst the curved or nautiloidal types, no examples were presented of a departure from the simple or at least the non-inflated form of siphuncle. The nautilus, it is true, has not yet been found to exhibit the beaded siphuncle in any of its species, but Mr. Billings has broken down the objection alluded to above, by citing examples of other curved forms with this character of siphuncle, preserved in the collections of the survey.

The specimens [of the old *Huronia vertebralis* of Stokes, re-named *Orthoceras Canadense* by Mr. Billings] in the collections of the Geological Survey of Canada show a regular transitional series, from those with siphons scarcely at all inflated to those with annulations an inch and a-half in diameter. The segments are also either fusiform, globular, oblate, spheroidal, nummuloid, turbinate, or more swollen at one side of the chamber than at the other. Some of these forms are also apparent in two other genera. Thus in *Gyroceras magnificum* the siphon between the septa is dilated into a series of fusiforms beads; in *Cyrtoceras regulare* the expansions are globular but scarcely two-thirds of a line in diameter: in *Cyrtoceras subturbinatum* globular, four lines in diameter, and exhibiting radiating lamellæ; while in one fragment of a species of *Cyrtoceras*, not described, it is expanded in the upper part of the chamber, and tapering below, exhibits a form very like Huronia.

The curious tree-like fossils, the Beatricea, first discovered by Mr. Richardson, in the Island of Anticosti, and subsequently in the fossiliferous limestone of Lake St. John, north of Quebec, are referred provisionally by Mr. Billings to the vegetable kingdom, but their true nature is still uncertain. The fossils associated with them are opposed to the view of a vegetable origin; unless we look upon them as gigantic fucoids; or as belonging to some extinct marine type of comparatively high organization. Their true place is probably amongst the corals. No description of these curious forms having yet appeared in the *Journal*, we quote the following, as given by Mr. Billings:

Genus BEATRICEA.

The above generic name is proposed for certain tree-like fossils collected in the Lower and Middle Silurian rocks of Anticosti. They consist of nearly straight stems from one to fourteen inches in diameter, perforated throughout by a cylindrical and nearly central tube, which is transversely septate. Outside of the tube, they are composed of numerous concentric layers resembling those of an exogenous tree. No traces of roots or branches have been distinctly observed. There appear to be two species, distinguishable only by the characters of the surface.

BEATRICEA NODULOSA.

Description.—The surface of this species is covered with oblong, oval, or subtriangular projections from one to three lines in height, each terminating in a rounded blunt point which is nearer to one end of the prominence than to the other. Some of the projections are six or seven lines in length at the base, and half as wide. Generally they are smaller, and often with a nearly circular base; the distance between them is from one to three lines. They exhibit in some specimens a tendency to an arrangement in rows following the length of the stem. In some instances these rows wind around the stem in spirals. In addition to these characters, the whole surface is fretted with minute points, and these when partially worn show a perforation in their centres.

In a specimen three inches in diameter, the diameter of the central tube is three-quarters of an inch; the transverse septa are thin, very concave, and at distances from each other varying from one line to one inch.

Locality and Formation.—Anticosti, at Wreck Point, Salmon River and Battery Cliff. Lower Silurian.

Collector.—J. Richardson.

BEATRICEA UNDULATA.

Description.—The surface of this s es is sulcated longitudinally by short irregular wave-like furrows from two lines to one inch across, according to the size of the specimen. In other respects it appears very like *B. nodulosa.* The largest specimen is ten feet five inches in length, about eight inches in diameter at the large end, and six inches and a-half at the smaller extremity. Another short fragment is fourteen inches in diameter.

All the specimens of both species are replaced by carbonate of lime, but show more or less perfectly the septate character of the central tube and the concentric arrangement of the layers of the stem. They are generally broken up into short pieces.

Locality and Formation.—Cape James, Table Head, two miles east of Gamache Bay, and numerous other localities in the Middle Silurian.

The four Reports contributed by Professor Sterry Hunt, embrace a wide and varied range of investigation. In the Report for 1853, the composition is given of several mineral springs occurring in different parts of the Province; with analyses of the waters of the St. Lawrence and Ottawa rivers; further analyses of the shells of lingulæ and other fossil genera, in which, it will be remembered, Mr. Hunt first made the important discovery of phosphate of lime as the predominating constituent; also, the results of some chemical examinations of limestones and dolomites belonging to the Laurentian series; assays of argentiferous galena from Lake Superior, the Chaudière Rapids, and other places; and some assays of gold from the Rivière du Loup. Notices of the more important of these topics, as treated by Mr. Hunt, have already appeared in the pages of this Journal.

The second Report is one of much scientific interest. It comprises, in the words of Mr. Hunt, "a series of investigations of the stratified-crystalline or metamorphic rocks of the country, undertaken in the hope that a careful comparative study of their composition, in connection with that of the unaltered sedimentary strata, may lead to the clear understanding of the nature of that metamorphic process whose results are so conspicuous in our Canadian geology." In the prosecution of this inquiry, a considerable number of complex analyses are given, the value of which will become still more apparent, as the subject is more fully developed. The labradorites and triclinic feld-spars of the Laurentian rocks generally, are considered by Mr. Hunt—in accordance with the opinion of Delesse, respecting these so-called species from other localities—to consist of mixtures of Albite and Anorthite in variable proportions. As these minerals, however, including albite and anorthite, agree so closely with one another in crystalline form, we might here adopt the view of one fundamental composition ($= x$ R O, x Al^2O^3, x Si O^3) combined with additional atoms of silica—Si O^3, 2 Si O^3, &c.—according to the species or, more properly, the variety: these additional atoms being held, furthermore, to be without influence on the crystallization of the compound, although necessarily affecting its comportment with chemical reagents. This view is apparently shadowed out, though not exactly stated in this manner, in the fourth edition of Dana's Mineralogy, vol. 2, page 228.

The observations which we give below, on the manufacture of hydraulic mortars with magnesia in place of lime, are extracted from the Report for 1855, in which Mr. Hunt has also published some long and important communications on the Metallurgy of Iron, in explanation of Chenot's Process, the Extraction of Salts from Sea Water, and other subjects of much practical interest:

MAGNESIAN MORTARS.

The attention of several chemists has been of late years turned to the study of cements and mortars, but it is especially to the laborious and admirable researches of M. Vicat of Grenoble, that we are indebted for a complete elucidation of some of the most important questions connected with the subject. The ordinary mortars composed of lime and sand, harden gradually by exposure to the air, and this process depends upon two distinct reactions; first, the absorption of carbonic acid from the air, and the formation of a sub-carbonate of lime, and secondly, upon a partial combination of the lime with the sand, forming a silicate of lime. When placed under water, however, and excluded from the influence of carbonic acid, mortars thus composed do not harden, but become dissolved or disintegrated; they cannot therefore be employed for constructions which are submerged.

Certain limestones have long been known to yield mortars or cements, which have the property of hardening under water; and pozzuolanas of Italy and some other countries, when mingled with ordinary lime, yield mortars which are possessed of similar properties. Pozzuolanas, and these peculiar limestones are comparatively rare; but Vicat has shown that it is possible to imitate them in a very simple manner, and with materials which are everywhere present, to prepare hydraulic cements. The limestones which yield hydraulic cements are those which are mingled with a certain proportion of clay, and by calcining an artificial mixture of carbonate of lime and clay, we may prepare hydraulic cements, varying in character according to the proportions of the mixture. When the limestone contains 10, 15, or 25 per cent. of clay, it becomes more and more hydraulic, and when the mixture amounts to one-third of the lime, we obtain a mortar which hardens almost immediately in air or under water. The proportion of clay may even rise to 60 per cent.

The name of Roman cement is applied to a mixture of this sort, but incorrectly, as the preparation of such a cement was unknown to the Romans. The *pozzuolana* or *trass*, which was employed by them to give hardness to their mortars, is a felspathic or argillaceous matter, which has been calcined by volcanic heat, and has thus acquired the property of rendering ordinary lime hydraulic. It suffices, in fact, to calcine any ordinary clay, especially with the addition of a little alkali, to obtain an artificial pozzuolana.

The well-known Portland cement (so called because its colour resembles that of the Portland stone,) is prepared by calcining a mixture in proper proportions, of chalk with the clayey mud of the Thames; but similar and equally good cements are now manufactured elsewhere in England and France by mixing chalk or marl with other clays. The materials are reduced to fine powder, and intimately mixed with the addition of water. The resulting paste is moulded into bricks, which are dried and burned. It is of importance that the heat in calcining be sufficiently elevated, otherwise the carbonic acid and water may be expelled without that reaction between the lime and clay which is required for the production of a cement. It is necessary to employ a white heat, which shall agglutinate and frit the mixture. After this operation the material is assorted, and the portions which are scorified by too much heat, as well as those insufficiently calcined, being set aside, the cement is pulverized for use. It is often advantageous to grind to powder the native mixture of limestone and clay before burning them, in order to ensure greater homogeneousness. It will also be seen that a calcination at a very elevated temperature is frequently required to develope the hydraulic character of limestones; the greater the temperature employed, the more slow is the solidification of the cement, but the harder does it become.

The portions of cement which have been over-heated and converted into a slag, as well the semi-vitrified masses obtained in the calcination of ordinary lime, overburned bricks and tiles, and the scoriæ of iron furnaces, may all be used with advantage to give hydraulic properties to ordinary lime, either by mingling with it before burning, or by employing them as pozzuolanas to mix with the slacked lime. The theory of the solidification of these various cements, and the important part played by the alkali which is always present, in forming a silicate of lime, has been carefully studied by Kuhlmann and Fuchs; the application of soluble glass for the silicatisation of limestones and other calcareous materials, depends upon a similar reaction. But important as is this question, both in a theoretical and practical point of view, I shall reserve it for another occasion.

The cements prepared by the different processes above indicated, leave nothing to be desired for constructions in fresh water, but do not uniformly resist the action of the sea, which causes a great many of these hydraulic cements to lose their cohesion, and eventually fall to pieces when immersed in sea-water. M. Vicat, junior, has found that this change depends upon the action of the magnesian salts of the sea-water upon the lime of the cement, and has proposed a mortar from which lime is excluded, consisting of caustic magnesia mixed with an artificial pozzuolana. For this purpose such materials should be selected as contain no calcareous matter, and he recommends pipe-clay, or the debris of certain felspathic rocks. These when calcined and mixed with 15 or 20 per cent. of magnesia, previously made into a paste with water, yield a cement which hardens after three or four days, either under fresh or salt water, and acquires after some time a great degree of strength.

But important as this discovery of Mr. Vicat promises to be, the high price of magnesia is opposed to the general adoption of this cement to marine constructions. The inventor calculates that if magnesia can be furnished for $30 or $40 the ton, the cement can be economically made use of, and the directors of the salines of the south of France are now endeavoring to manufacture magnesia on a large scale, from the chlorid of magnesium in the bittern of the sea-water. Carbonate of magnesia is abundant in nature, but almost always found united with carbonate of lime, forming a dolomite, and the pure magnesian carbonate has hitherto been a rare mineral. Associated with a little carbonate of iron and some silicious matters, however, it is found in abundance in the Eastern Townships, where it forms beds among the Silurian slates in Sutton and Bolton. Specimens of it from these localities attracted particular attention at the Exhibition at Paris, where the magnesian mortar of Vicat was first brought forward, and the Reporter of the Jury of the 14th class calls particular attention to the value of this mineral as a source of magnesia, and as possibly destined to become an article of export from Canada.

The magnesite from Bolton, where it forms an immense bed, resembles a crystalline limestone, and consists of about 60.0 per cent. of carbonate of magnesia, 9.0 per cent. of carbonate of iron, and 31.0 of quartz in grains, besides small portions of nickel and chrome. Some specimens from Sutton contain more than 80.0 per ct. of carbonate of magnesia. When this mineral is calcined, the carbonic acid is expelled, and there remains a mixture of magnesia with quartz and oxyd of iron. But as these impurities do not interfere with its application to the purposes of a cement, the previously ignited rock, which in the case of that from Bolton will contain 43.0 per cent. of caustic magnesia, may be directly mixed with calcined clay or pozzuolana, to form the magnesian mortar. Although it is not certain that these native carbonates can be economically wrought for exportation, the subject is certainly worthy of the attention of our engineers who are engaged in the construction of docks and piers in the lower ports of the St. Lawrence. At the same time the application of this mineral as an economical source of pure magnesia and magnesian salts on a large scale, is one worthy of consideration.

In his Report for 1856, Mr. Hunt takes up the composition of the magnesian and other rocks belonging chiefly to the metamorphic region of the Eastern Townships, and to the older metamorphic or Laurentian series of Grenville and the Ottawa. Following these researches, and partly based upon them, the subject of rock-metamorphism then comes under review. Discarding the agency of intense heat, Mr. Hunt seeks for the cause of metamorphism, in the action of alkaline carbonates in solution at a temperature not greatly exceeding that of the boiling point of water; and he brings forward some interesting experiments in support of this opinion. Although strictly, this is but an extension of the views of Bischof and some other inquirers who have preceded our author in these investigations, it cannot be denied that much praise is due to Mr. Hunt for carrying out the inquiry in an original spirit, and contributing in no small degree to render our knowledge of metamorphic action more satisfactory and precise. Bischof, in his investigations, has certainly fallen into an error which we trust Mr. Hunt will cautiously avoid—that of attempting to force all conditions of occurrence into harmony with his peculiar views: an error which has told more or less, in many minds, against the free reception of Bischof's conclusions, even when these conlusions are manifestly exact. Finally, at the close of Mr. Hunt's Report, analyses are given of the curious white traps of Montreal and its vicinity. These we propose to notice in another place.

E. J. C.

The Temple of Serapis at Pozzuoli. By SIR EDMUND WALKER HEAD, Bart. J. B. Nichols & Sons, London, 1858.

To the classic antiquary, the ancient divinity Serapis, and the rites by which he was worshipped, have furnished prolific themes for discussion. The Egyptian divinity was supposed, by some at least of the Greek writers, to be identical with Osiris; by later authors he has been described as the Egyptian Apollo. But so difficult is it to eliminate from Egyptian mythology anything strictly analogous to classic faith and worship, that Serapis has been identified with Zeus or Jupiter, with Pluto, with Æsculapius, and with Pan. But the difficulties grow still more complicated when we study the divinity in his Serapeia at Memphis or Thebes, where his favoured worship was associated with the rising of the Nile, and the fertilising of its submerged banks; and at Rome or Pozzuoli, where the intruding god had to contend for a time against the orthodoxy of old Pagan Italy. There, however, as elsewhere in all times, the persecuted rites grew in popular estimation; and in B. C. 43 the temple of Serapis reared its marble columns, by decree of the Roman Senate, in the Circus Flaminius, and the worship of the strange God became not only popular but fashionable; if, indeed the ancient Egyptian, and more modern Alexandrian, with the Greek and Roman Serapis, were the same.

But it is not this mythological question which now attracts attention, and beguiles a distinguished scholar to lay aside for a brief period the cares of vice-regal responsibility, for pleasant dalliance with the literary sphynx. It matters not, for his present purpose:

"Whether Serapis was a deity originally Egyptian, or whether he was a strange god from Sinope thrust into the place of Osiris by Ptolemy Soter. His worship became the prevailing one at Alexandria, and spread from that commercial city to all the countries with which it was connected. When Pausanias wrote, the deity was established in almost every part of Greece. We find him at Rome in the time of Catullus, and we should certainly look for a temple to him at Puteoli, the regular port for which the fleets of Alexandria steered."

At Pozzuoli, or Puteoli, accordingly, the ruins of a temple still remain on the site, where, according to the celebrated inscription now preserved in the Museo Borbonico at Naples, there existed a temble of Serapis in the year of the city, 649, or sixty-two years before the "canonization" of Serapis, and the building of the new temple of Isis and Serapis in the Circus Flaminius at Rome: B. C. 105. To the former temple a peculiar, popular, and scientific interest now attaches. Its ruined columns are discovered to be the *gnomon* of a scientific chronometer of singular value and utility, by means of which the far-reaching chronometry of the geologist finds important elucidation. The "*Lex Parieti faciundo*" of the Museo Borbonico marble has been challenged by critical antiquaries; aparently without good reason. But no sceptical Maffei or Carelli assails the genuineness of the lithodomous perforations by means of which the columns of Pozzuoli are graven with an indisputable record of their alternate submergence and upheaval, and with this, of the successive changes in the relative level of land and sea, within an easily ascertained period.

Sir Charles Lyell, in his "*Principles of Geology,*" *after noticing* the diverse opinions of Antiquaries as to the date, form, and purpose of the ruined structure at Pozzuoli, remarks:

"It is not for the Geologist to offer an opinion on these topics; and I shall, therefore, designate this valuable relic of antiquity by its generally received name, and proceed to consider the memorials of physical changes inscribed on the three standing columns in most legible characters by the hand of Nature. These pillars, which have been carved each out of a single block of marble, are forty-two feet in height. An horizontal fissure nearly intersects one of the columns; the other two are entire. They are all slightly out of the perpendicular, inclining somewhat to the south-west, that is, towards the sea. Their surface is smooth and uninjured to the height of about twelve feet above their pedestals. Above this is a zone, about nine feet in height, where the marble has been pierced by a species of marine perforating bivalve.—*Lithodomus*, Cuv.* The holes of these animals are pear-shaped, the external opening being minute, and gradually increasing downwards. At the bottom of the cavities, many shells are still found notwithstanding the great numbers that have been taken out by visitors; in many the valves of a species of arca, an animal which conceals itself in small hollows, occur. The perforations are so considerable in depth and size, that they manifest a long-continued abode of the lithodomi in the columns; for, as the inhabitant grows older and increases in size, it bores a large cavity, to correspond with the increasing magnitude of its shell. We must consequently, infer a long-continued immersion of the pillars in sea-water, at a time when the lower part was covered up and protected by strata of tuff and the rubbish of buildings; the highest part, at the same time, projecting above the waters, and being consequently weathered, but not materially injured.

"On the pavement of the temple lie some columns of marble, which are perforated in the same manner in certain parts; one, for example, to the length of eight feet, while, for the length of four feet, it is uninjured. Several of these broken columns are eaten into, not only on the exterior, but on the cross fracture, and, on some of them, other marine animals have fixed themselves. All the granite pillars are untouched by lithodomi. The platform of the temple, which is not perfectly even, is at present (1828) about one foot below high-water mark (for there are small tides in the Bay of Naples); and the sea, which is only one hundred feet distant, soaks through the intervening soil. The upper part of the perforations, then, are at least twenty-three feet above high-water mark; and it is clear that the columns must have continued for a long time in an erect position, immersed in salt water. After remaining for many years submerged, they must have been upraised to the height of about twenty-three feet above the level of the sea."

If we leave the ruins of the ancient temple, and turn our attention to the neighboring coasts, the like evidence of upheaval, depression, and submergence of the land meets the eye. But still the ancient temple has a value of its own, which the cliff of Monte Barbaro and

* *Modiola lithophaga*. Lam. *Mytilus lithophagus*, Linn.

the low terrace of La Starza cannot supply. The rocky cliff, perforated by the *Lithodomi*, tells the same tale of former submergence as the pierced marble columns; but the rock, though inscribed with the same characters, cannot tell all that is revealed by the pillars of the ancient temple of Serapis. It is something of no slight importance to the geologist to ascertain that any great change in the relative levels of sea and land has taken place within the recent human era, and this the temple columns establish at a glance. But if the date of the structure, and the uses of the edifice, can be established, far more accurate approximations may be made to a definite measurement of the period required for such geological phenomena as are there disclosed; and here it is that the scholar and the antiquary come to the aid of the scientific geologist; and from their combined labors truths of great value, and with a mutual relation of peculiar significance, are educed and rendered generally available.

Sir Edmund Head undertakes the solution of three questions, all of an antiquarian character, yet each of them possessing considerable importance in any discussion relating to the geological phenomena exhibited by the ruins of the so called Temple of Serapis at Pozzuoli. These are—

1st. Was it a temple of Serapis?
2nd. What is its proper age?
3rd. Can any light be thrown upon its history, or on the dates of the various changes of level?

To the first of these reference has been already made. Alexandria was the great seat of the worship of Serapis in its later Egyptian form; nor was his worship abolished in that famous commercial capital till the reign of Theodosius the Great,—the effective ally of orthodoxy against the Arian heresy,—when the ancient pagan rites were summarily abolished by Theophilus the archbishop of Alexandria, and the Alexandrian Temple of Serapis was demolished, or converted to the use of Christian devotees. The overthrow of the temple at Pozzuoli followed in like manner. "It served as a fortress when Olympius retreated to it, as the stronghold of paganism during those tumults, which led to the destruction of the temple itself under Theodosius."

Signor Carelli, who denies the sacred character of the ruined edifice, inclines rather to the idea of its having been public baths, but the Æsculapian attributes of Serapis render the bath room peculiarly compatible with the essential requisites or adjuncts of his temple; and on this subject Sir Edmund aduces some valuable evidence:

"At Pozzuoli a building of some sort occupied the centre of the area. Whether, as in Egypt, the image of the god was placed there, or behind the four columns to which the ruin owes its modern celebrity, may be uncertain. The lowness of situation must have deprived our temple of subterranean passages, and the underground arrangements so elaborately provided in the Egyptian model. The possession, however, of a natural hot spring just behind the temple must have made up for many disadvantages. No appendage could be more appropriate for the temple of a god who among his many attributes usurped those of Æsculapius.

"This warm spring, however, suggests another curious question with reference to a passage in Pausanias. After mentioning several cases of fresh springs in the sea, and the hot springs in the channel of the Mæander, Pausanias proceeds as follows:—'Before Dicæarchia of the Tyrseni (Pozzuoli) there is water boiling up in the sea, and for the sake of it an island made with hands, so that not even this water is wasted, but serves people for warm baths.'

"May not this spring be the very one now existing behind the Temple of Serapis?

"Had the hot spring of Pausanias originally discharged itself into the sea, it does not seem likely that it would have been used at all; but if its virtues had been long known to the inhabitants of Pozzuoli, and a gradual encroachment of the sea, or rather a depression of the land, deprived them of the benefit of the baths to which they had become accustomed, what could be more natural than that a small mound or island should be made by hand in the shallow water, in order that the baths might be again available?

"Pausanias does not indeed say that these baths were connected with a temple of Serapis, but this is immaterial.

"On this theory a number of curious questions present themselves.

"Which is the pavement of the building existing at the time of Pausanias? What, relatively to the floor as now seen, was the level of the original building submerged in the sea? Is it represented by the *mosaic pavement found five feet* below the floor of the temple? If so, it would be important to examine the soil between the two pavements, and to ascertain whether it appears to warrant the supposition that it was a part of a mound constructed artificially."

Here accordingly we perceive that a new element comes in to complicate the question. Not only has the land, with the superimposed temple, been raised and depressed by natural causes, but the hand of man has also been working and counter working with nature: filling in and raising up when she depressed, as now digging down to ascertain her former operations. But on this also the researches of accurate scholarship can throw fresh light. Sir Edmund Head proceeds:

"It should be stated that, according to the general notion, mosaic pavements were not in common use at Rome before the time of Sylla—that is, about eighty years before Christ; but it does not follow that a mosaic pavement may not have been added after that date to a building existing before it: so that the mosaic pavement in question may have been part of the Temple of Serapis mentioned in the 'Lex Parieti faciundo.' Pausanias lived in the time of Hadrian, as has been already stated, and, according to this view, the submergence of the first baths or temple, must have taken place between the time of Sylla and that date. We cannot, I presume, suppose that a mosaic pavement would be originally laid under water.

"The level below the water of the Mediterranean of the old mosaic pavement must correspond pretty accurately with that of the base of the columns of the submerged 'Temple of the Nymphs' in the neighboring bay. Did this submergence take place at the time of the great eruption of Vesuvius which overwhelmed Pompeii and Herculaneum, A. D. 79?

"Statius was born A. D. 61, and was therefore about nineteen at the time of the eruption of 79. As a native of Naples, he may be presumed to have been conversant with all the phenomena which then took place. His lines on the subject of the destruction of the cities are very striking:

Hæc ego Chalcidicis ad te, Marcelle, sonabam
Littoribus, fractas ubi Vesvius egerit iras,
Æmula Trinacriis volvens incendia flammis.
Mira fides! credetne virûm ventura propago,
Cum segetes iterum, et jam hæc deserta virebunt,
Infra urbes, populosque premi? proavitaque toto
Rura abiisse mari? necdum letale minari
Cessat apex——

"The latter part of this passage seems to me to mean "lands tilled by our ancestors (proavita) have disappeared in the body of the sea" (toto mari). The commentator in the Variorum edition (Lugd. Bat. 1671) appears to understand the word "proavita" as referring to the restoration of these districts hereafter 'proavita dicit respectu futuræ posteritatis'—which seems to me absurd. How were posterity to get the lands out of the sea again? Such is not the use of the word when applied to Hector:

"Pugnantem pro se, proavitaque regna tuentem."
Ovid. Metamorph, xiii. 416.

"I infer from the expressions of Statius that considerable tracts of land had been sunk in the sea by some sudden depression of the ground.

"May not this have been the time when the temple of the Nymphs, and the first baths or temple of Serapis, were covered with shallow water? Is it not possible that between this convulsion and the time when Pausanias wrote, the inhabitants of Pozzuoli may have made the island in the sea (χειροποίητον), and have erected on it a second temple—the one of which the ruin still puzzles the geologist?"

Such are some of the ideas—disclosing the graceful union of science and scholarship by which both have been so materially benefitted in modern times,—that reach us, towards the eve of a stormy session of our Canadian Parliament, from the pen of our Provincial Viceroy, and furnish a welcome example of relaxation amid the cares and responsibilities of Government, thus found among ourselves in the delightful seductions of scientific speculation and literary research.

D. W.

Introduction to Cryptogamic Botany: By the Rev. M. J. BERKELEY, M.A., F.L.S. London: H. Bailliere, 219 Regent-st., 1857.

A publication relating to Cryptogamic Botany, bearing Mr. Berkeley's name, cannot but be received by all students and amateurs of that branch of science with great expectation and deep interest. His profound knowledge, long experience, and discriminating judgment in respect to some of the most difficult sections of the department he has undertaken to illustrate have been abundantly proved; and, whilst there can scarcely be a higher authority than his, or a guidance better fitted to inspire confidence, there is hardly any branch of knowledge in which the want of assistance is more felt, or in which it is more eagerly sought by those who are determined seriously to apply to the subject.

For many years past, few have commenced the attempt to penetrate the mysteries of cryptogamic vegetation without having recourse to a work with a title similar to our author's, by the learned Kurt Sprengel, author of the Historia Rei Herbariæ, and of a valuable edition of the Systema Vegetabilium. When it is stated that the English translation of this work was first published in 1807, the last edition in 1818, we need not wonder, that, though excellent in its time, it has of late years been felt to be out of date and that the supply of something better adapted to the present state of science was an acknowledged *desideratum*. It was one, however, from which a mere compiler would shrink in despair, and to the various requirements of which few of our ablest men could hope to do justice. It will be generally agreed that the work has fallen into good hands, and that we have here "the right man in the right place." In short, wherever there is a cryptogamic student, Mr. Berkeley's book will be eagerly sought after, and those who do not yet possess it will be glad to know something of what they may expect. The first chapter is devoted to the distinction between the subjects of the work and the rest of the vegetable kingdom, and the name proper to be applied to them. The author recognizes only three grand divisions—Exogens, Endogens, and Cryptogams. He says, in reference to Lindley's system: "I cannot consider Dictyogens (much less Rhizogens and Gymnogens) as a class of *the same importance* with Endogens and Exogens. They are so clearly endogenous, notwithstanding the peculiarities of the venation, or much more of the structure of the stem, that unless every anomaly is to be considered as overthrowing a natural division, we must either be content to leave them in company with their allies, or give up the attempt of natural arrangement altogether." Probably the advocates of the system referred to, do not hold it to be necessary that all classes should be accounted of equal importance; their view is that smaller transition groups are better separated as classes than only set apart as sub-classes of the larger class which they most nearly approach. Few for instance would be satisfied with considering Gymnogens as no more separated from other Exogens than as any one alliance, or even than as one great section is separated from another. Those who do not admit the class, divide exogens into sub-classes of very unequal extent, Angiospermæ and Gymnospermæ. It can hardly be denied that this distinction is real and important. The question is respecting the best mode of expressing it, and we still incline to prefer Dr. Lindley's plan of increasing the number of classes, though some of them be obviously transition groups of smaller extent and less distinctly marked characters than the others. To us Dictyogens seem a good deal more doubtful than Gymnogens, but we like the idea of these transition classes, and accept for the present an arrangement which includes them. Grant that Gymnogens and Rhizogens have a nearer relation to Exogens, Dictyogens to Endogens, and that Acrogens and Thallogens may be connected together as Cryptogams, yet if these divisions must be recognized at all as something more than orders, the simplest way is to adopt them as classes, but without holding the principle that all classes are of equal value any more in the nature of their characters than in their extent. Having defined cryptogams by the joint consideration of their (generally) cellular substance, their growth by superficial development, the absence of organs strictly corresponding with stamens and carpels, though there are sexual organs—the general substitution of bodies resembling spermatozoa for pollen grains, and the absence of a true embryo—he proceeds to justify himself in retaining the familiar name Cryptogams in preference to several which have been proposed, in which probably most readers will think him successful. The second chapter more fully discusses the characters by which cryptogams are distinguished, specially examining difficult cases; enlarges on the importance and interest of the study, lays down some cautions as to the mode of pursuing it, illustrates the true meaning of analogy, homology, and affinity, attempts to show that there is no near approach to cryptogams in the higher divisions of the vegetable kingdom; and, after setting aside the notion of spontaneous or equivocal generation as equally untenable in respect to the lower and the higher organisms, concludes by dividing all cryptogams into two great sections, regarded by Lindley as classes of the vegetable kingdom—Thallogens and Acrogens. We quote the summary of characters in the first paragraph: "Cellular or more rarely cellular-vascular, flowerless plants, often destitute of stem and foliage, propagated by simple or compound microscopic spores, germinating by means of one or more simple threads, and rarely containing any embryo, sometimes producing a prothallus, which gives rise to secondary spores or young embryonic plants, increasing mostly by additions to the external surface, exhibiting sexual distinctions, diclinous or monoclinous, but never producing true stamens or pistil, and consequently possessing no true pollen, but, on the contrary, impregnated by spermatozoids, either provided with or destitute of slender flagelliform motile appendages," to which we add the concluding paragraph, containing the distinctive characters of THALLOGENS and ACROGENS: "Thallogens—seldom herbaceous or provided with foliaceous appendages; foliaceous appendages, if present destitute of stomata. Spores rarely producing a prothallus; and, if so, giving rise to a second order of spores germinating at definite points. Spermatozoids not spiral. Acrogens—mostly herbaceous, and provided with distinct, often stomatiferous foliaceous appendages. Spores, for the most part, producing a prothallus, or, if not, complicated fruit by means of the impregnation of an embryonic cell. Spermatozoids spiral."

We think it possible that our author may be disposed to go to an extreme in his rejection of all affinity between cryptogams and any of the higher forms of vegetation. He seems to us quite right in insisting on the reality of the distinctions between them, but the different groups must approach more nearly at some points than at others, and the resemblances which bring certain families into relation are as real though not perhaps as important as their differences.

Gymnogens, Endogens, and Acrogens, seem to us well marked classes, the two former among Phænogams, the latter among Cryptogams; but if there be any real resemblance between Palm Cycadaceæ and Ferns indicating an osculant point, we must not be deterred from recognizing this fact by fear of impairing the distinctness of the line of demarcation. But we leave this subject to lay before our readers the passage from Mr. Berkeley's argument on the importance of cryptogamic studies: "Another excellent inducement to the study of cryptogams is the fact that so many of the diseases, both of plants and animals, arise from their presence. The species which affect animals are probably few in number, and for the most part of common kinds, possessing great powers of ubiquity, and therefore able to establish themselves on what, from the very nature of things, cannot be their natural habitat. Though great attention has been paid to the study of such cryptogams as infest man, and other animals, they have seldom been studied by competent persons, possessed of an accurate knowledge of species, much less of a power of appreciating the changes which may take place in the same species, according to varying outward circumstances. Those who have recorded their occurrence, or have given figures illustrative of their aspect and structure, accompanied by distinctive characters, have often been physicians, better versed in anatomy and microscopy than in cryptogamic botany, and often unable to distinguish a mould from an alga. The parasites of the vegetable world are much more numerous, and are clearly autonomous; and, as some of them produce great ravages on those plants which most subserve the use of man, their study is of immense economical value, apart from other less utilitarian considerations. Till these parasites are accurately distinguished from each other, all attempts at remedy must be empirical; and thus, in the case of the diseases which affect the hop, no efficient remedy was even attempted till the nature of the two principal diseases with which the plant is affected, known under a multitude of names, was accurately ascertained."

The remaining portion of the volume is occupied by details respecting particular orders beginning with the lowest Thallogens, and terminating with the ferns, the highest in rank of cryptogamic plants. Instead of at once dividing Thallogens according to Lindley's plan into the Algal, Fungal, and Lichenal alliances, Mr. Berkeley regards the two latter as more closely connected, and judges it necessary, contrary we think to convenience and practical utility, to put them together under the name MYCETALES. This is a consequence of the theory that all divisions of one name must be of equal value and equally related to each other, a theory altogether at variance with well-known facts. The arrangement of Acrogens is as follows: "Spores or nucules solitary. CHARACEALES, an alliance consisting of the order *Characeæ* alone.

Spores numerous, giving rise to a plant which produces one or more successive sets of fructifying archegonia:—MUSCALES, § 1, without a peristome: (Hepaticæ) orders RICCIACEÆ, sporangia valveless, without elaters: *Marchantiaceæ*, sporangia dependent valvate or bursting irregularly; Spores mixed with elaters: *Jungermanniaceæ*. Sporangia erect, valvate; Spores mixed with elaters.

§ 2. Peristome mostly present, *Musci* [*Bryaceæ*]. Spores numerous, producing a prothallus which bears a single set of Archegonia which yield fructifying plants. FILICALES—*Filices* [*Polypodiaceæ*], sporangia annulate or rarely exannulate and closely crowded: *Ophioglossaceæ*, sporangia exannulate bivalvate: *Equisetaceæ*, sporangia dependent, unilocular, bursting laterally: *Marsiliaceæ*, sporangia multilocular: *Lycopodiaceæ*, sporangia axillary, unilocular." This arrangement seems to us an improvement on any with which we are acquainted. It is not free from difficulties, but it is upon the whole natural, and compares very favorably with rival systems. We cannot but feel surprised that Mr. Berkeley so little appreciates the value of Lindley's mode of nomenclature, which we had expected to see at once accepted by all writers on the subject. In the case of the ferns, for example, he has applied generally, yet not uniformly, the terminations in *aceæ*, which ought to mark leading orders to the sub-families; whilst, in naming the order, he has preferred the old title Filices to one formed on the analogy of other natural orders. Not less objectionable is the practice of speaking of *monopetalous* orders of plants, a term which conveys a false idea, and which all the most accurate writers are abandoning. We recommend the term *synpetalous* as concise and intelligible, and greatly preferable to *gamopetalous*, which was recommended by De Candolle; but the continued use of a term like monopetalous, which expresses a view universally acknowledged to be false, seems to us a serious evil. Taken as a whole, we can hardly speak too highly of Mr. Berkeley's work. It more than fulfils all reasonable expectations, and will prove such a help to the cryptogamic botanist that he will account its acquisition an era in his studies. The work is copiously illustrated with woodcuts from original sources, and forms one of the most striking volumes of the fine series with which it is connected.

W. H.

Handbook of Zoology, by J. Van der Hœven, &c., &c., in two volumes. Vol. II. Vertebrate animals. Translated from the second Dutch edition: By the Rev. W. Clark, M.D., F.R.S., &c., late Fellow of Trinity College, and Professor of Anatomy in the University of Cambridge.

We gladly announce the completion of this important work. We wish we could more entirely approve of its systematic arrangement; but, whatever may be supposed to be its faults, it offers most valuable aid to the student, and the account given of the general structure and physiology of each tribe, prefixed to an analysis of its families and genera, is precisely the sort of thing which is needed by the general student. Dr. Clark, in faithfully translating, has also, with the aid of the author, carefully improved the work, and it must be accounted a very valuable addition to the stores of scientific information in our vernacular tongue. It is only to be regretted that two such volumes are unavoidably somewhat expensive.

W. H.

Rational Philosophy in History and in System; an Introduction to a Logical and Metaphysical Course.—By Alexander C. Fraser, Professor of Logic and Metaphysics in the University of Edinburgh. Edinburgh: Thomas Constable & Co. Hamilton, Adams & Co., London.

This little tract has not received from the leading British Reviews the attention to which, in our judgment, it is entitled. Any notices of it with which we have met have been of a most general and vague character; leaving on the mind of the reader no distinct impression, except that the reviewers had nothing very particular to say about the work which they were criticising. This, we suspect, is to be explained by the circumstance that the work professes to be merely a provisional substitute for a syllabus or outline of the course which (with special reference to his own students) the author is labouring to mature; for assuredly it is not owing to the work being either common-place or unseasonable. A reviewer may ordinarily feel himself excused from giving anything more than a passing notice—if even so much—to a provisional substitute for a syllabus of a Professor's lectures; but the present case is somewhat exceptional. Mr. Fraser's tract is the only work hitherto published which contains a concise and faithful sketch of the modern Scottish philosophy. In the scattered notes, indeed, of the late Sir William Hamilton, the leading doctrines presented in the work before us are found; but, though set forth there clearly enough, it is in too fragmentary a manner, and in rather too esoteric language: objections, the former of which at least we hope to see removed when Sir William's lectures, now in course of publication, have been given to the world. Inasmuch, therefore, as the treatise under review supplies an important desideratum in philosophical literature, while it is also possessed of great intrinsic merit, we regard it as worthy of more attention than is usually accorded to works of a like description.

Before adverting more particularly to Professor Fraser's metaphysical system, a word regarding that part of his treatise in which he touches on the history of philosophy. The treatise is entitled, "Rational Philosophy in History and System;" and those who are in the habit of joining in the common outcry against speculative philosophy —that its history is nothing but a record of mutually destructive systems of thought, contrasting in this respect so unfavorably with the various branches of physical science, which, since their origin, have been always steadily progressing—would do well to ponder our author's profound remarks on this subject. He is fully warranted, we conceive, in saying that when success is measured by the highest standard, "no sphere of mental labour can record a longer series of illustrious successes than Rational Philosophy." But let it be understood what the true standard of judgment is. "A discovery, by means of reflection and mental experiment, of the limits of knowledge, is the highest and most universally applicable discovery of all; it is the one through which our intellectual life most strikingly blends with the moral and intellectual part of our nature. *Progress in knowledge is often paradoxically indicated by a diminution in the apparent bulk of what we know.* Whatever helps to work off the dregs of false opinion, and to purify the intellectual mass—whatever deepens our convictions of our infinite ignorance — really adds to, though it sometimes seems to diminish, the rational possessions of man." To one who is able to interpret it aright, the phenomenon, so obtrusive on the surface of the history of speculation, of a shifting succession of systems, is by no means inconsistent with the idea of real and great progress. If the various metaphysical theories which, to a superficial observer, appear to resemble the wild beasts in the vision of the prophet Daniel, each rising out of the sea to displace its predecessor: if these theories be carefully examined, they will for the most part be found to recognize important, though partial, truths; their mutual antagonism resulting either from the presence of error in all the systems, or from the denial, on the part of one system, of the truth contained in the others. The history of philosophy may consequently be read as a history, not of conflicting but of conspiring systems. As speculation is continued from age to age, what is erroneous in the several partial systems tends to drop away, having no principle of enduring life; while the really valuable elements survive, and are gradually drawn together into a harmonious and beautiful union; giving rise to what Mr. Fraser calls, in contradistinction to the partial or sectarian systems, the true CATHOLIC PHILOSOPHY. Of course, these ideas are not new; but, in the treatise before us, they are presented and illustrated in an unusually felicitous manner.

Professor Fraser is an adherent of the modern Scottish school of philosophy—more briefly, a Hamiltonian; though he does not by any means slavishly follow his illustrious predecessor. It being kept in view that the great problem which rational philosophy seeks to solve, is, "to determine what is meant at bottom by the so-called real existence which appears in innumerable forms, which every human action assumes, and on which life reposes," the following may be taken as a summary of the principal points in Mr. Fraser's metaphysical creed. (*a*). Real existence is ultimately incomprehensible by finite intelligence. Consequently, the grand problem of metaphysics is insoluble. What that real existence is, of which, in some of its phenomena or varying manifestations, we are perpetually conscious, man cannot know, cannot conceive. This doctrine is opposed, on the one hand, to the theories of those who believe that the problem can be positively solved: in other words, that we are capable of attaining to a knowledge of real existence; and, on the other hand, to the scepticism which represents reason as self-contradictory—in which case no conclusion of any kind would be possible; not even the conclusion that the problem is insoluble. (*b*.) Though real existence is ultimately incomprehensible by finite intelligence, certain of its phenomena or varying manifestations may be apprehended in consciousness. For instance, in every act of sensitive perception, mind and matter, the ego and the non-ego, are phenomenally apprehended together. Only a small part, indeed, of the universe lies within the sphere of our immediate perception, or is actually presented to consciousness; but the phenomena of the universe which are not actually, may be made virtually, present to consciousness; being "brought within the sphere of intelligible belief by means of the representative faculty, and an inductive comparison of instances." (*c*). The phenomena of real existence, actually or virtually present to consciousness, are temporal; that is, of finite duration. "Real existence, when perceived, must be perceived as something which appears on the stream of time; when merely conceived, it must be conceived as something manifested in time." (*d*). Since real existence can thus be apprehended only in some finite and transient manifestation, it might seem at first sight as though we never could have any ground for introducing into a system of metaphysical doctrine anything regarding real existence, non-phenomenal, absolute, infinite. And, indeed, it is true that the infinite cannot be grasped by consciousness, or an intelligible knowledge of it reached by deduction from what consciousness reveals. Yet we cannot but *believe* in the real as something above consciousness. Such faith, far from being irrational, is the only true rationalism; for our intellectual constitution contains among its elements a variety of beliefs, (commonly called transcendental), essentially incomprehensible, yet irresistibly forcing themselves upon the mind; so that "we are impelled to the infinite by faith," while nevertheless "we are repelled from the infinite by thought." (*e*). According to the view just given, the doctrine of insoluble Realism is built (as, in fact, every non-sceptical system of philosophy must at least profess to be) upon a recognition of the validity of the common beliefs of mankind, even when these are, or may be deemed to be, incomprehensible. And Mr. Fraser considers, that, as respects practice, "the spontaneous feelings and tendencies of human nature, regulated by our moral and religious trust" are "an available substitute for an intelligible theory of existence;" (no such theory, in his opinion, being capable of being framed). Here the canon of metaphysical presumption is laid down, viz.: that "a common belief may be presumed to be true until it is disproved." (*f*). If the great aim of speculation be to determine what at bottom is meant by the real existence which every human action assumes; and if, as our author thinks, this problem be insoluble: what purpose, it may be asked, beyond that of exercising and whetting the intellectual energies, does speculation serve? A two-fold purpose. In the first place, it repels the attacks of scepticism. In Mr. Fraser's opinion, the germs of scepticism—scepticism as to all that ennobles man, or that man holds dear—are latent in every theory which professes to explain existence; and not only so, but it is from the assumption that an intelligible theory of existence can be framed, and from the contradictions in which such an assumption issues, that scepticism in any instance derives its plausibility. If this be so, it is certainly of immense moment that the insolubility of the great problem of metaphysics should be scientifically made out. In the second place, the conviction, formally arrived at after many a weary effort to penetrate the mystery of existence, that we must *believe*, yet never can *comprehend*—that "knowledge" (as our author, in something of the spirit and tone of Pascal, beautifully expresses it) "must hang suspended, on the wings of Faith and Love, over a dark gulf which the line of reason cannot fathom"—this conviction, it is supposed, must exert upon the soul a direct influence of the most salutary kind; particularly in the way of fostering a spirit of humility and reverence.

Such, in brief outline, is Mr. Fraser's system of rational philosophy; and we are constrained to confess, that, with our present convictions, we cannot assent to it. Whether we can produce a better system, is another question. Perhaps, in due time, we may try. But meanwhile, without undertaking the responsibility of expounding and defending a metaphysical theory different from that of our author, we may (especially in view of the matured treatise, of which Mr. Fraser's present production comes forth as the herald) be allowed to indicate some of the points in which we regard his doctrine as unsatisfactory.

The most objectionable—as it is the most obvious—feature in the system, is, that, on Mr. Fraser's principles, we can have no *strict and perfect certainty* that anything real exists, beyond the phenomena of consciousness. The real, as distinguished from its temporal and changing phenomena, is not consciously apprehended. It cannot be conceived or known by the finite mind. We are, no doubt, impelled to exercise faith in its existence—a faith which Mr. Fraser eloquently insists that it would be in the highest degree unphilosophical to give up. Still, when we look into the matter, we find that after all he does not profess to claim for this faith an *absolute validity*, such as characterizes the knowledge which we have of the phenomena of Being. We do not suppose that Mr. Fraser would complain that the statement now made is inaccurate; but lest any of our readers should imagine that we are doing him injustice, we may observe that in the law of metaphysical presumption, laid down for the criticism of our common beliefs, and of those transcendental beliefs (among the rest), to which Mr. Fraser thinks that our persuasion of the ultimate infinity of the Real is due, it is clearly implied that certainty in the strict and proper sense of the term is *not regarded as* a necessary character of our common beliefs. Is the validity, for instance, of the causal belief absolute? Mr. Fraser would answer, as Sir W. Hamilton did before him: the belief must be presumed true, until it is disproved. This is a very different thing from saying that the belief is absolutely valid. It seems to us, in fact, to be virtually saying that the belief is *not* absolutely valid. We do not give a very absolute testimony to a man's honesty, when we declare that he must be presumed honest till he is proved a thief. Sir W. Hamilton's fully developed doctrine is, that the primary beliefs of mankind, regarded as testimonies to matters beyond their own subjective reality, are not essentially "above the reach of question." They must be presumed true in the first instance. But their validity may intelligibly and legitimately be made the subject of argument. *It is conceivable that they may be disproved, or at least discredited.* This has never yet been done; and, consequently, the original presumption in their favor is confirmed. Professor Fraser does not enter into detail, like Sir William; but his sentiments here are manifestly the same in the main with those of his distinguished master. On such a view, however, it is apparent that we can have no strict and perfect certainty of anything beyond the transient phenomena of the ego. We may, from a spontaneous impulse, believe in a substantive Self, in a material world, in God; but these beliefs may (conceivably at least) turn out to be unwarrantable. "As philosophy now stands" (the expression is Sir William Hamilton's) they have a claim upon our acceptance; but this very mode of putting the case implies that (conceivably at least) the verdict of metaphysicians, fifty years hence, may be: "as philosophy *now* stands" the validity of the natural beliefs of mankind must be abandoned. We are fully entitled therefore, to say, that, in whatever terms Mr. Fraser may at times speak of the confidence due to our common beliefs, his theory forbids us to exercise an absolutely perfect confidence in them; and, among other consequences of this, compels us to admit, not only that the real, as distinguished from its temporal manifestations, is inconceivable, but also (a widely different thing) that there is no absolute certainty that any such reality exists; compels us, in a word, to admit, that there is no strict and absolute certainty of the existence of anything, save the fleeting images that follow one another in the glass of consciousness. Now this doctrine we are utterly unable to assent to. If Mr. Fraser, when he publishes his system in its matured and extended form, can bring forward any considerations to remove our dislike to it, we shall weigh them carefully; but in the mean time, we cling to the persuasion that man has something more than a "presumption" of absolute existence. We cannot divest ourselves of the impression that Mr. Fraser's opinion is closely allied to that very scepticism against which he is so anxious to raise a barrier. Instead of the canon of metaphysical presumption, we would lay down the principle, that the truth of the common beliefs of mankind is perfectly and essentially certain; that no one of these beliefs can even be conceived false; and that a question as to their validity cannot be intelligibly raised. We are mistaken, if an examination of our various common beliefs in detail would not bear us out in affirming this principle—a principle, which, if it could indeed be demonstrated to be correct, would be fatal to the most important and distinctive parts of Mr. Fraser's metaphysical theory.

We suspect that it is for want of an investigation into the *nature* of our common beliefs, that the doctrine which Mr. Fraser has laid down respecting their *validity*, and which is the common doctrine of metaphysicians of the Scottish school, has obtained currency. Take, for instance, the causal belief—to which reference has already been made. What is this belief? As far as we can gather, Mr. Fraser looks upon it as a pure inexplicable mental mode—a mode, as Professor Ferrier, of St. Andrews, might say, of the ego *per se*. Were this the case, we should, of course, be shut up to Mr. Fraser's conclusion respecting its validity. A pure mental mode has no essential and necessary connection—as far as we can see—with anything else. Were the causal belief, therefore, a pure mental mode, we could go no further than "presume" the accuracy of its testimony to what is not included in its own subjective existence. Strict certainty, as distinguished from mere presumption, would, on such an hypothesis, be impossible. But, for our part, we do not regard either the causal belief, or any of the other cognitions, beliefs, &c., of the mind, in the light mentioned. On the contrary, our impression is that a pure mode of the ego—a mode of the ego *per se*—never, in any single instance, is an object of human consciousness.

The principle, that we can apprehend real existence only in certain of its phenomena, includes the familiar idea that neither mind nor matter can be substantively known by us, but that we can know only their qualities. It may seem absurd to shew hesitation regarding what is one of the common places of speculative philosophy; still, we would venture to ask—Is Mr. Fraser sure that he can discriminate the consciousness of quality from the belief of substance? Is he sure —to take the case of external perception—that he can discriminate his consciousness of the qualities of matter, on the one hand, from his belief in that substantive existence, on the other, of which the object apprehended in consciousness is a manifestation? Let it not be fancied that we are looking back in the direction of David Hume, if we say that we doubt whether this discrimination can be intelligibly made. It is impossible, in a few lines, to explain ourselves fully; and, as has been already intimated, the exposition of our own views is not at present the matter in hand. But we may observe, in general, that we regard what is termed the knowledge of quality as, in a certain sense, the knowledge of substance. The term *knowledge* may, no doubt, be defined in a particular manner, and conditions of knowledge laid down, from which the inference at once results, that substance cannot be known. But definitions prove nothing. Whatever may be judged the most fitting language in which to convey the idea intended, what we mean to convey is, that in every act of human consciousness, the real, as substantively existing, is so discovered, that not only are we determined, by a spontaneous faith, which nothing except a positive demonstration of the self-contradictory character of reason could overthrow, to "presume" its existence; but that its existence is necessarily involved in the consciousness realized; is (as we may express it) a factor requisite—not contingently, or in virtue of the arbitrary constitution of the universe, but in the very nature of things—to produce that consciousness.

In speaking of the inductive belief, through which we attain a knowledge of distant material objects, our author says: "Belief in the universe, as a stable and coherent objective system, is an element in our ordinary belief in the universe as something real. . . . . Through this inductive belief, our knowledge of existence, as a system of mutually related objects, is a progressive knowledge; nor, as it seems, is belief in the coherence or consistency of the surrounding universe different in kind from our practical faith in its reality as finite." The explanatory foot-note is added: "I do not now discuss the origin of the former belief, or its relation to mental association—one of the minor problems of a past day." Here may we be allowed to ask whether Mr. Fraser means to intimate that the origin of the two beliefs referred to is not the same? We should almost fancy that he does, from his specifying "the former belief" in so marked a way. Let our readers observe what the beliefs are. The one is our belief in the coherence of the universe; the other, our belief in the reality of the universe as finite: not, however, our belief in the reality of the phenomena of matter immediately apprehended in an act of external perception, but (as the context shows) our belief in the reality of material phenomena lying beyond the range of consciousness. Now we hold it to be altogether incontrovertible that the origin of these two beliefs is the same. Yet Mr. Fraser *seems* to deny this. We should have liked if he had told us what he thinks the origin of our belief in the coherence of the universe to be; and, in connection with this, what validity he ascribes to it. We have no hesitation in saying that we do not regard it as a primitive belief, or as possessed of any such absolute validity as (for instance) the causal belief. In itself, the question of the origin of our belief in the coherence of the universe may indeed be, as Mr. Fraser says, a minor question; it is hardly so, however, if we consider the indication which an erroneous solution of it would afford, of radical imperfection in the general philosophical views of any one by whom such a solution was adopted.

The doctrine that real existence is ultimately infinite, is manifestly irreconcileable with the vulgar notion, that body is made up of continuously extended material particles, or ultimate molecules, of finite size. We were anxious to learn exactly what Mr. Fraser's opinion is respecting the extension of body, but have been disappointed to find him extremely reserved on this interesting point. Does he believe that body is extended at all? He appears to say so, though never very explicitly. The most distinct statement on the subject which his treatise contains, as far as we have noticed, is this: "If it be the common feeling of the human mind, in its healthy condition, that an external and *extended*, and not merely the internal or self-conscious world, is actually present to consciousness in external perception, may that common feeling be arbitrarily set aside as irrational? If so, all our common feelings may be worn away by speculative reasoning." This is hardly enough to satisfy our curiosity. On the one hand, if it be meant that body, in its own absolute nature, is extended, can this be made to harmonise with the principle of the ultimate infinity of the real, even supposing the infinite divisibility of matter to be conceded? On the other hand, when body is spoken of as extended, is the meaning only this—that the phenomena of body, manifested to conciousness, are apprehended in finite space? Then we ask, is the finite extension of body absolutely (a point on which we ourselves express no opinion) denied by Mr. Fraser? We ask also, can he explain (what we confess is in the meantime dark to our minds) in what sense the phenomena of body, as distinguished from body absolutely, are apprehended in finite space?

We do not overlook the fact that the work under review is merely "*an introduction* to a logical and metaphysical course." We shall only add, meanwhile, that we greatly desiderate from Mr. Fraser a fuller criticism than he has given us, of the conceptions which fill so important a place in his metaphysical system—of time (infinite) and duration (finite), with a determination of the relation between them.

It is hardly necessary to notify any intelligent reader that if a considerable part of this paper has been occupied with the statement of objections, we are not therefore to be regarded as passing an unfavorable verdict on the work reviewed. We have already said that we regard the work as possessing merits of a very high order. Had this not been our opinion, we should not have thought it worth our while to be particular in indicating our dissent from the author's main positions. Whether or not the modern Scottish philosophy be founded in truth, is a matter on which there may be difference of sentiment. We take the negative view; but if this judgment is wrong, we are anxious to be convinced that it is so; and we know of no man more fitted, by learning and natural capacity, than Professor Fraser, to correct misconceptions, to remove difficulties, and to pour in upon the system which he advocates, the light necessary to win the adhesion of those who at present are unable to concur with him.

G. P. Y.

SCIENTIFIC AND LITERARY NOTES.

GEOLOGY AND MINERALOGY.

MASTODON REMAINS, MORPETH, CANADA WEST.

A notice of the recent discovery of a large tooth of the Mastodon Ohioticus (?) in the Drift of Morpeth, C. W., has been communicated to us, with a drawing, by Mr. J. W. Keating. Mr. Duck, of Chatham, has also forwarded a notice of the same, accompanied by drawings, to Dr. Wilson. The tooth was found in drift sand on a limestone ridge, about seven feet beneath the surface of the ground. It is thought that, by a further exploration, other specimens may be brought to light; and we much regret that, being on the point of leaving for England we are unable to pay a visit to the locality: more especially as this tooth appears to indicate a species of Mastodon not hitherto discovered in North America,—at least, if the drawings forwarded to us be correct. The *Mastodon Ohioticus* Blum. (= *M. maximus*, Cuv.; *giganteus*, auct.), the common North American species, belongs to the sub-genus TRILOPHODON of Falconer, in which the crown-ridges of the teeth do not exceed four in number, and only amount to four, indeed, in the last true molar: the other true molars, and the first milk molar, exhibiting three ridges. In the drawings of the Morpeth specimen, the tooth shows five distinct crown-ridges, thus resembling the last true molar of Falconer's TETRALOPHODON sub-genus. It would be advisable, therefore, to place the tooth in the hands of some competent person, for minute examination.

PERMIAN STRATA IN NORTH AMERICA.

We mentioned in the last number of the Journal (page 261) that Permian strata had recently been discovered in Kansas Territory. In Silliman's Journal for May, an additional notice is given of the occurrence of rocks of the same age in the Guadalupe Mountains of New Orleans. A series of Permian fossils, collected from a white limestone of that locality, one thousand feet or more in thickness, by Dr. G. G. Schumard, were described by his brother, Dr. B. F. Schumard, in a paper read before the Academy of Sciences, at St. Louis, on the 8th of last March.

LARGE BOULDERS.

The gneissoid and other boulders, so abundantly scattered over the drift area of Canada, are not, as a general rule, of very large size. On a recent examination, however, of a supposed outcrop of limestone in the Township of Albion, C. W., lot 24, concession 9, a point on the highest ridge between Lake Ontario and Lake Huron, we found the so-called bed of rock to be merely a large boulder of Black-River Limestone, containing amongst some indistinct fossils, a well-preserved specimen of *Columnaria alveolata*. It was thought that the "rock" might prove to be an outlying patch of the Niagara limestone; but drift clay and sand with boulders of gneiss and limestone, were seen at lower levels in the same hill; and the presence in the stone of the characteristic Black River coral, showed at once its true origin. The face of this boulder, on the slope of the hill in which it is imbedded, has been blasted off; and a considerable quantity of lime has been obtained from it. Mr. Murray, in one of his recently published reports, mentions the occurrence of some very large boulders of sandstone or conglomerate in the drift of Goderich, in Canada West. These, it appears, under the belief that they constituted a portion of the solid strata, have actually been quarried, in one locality, for building purposes. Mr. Murray refers them to the Oriskany Sandstone, or to the Chemung and Portage group. (See Geological Report in 1855, page 133.)

HEMATITE PSEUDOMORPHS.

In a small boulder, consisting of pale red feldspar with numerous grains and rounded crystals of quartz, the writer of these notes detected some small but very distinct crystals (octahedrons with truncated edges,) of a steel-blue and feebly magnetic substance, which exhibited all the reactions of sesqui-oxide of iron, and yielded a dull red streak. These little crystals must be consequently either *Martite*, or *altered Magnetite*, in all probability the latter. The existence of Martite, indeed, as a truly independent species, remains yet to be proved. The boulder in which the crystals occur was found on the shore of Bass Lake, near the road between Coldwater and Orillia, in Canada West, and about four miles from the latter village. Unaltered Magnetite in small granular masses, is present in almost all the crystalline boulders so abundant in that part of the country.

PICTET'S PALEONTOLOGIE: TRIARTHRUS BECKII.

In the second volume of the new edition of Traité de Paléontologie, by Prof. Pictet, of Geneva, there occurs a striking example of the inexpediency of giving to rock groups names founded on the mineral characters of these. In the volume in question, it is stated that *Triarthrus Beckii*, the well-known trilobite of our Utica schist, occurs not in the Silurian, but in the Carboniferous formation,—the term bituminous shales, so often applied to the Utica schist, having manifestly been mistaken by Professor Pictet for the bituminous shales of the coal measures. In the fourth volume, published two years after the appearance of the second, the error is repeated. In the second volume (page 492) Prof. Pictet states, "Le *Triarthrus Beckii*, Green, a été trouvé dans un schiste carbonifère des environs d'Utica (etat de New York). C'est, comme je l'ai dit plus haut, la seule espèce de cette famille qui n' appartienne pas à l'èpoque silurienne;" and in the fourth volume (page 601), the genus *Triarthrus* is refered, with *Phillipsia*, to the Carboniferous epoch. As this error does not appear to have been remarked, we venture to notice it in the present place, but with full acknowledgment of the general excellence and undoubted value of Professor Pictet's useful and most beautifully illustrated work.

NEW GEOLOGICAL MAGAZINE.

We have just received the fourth number of a new monthly magazine, "The Geologist," published in London (England), under the editorship of S. Y. Mackie, Esq. The number before us contains a series of interesting articles, by Professor De Koninck, Professor Ansted, and others, written in a sufficiently popular manner to suit the general reader, and afford information to persons commencing the study of Geology. The list of promised contributors to this new scientific magazine, augurs well for the success of the work. An article in the present number, by Professor Buckman, on the application of Geology in coal-seeking, might be read with profit by some of our Canadian coal discoverers. The Geologist is published once a month by Messrs. Reynolds & Co., of 15, Old Broad Street, London, at one shilling per number.

CARL FRIEDRICH PLATTNER.

We notice with great regret in the last number of Silliman's Journal, a record of the death of Professor Plattner, of Freiberg, well known as the first blowpipe analyst of the day, and the author of the celebrated treatise, "Die Probirkunst mit dem Löthrohre," and other valuable works. Plattner died on the 22nd of January. He was born on the 2nd of January, 1800. For same time before his death, we believe, he was severely afflicted. E. J. C.

CHEMISTRY.

ON THE PURIFICATION OF SULPHURIC ACID.

Cameron found as much as one ounce of arsenious acid deposited from eight pounds of oil of vitriol, and in his paper, published in the Chemical Gazette, 1856, he expresses the opinion that such acid could not be rendered sufficiently pure for accurate investigations. It is well known that the best method of freeing sulphuric acid from arsenic is by passing a current of hydrochloric acid through the oil of vitriol heated nearly to boiling. In order to test the practicability of this method in cases where large quantities of arsenic are present, an experiment was made on quantities of sulphuric and arsenious acid in the above proportion, viz. 1 ounce to 8 pounds. A large portion of the arsenious acid remained undissolved, and hence the experiment was performed under the most disadvantageous circumstances. After passing the gas through the heated acid for one hour, it still exhibited traces of arsenic, but after continuing a strong current for half an hour longer, the residual acid was so pure that no trace of arsenic could be detected by Marsh's test. Hence we may conclude, as might have been presumed *a priori*, that this process is available whatever may be the quantity of arsenic present.

ON SOME COMPOUNDS OF PALLADIUM.

Palladio-bichloride of potassium is usually prepared by gently heating protochloride of palladium with aqua regia, and adding chloride of potassium; or by boiling the palladio-protochloride with aqua regia. A better method is to pass chlorine through a concentrated hot solution of the palladio-protochloride. Almost the whole of the palladium is precipitated in the form of the bichloride compound, and what remains in solution may advantageously be employed in preparing the chloride of palladammonium.

I am not aware of notice having been taken of the remarkable changes of color of the palladio-bichloride of potassium, under the influence of heat. The change is more striking than with red oxide of mercury, the salt becoming black with a very slight increase of temperature, and resuming its scarlet color on cooling. The conversion with the palladio-protochloride does not take place until the temperature has been very considerably raised and the salt fuses; the color then changes to brown.

Cyanide of Palladammonium.—This salt was originally described as ammoniated cyanide. It can be readily obtained by the addition of hydrocyanic acid to an ammoniacal solution of chloride of palladammonium. It falls as a white crystalline powder, which can be crystallised by re-solution, &c. Analysis showed it to be the salt described by Fehling.

Sulphide of Palladammonium.—When dilute hydro-sulphuric acid, or very dilute sulphide of ammonium, is added to a solution of chloride of palladammonium, the precipitate formed is, in the first instant, of a bright red, or orange red color, similar to the sulphide of antimony; it changes very rapidly into brown or brownish black sulphide of palladium. The red precipitate probably contains palladammonium, but is not a permanent compound.

Double Sulphocyanides of Palladium.—Buchton has described the double sulphocyanides of platinum, but I am not aware that the corresponding palladium compounds have as yet been examined. They may be obtained in the same way as the platinum salts, viz. by digesting the palladio-bichloride of potassium with a solution of the sulphocyanide of potassium. The potassium salt crystallizes in ruby red prisms which can be obtained of considerable size, easily soluble in water and alcohol. By this latter solvent the salt may be freed from the alkalic chloride with which it is apt to crystallize, and from which it is difficult to separate it without loss. The mixed salts are stirred up with alcohol, and the solution rapidly decanted. The salt is anhydrous, melts at a high temperature, and gives off sulphur, bisulphide of carbon, &c. Very slowly oxidized by nitric acid, after long boiling a white substance is produced, free from sulphur, and corresponding apparently to the platinum compound partly examined by Claus.

The deep red solution of the potassium salt gives with

Solution of	sub-oxide of	mercury	A black	precipitate.
do	chloride of	mercury	No	do
do	acetate of	lead	Orange yellow	do
do	nitrate of	bismuth	Dirty orange	do
do	sulphate of	copper	Brown	do
do	Chloride of	cadmium	Orange	do
do	do	zinc	do	do
do	sulphate of	nichel	Reddish brown	do
do	do	manganese	Yellowish brown	do
do	do	iron (Fe O)	Reddish brown	do

The ammonium salt could not be obtained by the action of sulphocyanide of ammonium on the palladio-bichloride of ammonium. It and the sodium salt were obtained from their respective sulphates and the potassium compound.

Similar compounds were obtained by using the palladio-protochloride. The potassium compound crystalizes in dark red needles. The composition of these various salts has not yet been determined, owing to the small quantity of palladium in my possession, but there can be little doubt that they correspond exactly to the platinum salts. The formulæ would then be $Pd.\,Rh.^2 + M.Rh.$ and $Pd.\,Rh. + M.\,Rh.$

The potassium salts are converted by ammonia into a salt crystallizing in fine *reddish brown needles, soluble in water and alcohol*; the same compound can be prepared by acting on the chloride of palladammonium with sulphocyanide of potassium, in the same way as recommended by Buckton for the platinum salt. The compound is the sulphocyanide of palladammonium.

$$N\left.\begin{matrix}H\\H\\H\\Pd\end{matrix}\right\}Rh.$$

The sulphur is oxidized with very great difficulty, even by hydrochloric acid and chlorate of potassa.

Double Salts of Bismuth.—Jacquelain long since described the bismuths, chloride of potassium, $2\,K\,Cl + Bi\,Cl^3 + 5\,H\,O$. Arppe states that by dissolving 1 equivalent of hydrated oxide of bismuth and 2 equivalents of chloride of potassium, in hydrochloric acid, a salt could be obtained of the formula $3\,KCl + Bi\,Cl^3$ and by using the proportions $2\,KCl$ & $3\,Bi'O^3\,H\,O$, another having the same form but consisting of $2\,KCl + Bi\,Cl^3$

In making some preparations of bismuth I have been unable to obtain these two compounds, the salt crystallizing out was in both cases,—and also when a large excess of potash salt was employed,—only the Jacquelain salt.

	I.	II.	Cal.
Bi	—	—	40.38
Cl	34.76	34.63	34.85
K	15.66	16.13	15.42
HO	8.46	8.36	8.85

The salts separate out first in rhombic tables, but as they increase in size, they assume the form of a rhombic octohedron, with largely extended terminal planes, and two side polars (brachydomes), which is the well known form of Jacquelain's salt.

If the above mixtures be boiled in hydrochloric acid without the addition of any water, a granular salt separates, the formula of which is $2\ KCl + BiCl^3 + 3\ HO$.

		Cal.
Bi	42.82	42-39
Cl	34.91	36.13
K	15.83	15.97
HO	5.66	5.51
	99.22	100.00

No anhydrous crystallized salt could be obtained by any means.

H. C.

METEOROLOGY.

At the third ordinary meeting of the Canadian Institute, during the past Session, a report was submitted and adopted from the Committee on Meteorology, after a reference to Professor Kingston. the Director of the Magnetic Observatory, We now print, by order of the Council, the Report of the Committee, along with that from the Director of the Observatory. Their publication has been delayed. owing to the absence of Professor Kingston in Europe.

REPORT OF THE METEOROLOGICAL COMMITTEE,

Read before the Canadian Institute, 9th January, 1858,

BY PROFESSOR KINGSTON, M. A.

In the spring of 1856 a Committee was appointed by the Canadian Institute, for the purpose of conferring with Dr. Ryerson, the Chief Superintendent of Education, relative to the system of meteorological observations about to be instituted at the Senior County Grammar Schools in Upper Canada, and to consider the steps necessary for rendering the system complete.

That so long a delay should have occurred in presenting a report demands some explanation.

The object set forth, it should be noticed, in the appointment of the Committee, was not, as some have erroneously supposed, to institute or even to propose the means of instituting a system of meteorological observation, but simply to consider the steps necessary for rendering complete that about to be instituted by the Board of Education. Now it is clear that any organization effected through the influence of the Canadian Institute, and designed to be supplementary to the system alluded to, should be in harmony with it as regards the hours of observation, forms of registration, and other details, and that if the Institute had successfully attempted to set on foot another system prior to the establishment of that in connection with the Board of Education, there would have been no security for the maintenance of the unity so essential to the success of the undertaking. The simple fact, then, that the proper function of the Committee was to promote the extension of a system which, prior to the present time, was not in existence, will, it is thought, be a sufficient justification of this apparently tardy action.

The arrangements for setting the Grammar School observations in operation are however, it is believed, now complete, a circular to that effect, to the various Boards of Trustees, having been recently issued from the Education Office. Your Committee, therefore, now feel at liberty to state what steps, in their opinion, should be taken towards the promotion of a knowledge of the meteorology of British North America, and what share especially the Institute ought to take in the matter.

The Committee, in doing this, confine themselves to recommending that which they believe likely to issue in practical action, and purposely abstain from suggesting any schemes which, however desirable in the abstract, are at present unattainable.

Systematic observations three times every day involve, there is no doubt, great personal inconvenience. The avocations of most people would render impossible their attendance at the prescribed hours; and of those not thus hindered, many would be reluctant to submit to the necessary restraint. But it is probable that among those who, from various causes, might be prevented from undertaking regular observations three times each day, many intelligent persons might be found who would be willing to lend a helping hand if any task less onerous could be proposed to them.

Now the services of such agents might be rendered available in one or more of the following modes:

1. By observations of temperature with self-registering thermometers, which require attendance but once each day.

2. By recording the depth of rain and snow, a work in which it is not essential that the measurements be made each day at the same hour.

3. By recording once, or twice, or three times daily, the direction of the wind and the general state of the weather.

To such regular observations might be added:

4. The making occasional communications relative to storms and extraordinary phenomena, or to the results of any special investigations which the observer might think fit to undertake.

The collection of meteorological data then would be carried on by observers whom it may be convenient to divide into three classes.

I. Regular observers of the first class, including all who conform to the instructions issued under the authority of the Board of Education in Upper Canada.

II. Regular observers of the second class, who record either the daily extremes of temperature, the depth of rain and snow, the state of the wind and weather, or any combination of these three.

III. Occasional correspondents.

Now with reference to observers of the first and second class, it is to be remarked, that in order to turn to account observations of temperature so as to deduce the monthly mean values of that element, it is requisite that tables be formed, derived from the hourly observations at some central station. Such tables have been calculated for Toronto, and these it is probable will be applicable to the greater part of Upper Canada, but as regards the reduction of observations in Lower Canada, it will be necessary that hourly observations be taken for two or three years at some eastern station, such for instance as Quebec.

In the furtherance of the objects above indicated, the action that the Institute may take is two-fold. 1st. By procuring the services of observers, and by placing them in communication with the Toronto Observatory. 2nd. By procuring for such observers the requisite instruments and register books.

The procuring observers may be promoted by addressing *memorials to the* Governments of Canada and other Provinces of British North America; to Departments under Government (especially to the Department of Education in Lower Canada); and to other public bodies. The memorials referred to should be made on the requisition of the Director of the Observatory *to the Council of the Institute*. Observers, it is thought, might also be obtained by advertisement, and through the influence of individual members of the Institute.

With the view of securing the employment of suitable instruments and uniform registration, the Committee recommend that the Institute be prepared to procure such at a stated price, payable in advance, for any person willing to take part in these observations, and that advertisements be published to that effect.

Through the kindness of the Chief Superintendent of Education of Upper Canada, very excellent instruments may be obtained from the Education Office, as well as the register books and instructions for first class observers. For observers of the second class much simpler forms may be used, of which a supply should be kept for distribution by the Institute.

The Committee think it needless to add any further remarks, as any action of the Institute not already and expressly named, will be made with the concurrence of the Director of the Observatory, in conformity with the recommendations already given.

The above Report having been referred, by the Council of the Canadian Institute, to Professor Kingston, the Director of the Toronto Observatory, the following proposals were submitted by him for their consideration, and are now printed by order of the Council, with a view to their being effectively carried out.

In furtherance of this, the co-operation of all members of the Institute, or others who may be able and willing to aid in any of the objects specified, is earnestly invited.

MAGNETIC OBSERVATORY,
Toronto, 12th January, 1858.

SIR,—With reference to the Report of the Meteorological Committee, lately adopted by the Canadian Institute, wherein it is recommended that the extension of the system of meteorological observation be promoted by their memorializing public departments, on the requisition of the Director of the Observatory, I request that you will submit to the Council the two following proposals:

1. That the Chief Superintendent of Education in Lower Canada be invited to use his influence in obtaining the co-operation of the principal seminaries and monastic establishments, and in placing them in communication with the Toronto Observatory. With a view of securing the employment of trustworthy instruments, it might be desirable to suggest that a supply be kept at the Education Office, and that the aid of the Director of the Toronto Observatory be sought, for procuring them.

2. My second proposal relates to the registration of rain, which, if it were carried out on a sufficiently extensive scale, would furnish information very valuable for engineering purposes, as well as in a meteorological point of view. The observations are of a very simple kind, requiring only the measurement by a graduated glass of the number of cubic inches of rain received in the guage, and its entry in the proper column of the register. The measurement is made but once each day, and not necessarily at the same hour. The cost of furnishing each station, including package and carriage, would not exceed $8 in the first instance, with a subsequent annual cost, for postage and register papers, of $2.

One class of persons particularly qualified, from the stationary nature of their occupation, for keeping such records, are the light-house keepers on the Lakes and the Upper and Lower St. Lawrence. As the light-houses are under the control of the Board of Works, the co-operation of that Department might be sought for furthering this object.

With respect to similar records at stations remote from the river, I am not able to name any persons *as a class* whose services could be reckoned on, but I conceive that many individuals might be found willing to take part in this work, and to purchase the guages, &c., at the moderate cost above named, and that it would be desirable to seek their aid by advertisement.

The question how to meet the expense of furnishing guages to the light-houses I leave to the consideration of the Institute.

I have the honor to be, your obedient servant,

G. T. KINGSTON,
Director.

E. A. Meredith, Esq.,
Corresponding Secretary, &c., &c.,
Canadian Institute.

MISCELLANEOUS.

PAUL KANE.

We learn with much pleasure that our talented Canadian Artist, Paul Kane, has effected very satisfactory arrangements with the eminent London publishers, Messrs. Longman & Co., for the issue of a work prepared from his notes, to be entitled: "Rambles of an Artist among the Indian Tribes of British America, during a four years' sojourn in the Hudson's Bay Territory, Oregon, and along the shores of the Pacific." This interesting and truly Canadian work will be illustrated by engravings executed in the highest style of art, from Mr. Kane's finished sketches and oil paintings; and at the present period, when so great an interest has been excited in North Western territories, the Red River Settlement, the Gold regions of Frazer's River, and the colony of Vancouver's Island,—all of which are included in the subjects of Mr. Kane's notes and sketches,—it is not easy to conceive of a more timely publication, or one likely to do more credit to Canada.

ROBERT BROWN.

The greatest botanist of our time, ROBERT BROWN, has paid the debt of nature, and is gone from amongst us. He had reached the highest pinnacle of scientific reputation, and affords one of the most remarkable instances of this result being achieved not by multitude of writings or frequency of appearance before the public, but by the extraordinary value of a few works, and the impression made on all who had intercourse with him of his profound knowledge, wonderful sagacity, accuracy, caution, and philosophic spirit, qualities which were united with singular modesty and a most amiable disposition. He has left his mark on the age, and his name will go down with honor to posterity. He died on the 10th of June, at the age of 85, having retained his faculties in an unusual degree almost to his last hour.

DR. CHARLES MACKAY.

We referred, in a former number, to the cordial reception accorded to Dr. Charles Mackay, during his recent tour through the United States, and quoted the lively poem of "John and Jonathan," which he recited on the occasion of the festive entertainment with which he was greeted at Washington. The following vigorous stanzas may be accepted as the response to that genial poem of our modern Scottish Songster—the "Minstrel of the joyous Present." They were addressed to him, at Boston, when on the eve of his final departure from the American shores; and are from the pen of the American poet, Oliver Wendell Holmes:—

BRITAIN AND AMERICA.

Brave singer of the coming time,
Sweet minstrel of the joyous present,
Crowned with the noblest wreath of rhyme,
The holly-leaf of Ayrshire's peasant.

Good-by! good-by! Our hearts and hands,
  Our lips in honest Saxon phrases,
Cry, God be with him till he stands
  His feet amid his English daisies.

'Tis here we part. For other eyes
  The busy deck, the fluttering streamer,
The dripping arms that plunge and rise,
  The waves in foam, the ship in tremor,
The kerchiefs waving from the pier,
  The cloudy pillar gliding o'er him,
The deep blue desert, lone and drear,
  With heaven above and home before him.

His home! The Western giant smiles,
  And twirls the spotty globe to find it:
"This little speck, the British Isles?
  'Tis but a freckle, never mind it!"
He laughs, and all his prairies roll,
  Each gurgling cataract roars and chuckles,
And ridges, sketched from pole to pole,
  Heave till they shake their iron knuckles.

Then Honor, with his front austere,
  Turned on the sneer a frown defiant,
And Freedom, leaning on her spear,
  Laughed louder than the laughing giant:
"Our islet is a world," she said,
  "Where glory with its dust has blended,
And Britain keeps her noble dead
  Till earth, and seas, and skies are rended!"

Beneath each swinging forest bough
  Some arm as stout in death reposes;
From wave-washed foot to heaven kissed brow,
  Her valor's life-blood runs in roses.
Nay, let our ocean-bosomed West
  Write, smiling in her florid pages:
"One-half her soil has walked the rest
  In poets, heroes, martyrs, sages!"

Hugged in the clinging billows' clasp,
  From seaweed fringe to mountain heather,
The British oak, with rooted grasp,
  Her slender handful holds together.

With cliffs of white and bowers of green,
  And ocean narrowing to caress her,
And hills and threaded streams between—
  Our little Mother Isle, God bless her!

In earth's broad temple, where we stand,
  Fanned by the eastern gales that brought us,
We hold the missal in our hand,
  Bright with the lines our Mother taught us.
Where'er its blazoned page betrays
  The glistening links of gilded fetters,
Behold, the half-turned leaf displays
  Her rubric stained in crimson letters.

Enough. To speed a parting friend,
  'Tis vain alike to speak and listen;
Yet stay—these feeble accents blend
  With rays of light from eyes that glisten.
Good-by! once more. And kindly tell,
  In words of peace, the Young World's story;
And say, besides we love too well
  Our Mother's soil—our Father's glory.

ARCTIC SCENERY.

It can scarcely have failed to suggest itself to every considerate reader of the beautifully illustrated edition of Dr. Kane's Arctic Expedition, that the views owed not a little of their artistic effect to the skill of the New York or Philadelphia draughtsman. We have only to bear in remembrance the sunless winter, spent in a region which nearly precluded exposure to the open air for even a brief period; and then to conceive of the manipulation of a pencil held in a hand gloved and furred till it was as delicate as a polar bear's paw. Any sketches made under such circumstances could, at best, be mere suggestive notes; and from such slight hints we presumed the artists employed by Messrs. Loyd & Co., of Philadelphia, had eliminated their tasteful and showy vignettes. But we were totally unprepared for such a shameless fraud as it is now affirmed—seemingly on indisputable evidence—has been perpetrated; thereby linking the honored name of Dr. Kane, with what the correspondent of one of the New York journals justly characterises as "a piece of literary swindling worthy of the notorious Barnum;" and such as would, in England, stamp the character of any publishing house resorting to such frauds with such a reputation as would effectually arrest its chances of further profitable deception of the public..

"It is well known," says the writer in question, "that Dr. Kane's work on the Arctic Expedition was all the rage a short time ago in American Society. An engraver, named Cyram, has lately sued the publishers, Loyd & Co., of Philadelphia, for the sum of $264, due for engraving plates for Dr. Kane's work. Some amusing facts came out on the trial. It appears that the picture representing the *Advance* stuck in the ice, was copied from an old picture in Captain Cook's

Travels in the South Seas, with ice thrown in *ad libitum.* The portrait purporting to be of Sontag, one of Kane's officers, was altered from a portrait of a highwayman in the *National Police Gazette.* An engraving regresenting the occultation of Saturn, was produced by altering an eclipse of the sun from an old geography. There was more of the same sort. If this is the way Philadelphia publishers bring out the crack books of the season, they deserve to be as world-famous as the Philadelphia lawyers."

ADDISON'S PORTRAIT.

Among the favorite literary Englishmen of the eighteenth century, it might surely be assumed, with unhesitating confidence, that none is better known to us, in all that pertains to his life and social habits, and above all to his external appearance, than Addison. His portrait, engraved and re-engraved, is familiar to all of us; his statue forms one of the fitting ornaments of Poet's Corner, in Westminster Abbey; his features have been commented upon by successive biographers, and brought under review in the graphic essay of Macaulay, as those of a face well-known to all men. Yet it would seem that we have been hoaxed, or hoaxing each other all along. The "Addison" of the portraits and of Poet's Corner is no Addison at all; and the critics are now busy proving that the *Sir Andrew Fountain*, who has been masquerading under the name of Addison, in Westminster Abbey, for half a century, is nevertheless no charlatan, but a very respectable gentleman, thrust in there deservedly enough, though by no deed of his own.

"It is not very long," says one writer, "since the curious incident occurred of a portrait, sold in a private collection, which had long been catalogued as a 'King of Denmark,' being discovered to be an engraved portrait of James II. of England. Within these few days another discovery in portrait-lore has been made which will excite no little surprise, and some regret perhaps, amongst cognoscenti. At Holland House, as we all know, is a portrait long supposed to be that of Addison, which has been prized as one of the gems of the art collection of the noble owner. So highly was it esteemed in this light that when some years ago Mr. Leslie was employed by the late Lord Holland to paint the portraits of his Lordship and Lady Holland, the Addison picture was also included, occupying a prominent position in the foreground. And further, so excellent a likeness was this portrait considered, that when, under the auspices of the late Lord Holland, an agitation was got up which resulted in the production of a statue of Addison for Westminster Abbey, the Holland House portrait was adopted by Sir R. Westmacott, as the authority for his work. Now it happens that this portrait turns out to be no portrait of Addison at all. On a visit recently made to Holland House by Mr. Fountain of Narford, himself a distinguished collector, he identified the picture as a counterpart of a portrait of his ancestor, Sir Andrew Fountain, which had long been in possession of the family. In addition to a portrait, of which the Holland House portrait is probably a copy, Mr. Fountain possesses a miniature repetition of the same original by Zincke, and a full length of Sir Andrew, in his robes, as Lord Chamberlain to Caroline, Queen Consort of George II., and in all these works the likeness is strikingly identical. How the

Holland House portrait became mistaken for one of Addison it would be difficult to explain; but this circumstance may assist in accounting for its being at Holland House at all—Addison and Sir Andrew Fountain were intimate friends, and both friends of Sir Stephen Fox, the founder of the Holland family. Touching the merit of the supposed portrait itself, it is rather singular that Lord Macaulay, in his Essay on Addison, speaks of it in terms of qualified praise, which, after the discovery just made, have a remarkable significance. After looking at the picture he writes,—'The features are pleasing; the complexion is remarkably fair; but in the expression we trace rather the gentleness of his disposition than the force and keenness of his intellect.' Now that the mistake has come to light, it is in the interest of art and literature that it should be made generally known, in order to prevent any further resort by artists or publishers to a mythical portraiture of the great essayist." So says a writer in the *Illustrated London News.* But what of the Addison, *alias* Fountain, of Poet's Corner? It would seem to be curable in the estimation of some, at least, of the critics, by the very simple process of a new inscription, which shall give back to Sir Andrew his own face, and turn the fictitious Joseph out of the Abbey, till his friends and admirers shall see fit to restore him in honest good faith. "Why should not Sir Andrew Fountain be in Westminster Abbey?" writes a Norfolk man to the Athenæum; and all disinterested readers echo, why not? "Sir Andrew Fountain was one of the most distinguished men of his time. Born of an ancient family of the County of Norfolk, he entered the University of Oxford at an early age, where he displayed remarkable talent. He was selected, as the most distinguished scholar of his year, to deliver the Latin oration before William III., who was so pleased with him that he knighted him on the spot. He formed part of the brilliant embassy of Lord Macclesfield to the Electress Sophia, in 1701. He there was a conspicuous ornament of the most brilliant circle in Europe. He became afterwards the constant correspondent of Leibnitz, who frequently consulted him, Sir Andrew Fountain being one of the most learned Anglo-Saxon scholars in Europe. He published a treatise on Anglo-Saxon and Anglo-Danish coins, in Hickes's 'Thesaurus Septentrionalis.' He was intimate with Pope and Addison; and, above all, he was the first *real* friend Swift ever found during his stormy life—the first man who took him by the hand and treated him like a gentleman, and introduced him to his distinguished friends as an equal. Sir Andrew accompanied, in 1707, the accomplished Thomas Lord Pembroke, then Lord Lieutenant, to Ireland, where he found Swift living in comparative obscurity. Sir Andrew introduced him to Lord Pembroke, and they all three became most intimate. They returned together to England in the following year, and Swift then resided with Sir Andrew; and now, for the first time, Swift's talents were appreciated by the great London world. Sir Andrew Fountain was the trusted friend of Caroline, wife of George II.; indeed, so highly did she appreciate his great abilities, that she requested him to superintend the education of her favorite son William." On the death of Sir Isaac Newton, he became Warden of the Mint. Men of less mark, therefore, than the friend of Swift, and Newton's successor in the Mint, have undoubtedly got admission among the Abbey's noble dead; though none of them by so odd a chance of mistaken identity.

D. W.

MONTHLY METEOROLOGICAL REGISTER AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—APRIL, 1858.

Latitude—43 *deg.* 39.4 *min. North. Longitude*—79 *deg.* 21 *min. West. Elevation above Lake Ontario,* 108 *feet.*

Day.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	Mean.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	ME'N	Excess of mean above Average	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Resul't. Direc-tion.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Re-sult'.	ME'N	Rain in inches.	Snow in inches.
1	29.723	29.675	29.684	29.6952	37.8°	53.0°	43.8°	45.78°	+ 9.55°	.148	.172	.219	.181	.65	.43	.76	.60	N E b E	E	Calm.	N 86° E	6.0	9.0	0.0	3.95	4.25	...	...
2	.712	.638	—	—	34.6	58.1	—	—	—	180	197	—	—	89	39	—	—	Calm.	S	E b S	S 46 E	0.0	4.2	3.0	1.71	2.93	...	...
3	.568	.544	.495	.5300	35.3	55.5	48.0	48.49	+11.47	173	227	182	200	84	51	53	59	N E b N	S E b E	E b N	N 78 E	2.0	3.5	8.4	5.70	6.10	...	...
4	.438	.283	—	—	43.6	59.9	—	—	—	258	266	—	—	91	51	—	—	N E b E	E b N	S W b S	S 23 E	7.5	10.0	7.2	1.86	7.57	0.035	...
5	.415	.313	.524	.4190	39.3	49.8	36.4	42.37	+ 4.65	190	142	110	147	78	38	51	54	S	NW b W	W b N	S 87 W	6.2	23.0	17.8	12.42	14.79	...	...
6	.634	.767	.933	.7925	34.1	34.0	25.9	30.83	— 7.20	111	093	107	103	56	47	76	61	W N W	N W	W N W	N 51 W	16.0	22.6	6.2	13.40	13.85	...	...
7	30.003	.930	.819	.9168	23.8	36.5	29.5	31.07	— 7.35	082	121	099	092	64	55	61	53	W N W	S b W	N N E	S 45 E	3.4	13.2	4.0	0.34	5.56	...	...
8	29.764	.613	.321	.5287	33.5	35.7	38.7	36.73	— 1.98	158	166	214	174	82	79	91	79	E N E	E b N	E b N	N 77 E	12.3	20.2	14.8	16.02	16.06	0.055	...
9	.199	.198	.374	.2708	40.7	56.9	48.0	48.53	+ 9.50	204	236	183	213	80	49	53	63	E N E	W S W	W	S 83 W	4.0	18.2	13.4	9.42	11.49	0.010	...
10	.578	.682	.735	.6732	43.4	46.2	38.3	42.52	+ 3.10	211	151	159	172	74	48	68	63	W b N	N	N b W	N 11 W	9.0	17.2	5.4	7.32	11.79	...	...
11	.775	.706	—	—	35.0	34.6	—	—	—	104	113	—	—	50	56	—	—	E N E	E	E b N	N 76 E	18.2	13.7	4.5	11.84	12.04	...	...
12	.511	.418	.225	.3660	37.2	38.6	38.6	38.03	— 2.10	132	159	189	172	59	68	80	75	E N E	E b N	E b N	N 76 E	22.6	23.4	25.5	22.55	22.57	0.630	...
13	.123	.101	.126	.1170	37.8	41.5	40.0	39.80	— 0.63	218	228	231	229	96	87	91	93	E N E	E b N	Calm.	N 64 E	14.0	8.4	0.0	3.29	4.82	0.135	...
14	.101	.109	.183	.1378	38.6	50.7	44.3	44.42	+ 3.68	215	279	259	254	92	75	89	87	W b S	S b W	S S E	S 12 W	2.2	13.0	2.8	2.29	3.28	0.037	...
15	.234	.282	.356	.2992	40.9	50.5	46.4	45.77	+ 4.72	238	247	213	223	93	67	66	73	S E b S	S W b W	N b W	S 85 W	1.2	14.0	13.8	6.78	10.10	inap.	...
16	.468	.399	.530	.4737	33.5	53.4	38.2	42.27	+ 0.78	161	082	160	129	84	19	69	53	NW b N	W	NW b N	S 86 W	3.4	19.5	6.0	6.32	9.00	...	...
17	.636	.642	.752	.6813	34.4	47.2	34.2	38.65	— 3.07	108	130	131	117	53	40	66	51	NW b N	S b E	Calm.	S 56 W	13.8	8.5	0.0	2.76	5.53	...	...
18	.822	.838	—	—	30.6	46.3	—	—	—	107	141	—	—	63	44	—	—	NW b N	S b E	N N E	N 57 E	0.5	2.3	1.2	2.24	4.46	...	...
19	.933	.893	.710	.8325	41.5	41.5	38.9	40.53	— 1.82	065	118	211	141	24	46	89	56	E N E	E b N	E b N	N 80 E	14.0	10.5	21.4	17.46	17.51	0.075	...
20	.515	.282	.041	.2528	38.9	40.6	41.5	40.38	— 2.40	219	232	249	236	93	92	95	94	E b N	E N E	E b N	N 46 E	18.2	11.8	5.5	6.67	11.88	0.390	...
21	.169	.321	.461	.3353	41.1	50.7	46.2	45.18	+ 2.03	195	185	228	204	76	49	73	68	W N W	W b N	W S W	N 84 W	19.2	19.0	3.0	9.79	10.00	0.015	...
22	.467	.215	.054	.2445	42.2	54.6	52.3	50.45	+ 7.08	226	281	304	270	84	65	77	74	W S W	E b S	S b E	S 20 E	4.0	8.5	4.5	2.38	9.62	0.095	...
23	.281	.483	.532	.4503	44.2	43.0	35.3	40.25	— 3.45	186	120	127	142	64	41	61	56	W	W b N	W b N	N 84 W	21.6	22.0	9.0	15.51	15.58	...	...
24	.545	.544	.707	.6008	32.4	35.3	29.2	32.40	—11.60	138	147	106	128	75	72	66	70	W b N	W b N	W b N	N 79 W	6.2	17.0	7.5	12.51	13.33	...	inap.
25	.768	.789	—	—	29.5	36.8	—	—	—	099	117	—	—	61	53	—	—	W b N	N N W	NW b N	N 34 W	9.5	4.5	3.5	4.83	6.09	...	0.1
26	.865	.856	.858	.8598	30.6	40.4	32.5	35.10	— 9.60	100	131	150	121	58	52	82	60	N b W	S	S	S 1 E	9.8	13.6	2.0	2.96	6.59	...	...
27	.838	.739	.694	.7507	29.6	44.0	37.1	38.40	— 6.62	127	108	115	113	77	38	52	50	N N W	S E b S	NW b N	N 51 W	4.0	8.5	8.9	3.15	8.92	...	...
28	.678	.625	.580	.6237	34.7	50.9	38.6	43.20	— 2.20	145	140	128	148	73	37	54	54	NW b N	S W b S	N N W	N 59 W	12.0	14.0	7.8	6.81	9.19	...	...
29	.558	.412	.205	.3628	36.4	49.1	42.2	43.15	— 2.58	132	149	240	178	61	42	89	64	Calm.	E b S	E N E	N 78 E	0.0	5.8	1.5	2.91	4.08	0.165	...
30	.034	.215	.457	.2527	44.9	[illegible]	49.0	52.13	+ 6.08	270	326	297	304	90	59	85	78	NW b N	W N W	NW b W	N 43 W	5.0	17.8	7.0	7.31	8.23	inap.	...
M	29.5136	29.4915	29.4966	29.4987	37.07	46.44	39.72	41.46	+ 0.47	.166	.175	.184	.176	.73	.54	.73	.66	....	....	....	....	8.86	13.23	7.19	......	9.57	1.642	0.1

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR APRIL, 1858.

Highest Barometer . . . . 30.006 at 8 a.m. on 7th } Monthly range=
Lowest Barometer . . . . 29.011 at midnight on 20th } 0.995 inches.

Self-registering Ther.
- Maximum temperature . . . . 65°2 on p. m. of 30th } Monthly range=
- Minimum temperature . . . . 21°8 on a. m. of 7th } 43°4
- Mean maximum temperature . . 48°32 } Mean daily range = 14°16
- Mean minimum temperature . . 34°15 }
- Greatest daily range . . . . 24°8 from p. m. of 2nd to a. m. of 3rd.
- Least daily range . . . . 3.2 from a. m. to p. m. of 6th.

Warmest day . . 30th ... Mean Temperature . . . 52°13 } Difference=21°30.
Coldest day . . . . 6th ... Mean Temperature . . . 30°83 }

Maximum Radiation { Solar . . . . 79°8 on p. m. of 30th } Monthly range=
{ Terrestrial . . . . 2.8 on a. m. of 7th } 77°0

Aurora observed on 4 nights, viz.: 9th, 10th, 14th and 15th; possible to see Aurora on 17 nights; impossible on 13 nights.

Snowing on 2 days; depth, 0.1 inches; duration of fall 2.5 hours.

Raining on 13 days; depth, 1.642 inches; duration of fall, 80.8 hours.

Mean of cloudiness=0.65; most cloudy hour observed, 2 p. m., mean=0.72: least cloudy hour observed, 10 p. m., mean=0.59.

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

North.	South.	East.	West.
2024.02	875.82	2629.79	2911.32

Resultant direction, N 14° W; Resultant Velocity, 1.64 miles per hour.
Mean velocity of the wind 9.57 miles per hour.
Maximum velocity . . . 20.5 miles per hour, from 9 to 10 a. m. on 23rd.
Most windy day . . . . . . 12th—Mean velocity, 22.57 miles per hour.
Least windy day . . . . 2nd—Mean velocity, 2.93 do
Most windy hour, 11 a. m. to noon—Mean velocity, 13.57 do } Difference
Least windy hour, midnight to 1 a.m.—Mean velocity, 6.06 do } 7.51 miles.

1st Frogs croaking loudly during the evening.
2nd—Large and perfect Halo round the sun at 2 p. m.
4th—Distant Thunder at 4 p. m., first of the season.
12th—Very Stormy day; constant Rain, wind high and squally.
13th—Dense Fog from 4 p. m.
14th—Perfect Rainbow at 4 p. m.
24th and 25th—Slight flurries of Snow; very cold days.
29th—Thunderstorm, Lightning and Rain from 7h. 30m. p. m.

Temperature—The mean temperature of April, 1858, was 0°38 above the average of the last 19 years.

Rain—The depth of rain was 0.849 inches less than the average of the same number of years.

Snow—The amount of snow was 2.35 inches less than the average, the depth being almost inappreciable.

Wind—The mean velocity of the wind was 2.28 miles per hour above the average, being the greatest velocity for April during 11 years, with the exception of 1857.

The Resultant Direction and Velocity of the Wind for April, from 1848 to 1857 inclusive, were respectively N 19° W, and 1.90 miles.

COMPARATIVE TABLE FOR APRIL.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant Direction.	Resultant Velocity.	Mean Velocity
1840	42.4°	+ 1.3°	65.9°	25.3°	40.6°	14	3.420	2	...	...	...	...
1841	39.2	— 1.9	62.9	22.1	40.8	3	1.370	3	...	...	...	0.51lbs
1842	43.1	+ 2.0	89.5	21.6	67.9	8	3.740	2	...	...	...	0.57 "
1843	40.9	— 0.2	70.0	15.1	54.9	7	3.185	3	0.1	...	...	0 46 "
1844	47.5	+ 6.4	74.5	17.2	57.3	10	1.515	1	inap.	...	...	0.24 "
1845	42.1	+ 1.0	66.0	14.8	51.2	11	3.290	4	1.5	...	...	1.00 "
1846	44.0	+ 2.9	79.4	24.4	55.0	10	1.300	2	1.3	...	...	0.55 "
1847	39.2	— 1.9	65.6	8.4	57.2	8	2.870	2	4.0	...	...	0.59 "
1848	41.3	+ 0.2	65.4	26.5	38.9	5	1.455	1	0.5	N 77 W	1.46	4.89ms.
1849	39.0	— 2.1	70.9	23.2	47.7	10	2.655	2	1.7	N 43 W	3.14	7.50 "
1850	37.9	— 3.2	63.2	18.2	45.0	7	4.720	2	1.1	N 39 W	1.12	7.64 "
1851	41.3	+ 0.2	59.2	25.8	33.4	11	2.295	3	1.2	N 14 E	2.52	8.07 "
1852	38.2	— 2.9	53.8	19.8	34.0	6	1.990	4	9.4	N 23 E	2.44	6.68 "
1853	41.9	+ 0.8	65.7	27.0	38.7	10	2.625	1	1.0	N 12 W	1.90	5.20 "
1854	41.0	— 0.1	65.1	22.3	42.8	12	2.685	4	2.7	N 53 E	2.44	6.82 "
1855	42.4	+ 1.3	63.8	12.2	51 6	8	2.030	3	1.6	N 36 W	3.99	7.57 "
1856	42.3	+ 1.2	69.8	15.1	54.7	13	2.780	3	0.1	N 29 E	1.61	6.05 "
1857	35.4	— 5.7	51.9	10.0	41.9	10	1.755	11	12.9	N 60 W	4.15	10.24 "
1858	41.5	+ 0.4	61.5	23.8	37.7	13	1.642	2	0.1	N 14 W	1.64	9.57 "
Mean	41.08	...	66.53	19.62	46.91	9.3	2.491	2.9	2.45	...	...	7.29

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—MAY, 1858.

Latitude—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.				Mean Temp. + or − of the Average	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 P.M	ME'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	10 P.M	Result.	ME'N		
1	29.635	29.737	29.884	29.7730	° 39.8	° 50.9	° 42.2	° 44.72	° − 1.70	.173	.224	.201	.199	.70	.60	.74	.67	N W	S S E	N N W	° N 22 W	3.4	8.0	12.8	4.34	6.74	......	...
2	30.105	30.140	—	—	35.0	44.3	—	—	—	.142	.141	—	—	.70	.54	—	—	N	S S E	S	S 77 E	4.7	3.5	1.2	1.52	3.02	......	...
3	30.154	30.048	.904	30.0290	38.4	47.8	44.4	44.30	− 2.75	.141	.058	.132	.110	.61	.17	.44	.39	N E b N	E b N	E N E	N 76 E	2.0	16.0	9.0	11.55	11.63	......	...
4	29.758	29.653	.563	29.6465	45.4	55.2	50.1	50.30	+ 2.88	.235	.272	.250	.253	.77	.62	.69	.69	E N E	E b N	E	N 72 E	9.0	12.5	1.5	6.82	7.09	0.085	...
5	.491	.433	.410	.4387	47.2	56.3	47.6	51.08	+ 3.35	.298	.333	.282	.310	.91	.73	.86	.83	E b N	E	E N E	N 54 E	4.5	9.0	4.4	6.13	7.41	Inap	...
6	.375	.419	.522	.4508	52.3	62.5	54.6	57.15	+ 9.12	.264	.202	.239	.228	.67	.35	.55	.51	N b W	N	N b W	N	12.4	15.0	1.5	8.07	9.19	......	...
7	.637	.634	.646	.6397	53.7	58.4	50.1	55.12	+ 6.70	.202	.255	.241	.227	.48	.52	.67	.53	N b W	S S W	Calm.	S 13 E	5.0	7.4	0.0	1.52	3.31	......	...
8	.665	.592	.496	.5813	45.4	63.5	50.9	53.52	+ 4.73	.253	.254	.271	.266	.83	.42	.72	.66	Calm.	S E	Calm.	S 50 E	0.0	6.0	0.0	2.04	2.54	Inap	...
9	.389	.386	—	—	51.6	66.0	—	—	—	.294	.311	—	—	.77	.48	—	—	Calm.	N W b W	N W b W	N 68 W	0.0	31.1	11.5	10.66	13.16	......	...
10	.679	.661	.625	.6523	37.1	50.1	45.3	44.87	− 4.63	.179	.128	.155	.158	.81	.34	.50	.53	N W b W	S S E	N E	S 84 E	1.2	9.0	3.5	3.48	5.78	0.055	...
11	.455	.203	.040	.2135	44.0	44.0	44.3	43.97	− 5.93	.188	.257	.268	.243	.65	.90	.92	.84	E N E	E N E	E N E	N 73 E	21.5	26.0	4.4	15.24	19.63	1.590	...
12	.115	.326	.542	.3532	45.3	48.0	46.0	45.78	− 4.38	.270	.196	.274	.234	.80	.58	.88	.76	S W b W	W b N	W N W	N 76 W	9.0	27.2	3.2	11.84	12.07	0.082	...
13	.720	.774	.740	.7475	42.2	57.0	47.8	49.70	− 0.87	.177	.312	.227	.236	.65	.67	.68	.64	N W	S b W	E	N 70 E	10.0	5.5	4.7	1.18	8.16	......	...
14	.687	.569	.473	.5722	45.8	52.0	48.3	48.72	− 2.17	.210	.226	.263	.226	.67	.56	.78	.65	E N E	E N E	N E b E	N 67 E	16.2	14.7	1.4	8.28	9.03	......	...
15	.511	.461	.738	.5910	51.2	63.4	39.3	50.15	− 1.13	.288	.200	.116	.188	.76	.34	.48	.51	N W b N	W S W	N W	N 42 E	6.2	18.5	17.0	12.65	14.40	......	...
16	.896	.842	—	—	39.7	47.2	—	—	—	.100	.160	—	—	.41	.49	—	—	N W	S b W	Calm.	S S W	1.4	13.1	0.0	2.69	5.80	......	...
17	.665	.462	.427	.5060	43.6	39.7	41.5	40.92	−11.07	.189	.231	.220	.217	.66	.95	.84	.85	E N E	E N E	N E	N 69 E	11.6	18.8	3.2	11.37	11.97	0.540	...
18	.500	.622	.709	.6228	41.8	49.4	41.1	44.28	− 8.00	.253	.220	.227	.232	.96	.62	.87	.80	S W b W	W N W	Calm.	N 65 W	3.4	14.8	0.0	6.51	6.69	......	...
19	.714	.641	.566	.6273	44.9	50.7	45.2	47.33	− 5.28	.182	.155	.239	.208	.60	.42	.79	.64	N W	S	N W b N	N 15 W	5.0	1.2	9.2	3.30	6.53	0.010	...
20	.504	.531	.613	.5517	41.8	49.4	42.9	45.52	− 7.50	.226	.269	.244	.241	.85	.76	.88	79	N b E	S W b S	W	N 65 W	4.8	13.5	11.0	10.13	10.67	0.040	...
21	.662	.679	.769	.7047	42.4	51.6	42.6	46.28	− 7.03	.157	.162	.271	.170	.57	.42	.62	.54	W	W N W	N W b N	N 49 W	9.4	16.5	9.5	13.08	13.55	Inap	...
22	.836	.873	.814	.8373	43.6	53.4	48.9	49.15	− 4.55	.175	.259	.199	218	.61	.62	.56	.61	N N W	S	S	S 5 W	7.0	7.9	9.0	3.62	5.60	......	...
23	.733	.439	—	—	47.6	48.7	—	—	—	.224	.260	—	—	.68	.76	—	—	S	E N E	E N E	N 46 W	2.7	4.2	1.5	1.84	8.29	0.760	...
24	.303	.401	.457	.3993	51.9	58.6	56.8	55.63	+ 1.35	.289	.330	.319	.309	.75	.67	.69	.70	N W	S S W	E N E	N 31 W	16.8	11.2	2.9	3.46	7.81	......	...
25	.507	.463	.373	.4423	50.5	51.9	49.6	50.78	− 3.90	.256	.255	.329	277	.69	.64	.92	.75	E N E	E b N	E b N	N 76 E	10.2	14.8	19.0	18.18	18.19	1.050	...
26	.271	.328	.381	.3310	46.2	45.8	44.3	45.38	− 9.60	.283	.287	.278	.282	.90	.93	.95	.93	E b N	E N E	E N E	N 67 E	20.8	13.2	9.6	13.13	13.15	1.190	...
27	.493	.662	.716	.6348	45.1	52.1	50.9	49.15	− 6.13	.276	.276	286	.281	.92	.70	.76	.81	E N E	E b N	N E	N 70 E	11.4	11.6	4.2	10.00	10.08	Inap	...
28	.707	.807	.746	.7800	47.4	56.3	48.7	50.70	− 4.95	.280	.240	.250	.257	.86	.53	.73	.70	E N E	E b N	E b N	N 83 E	8.2	17.0	5.5	11.31	11.46	......	...
29	.710	.611	.597	.6325	50.9	53.4	49.8	50.10	− 5.85	.250	.219	.297	.255	.67	.53	82	.71	E	E b N	S E b E	E	11.2	20.0	8.4	11.08	11.37	0.310	...
30	.614	.639	—	—	46.9	56.6	—	—	—	.300	.366	—	—	.93	.80	—	—	E	E N E	E b N	N 79 E	3.6	6.2	9.0	6.99	7.10	0.105	...
31	.413	.254	.571	.4200	54.5	64.7	52.7	56.77	+ 0.22	.395	.491	.309	.389	.92	.80	.77	.83	S E b E	W S W	Calm.	S 21 W	6.2	9.6	0.0	2.65	7.01	0.150	...
M	29.5868	29.5709	29.5893	29.5838	45.86	53.31	47.15	48.90	− 2.58	.234	.243	.242	.239	.74	.59	.74	.69	....	....	....	....	7.70	13.00	5.75	......	9.30	6.367	...

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR MAY.

Highest Barometer........................ 30.198 at 8 a. m., on 3rd } Monthly range=
Lowest Barometer .... 29.032 at midn't on 11th } 1.166

Self-regist'ing Thermom.
- Maximum Temperature........... 69°.8 on p. m., of 9th } Monthly range=
- Minimum Temperature........... 31°.0 on a. m., of 16th } 38°.8
- Mean maximum Temperature .... 55°74 } Mean daily range=
- Mean minimum Temperature .... 41°68 } 14°.06
- Greatest daily range .... 25°.0 from a. m. to p. m. of 23rd.
- Least daily range................. 2°.7 from a. m. to p. m. of 26th.

Warmest day......... 6th ... Mean temperature......... 57.15 } Difference = 16°23.
Coldest day.......... 17th ... Mean temperature......... 40°92 }

Maximum Radiation. { Solar................................. 83° 5 on p. m. of 31st, } Monthly range=
{ Terrestrial........................ 12°.8 on a. m. of 16th. } 70°7

Aurora observed on 5 nights, viz., on 1st, 7th, 8th, 9th and 21st.
Possible to see Aurora on 17 nights; impossible on 14 nights.

Snowing on days,—depth inches; duration of fall hours.
Raining on 17 days,—depth 6.367 inches; duration of fall 103.2 hours:

Mean of cloudiness = 0.69.
Most cloudy hour observed, 4 p. m., mean = 0.83; least cloudy hour observed midnight, mean, =0.51.

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

North.	South.	East.	West.
2579.67	749.12	3519.84	1847.84

Resultant direction N. 42° E.; Resultant Velocity 3.33 miles per hour.
Mean velocity.............................. 9.30 miles per hour.
Maximum velocity .... 32.6 miles from 2 to 3 p. m., on 9th.
Most windy day........................ 11th...Mean velocity 10.63 miles per hour.
Least windy day .... 8th...Mean velocity 2.54 ditto.
Most windy hour ... 2 to 3 p.m...............Mean velocity 13.33 ditto. } Difference
Least windy hour ... 9 to 10 p. m...........Mean velocity 5.86 ditto. } 7.47 miles.

Solar Haloes.—Solar Halo and bright Parhelia on 3rd at 7 a. m. Halo on 7th at 2 p. m., imperfect. Halo and distinct Parhelia on 10th at 5 p. m. Halo on 19th at 3.30 p. m. Halo and Parhelia on 30th at 4.30 p. m.

Lunar Halo on 22nd at 8.30 p. m. Very perfect and brilliant Paraselene, exhibiting prismatic colours, at 2 a. m. on 23rd.

Hoar Frost on the mornings of 1st, 10th, 13th, 19th, and 21st.

Ice on the Pools on 2nd at 6 a. m., and 16th at 6 a. m.
Thunderstorms on 17th, 7 to 9 a. m., and 31st, 3 to 5 a. m.
Sheet Lightning on 14th, 10 p. m. to midnight.
Dense Fog on 18th at 6 a. m., and 30th 6 to 9 a. m.
Heavy Dew noted on the mornings of 6th, 8th, and 23rd.
The Resultant Direction of Velocity of the Wind for the month of May, from 1848 to 1858 inclusive, were, respectively, N. 3° W. and 1.42 miles.

COMPARATIVE TABLE FOR MAY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
										Resultant.		Mean Force or Velocity.
	M'n.	Diff. from Aver.	Max. ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Direction.	V'y.	
	°	°	°	°	°							
1840	53.8	+2.[illegible]	74.5	30.8	43.7	9	4.150	...	Not rec'ded	...	...	....
1841	50.5	−0.[illegible]	76.2	26.6	49.6	11	2.350	1		...	...	0.35 lbs.
1842	49.1	−2.[illegible]	74.3	30.0	44.3	7	1.275	...		...	...	0.53
1843	49.1	−2.[illegible]	79.9	28.9	50.7	5	1.570	...	...	...	...	0.52
1844	53.6	+2.4	77.7	29.0	48.7	14	5.670	...	...	...	...	0.30
1845	49.6	−1.[illegible]	76.6	29.4	47.2	8	2.300	...	...	...	...	0.55
1846	55.5	+4.[illegible]	78.1	34.3	43.8	9	4.375	...	...	...	...	0.46
1847	54.4	+3.2	72.5	27.8	44.7	12	2.040	...	...	...	...	0.29
1848	54.1	+2.9	78.5	31.9	46.6	13	2.520	...	...	N 40° W	1.31	4.93 mls.
1849	48.0	−3.2	72.5	32.7	39.8	16	5.115	...	...	N 51° E	1.97	5.33
1850	47.6	−3.[illegible]	76.3	31.1	45.2	7	0.515	1	Inap.	N 64° W	2.05	6.32
1851	51.3	+0.[illegible]	73.2	28.7	44.5	12	2.950	1	0.5	N 32° W	1.59	6.34
1852	51.4	+0.[illegible]	73.3	34.5	38.8	7	1.125	1	Inap.	S 82° W	0.99	4.00
1853	50.9	−0.[illegible]	78.4	38.4	40.0	17	4.420	1	Inap.	N 20° W	0.93	5.14
1854	52.2	+1.[illegible]	[illegible]9.0	27.6	41.4	11	4.630	...	...	S 66° E	0.26	5.38
1855	53.1	+1.9	74.8	33.9	40.9	6	2.565	2	0.9	N 1° W	2.76	5.93
1856	50.5	−0.7	[illegible]0.1	35.5	44.6	14	4.580	1	Inap.	N 4° E	3.99	9.81
1857	48.9	−2.[illegible]	72.5	27.9	44.6	15	4.145	1	Inap.	N 23° W	1.14	8.13
1858	48.9	−2.[illegible]	[illegible]6.0	25.0	31.0	17	6.367	...	...	N 42° E	3.33	9.30
M	51.18	...	74.95	31.26	43.68	11.1	3.300	0.5	0.09	...	...	6.42 Mls.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—APRIL, 1858.

(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° Fahr.			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	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.				6 A.M.	2 P.M.	10 P.M.
1	30.060	29.950	29.961	28.4	50.9	40.0	.117	.302	188	.76	.82	.77	E N E	NE b E	E N E	1.75	0.57	2.68	...	...	...	Clear.	Clear.	Clear.
2	29.916	.811	.761	37.0	60.2	46.2	.199	.283	.239	.90	.54	.77	S E	S W	S S W	0.00	0.00	0.00	...	...	...	Cum. Str. 10	Do.	Do.
3	.770	.771	.724	41.6	60.1	37.0	.212	.310	.178	.82	.60	.81	SW b S	E b N	E by N	0.00	0.00	0.00	...	...	...	Do. 10.	Do.	Do. Aur. Bor.
4	.828	.718	.65	32.0	48.9	46.7	.143	.242	.262	.79	.74	.84	NE b E	S E b E	S E	0.00	0.00	0.00	...	...	...	Clear.	C. C. Str. 40.	Str. 4.
5	.714	.657	.579	43.6	55.5	46.7	.231	.315	.286	.83	.71	.92	S S E	S E	S b E	0.00	0.00	0.00	...	Inp.	...	Nimb. 10.	Do. 6.	Cum. St. 10.
6	.710	.726	.932	33.4	42.6	25.5	.175	.134	.100	.94	.50	.74	W S W	W b N	W N W	0.00	20.10	21.30	...	...	...	Clear.	C. Str. 4.	Clear.
7	30.073	.929	30.061	16.0	34.8	30.2	.059	.138	.130	.65	.71	.78	W N W	W S W	W N W	21.30	14.90	16.25	...	...	...	Do.	Clear.	Do.
8	.120	30.155	29.925	21.1	48.0	34.0	.080	.236	.162	.71	.70	.83	N E	S E	NE b E	1.47	0.85	0.45	...	...	...	Do.	Str. 4.	C. St. 8. Au. Bor.
9	29.650	29.549	.510	28.4	31.5	30.6	117	.168	.161	.76	.95	.95	NE b E	N E b E	N b E	8.82	15.21	9.62	...	0.573	...	Nimb 10.	Nimb. 10.	C. St. 10.
10	.674	.868	.950	28.4	37.9	34.3	.135	.171	.155	.88	.76	.79	NE b E	N W	N W	0.86	2.73	0.52	...	Inp.	...	C. Str. 10.	C. St. 4.	Clear. Aur. Bor.
11	29.997	.961	.970	24.4	42.3	35.0	.083	.177	.162	.66	.66	.80	N b W	N N W	N N E	8.77	8.23	6.27	...	...	...	Clear.	Clear.	Clear. Aur. Bor.
12	.874	.850	.729	29.6	47.9	39.0	.105	.212	.188	.66	.62	77	N E	E S E	NE b E	4.00	3.31	2.14	...	...	...	Do.	C. C. Str. 6.	Cir. St. 9. A. Bor.
13	.508	.464	.467	37.2	43.0	40.3	.178	.261	.241	.81	.96	.98	NE b E	N E b E	NE b E	10.37	6.85	6.52	...	0.600	...	C. Str. 10.	Nimb. 10.	Nimb. 10.
14	.332	.256	.360	38.1	43.5	41.5	.229	.271	.251	.99	.96	.96	NE b E	N	W S W	2.90	5.52	0.00	...	Inp.	...	Do. 10.	C. Str. 10.	Cir. St. 10.
15	.327	.378	.470	36.9	47.0	44.3	.207	.249	.282	.98	.77	.97	S S E	W S W	SW b S	0.20	10.41	5.61	...	...	...	Do. 10.	C. C. St. 6.	Nimb. 10.
16	.570	.614	.633	38.1	56.1	37.0	.208	.308	.184	.92	.69	.85	S W	S S W	W S W	4.86	11.22	7.42	...	0.040	...	St. 2.	C. St. 8.	Clear. Aur. Bor.
17	.720	.714	.830	33.4	42.2	33.0	.162	.134	.150	.84	.50	.80	W S W	W	W S W	7.80	15.90	8.97	...	...	...	Clear.	Do. 4.	Do.
18	.900	.929	.070	29.0	48.7	37.0	.093	.120	.116	.59	.36	.53	N N W	N W	N N W	0.02	7.02	9.43	...	...	...	Do.	Clear.	Do.
19	.203	.175	.104	29.5	53.0	37.7	.129	.136	.171	.80	.35	.76	N N E	N b E	S by E	0.88	1.01	1.33	...	...	...	Do.	Do.	Light Cir. Lunar
20	.045	.793	.635	33.5	50.6	36.2	.175	.186	.170	.94	.51	.80	E	SE b E	S E	0.48	7.97	7.52	...	0.253	...	C. St. 8.	C. St. 10.	Rain. [Halo.
21	29.283	.423	.615	33.5	42.6	36.1	.162	.177	.170	.84	.66	.80	E by S	E b N	SW b S	6.45	0.80	0.02	...	0.310	2.80	Snow.	Do. 10.	C. St. 10.
22	.730	.686	.548	34.0	51.5	45.0	.182	.289	.251	.95	.76	.84	SE b S	SE b S	S b W	0.02	1.98	3.27	...	...	...	C. St. 2.	Do. 10.	Clear.
23	.501	.498	.581	45.0	50.6	44.1	.182	.258	.218	.61	.71	.76	S W	W	W N W	10.96	18.13	8.93	...	0.263	...	C. C. St. 8.	Nimb. 10.	C. St. 10.
24	.603	.592	.760	34.5	35.5	32.0	.155	.177	.088	.79	.85	.49	W	S W	SW b W	3.20	8.63	19.36	...	...	...	C. St. 6.	C. C. St. 6.	Clear.
25	.875	.900	30.000	30.0	36.1	31.0	.154	.149	.142	.94	.71	.84	W N W	W	S b W	3.62	4.00	3.75	...	...	...	Do. 10.	C. St. 6.	Do.
26	30.006	29.934	30.031	29.6	41.9	35.3	.105	169	.177	.66	.65	.85	NE b E	S W	S S W	0.51	1.92	0.32	...	...	...	Clear.	Do. 10.	C. St. 8.
27	29.912	.847	29.862	30.0	55.0	39.1	.130	.157	.131	.78	.38	.55	W	SE b S	N b E	0.31	0.42	0.57	...	...	...	Do.	C. C. St. 8.	Cir. Cum. 6.
28	.624	.510	.648	34.5	49.0	34.5	.138	.086	.142	.71	.24	.70	N W	W N W	W	10.82	8.10	16.23	...	...	...	C St. 10.	C. St. 10.	Clear.
29	.690	.562	.541	36.0	57.3	47.5	.170	.142	.249	80	.30	.77	W	W b N	S b W	9.48	32.02	6.16	...	...	...	Clear.	Clear.	C. St. 6.
30	.329	.286	.550	39.9	43.5	43.8	.188	.271	.269	.77	.96	.90	NE b E	N b E	S S E	7.08	8.05	1.90	...	0.803	...	C. St. 10.	Nimb. 10.	Do. 10.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—MAY, 1858.

(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.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	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.	10 P.M.	2 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	29.762	29.877	30.065	41.0	54.2	41.1	.190	.206	.169	.74	.49	.65	N W b N	W b N	N W b W	5.37	4.22	6.70	...	...	...	Clear.	Cum. 2.	St. 2.
2	30.316	30.265	.306	34.1	49.6	39.0	.162	.175	.13	.80	.50	.55	N W b W	N W	N b W	5.20	0.51	1.47	...	...	...	Do.	Do. 1.	Clear.
3	.404	.202	.194	29.0	57.3	42.5	.136	.242	.215	.83	.52	.79	W b N	S	S b E	0.64	0.70	1.15	...	...	...	Do.	Clear.	Do.
4	.150	29.985	29.980	36.5	71.6	50.6	.101	.572	.309	.90	.76	.85	E	S E b S	E S E	0.00	0.20	0.00	...	...	...	Do.	Do.	Do.
5	29.831	.718	.647	46.0	68.1	53.6	.262	.380	.375	.83	.56	.93	E b N	S E b E	S b E	0.00	1.38	0.21	...	Inp.	...	C. Str. 10.	Rain.	Cirr. Str. 10.
6	.597	.617	.690	54.1	56.5	50.0	.396	.449	.309	.99	.99	.85	S E b S	N E b N	N E b N	0.25	5.80	9.81	...	0.300	...	Rain.	C. Str. 10.	Clear.
7	.759	.748	.782	43.1	69.6	53.6	.254	.490	.375	.92	.68	.93	N E b N	E b S	S E b S	4.90	2.80	0.15	...	...	...	Clear.	Clear.	Cu St. 4. A. B.
8	.895	.662	.684	42.3	78.2	58.1	.222	.550	.337	.83	.58	.70	E	S E b S	S E b S	0.20	0.00	0.01	...	...	...	Do.	Cum. Str. 4.	C. Str. 10.
9	.625	.583	.537	58.5	72.9	67.2	.476	.539	.626	.97	.72	.95	S E b S	S S E	S	1.43	3.60	6.60	...	0.253	...	C. C. Str. 10.	Cir. Str. 6.	Cu. St. 2. A. B.
10	.737	.739	.866	41.0	54.5	45.2	.190	.231	.218	.74	.55	.76	W b E	W	E N E	16.06	10.40	2.70	...	...	...	Cirr. Str. 6.	Do. 4.	C. Str. 6.
11	.914	.814	.701	36.2	50.1	46.8	.170	.283	.305	.80	.78	.99	N E	N E b E	N E b E	0.20	0.93	11.86	...	0.100	...	Cum. 4.	Do. 8.	Rain.
12	.395	.411	.505	45.4	53.0	44.7	.293	.382	.241	.98	.96	.84	W N W	N E b E	S W b W	5.25	6.19	3.55	...	1.266	...	Rain.	Rain.	C. Str. 10.
13	.616	.842	30.020	43.3	52.0	42.2	.222	.232	.177	.83	.60	.66	N E b E	W	N W	17.40	14.17	8.00	...	...	...	C. Str. 4.	C. Str. 2.	Clear.
14	.990	.911	29.818	40.1	58.4	47.0	.182	.282	.273	.93	.58	.85	N E b E	S S E	S E	1.46	0.66	1.60	...	...	...	Clear.	Clear.	Do.
15	.677	.588	.641	44.5	65.2	47.5	.251	.490	.292	.84	.81	.92	E N E	E	N W	3.56	2.31	8.08	...	Inp.	...	C. Str. 10.	C. Str. 10.	C. Str. 6.
16	.860	.873	.971	39.0	49.7	42.1	.158	.182	.140	.68	.52	.53	N b W	S E b E	E	9.60	13.77	15.07	...	...	...	Do. 10.	Cum. 2.	Cl. Au. Bor.
17	.894	.816	.798	46.0	58.1	45.0	.269	.282	.257	.88	.58	.84	W	W	S b W	1.20	1.48	4.70	...	...	...	Str. 4.	C. C. Str. 6.	C. Str. 6.
18	.762	.723	.856	43.5	47.5	45.0	.254	.320	.282	.92	.96	.96	S E	S b W	W S W	11.99	0.00	0.71	...	0.486	...	Ni. 10.	Rain.	Rain.
19	.855	.707	.850	44.1	67.2	53.0	.265	.457	.328	.92	.69	.83	W	S b W	S	1.71	1.11	1.19	...	0.646	...	C. Str. 8.	C. C. 4.	C.C.C. Lun. H.
20	.653	.300	.643	49.2	52.4	47.2	.345	.334	.320	.99	.86	.98	S	W S W	W b N	4.31	6.81	4.22	...	0.212	...	Rain.	Rain.	C. Str. 10.
21	.593	.708	.751	45.3	50.0	46.0	.275	.315	.293	.92	.89	.96	N E	S W b W	N E	5.51	6.46	0.20	...	0.203	...	C. Str. 8.	Do.	Do. 9.
22	.884	.909	30.003	44.0	60.4	48.0	.279	.380	.210	.99	.76	.89	E N E	W N W	W b N	7.15	1.22	4.08	...	0.103	...	Do. 8.	C. Str. 4.	C. C. S. 7. L. H.
23	.959	.792	29.569	47.2	67.6	52.5	.256	.407	.361	.81	.63	.93	W N W	W b S	S S W	3.00	3.72	9.45	...	0.203	...	Cum. 4.	C. C. Str. 10.	Rain.
24	.365	.410	.590	52.4	61.6	53.7	.361	.338	.318	.94	.65	.73	N E b E	S S W	N E b E	7.40	12.17	3.62	...	1.606	...	Rain.	C. Str. 8.	C. Str. 6.
25	.734	.849	.824	47.4	61.1	50.5	.276	.310	.309	.86	.60	.85	N E b E	N E	E S E	1.46	8.11	3.51	...	...	...	C. Str. 8.	C. C. Str. 6.	C. Cirr. 6.
26	.323	.825	.892	51.7	73.0	56.3	.296	.416	.336	.79	.52	.75	N E b E	S E b S	S E b S	2.05	6.65	1.90	...	...	...	C. Cir. 4.	St. 10.	Str. 4.
27	.819	.845	.947	54.6	73.1	57.8	.308	.409	.268	.74	.50	.58	E b N	N E b E	N E b E	0.20	1.43	1.41	...	...	...	C. Str. 8.	C. Str. 6.	Clear.
28	30.060	29.995	.946	51.9	74.2	60.1	.221	.467	.462	.59	.56	.90	W N W	E b N	S E	5.03	0.42	0.16	...	...	...	Clear.	Clear.	Do.
29	.017	.907	.811	52.1	77.6	59.0	.282	.475	.358	.73	.49	.73	E	S E	S E b S	0.12	0.91	2.15	...	...	...	Cum. C. 2.	Do.	Do.
30	29.918	.805	.876	58.1	76.3	61.0	.323	.343	.436	.74	.39	.88	S E	S E	S E	0.62	3.90	1.42	...	...	...	Clear.	Do.	Do.
31	.910	.675	.608	50.0	79.9	70.1	.283	.772	.436	.78	.78	.57	S E	S S E	S S E	0.12	8.90	10.42	...	Inp.	...	Cum. C. 4.	C. Str. 6.	C. Str. 4.

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

Barometer	Highest, the 19th day	30.203
	Lowest, the 14th day	29.256
	Monthly Mean	29.757
	Monthly Range	0.947
Thermometer	Highest, the 2nd day	61°1
	Lowest, the 7th day	16°0
	Monthly Mean	39°06
	Monthly Range	45°1
Mean of Humidity		.717
Greatest Intensity of the Sun's Rays		94°1
Lowest point of Terrestial Radiation		14°7
Amount of Evaporation in inches		2.310

Rain fell on 11 days, amounting to 2.832 inches ; it was raining 47 hours, and accompanied by thunder on one day.

Snow fell on one day, amounting to 2.80 inches ; it was snowing 5 hours 40 minutes.

The most prevalent wind was W. N. W.

The least prevalent wind was N.

The most windy day was the 7th ; mean miles per hour, 17.45.

The least windy day was the 2nd ; mean miles per hour, 0.00.

Aurora Borealis visible on six nights.

The electrical state of the atmosphere has indicated high tension.

zone was in rather large quantity.

Frogs first heard the 15th day.

Swallows first seen the 15th day.

Lu nar Halo visible on one night.

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

Barometer	Highest, the 3rd day	30.404
	Lowest, the 24th	29.365
	Monthly Mean	29.751
	Monthly Range	1.039
Thermometer	Highest, the 31st day	80°.5
	Lowest, the 14th day	30°.6
	Monthly Mean	53°02
	Monthly Range	49°9
Greatest intensity of the Sun's Rays		99°.9
Lowest point of Terrestrial Radiation		30.1
Mean of Humidity		.764
Amount of Evaporation		2.89

Rain fell on 14 days amounting to 5.387 inches ; it was raining 97 hours 25 minutes, and was accompanied by thunder on 1 day.

The most prevalent wind was N. E. by E.

The least prevalent wind W.

The most windy day the 13th ; mean miles per hour 13.19.

Least windy day the 4th ; mean miles per hour 0.06.

Aurora Borealis visible on 3 nights.

Lunar Halo on 2 nights.

The electrical state of the Atmosphere has indicated light tension.

Ozone was present in large quantity.

Shad (*Alcsa*) first caught on the 29th day.

Frost occurred on the morning of the 14th day