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OF SOME OF THE SUPERSTITIONS AND CUSTOMS COMMON AMONG THE INDIANS IN THE VALLEY OF THE ASSINIBOINE AND SASKATCHEWAN.

BY HENRY Y. HIND, M.A.

PROFESSOR OF CHEMISTRY AND GEOLOGY, TRINITY COLLEGE, TORONTO.

Read at the President's Conversazione, of the Canadian Institute, 27th April, 1859.

One result of the active pursuit of the fur trade for upwards of a century in the valley of the Saskatchewan, is seen in the blending of different tribes by intermarriage. The Crees of the Plains and the Ojibways and Swampys of the Woods, although speaking different languages, are often found hunting the buffalo in company and not unfrequently form family connections. The Ojibways of Lake Winnipeg may now be discovered, summer and winter, near the Grand Forks of the Saskatchewan, having emigrated four hundred miles west of Red River, where they have permanently established themselves. All the Ojibways now found west of the Lake of the Woods are invaders of the country. The real home of the Ojibway is the region about the south and west of Lake Superior. Their habits of life have changed with the character of the country the emigrants or invaders

now occupy. They are no longer dependant upon the forest for their supply of food and clothing; but many of them, on the banks of the Assiniboine, Red River, and Lake Manitobah, possess horses and join the half-breeds in their annual spring and fall hunts. Notwithstanding this intercourse and blending of different tribes, most of the superstitions and customs peculiar to each are still maintained and practised.

It is often asked whether the thrilling descriptions of savage life, as given in Cooper's delightful romances, are imaginary or real; and, if real, whether they exist now among the tribes which have long been familiar with civilized man, such as the Plain Crees, the Sioux, the Swampys, and the Ojibways. It is enough to visit the secluded Ojibway graves, on the banks of the Red River, and behold there Sioux scalps decorated with beads, bits of cloth, coloured ribbons, and strips of leather suspended at the extremity of a long slender stick near the head of the grave, to feel satisfied that one barbarous custom still prevails. But to be an eye witness of a scalp dance or a skull dance is more than enough to press home the conviction that the fiendish passions, so faithfully described by Cooper, still find expression in violent gesture, loud vociferation, triumphant song, and barbarous feasting with undiminished strength and bitterness, even after a century's intercourse with civilized men.

In the following pages, I shall endeavour to describe some incidents which will show how far old superstitions and customs prevail among the Indians occupying the country I visited last summer, between Red River and the south branch of the Saskatchewan.

Early last spring, the warlike bands of Ojibways, called the Lac la Pluie Indians, were thrown into a state of savage excitement by the arrival of messengers from their friends on the Red River, with tidings that two Sioux had been killed and scalped in the Plains. In testimony of this triumph, they brought with them two fingers severed from the hands of the unfortunate Sioux. The announcement of the intelligence that the scalps would be sent after their Red River brethren had celebrated war dances over them, was received with wild clamour and shouting. After the scalps had been carried from hand to hand and the victory that won them triumphed over with dancing, singing, and feasting, they would be returned to the warriors who took them, and finally suspended over the graves of relatives or friends mourning the loss of any of their kindred by the hands of the Sioux.

The wood Indians assemble in the spring to celebrate their medicine and other notable ceremonies. During the summer they separate into families or small bands, and hunt, fish or go to the Plains in search of buffalo. At the approach of winter, they "take debt" or otherwise obtain supplies at the different posts of the Company, and retire to their winter quarters to trap the fur-bearing animals. The Plain or Prairie Indians follow the buffalo, and vary the monotony of their existence by forming war parties against their enemies, such as the Plain Crees against the Sioux and the Blackfeet, the Ojibways against the Sioux.

When on the south branch of the Saskatchewan last August, we found the Plain Crees hastening from the west to the east bank of the river, at the Elbow, with a strong war party of Blackfeet in pursuit. The chief of the Crees of the Sandy Hills, near the south branch, Short-stick by name, pointed out some of his band who had penetrated through the Blackfeet country to the Rocky Mountains two years ago, and returned with several scalps, grizzly bear claws, necklaces, pipes, and other trophies of success; he also related with much feeling how twenty-five young warriors had gone on a similar excursion the summer before last, but none had yet returned. Last July, the Plain Crees met a portion of the Blackfeet tribe, at the Eagle Hills, on the north branch of the Saskatchewan, to arrange terms of peace. All matters went on smoothly and the tribes separated as friends. Some of the Crees, however, incapable of resisting the opportunity, stole some horses from the Blackfeet. They were pursued, and three of them taken. One was killed instantly, the others were led back in triumph to the camp of the Blackfeet. They were stripped, their hands were tied behind their backs, a hole bored through both wrists and a stick passed through them and so tightly fastened that it could not be removed without assistance. The captives were then separated and dismissed singly to find their way to their friends. One only reached his tribe and was lying in a tent which we passed on the banks of the Qu'apelle, near the south branch.

The chief "Short-stick," when relating these adventures, held up the pipe he had in his hand and exclaimed, "this is what my Blackfoot friend gave me one day, the next he killed my young men; he is now my enemy again." I expressed a wish to purchase the pipe; the chief's reply was "take it," handing it to me with a gloomy frown, and silently extending his hand for the common "clay" which

I was smoking at the time. The great chief of the Plain Crees is styled "the Fox;" he is well figured in a photograph. "The Fox" is held in high esteem by all the Plain Indians with whom he comes in contact, either in peace or war. He is dreaded by the Sioux, the Blackfeet, the Bloodies, the Fall Indians, the Assiniboines, and all the tribes who occasionally hunt on the Grand Coteau de Missouri and the south branch of the Saskatchewan.

The cruel, barbarous treatment of prisoners so often described in narratives of Indian warfare, is common even now in the prairies south of the Qu'appelle or Calling River and the Assiniboine. Not a year passes without two or more of the Red River half-breeds being scalped by Sioux: sometimes, as was the case last year, quite close to the settlement of St. Joseph, on the boundary line, about 30 miles west of Red River. When a prisoner is taken, the Sioux sometimes adopt a terrible mode of death, during the summer season. They have been known to strip a half-breed, tie him to a stake on the borders of a marsh in the prairie, and leave him exposed to the attacks of millions of mosquitoes, without being able to move any part of his body; and when the agony of fever and the torment of thirst come upon him, they leave him to die a dreadful lingering death, with water at his feet, and buzzards hovering and circling around him in loathsome expectation. By way of illustrating the character of the medicine or conjuring ceremonies, which may be witnessed during all seasons of the year, when several families are encamped together, I shall describe a scene of which I was an eye witness last summer near the Hudson Bay Company's post in the Touchwood Hills, between the south branch of the Saskatchewan and the Assiniboine. The conversation was carried on in Cree, but, I believe, faithfully interpreted to me by the officer then in charge of the post, who was present. The interpretation was pronounced exact by one of the Cree half-breeds attached to my party.

At the time of my arrival at this Post, a conjuror of some celebrity was endeavoring to cure an invalided woman by the exercise of his cunning. The sick woman was lying in a buffalo skin tent; the conjuror, painted and decorated, employed himself in beating a medicine drum within a few feet of her, and in singing at intervals the following words, first uttered slowly, with a pause between each word, then as in ordinary conversation; lastly, with energy and rapidity:

"Great—is—the—man—who—walks—
In—the—middle—of—the—Earth,—
He—is—the—only—true—Lord."

The word "Lord" is not employed in the sense of supreme master, but is rather intended to convey an idea of independence and individual power; and is better expressed in English, as the half-breeds informed me, by the word "gentleman."

The conjuror occasionally came out of the tent; and whenever the supposed Manitou or Fairy who was the alleged cause of the woman's illness approached, a little bell, suspended from the poles supporting the tent, tinkled, and gave the alarm; the conjuror immediately seized his drum, commenced his song, and, by his incantations, succeeded in pacifying the Manitou. These proceedings continued for two nights; and, at the close of the second night, after a prolonged ringing of the little bell, violent shaking of the tent poles, loud beating of the drum, and chaunting of the words before quoted, the conjuror announced that he had discovered the reasons of the Manitou's anger, and the means to appease it.

You had a dream, said the conjuror, and when you rose in the morning you promised to make an offering to the Manitou, you have forgotten your pledge, and you are sick.

The woman demanded what she had dreamt, and what she had promised, avowing her ignorance of both dream and promise. But the conjuror told her, that when the buffalo were around her tent last winter, and no fear of starvation before her eyes, she had dreamed that the buffalo would always surround her, that famine and sorrow were always to be strangers to her, and, in gratitude, had vowed to make a sacrifice of her best robes. The woman, wearied no doubt with the conjuror's unceasing drum and song, probably too, believing that a false confession was the lesser evil, as it might bring the promised relief, acknowledged that the conjuror was in the right. The penalty she was told to pay consisted of the sacrifice of throwing away of two robes, or double the amount of the promise she had made, after which her health was to be restored.

Scenes similar to the one just described may be witnessed whenever several families are camping together; but the sacrifices required to be made depend upon the ability of the deluded creatures to satisfy the demands of the conjuror.

"The Happy Hunting Grounds," the Heaven of Indians, so often

spoken of by writers of fiction, are an actual reality in the imaginations of Crees and Ojibways, as well as of other north-western tribes. A plain Cree on the Qu'appelle gravely informed one of my men that he had been dead once, and visited the spirit world. His narrative was to the following effect:—"I was sick, and fell asleep. I awoke on the bank of a deep river, whose waters were flowing swiftly and black from a great mist on the south to a great mist on the north. Many other Indians sat on the banks of the river, gazing on its waters, and on the gloomy shore which lay wrapped in mist on the other side. Time after time the mist before us would roll away and reveal the mouth of another great river pouring its flood into the one on whose banks I was sitting. The country to the south of this river was bright and glorious, to the north dark and gloomy. On the one side was the happy hunting grounds, on the other the hunting grounds of the bad Indians. Time after time my companions tried to cross the swift stream before us, in order to reach the happy hunting grounds; some arrived in safety, others reached the north bank, and disappeared in the mist which overhung the bad country. I tried at last, but the current was too strong for me, the recollection of bad deeds prevented me from stemming the current, and I was swept on to the north shore of the opposite river. I scrambled up the bank, and spent many moons in hunting in that dreary land; always on the point of starving, or of being hurt by enemies, or wet and cold and miserable. At length I came upon a river like the one I had crossed, with mists and a great stream opposite, breaking clouds revealing happy hunting grounds on one side, and a more gloomy and terrible country on the other side. Other Indians were there before me, looking at the river and trying to cross; many succeeded, a few were swept to the bad country, these were very wicked Indians. I tried to cross. I knew I had been a good Indian in this dreary hunting ground. I took courage, and swam strong against the stream. I reached the happy hunting grounds; all my sorrow disappeared as I climbed to the top of the bank and saw before me Indians numerous as grass leaves, buffalo on the distant plains thick as rain drops in summer, a cloudless sky above, and a warm, fresh, scented, happy breeze blowing in my face. I sank to sleep, and woke alone in my tent in these prairies again."

Whatever faith the Indian medicine men possess in the efficacy of their charms, it is certain that they entertain great respect for the

white man's medicine. A laughable incident occurred at the Touchwood Hills. The conjuror of whom mention has just been made, entered the room at the post where I was sitting with Mr. and Mrs. H., who were temporarily in barge. The Indian and a companion seated themselves upon one of my boxes which contained a small medicine chest. Mrs. H. asked me to give her some sticking plaster. I crossed the room to open the medicine chest, when Mrs. H. (a half-breed) said to her husband, in the Cree language: "Will his medicine do me any harm if I stop here while he opens them?" Mr. H. answered jestingly, "yes, you had better go into the other room." I motioned the Indians to move, they rose, and I opened the chest; the moment they saw the bottles they hurried out of the room, hastened to the summit of a neighboring hill, and divesting themselves of every article of clothing, shook their garments repeatedly, and, after hanging them on bushes in the sun, squatted on their haunches to await the deodorizing influence of the breeze.

In the valley of the Qu'apelle River, we frequently found offerings to Manitou or Fairies suspended on branches of trees; they consisted of fragments of cloth, strings of beads, shreds of painted buffalo hide, bears' teeth and claws, and other trifles. Our half-breeds always regarded them with respect, and never molested or liked to see us molest these offerings to Manitou. This custom prevails everywhere in the valley of Lake Winnipeg, and it may truly be said that the Medicine drum is heard far more frequently in some parishes of Selkirk Settlement than the sound of church bells.

A conjuror celebrated for the potency of his charms will often exercise a very injurious influence over an entire band consisting of ten or twelve families, in deterring them from frequenting particular hunting or fishing grounds if they offend him. Out of numerous instances of this dangerous influence, I select the following. It occurred on the Dauphin River. When ascending that stream, we came upon a large camp of Ojibways who were on their way to the Hudson Bay Company's Post, at Fairford. Their usual wintering place was at the Pike's Head, an excellent fishing station, on Lake Winnipeg; but they had abandoned the intention of wintering there in consequence of a threat which had been conveyed to them from a noted conjuror of the Grand Rapids of the Saskatchewan, to the effect that if the band ventured to winter at the Pike's Head, "He would do something." This ambiguous threat was quite sufficient to

deter them from visiting their old haunts, and would probably be instrumental in producing much suffering if not actual want to many of the band.

Sacrifices and offerings are of very frequent occurrence among the Indians of the Saskatchewan Valley. The customary offerings consist of two, three and sometime five dogs. At the mouth of the Qu'apelle River, an Indian, in June last, set his nets and caught a large fish of a kind different to any with which he was familiar. He immediately pronounced it to be a Manitou, and, carefully restoring it to the water again, he at once sacrificed five valuable dogs to appease the anger of the supposed fairy. On approaching Long Lake, an arm of the Qu'apelle River Valley, the Crees warned us not to visit the Lake by night, as it was full of devils. They told me very extraordinary tales of the dimensions and power of these devils, and appeared to live in awe and terror of them. Like most heathen and barbarous races, the Indians suffer much from their superstitious fears. When the weather is fine and their tents are well supplied with provisions, they are an independent and joyous people. Full of frolic, and fond of relating anecdotes, they laugh immoderately at any trifling joke or absurdity, and seem thoroughly to enjoy existence. A ridiculous incident occurred in the tent belonging to the chief, Short-stick, in which I played a more prominent part than I should have selected had any choice been offered me. I heard of this incident again hundreds of miles from the spot where it occurred as we journeyed homewards from the Grand Forks.

It happened thus. I visited Short-stick in his tent after a long and tedious talk which lasted seven hours, relating to the object we had in view in visiting the country. Three of Short-stick's wives were visible with their children, forming altogether a party of eighteen or twenty. I rose from the buffalo robe where I was seated by the side of Short-stick to examine some arrows which one of his sons was making, and when my curiosity was satisfied, I sat down on what I thought to be a bundle of buffalo robes. I was a little astonished to feel the robes move beneath me, and before I could rise and look into the cause, I found myself projected into the middle of the tent among the embers, by means of some violent spasmodic action from beneath the supposed pile of robes. Short-stick and his three wives with the other inmates, shrieked with laughter, vociferating some words in Cree. Meanwhile, the buffalo robes were slowly thrown on one side, and, to my aston-

ishment, were revealed the huge proportions of Short-stick's fourth, youngest and best wife. She shook a mass of hair from her head and joined in the laughter at my discomfiture. Other Indians hearing the noise came in, and Short-stick, with tears in his eyes, told his friends how "the white stranger had sat upon his best wife, thinking she was a pile of robes, and how she tossed him into the middle of the tent like a buffalo bull pitching a colt."

As I passed near the door of the tent belonging to Short-stick's eldest son, who accompanied me, a young squaw outside was leaning upon sticks, evidently in great trouble and weeping bitterly; the moment she saw us she hobbled into the tent with a low cry of pain and closed the entrance. I asked the interpreter what this meant. After some conversation with her husband, he said that the woman was suffering from a beating he had given her for a violation of her faith during his absence in the spring on a war excursion. "I would have killed her," muttered the husband, "but I thought it a pity to kill two at once. She had her choice whether she would have her hair, her nose or her ear cut off, or whether she would have a beating; she chose what she has got, and I would have killed her had I not known I should regret having killed both." It is needless to add that the woman soon expected to become a mother.

In order to understand the character and nature of wild Indians, they must be seen in their tents when well supplied with provisions, and disposed to be cheerful and merry. In the prairies, on horseback, they are often quiet and watchful, always on the look out, and if twenty or thirty are in a band they generally manage to see a suspicious object in the distance at the same moment, so that a simultaneous note of exclamation is uttered by most or all of the party. In hunting the buffalo they are wild with excitement, but no scene or incident seems to have such a maddening effect upon them as when the buffalo are successfully driven into a pound. Until the herd is brought in by the skilled hunters all is silence around the fence of the pound, each man, woman and child holding, with pent up feelings, his robe so as to close every orifice through which the terrified animals might endeavour to effect an escape. The herd once in the pound the scene of diabolical butchery and excitement begins; men, women and children climb on the fence and shoot their arrows or thrust their spears at the bewildered buffalo, with shouts, screams and yells horrible to hear. But when the young men, and even women jump into the arena

amidst the dying and the dead, smear themselves with blood, thrust their arms up to the shoulders into the reeking bodies of their victims, the savage barbarity of the wild prairie Indian shows itself in its true colours. Not even a scalp dance over many fallen foes affords such a terrible picture of degraded humanity as do a large band of prairie Indians, some hundreds in numbers, during and after the slaughter of buffalo in the pound.

The condition of the Indians now is very different to what it used to be half a century since. Not only have imported diseases greatly diminished their numbers, but game of different kinds has become so scarce that during some seasons starvation is no fiction.

In sickness prairie Indians are much depressed, and often seek consolation in the monotonous drum of the medicine man and his heathenish incantations, an infliction which the grossest and most debased superstition alone would tolerate; submitted to with hope and confidence, however, by men who are anxious and timid during the roll of thunder, invoking the Great Bird by whose flapping wings they suppose it produced, or crouching from the blink of his all penetrating eye, which they allege is the lightning flash.

CONTRIBUTIONS TO METEOROLOGY, FROM OBSERVATIONS TAKEN AT ST. MARTIN, ISLE JESUS, CANADA EAST.

BY CHARLES SMALLWOOD, M.D., LL.D.
PROFESSOR OF METEOROLOGY IN THE UNIVERSITY OF M'GILL COLLEGE, MONTREAL.

Read before the Canadian Institute, 9th April, 1859.

The following observations extend over the year 1858: The Geographical co-ordinates of the Observatory are Latitude 45°32′, North, and Longitude 73°36′, West, from Greenwich. The cistern of the Barometer is 118 feet above the level of the Sea, the Mean Results are obtained from tri-daily observations taken at 6 a.m., 2 p.m., and 10 p.m., and the whole of the observations have been subjected to the usual corrections, depending on the constructions of the instruments and for temperature.

Barometric Pressure.—The highest reading of the Barometer during the year, was at 10 p.m., on the 22nd of January, and indicated 30.697 inches. The lowest reading for the same period occurred at 2 p.m., on the 21st of March, and was 29.021 inches, giving a yearly range of 1.676 inches. The greatest monthly range was in January, and this holds good for a series of years, with the exception of last year, 1857, when December indicated the greatest monthly range. June of the present year indicated the lowest monthly range, 0.660 inches, although July for a series of years has indicated the least monthly range. This year July exceeded by 0.014 the lowest range of June. The mean barometric pressure for the year was 29.829, which exceeds by 0.071 inches the mean of last year, and shows an increase in pressure of the atmosphere compared with a series of years. The mean height of the barometer for the month of January was 29.907 inches; for February, 29,809 inches; for March, 29.804 inches; for April, 29.757 inches; for May, 29.751 inches; for June, 29.771 inches; for July, 29.759 inches; for August, 29.789 inches; for September, 29.830 inches; for October, 29.982 inches; for December, 30.015 inches. The mean monthly range of the barometer for the month of January was 1.627 inches; for February, 1.129 inches; for March, 1.340 inches; for April, 0.947 inches; for May, 1.039 inches; for June, 0.660 inches; for July, 0.674 inches; for August, 0.714 inches; for September, 1.221 inches; for October, 1.032 inches; for November, 0.856 inches; and for December, 1.241 inches.

The greatest range within twenty-four hours, with a rising column, occurred on the 21st January, and was 0.730 inches; and the greatest range, with a falling column, was on the 10th of January, and indicated 0.903 inches. The most sudden variation, with a rising column, occurred on the 18th June, and from 3 p.m. to 3.20 p.m. (*twenty minutes*) indicated a rise of 0.075 inches. The *Symmetrical wave of November* exhibited but little fluctuation, the final trough terminated at 6 a.m. on the 30th day.

Temperature of the Atmosphere.—The mean temperature for the year was 40°.04 Fahrenheit, which shows a decrease in temperature of 0°.53 compared with the temperatrue of 1857, and indicates 1°.520 less than the mean temperature for a series of years. The lowest observed temperature was on the 13th of February, and indicated 30°.2 below zero. The highest temperature occurred on the 7th of July, and was 99°.3, giving a yearly range or climatic difference of

129°8. *February* was the coldest *February* on record here, and indicated 14°05 colder than the mean of last February, 1857. The highest degree of temperature for the month was 39°.4, and the lowest 30°.2 below zero. The most sudden decrease of temperature occurred on the 18th of June, and indicated in twenty minutes a decrease of 17°.1; the thermometer standing at 3 p.m. at 93°8, and at 3.20 p.m. 76°.7. The mean temperature of the air for the month of January was 13°.76; for February, 7°.56; for March, 23°52; for April, 39°.06; for May, 63°.02; for June, 67°.21; for July, 66°.50; for August, 66°.12; for September, 59°.13; for October, 46°48; for November, 26°78; and for December, 12°.37. July which has for a series of years indicated the greatest *mean* temperature showed this year 0°.71 less than the *mean* temperature of June. This was owing to the low temperature accompanying the excessive rain of the month of July.

Humidity.—The relative mean humidity of the atmosphere for the year (saturation being 1,000) 0.778. July indicated 0.074 of moisture more than the *mean* of a series of years. The mean humidity for the month of January was .786; for February, .703; for March, .789; for April, .717; for May, .764; for June, .756; for July, .818; for August, .818; for September, .804; for October, .792; for November, .809; and for December, .787. Complete saturation occurred in July, and is the only instance on record here of such an occurrence.

Rain fell on 111 days, amounting to 50,035 inches on the surface. It was raining 521 hours 33 minutes, and was accompanied by thunder and lightning on 20 days. This amount of rain exceeds by upwards of 7 inches the usual average amount compared with a series of years, and was owing to excessive rains in June and July.

A very heavy storm occurred on the 10th of June, which lasted 28 hours and 48 minutes, and amounted to 6.175 inches. There fell in one hour (from 5 to 6 p.m.) 0.933 inches, and from 6 p.m. to 7.28 p.m. the amount of 1.333 inches. The river surrounding this Island rose 8 inches in height.

Another storm of heavy rain set in at 3 a.m. on the 12th day of July, and ceased at 12.40 p.m. of the 13th, and indicated a depth of rain on the surface of 6.374 inches; it was accompanied by a N.E. by E. wind. The river in the neighborhood rose nearly 2 feet in perpendicular height, and the amount of rain which fell during this month was

12.214 inches, and is the most rainy *July* on record. The amount of rain which fell in the month of August was less than the usual mean quantity for that month.

Snow fell on 46 days, amounting to 58.96 inches in depth; it was snowing 281 hours, 30 minutes; this amount shows a decrease equal to 36.80 inches compared with the mean amount of a series of years. February and December were the months which showed the greatest amount of snow. The first snow of the season fell on the 4th of November, and the last snow of spring fell on the 21st April.

Evaporation.—The amount of evaporation from the surface of water, during the seven months which the observations are recorded (owing to the presence of frost) amounted to 18.730 inches, which is 1.515 inches less than the amount of last year. July indicated about 1 inch less than the usual amount; the amount of ice evaporated during the remaining months of the winter season showed about the usual average amount.

Wind.—The most prevalent wind during the year was the N.E. by E. The next in frequency the W. by N., and the least prevalent the S. The aggregate amount linear in miles run was 41,338.60 miles, which shows a decrease of 13,086.50 miles compared with last year, and a decrease of 11,723.03 miles compared with 1856. The yearly mean velocity was 4.613 miles per hour, which is 1.567 miles less than the mean annual velocity for 1857. The maximum velocity was 37.70 miles per hour. January was the most windy month, and September the calmest.

The greatest *Intensity of the Sun's Rays* was 117°, and the lowest point of *terrestrial radiation*, 31°.2 below zero.

The yearly amount of *Dew* was considerably below the usual mean amount compared with a series of years.

There were 56 days perfectly cloudless, which is 25 more than the cloudless days of 1857. There were 118 nights suitable for astronomical purposes.

The Aurora Borealis was visible at observation hours on 39 nights. *Lunar Haloes* were seen on 4 nights. The *Zodiacal Light* was very bright in February, but since then has exhibited no special appearance. *Parhelia* were visible on 2 days.

The Eclipse of the Moon was *visible* on the 27th February. The Eclipse of the Sun was *invisible* on the 15th March owing to cloudy weather.

The winter of 1857–58 fairly set in on the 22nd December, 1857.

Ozone.—The amount of ozone during the year has shown an increase on the usual average. Observations are now being taken here, intended to show the effects of the different clouded rays of light on the Ozoneometer, and also the effects of vegetation on the amount.

Atmospheric Electricity.—The tri-daily observations are still continued in this important branch of science, the amount indicated in frequency and tension is very near equal to the amount of last year, but is nevertheless rather below the usual average. The *Romershausen* apparatus seems pretty well adapted for the purpose of collecting atmospheric electricity, but is inferior to the large apparatues which is erected here, both as to collecting and retaining the electric charge.

The Song Sparrow (*Fringilla Meloda*) the harbinger of spring, first heard on the 10th March. Swallows (*Hirundo Rufa*) first seen the 15th April. Frogs (*Rana*) first heard the 15th April (this is about a week earlier than usual,) Shad (*Alosa*) first caught 29th May. Fire-flies (*Lampyris Corusca*) first seen the 18th of June. Snow Birds (*Electrophanes Nivalis*) first seen 26th October. Crows did not winter here this year. Wild Strawberries in flower 27th May, and matured 26th June. Gooseberry in leaf 9th May. Currant tree in leaf 21st May. Plum tree in blossom 26th May. Apple tree in leaf 3rd June.

The potatoe rot, which manifested itself but partially this year, commenced in this neighborhood on the night of the 7th August.

St. Martin, Isle Jesus, 21st March, 1859.

GRUS AMERICANA AND GRUS CANADENSIS: ARE THEY THE SAME BIRD IN DIFFERENT STAGES OF GROWTH?

BY T. J. COTTLE, F.R.C.S.E.

Read before the Canadian Institute, 12th February, 1859.

The great variation of plumage that many species of birds, especially of the order Rapaces, undergo before arriving at their adult dress, and the consequent multiplication of species, is well known to Ornithologists: And it falls rather to the task of the out-door naturalist than to the systematist in his closet, to unravel such difficulties.

In this notice it will be my endeavour to show that the Whooping Crane (*Grus Americana*) and the Sand-hill Crane (*G. Canadensis*) are not identical birds. This assertion from an obscure naturalist, in contradiction of America's two greatest ornithologists, Wilson and Audubon, may well be considered presumptuous. In this brief notice, however, I confine myself to the setting forth of facts which have come under my own personal observation, with the hope of eliciting further information from other observers.

Audubon, in his Synopsis, the only work of his I have at hand to consult, under his species *Grus Americana*, gives *G. Canadensis* as a synonym without comment. Wilson speaks more guardedly, and does not seem decided, he says:

"It is highly probable that the species described by naturalists as the *G. Canadensis*, is nothing more than the young of the Whooping Crane, their descriptions exactly corresponding with the latter. In a flock of six or eight, three or four are usually of that tawny or reddish brown tint on the back, scapulars and wing coverts, but are evidently yearlings of the Whooping Crane and differ in nothing but in that and size from the others. They are generally five or six inches shorter and the primaries are of a brownish cast." He then goes on to say: "The Whooping Crane is four feet six inches in length, from the point of the bill to the end of the tail."

My first reason for suspecting this idea to be incorrect, was, that during a visit I paid to the Prairies of Illinois some three years back, I saw several large flocks of these birds, containing in the aggregate some hundreds, and not one white or even mottled bird among them. I was informed by a farmer, that shortly before my arrival, there had been some beautiful white swans feeding on his corn in company with the Sand-hill Cranes. As this was an unusual habit for swans, I have no doubt they were the Whooping Crane in adult white plumage; but none were to be seen after my arrival. As this was quite at the end of October, is it not probable that the Whooping Crane had passed on in his annual southern journey, while the Sand-hill, a distinct though closely allied species, was later in its migrations? It is not likely that young birds would be more capable of braving cold than the old, or that they should be so much more numerous as to be present in hundreds without a single adult individual among them.

This may be said to be only conjecture, but what has confirmed my

previously conceived idea, is, that three or four individuals of the Sand-hill Crane, have been in the possession of Mr. Barnett, of the Museum, Niagara Falls, he tells me, for five years: and he can see no change of plumage in them during the whole of that time. Now I know of no bird that attains so great an age without assuming its adult plumage, or, at any rate, making an approach to it. The Bald Eagle takes longer than any American bird I know, and he is in full plumage in the fourth year, and begins to show the white on head and tail in the second or third year. And as Mr. Barnett says that his Cranes have not made any change in their plumage since he had them, they must have lost the characteristic brown plumage of the young before he saw them and must be more than five years old. In the summer of 1856 I visited the Falls, and saw a pair of young birds that had been hatched that season; they were entirely brown. The parent birds were much attached to them and fiercely attacked an intruder, their sharp and powerful bills making them dangerous antagonists. I regret that when sending to Mr. Barnett for information regarding the old birds, I forgot to enquire if the young birds I had seen had lived, and, if so, when they had changed their plumage.

I think the proofs are sufficient to claim specific distinction for the Sand-hill Crane. It is very probable that the young of the Whooping Crane may very much resemble that of the Sand-hill, and that they might easily be mistaken the one for the other.

The specimen I procured in Illinois has one or two brown feathers on the scapulars. The primaries are dusky black; and the length is nearly four feet, being as near as possible, as Wilson observes, six inches less than his measurement of the Whooping Crane. So unvarying a measurement I think must be a specific difference.

REVIEWS.

Geological Survey of Canada. Report of Progress for the year 1857. Printed by order of the Legislative Assembly: Toronto, 1859.

The Geological Survey continues amply to sustain the reputation of its earlier contributions to our growing science. In the Report of Progress now before us, there are many valuable additions to the already large accumulation of facts belonging to the geology

and geography of the Province; and a more varied character is imparted to it, by the introduction of numerous details connected with our Natural History, properly so-called. It is to be regretted that the means at the disposal of the Geological Commission will scarcely allow of a more extended elaboration of this latter feature: otherwise, we might hope to see, in future Reports, an exposition of the Botany and general Fauna of the various districts visited by the Survey. Our knowledge of the natural history of the remoter regions of both Upper and Lower Canada, is at present of the most meagre character; and it is obviously impossible to do much towards the amendment of this by any effort of private enterprise. Whilst urging the consideration of this question, therefore, upon the attention of the Legislature, we welcome the commencement of the good work, slight though it be, laid before us by the Director of the Survey in the Report now under review.

In addition to a general statement of working details by Sir William Logan, this Report contains no less than five distinct communications by the Officers of the Survey, together with a Report on Canadian Graptolites by Professor Hall of Albany, and one on the respective longitudes of some of the principal places in Canada by Lieut. Ashe, R. N. The details of Sir William's more special explorations in connexion with the Laurentian limestones of Grenville, &c., are to appear in the Report for 1858.

The Report of Mr. Murray comprises an elaborate survey of the mouths of the French River, with the adjacent coasts and islands; a description and survey of Echo Lake and the surrounding country; and an examination of the Huronian limestone of the Bruce Mines' district. Apart from the purely geological information afforded by Mr. Murray's researches, the thanks of our geographers are again due to him for his carefully conducted topographical measurements along the northern coast-line of Georgian Bay—a district of much intricacy. For the accurate delineation, indeed, of the geographical features of this part of Canada, we are chiefly indebted to Mr. Murray's skill as an instrumental surveyor. Passing to the geological portion of the Report, we find that Laurentian rocks, of no special interest, prevail exclusively on the coast and islands in the neighbourhood of French River; whilst around Echo Lake the rocks are chiefly of Huronian age. A slight outcrop of over-lying unconformable strata, suggested as Lower Silurian, skirts the shores of Great

and Little Lakes George, St. Mary River, and a portion of Sugar Island. The physical structure of the district was principally worked out by means of a broad limestone band, associated with the other Huronian rocks. The formation generally, as in other places, was found to be traversed by masses of trap, greenstone, and porphyrytic granite. Copper pyrites appeared to be disseminated very generally through the greenstone, and in quartz veins, especially south of Echo Lake and north of the mouth of Root River; both of which localities, Mr. Murray informs us, have been taken up for mining purposes, but without advantageous results. Specular Iron Ore was also observed, both in the trap and in the sedimentary portion of the series. Around Echo Lake, the rocks presented examples of polished surfaces with ice-grooves and scratches, the direction of the latter varying from S. 55° W. to S. 70° W.

The Report of the Assistant Provincial Geologist is followed by one from the pen of Mr. Richardson, Explorer to the Survey. Mr. Richardson's labors comprise a detailed examination of the Magdalen River, in Gaspé, and a portion of the country to the east as far as Gaspé Bay; with an exploration of the Saguenay and Lake St. John. His Report, like that of Mr. Murray, is accompanied by several plans and sections*, and abounds in matter of much geological interest, more especially when considered in connexion with the previous explorations of Sir William Logan and Mr. Murray in the Gaspé peninsula. In its physical structure, Eastern Gaspé appears to offer a series of synclinals and anticlinals running more or less parallel to the northern coast, and comprising, passing from north to south, a range of beds from the upper portion of the Lower Silurian strata to the lower portion of the Carboniferous formation. In Mr. Richardson's map, one of these synclinals is shewn to constitute a probable continuation of Gaspé Bay, and to extend westerly in a broad trough far into the county. The edges of the trough consist of "Gaspé limestone," with "Gaspé sandstone" in the central portion. Amongst the economic substances met with by Mr. Richardson in that portion of Gaspé to which his explorations were confined, the following are cited:—Brick-clay from the mouth of the Magdalen, Serpentine (apparently, however, of poor quality), and common and hydraulic limestones—the latter, magnesian.

* The topographical work of Mr. Richardson's exploration was performed by Mr. Scott Barlow, whose efficient services are fully credited in the Report.

In the second part of his Report, Mr. Richardson speaks highly of the climate and agricultural capabilities of the Valley of Lake St. John. He remarks — "the cultivable land of the Valley of St. John most probably occupies a very large proportion of its area [estimated at about 5000 square miles], and, as in the settled part of it good crops seem to be the general result, it appears to me very probable that the valley will hereafter support a very considerable population. There appears to be no doubt in the minds of the settlers that they are able to grow all the kinds of grain produced in the neighbourhood of Montreal, and in equal abundance; and the unexplained superiority of climate in the valley over places more to the south, renders the investigation of this part of the Province a subject of considerable interest." The greater part of the valley is occupied by Laurentian rocks, including many beds of lime feldspar, and capped in places by thick deposits of Drift or Post-Tertiary clays and sands. Lower Silurian strata occur however in the islands and on the shores of the lake. These strata, as clearly indicated by their fossils, belong to the Trenton group and to the Utica slate; but traces of the Hudson River group, and probably also of the Middle Silurian series (?) appear to have been met with on one of the islands: indicating perhaps a geological connexion between this district and Anticosti. In reference to this view, the occurrence, at least, on this island, of the curious *Beatricea undulata* (so abundant in Anticosti) is a fact of no little interest. Another important palæontological discovery made by Mr. Richardson on Lake St. John, is the association of *Halysites catenulatus*, the well-known "chain coral," with Trenton fossils. Until recently, this species was looked upon as exclusively confined in America to the horizon of our Niagara and Clinton group. Mr. Richardson found it in Anticosti* associated with Hudson River types, and he now recognises it in a still lower position.

In addition to Mr. Barlow, the Surveyor, Mr. Richardson was accompanied in his exploration by Mr. Robert Bell; and the latter gentleman has drawn up a Report of considerable merit on the mollusca and natural history generally of the districts visited by the exploring party. As a knowledge of our living mollusca is of the greatest importance for the proper investigation of our Post-Tertiary deposits, we have collected in the following classified list the different

* See our Review of the Report of Progress for 1856: *Canadian Journal*, vol. III, p. 327.

species met with by Mr. Bell in the course of his expedition.* Although necessarily an incomplete enumeration of our terrestrial, fresh-water, estuary, and marine species, taken together, it may help to direct attention to the subject, and serve as a groundwork for future additions.

CANADIAN MOLLUSCA, INCLUDING A FEW SPECIES FROM LABRADOR:

CEPHALOPODA.—[Mr. Bell does not enumerate any examples of this class; but Prof. Dawson (Canadian Naturalist, vol. iii, p. 329) has obtained *Loligo illecebrosa* from the coast of Gaspé; and examples of the following genera may probably be looked for, in addition;—*Octopus, Cirroteuthis, Onychoteuthis,* and *Ommastrephes.* A species of the latter genus certainly occurs in the Gulf of the St. Lawrence. It is the "flying squid" or "sea-arrow" so abundantly used as bait by the Newfoundland fishermen.]

GASTEROPODA.

HELICIDÆ:—*Helix hortensis* (imported); *H. alternata; H. labyrinthica* (Say); *H. egena* (Say); *H. lucida* (Drap.); *H. striatella* (Ant.); *H. pulchella; H. harpa;* [*H. alboldabris* (Say); *H. monadon*† (Racket).] *Succinea obliqua* (Say); *S. vermeta* (Say). *Vitrina pellucida* (Drap). [The latter species was found by Mr. Bell, near the mouth of the Magdalen River. Unless introduced, its occurrence is of some interest, as the genus *Vitrina* belongs almost exclusively to the Old World. It forms a connecting link between the *Helicidæ* and the *Limacidæ*].

LIMNÆIDÆ:—*Limnæa catascopium* (Say); *L. umbrosa* (Say); *L. apacina* (Lea); *L. modicella,* and two new species. [The well known *L. stagnalis, L. gracilis,* and several other species, likewise occur in Canada]. *Physa aurea* (Lea); *P. heterostropha* (Say); *P. ancillaria* (Say); *P. elliptica* (Lea). [*Ancylus rivularis* (Say).] *Planorbis trivolvis* (Say); *Pl. parvus* (Say); [*Pl. deflectus; Pl. companulatus;*

* The shells collected by Mr. Bell were subsequently examined, and their specific determinations confirmed, by the distinguished conchologist Prof. Lea of Philadelphia. A few of the species mentioned in our list were obtained by Mr. Bell in a previous expedition to the mouth of the St. Lawrence; and some are added from personal observation and other sources, especially Professor Dawson's paper "A Week in Gaspé," published in the third volume of the *Canadian Naturalist.*

† We have found the shell of this species, in great profusion, imbedded in the "flats" of the Grand River, in Western Canada. A compressed "parietal" tooth extends into its somewhat contracted aperture.

Pl. bicarinatus. The two latter found by Mr. Billings, at Lake Clear.]

STROMBIDÆ:—[*Rostellaria occidentalis*, Mr. Carpenter, Labrador coast].

MURICIDÆ:—*Fusus borealis* (DeKay); [*F. paramidilis*, obtained by Prof. Dawson from stomachs of cod; *F. (Trophon) scalariforme*, Mr. Carpenter, Labrador coast].

BUCCINIDÆ:—*Buccinum undatum*; [*B. trivitatum*, Prof. Dawson]. *Purpura lapillus.*

NATICIDÆ:—*Natica heros*; *N. triseriata* (?); [*N. Grœnlandica*, *N. clausa*, Prof. Dawson, from stomachs of cod].

TURRITELLIDÆ:—*Scalaria Grœnlandica* (Gould). [*Turritella erosa*, Prof. Dawson, from stomachs of cod].

LITTORINIDÆ:—*Littorina tenebrosa*; *L. palliata*; *L. rudis.* [*Lacuna vincta*, Prof. Dawson].

TURBINIDÆ:—[*Margarita* (*Trochus*) *undulata*, *M. helicina*; Prof. Dawson, from stomachs of cod].

PALUDINIDÆ:—[*Paludina decisa* (Say); and two or three (?) other species]. [*Valvata tricarinata* (Say); *V. pupoidea* (?)].

PATELLIDÆ:—[*Acmœa* (*Lottia*) *testudinalis*, *Acmœa cæca*, Prof. Dawson].

CHITONIDÆ:—[*Chiton marmoreus*, Prof. Dawson].

LAMELLIBRANCHIATA.

MYACIDÆ:—*Mya arenaria*; *M. truncata*; [*M. Uddevallensis*]. [*Saxicava rugosa*, Prof. Dawson].

SOLENIDÆ:—*Solen ensis.* [*Machœra costata*, Prof. Dawson]. *Glycimeris siliqua.*

TELLINIDÆ:—*Tellina grœnlandica*; *T. calcarea*; *T. tenera. Sanguinolaria fusca*, *Mesodesma arctata.*

MACTRIDÆ:—*Mactra ovalis.*

CYPRINIDÆ:—[*Cardita borealis*, Prof. Dawson]. *Astarte sulcata.* [The dredge will probably reveal the presence of other species of *Astarte*, with examples of *Cyprina Islandica*, &c.]

CYCLASIDÆ:—[*Cyclas.* Seven or eight small species appear to belong to our lakes and rivers].

CARDIADÆ:—*Cardium Islandicum*; [*C. Grœnlandicum* (?)]; [*C. pinnulatum*, Prof. Dawson, from stomachs of cod].

UNIONIDÆ:—*Unio complanatus*; *U.* (*Alasmodon*) *arcuatus*; *U.*

(*Magaritana*) *margaritiferus* [with several other species (as *U.* (*M.*) *marginata*, and *U.* (*M.*) *rugosa*, found by Mr. Billings at Lake Clear), but *U. arcuatus* and *U. margaritiferus* are perhaps identical]. *Anodon fluviatilis*, found by Mr. Billings at Lake Clear.

ARCADÆ:—[*Leda* (*Yoldia*) *limatula*, Prof. Dawson]. The dredge will undoubtedly reveal the existence of other species in the St. Lawrence Gulf.

MYTILIDÆ:—*Mytilus edulis*. [*Modiola modiolus*, *M. decussata*, Prof. Dawson].

OSTREIDÆ:—*Anomia ephippium*. *Pecten Islandicus*; *P. Magellanicus*.

PALLIOBRANCHIATA OR BRACHIOPODA.

RHYNCONELLIDÆ:—[*Rhynconella psittacea*—not obtained by Mr. Bell, but known to occur in the Gulf of the St. Lawrence].

The valuable report communicated by Professor Hall, contains descriptions of various new species of Canadian graptolites, obtained within the last few years, in a condition of extraordinary preservation, in the Hudson River group of Point Levi, opposite Quebec. As this report will form the subject matter of one of the forthcoming Decades of Canadian Organic Remains, its contents will be brought before the notice of our readers in another number of the Journal. At present, therefore, we will merely observe, that Professor Hall considers the graptolites to be distinct from the Bryozoa*; and he inclines to the opinion that these organisms were perhaps pelagic forms, floating freely in the sea. The latter idea appears now to be very generally entertained; but there is a somewhat forcible objection to it, which does not seem to have occurred to the holders of this view. It is evident that the compound graptolite structure, or organism, could have possessed in itself no direct powers of locomotion. If free, it must have floated whithersoever the waves and winds directed it; and, in this manner, it must have drifted, sooner or later, upon coast lines, and there have perished. We, therefore, still hold to the earlier opinion, that the graptolite mass, in the living state, was attached by its base —and there is nothing in Sir William Logan's new forms to invalidate this,—to stones, sea-weeds, and other submarine bodies. We

* See, on this subject, a note by the writer, in vol. i, p. 388, of this Journal.

are glad to find that Professor Hall persists in the non-recognition of the so-called genera *Monograpsus*, *Diplograpsus*, *&c.* Although he stands, in so doing, almost alone amongst palæontologists, every new discovery tends to prove the justness of his views.

The Report of Mr. Billings, although necessarily of limited popular interest, will be fully appreciated by all engaged in the study of our palæontology. It comprises descriptions and figures of various new genera and species of Canadian fossils, with a brief notice of Lake Clear, in the newly surveyed township of Sebastopol, and an exceedingly interesting essay on the Fauna of the Black River and Trenton Limestones of Canada, as compared with that of similar formations in New York and Tennesee. Amongst the new forms, we have a remarkable species of *Obolus* (*O. Canadensis*, Billings), two inches or more across, from the Trenton (or Black River) limestone of the Fourth Chute of the Bonnechère, Pauquette's Rapids, and from the townships of Stafford and Westmeath, in the County of Renfrew. Also a new genus of Brachiopoda named *Eichwaldia*, by Mr. Billings, characterized more especially by a perforation for the peduncle at the *back* of the umbo of the larger valve; and a new lamellibranchiate genus named *Cyrtodonta*. The latter, which is distinguished by the possession of three more or less curved anterior or cardinal teeth, (whence the generic name,) and two or three lateral teeth (situated posteriorly), exhibits species from the Black River limestone, the Trenton limestone, and the Hudson River group, respectively. The results of Mr. Billings' comparative analysis of the fossils of the Black River and Trenton beds of Canada, New York, and Tennesee, confirm the fact, first shown by Sir William Logan in 1851, of a gradual passage of the lower into the higher formation with us, whilst in the State of New York a strong line of demarcation exists between the two. In Tennesee, on the other hand, there is a complete intermingling or rather inversion of these forms; some of the more highly characteristic Black River types of New York, (*Columnaria alveolata* and *Stromatocerium rugosum*, for example,) occupying a higher position than the typical Trenton forms.* For this reason, whilst retaining for special applications the subdivisions of Chazy, Bird's Eye, Black River, and Trenton limestones, it is advisable in a general point of view to arrange

* See Professor Stafford's paper "On the Silurian Basin of Middle Tennesee," in Silliman's Journal, 2nd series, vol. xii. p. 352,—quoted by Mr. Billings.

these deposits together under the common term of the Trenton group or series.

Mr. Sterry Hunt's contributions to the Report of Progress for 1857, comprise a continuation of his researches on the composition of our magnesian limestones and the formation of dolomites generally, together with a valuable and very interesting communication on Fish Manures. Pure dolomite consists of equal atomic proportions of carbonate of lime and carbonate of magnesia; or, in 100 parts, of CaO,CO^2 54.35, and MgO,CO^2 45.65. Very few of our magnesian limestones, however, exhibit these exact proportions; but Mr. Hunt, availing himself of a reaction pointed out by Karsten many years ago, has shewn that most of these consist of an admixture of carbonate of lime and true dolomite. Whilst the latter compound resists the action of cold acetic acid, or is but slightly attacked, carbonate of lime is readily dissolved by that re-agent, and hence, a separation of the two is easily effected; the silica and other accidental matters being afterwards removed from the dolomite by treatment with hydrochloric acid. A portion of the carbonate of magnesia, in the majority of the dolomites analysed by Mr. Hunt, is replaced by carbonate of iron, and in some, also, by carbonate of manganese. Examples of magnesian limestones containing a larger amount of magnesia than is required for the production of a dolomite, although of not uncommon occurrence in other countries, do not appear to have come under observation in Canada. With regard to Mr. Hunt's comprehensive and now apparently well-established views on the origin and formation of dolomites, we must refer our readers to the valuable paper communicated by that gentleman to the last number of the Canadian Journal (page 184), Mr. Hunt having greatly extended his experimental researches on this subject since the date of the present Report.

Mr. Hunt's remarks on the manufacture of fish-manures are of great practical importance, and merit well the attention of our agriculturists. Fish have long been used as a manure in many parts of Europe bordering on the sea, and more especially along the western coast of France, in Scotland, and on the hop grounds of the English counties of Kent, Sussex, and Hampshire. At Concarneau, in the department of Finisterre in France, an establishment for the manufacture of portable manure from the offal of sardines, caught extensively off that coast, is in active operation. The process consists in exposing the fish-offal for some hours to steam heat, pressing it afterwards to

extract the oil and water, and then drying the pressed mass thoroughly, and grinding it to powder. One hundred parts of offal are said to yield about twenty-two parts of powder, of which from four to five tons are daily produced in the manufactory at Concarneau. The powder, according to Mr. Hunt, averaged, in 1854, about $37 the ton, and is now probably of greater value. M. Démolon, the proprietor of the Concarneau works, has likewise established a manufactory of a similar kind at Kerpon on the coast of Newfoundland, which produces from cod refuse an annual yield of 8,000 or 10,000 tons of portable manure. Of late years also, Mr. Duncan Bruce of Gaspé has endeavoured to introduce the manufacture of fish-manure into Canada. He mixes the dried fish-remains with the products of distillation of a bituminous shale, and with the calcined residue of this shale, but the utility of this mixture seems to be, at least, questionable. In summing up his observations, Mr. Hunt remarks, "the results which we have thus given clearly shew that by the application of a process similar to that now applied in France and in Newfoundland, which consists in cooking the fish, pressing it to extract oil and water, drying by artificial heat, and grinding it to powder, it is easy to prepare a concentrated portable manure, whose value, as a source of phosphoric acid and ammonia, will be in round numbers about $40 the ton. We can scarcely doubt that by the application of this process a new source of profit may be found in the fisheries of the Gulf, which will not only render us independent of foreign guano, now brought into the Province to some extent, but will enable us to export large quantities of a most valuable concentrated manure, at prices which will be found remunerative." There seems to be no reason why our fisheries of the West should not also be able to maintain, to a certain extent, manufactories of this manure.

The Report of Lieut. Ashe, R. N., contains the results of a series of operations undertaken by him at the request of Sir William Logan, for the determination of the correct longitude of Quebec by reference to that of Cambridge Observatory in the United States; and the longitude of Montreal, Ottawa, Kingston, Toronto, Collingwood, Windsor, and Chicago, respectively, by reference to that of Quebec,—the determinations being effected essentially by the direct transmission of signals along the wires of the electric telegraph. Between Chicago and Quebec, the signals were transmitted without intermediate repetition, "*via* Toledo, Cleveland, Buffalo, Toronto, and Montreal, a distance of

1210 miles, and were distinctly heard at either end of the line." The time occupied by the transmission of a signal throughout that distance was only 0.8 of a second. The signals were based upon the passage of stars across the field of a transit instrument fixed in the meridian upon as solid a support as could possibly be obtained; and Lieut. Ashe was put to no little trouble in effecting this latter and most essential point. The longitudes thus carefully ascertained, were found to differ considerably from those previously admitted. The following are those obtained by Lieut. Ashe, in hours, minutes, and seconds, west of Greenwich :—Quebec, 4h. 44m. 49.02s. Montreal, 4h. 54m. 11.72s. Ottawa, 5h. 2m. 48.29s. Kingston, 5h. 5m. 54.22s. Toronto (Magnetic Observatory), 5h. 17m. 33.43s. Collingwood, 5h. 20m. 50.53s. Windsor, 5h. 32m. 8.02s. Chicago, 5h. 50m. 30.54s.

These determinations were made with a view to impart additional accuracy to the large Map of Canada, on which the Geology of the Province is now being laid down under the direction of Sir William Logan. Valuable, therefore, as this map will undoubtedly be to geologists, and to all interested in the correct delineation of the physical structure of the country, its publication will also be of no common value in a purely topographical point of view.

E. J. C.

The Master-builder's Plan or the principles of organic architecture as indicated in the typical forms of animals. By George Ogilvie, M.D., Lecturer on the Institutes of Medicine, &c., in Marischal College, Aberdeen. London: Longmans. 1858, 8vo.

Dr. Ogilvie has selected a subject upon which a good popular work was undoubtedly wanted, to communicate not merely to the special student of natural science, but to the intelligent and cultivated portion of society generally, the splendid discoveries now recognized among competent judges, of Owen and those who have laboured in different departments in the same spirit: discoveries which have done for Zoology, what Goethe, DeCandolle and others, did for Botany, elevating its character as a philosophical study, and assisting the inquirer to appreciate not only the beautiful adaptations of particular organisms to the circumstances and wants of the creature, but also

the common plan which runs through extensive groups and the manner in which comparatively slight variations are made to fit each for its destined condition. The subject is interesting and important, the author's style clear, correct, and pleasing, and the numerous illustrations afford great assistance to the reader, so that although the work pretends to no novelty, it promises much utility, and deserves to be recommended to all who desire to comprehend the great principles and general results of Zoological Science.

In giving an outline of Zoological classification, it would in our opinion have been an improvement, if our author had made Protozoa a fifth sub-kingdom containing the classes Porifera, Rhizopoda, and Infusoria; and notwithstanding the close relationship of Polypifera and Acalephae forming Mr. Huxley's COELENTERATA, it might be as well at present to keep them separate as classes with Echinodermata of the Radiate sub-kingdom. Among Vertebrata there ought to be no hesitation in distinguishing five classes, Fishes, Amphibia, Reptilia, Birds, and Mammalia. There is without doubt a considerable external resemblance between Amphibia and some Reptilia, but the Anallantoidian embryo; the naked surface; the two modes of respiration in most species, at least in some stages of their existence, most of them passing through metamorphosis; the absence of ribs, and some other anatomical particulars, form perhaps as good characters for a class as those which distinguish other received classes and justify the eminent naturalists who assign a fifth class to Vertebrata.

We may possibly be somewhat influenced in this decision by a fancy that we have found natural and good divisions in all parts of the animal kingdom, falling into the numbers three or five. It seems to us that there is something in this of a general law. Under each type we have a group expressing its lowest degree of development, one expressing the predominance of the functions of vegetative life, and one in which the functions of animal life take the lead. Each of the two latter however, naturally sub-divides, at least in all the higher divisions into two, expressive of different variations in the destined mode of life. In the last mentioned divison, one for example, will display more of power or fierceness, another more of vivacity and activity. In the greater natural divisions we sometimes think we observe a nucleus or central group, peculiarly typical, around which the five leading modifications dispose themselves. Beyond this, we know of no deviations from the above mentioned numbers which we

are not either prepared to condemn as erroneous, on what seem to us abundantly sufficient reasons, independent of any numerical theory, or regard as cases of imperfect knowledge and, as yet, unsettled arrangement. If we could here take space for the illustration of our ideas, we should choose for the purpose the great class of birds; should designate the Insessores as a great central group, peculiarly typical, and range around them Raptores, Scansores, Rasores, Grallatores and Natatores, whilst the Insessores themselves, placing the families of Sylviadae and Fringillidae in the centre, as the most typical birds, would, by the sections Dentirostres, Syndactyli, Conirostres, Tenuirostres, and Fissirostres, represent the five greater deviations from the type in the order in which we have given them. In the same way the families under each order and section are found to be analogous to the greater divisions. What we have proposed may seem but the echo of a system which has passed away, and may be condemned as an attempt to fetter nature with our theories. We can but say that with us it results from practical labour in an extended field, and that all the theory which pertains to it is an attempt to explain and connec together a series of judgments in particular cases, with, as a general result, a disposition to expect that other cases of a similar kind will conform to those already examined. The means of classifying well are improving from day to day, with the increase of anatomical and embryological knowledge, but classification has not yet improved in proportion. Opinions fluctuate, and there is a feeling of the need of at least very great improvements. It is a time when authority and prescription lose their hold on us, and men look around in search of something better, often, no doubt, falling on a wrong track, yet even then, perhaps, doing something to prepare the way for more ingenious or more judicious successors. We touch on the subject of classification only incidentally here, and must not dwell upon it, but since, so far as it is good, it expresses and conveys knowledge, and all its faults mislead and embarrass students, it is worthy of all the attention we can bestow upon it.

The analogies now observed between Vertebrata and Articulata are, we conceive, to be accounted for from the consideration that these two sub-kingdoms exemplify the preponderance of the functions of animal life, the former being the especial manifestation of power, the latter of activity, whilst the Mollusca and Radiata manifest the predominance of the vegetative functions and accordingly are formed on entirely differ-

ent models and the Protozoa represent the lowest degree of development consistent with animal life. The following introductory account of the points of agreement and difference between Vertebrata and Articulata is deserving of attention: "In the following remarks attention will be directed mainly, and in the first place to the Articulate and Vertebrate groups, which appear to form a natural series distinguished by some remarkable peculiarities, wanting in the other two [Mollusca and Radiata], especially by the presence of a jointed frame-work or skeleton, for the support of the soft parts of the body. This is a character indicated by their names, Vertebrata and Articulata, meaning respectively, *hinged* and *jointed* animals, and suggesting the same general idea of a series of parts, so connected as to turn on each other, in the manner of a hinge or joint. All these animals, in fact, have in so far the same general conformation, that their skeleton consists of a series of pieces, placed one in front of the other, so as to form an elongated shaft, which, notwithstanding the rigid nature of the several parts, has a certain flexibility, owing to the numerous joints connecting these together. At the anterior end of this column is the head, in which, along with the principal organs of sense, is situated the mouth or anterior opening of the alimentary canal, closed by movable jaws. The animal is also furnished with locomotive organs or limbs, all having a downward direction, and jointed like the shaft of the skeleton, to which they are connected in pairs. The arrangement of these parts, and indeed the whole organisation of the animal, is highly symmetrical in its earliest condition, although in many cases, as the embryo assumes the characters of the adult, this is interfered with by the disproportionate development of certain organs of the body.

"But Vertebrate and Articulate animals agree farther in some respects which do not seem to have any necessary dependence on this segmentation implied in their respective names. In both groups the central tract of the nervous system forms a cord along the axis of the animal, with its anterior extremity developed into an organ having a certain analogy to the human brain. In both the central organs for the circulation of the blood are a contractile vessel or heart, propelling the blood towards the head, and an arterial trunk returning the main current in the opposite direction. In both the digestive system is represented by a canal running in the length of the interior of the body, and opening before and behind by appropriate orifices on the lower as-

pect of the animal. On the other hand, although these several systems agree in many of their relations in the two groups, in some points they are as strikingly contrasted. Thus the skeleton, which is mostly confined in Vertebrata to the interior of the body, is wholly external in Articulated animals, so that the jointed character is at once apparent in them, while in the former it is so obscured by the investing layer of soft parts, as almost to escape notice, till exposed by dissection. Again, the position in the body of the vascular, nervous, and alimentary systems, is completely reversed in the two groups, notwithstanding the close correspondence of many of their details."

In his second, third, and fourth chapters Dr. Ogilvie has given a very excellent outline of the modifications of the Vertebrate and Articulate types in the several classes of the two great sub-kingdoms. As may be inferred from what we have already said, we think he might with advantage have dwelt on the peculiarities of the Amphibian group, and so, in treating of Articulata, our views of their classification would lead to some changes of plan, thus we can see no more reason for separating the lower *Articulata from the higher under a distinct name* (they are called *Annuloida* by MILNE-EDWARDS,) than for detaching the mites from Arachnida, the Ichthyopthira from Crustacea or any other section of low development from the class which it resembles in the essentials of structure. Annelida with its appended sub-class Entozoa differs from the higher *Articulata by just such a change in its external skeleton as* is observed in the internal in a few of the lowest Vertebrata. The Rotifera, not mentioned by our author, doubtless from his adopting some different idea of their position, seem to us to constitute the lowest Articulate class; next to them we place Annelida, of which we must regard Entozoa as a *mere section containing the less developed forms.* The great class Crustacea, so varied and extensive in its series of forms, is the highest in which the functions of vegetative life predominate, whilst Insecta, of which Myriapoda seems to be but an inferior section, and Arachnida complete the sub-kingdom, and specially display the activity and fierceness which are *usually found in those* higher classes where the nervous and motory functions are in most vigour. The leading points of contrast between Vertebrata and Articulata are thus summed up by our author. pp. 86, 87.

"1. In the skeleton being:—
In Vertebrata mainly internal;
In Articulata wholly external.

"2. In the Ventral or lower surface (on which are situated the limbs and the two orifices of the Alimentary canal) coinciding in Vertebrata with the haemal aspect.
In Articulata, with the neural aspect.
"3. In the anterior end of the Alimentary canal, reaching this surface by traversing:—
In Vertebrata a vascular loop;
In Articulata [both a vascular and*] a nervous loop.
"4. In the posterior end of the Alimentary canal, reaching the same surface:—
In Vertebrata, short of the neuro-vascular spine, which is prolonged as a tail;
In Articulata, beyond the termination of the nervous cord, and at the extremity of the body, so that there is no true tail."

In what he says of the Mollusca, Dr. Ogilvie follows the views of Huxley, a very learned and ingenious man, an original observer, and a bold speculator, who has, we have no doubt, thrown much valuable light on the Molluscan structure; but the summary given by our author leaves the difficulties respecting the classes in this sub-kingdom untouched, not even naming several important groups, whose leading characteristics would be interesting to the most general student. We must refer to the volume itself for the summary of Mr. Huxley's doctrines. Our author remarks upon them that, "though there may attach a certain ambiguity—as he admits himself—to some of his conclusions, he seems to have abundantly established the general principle that the modifications of the common plan,—which, in Vertebrata and Articulata, are dependent on the over-development or abortion of some of the parts entering into the composition of the several segments, or by the addition or subtraction of entire segments of the skeleton, are to be ascribed in Mollusca to local expansions of certain parts of the soft body of the animal. By such out-growths of particular regions we are to explain not only the very general loss of symmetry, and the neural and haemal flexures characterising the several classes, but also the origin of such appendages as the arms and funnel of the cuttle-fish, and the gill tufts and tentacles of other Mollusca. Even the so-called external skeleton or shell—which is certainly the most permanent, as it is to general observers the most characteristic feature of the group—is merely the calcareous cast of such an expansion, being moulded on the fold termed *the mantle*,

* The bracketed words apply only to a portion of Articulata.

whose characters it faithfully preserves, even to the papillary prolongations of its margin, which are a distinguishing mark of some species."

We think it will probably be decided that the method in most general use of characterising the classes of mollusca in a great degree by their organs of motion is unsatisfactory, and that the groups known as Pteropoda, Heteropoda, and Gasteropoda ought to be combined, the first mentioned being but a less developed state, resembling the fry of many Gasteropoda, and the second small group a mere modification of the same general structure. Thus the Cephalous Mollusca, exhibiting the greatest power and activity of which the type admits, would form two classes, the Cephalopoda standing highest. The *Bryozoa* display the lowest degree of development in the whole sub-kingdom; *Tunicata* will stand next; and *Conchifera*, uniting the Lamellibranchiate and Palliobranchiate groups, which are but sub-classes, will complet the series, giving us representatives in this sub-kingdom of all the great divisions of the animal kingdom, in classes which, both as to the essential agreement of their members and the soundness of the distinctions employed, are as good as we can find in any part of the system.

As we descend in the scale of being we find the number of the greater divisions diminished, and the characters less easily appreciable. In our opinion the sub-kingdom Radiata is sufficiently bound together by its characteristic arrangement of its nervous system and its striking external character; and we are equally satisfied that its three classes *Echinodermata*, *Acalephae*, and *Polypifera*, ought to be distinguished. Cuvier combined the two former under the name of *Radiaria*, whilst filling up the sub-kingdom with lower developments of other types, in which either no perceptible nervous system, or a very rudimentary one, could be found. Mr. Huxley, in a more advanced stage of knowledge on the subject, rightly perceives the Acalephae to be rather connected in all important points of structure with Polypifera; but, acknowledging the justness of his views thus far, we are not prepared to run these two classes into one, or to separate them altogether from Echinodermata, which latter, notwithstanding certain analogies which mark their higher position, must, in our opinion, be excluded from Articulata. The attempt to do away with the distinctness of the Radiate type does, at present, we must confess, look to us like straining after novelty at the expense of nature and

truth. With regard to the Protozoa, Dr. Ogilvie offers little information, and what he does give relates almost exclusively to Rhizopoda. In considering this lowest sub-kingdom, we have, on the one hand, to guard against mistaking for distinct forms embryonic conditions of other minute animals, and on the other to decide whether certain tribes belong to the animal or vegetable kingdom. Mistakes have been made by eminent naturalists in both these directions, but we arrive at the conclusion that after setting aside those tribes which are truly vegetable, and making every allowance for larval forms, there remain three classes of Protozoa, *Infusoria* having something of a fixed shape, an oral orifice, and some approach to a special external covering. *Rhizopoda* destitute of these characters, deriving nutriment by involving the prey in the sarcode, and getting rid of hard or useless portions by openings in this primitive gelatinous substance which can at the will of the animal be varied in form, or extended into arms or feet. The Rhizopods are either naked or enclosed in a horny, silicious, or calcareous case which may be simple or composite from the production of germs having a definite arrangement. *Porifera* resemble Rhizopoda in their substance, but are distinguished by growing in masses formed about channels through which the water which yields the required nutriment, probably decaying animal and vegetable matter, is made to pass by a ciliary movement, and which are kept open by means of hard parts, horny, silicious, or calcareous, in the form of spicula or of a net-work of fibres. In the present state of knowledge these characters seem to us clear and sufficient as distinctions of classes, and well fitted to assist inquirers in gaining a general view of the system of nature. Dr. Ogilvie's 8th chapter, entitled, "the law of typical form and manifestation of design, co-extensive with organic nature," is an excellent statement, in a concise yet intelligible manner, of a most important principle. We quote a short parapraph from his concluding remarks: "It is unnecessary farther to multiply instances in illustration of the law of typical form, as those now adduced appear sufficient to show there is some principle involved in the construction of animals beyond the mere adaptation of their organization to their appropriate spheres of life. Yet we shall certainly never disparage the indications of the latter, if we pursue the study of nature with unprejudiced minds; for even in the common type, and still more obviously in its modifications, characteristic of classes and minor

divisions, down to species, we may trace clear evidence of the adaptation of the structure to the exigencies of the case. It may be added that one very important modification of the typical conformation which recurs so regularly in the different classes, as to become itself part of the general plan, seems to be essentially an adaptation of it to a special end. It is matter of observation that in all the classes, as we ascend to the higher species, certain regions lose their uniformly jointed character, by the expansion and partial fusion of the segments. We see this very remarkably in the cephalo-thorax of crabs and spiders, and in the skull of Vertebrata, for in these cases the modification is so extreme, as completely to disguise their typical formation, which is only traceable by the clue furnished by the corresponding regions in the less highly developed species. This peculiarity has a very obvious relation to the concentration of the nervous and vascular systems, in adaptation to more centralized vitality of the higher species generally."

Our author concludes his work with a chapter on the bearing of the subject on natural theology, where we have only to regret the very limited space he has allowed himself. His work is on the whole well fitted for usefulness, and we would hope also for popularity. It will assist in diffusing the knowledge of some grand discoveries, and ingenious speculations, and being a pleasing and elegant volume, well illustrated and of no formidable size, may be recommended to those who desire general information as well as to all lovers of natural science.

W. H.

Taylor's Treatise on Poisons. 2nd Edition. Blanchard & Lea. 1859.

The appearance of a second edition of Dr. Alfred Taylor's valuable work "On Poisons," has long been desired by all engaged in that most delicate and responsible part of the Chemist's avocations, viz. the detection of poisons. The original work was one which occupied a high if not the highest place among treatises on this subject, not only from the completeness of the work itself, but also from the acknowledged talent of the author, who may be said to be the first toxicologist of England, and who has probably had more experience in cases of poisoning than any other person living.

The detection of poisons by chemical means having of late years attracted the attention of some of the most distinguished chemists, it was natural to expect that in the new edition (carefully and accurately reprinted by Messrs. Lea and Blanchard,) every attention would be paid to such improvements as had been made and had stood the test of experience, and that such new processes as had been recommended by competent authorities would be here reproduced, and if open to objection would be discussed in a spirit of impartial enquiry; in short, that the work in scientific accuracy would keep pace with the time. Such, however, does not appear to be the case as regards the only portion of the work which we have as yet had time to examine, and in the following pages we intend to draw attention to a few matters connected with the detection of arsenic, and more especially to the very off-hand manner in which Dr. Taylor dismisses the method of extracting that substance from organic tissues, which originally proposed by Duflos, has received the sanction of such men as Fresenius, Otto, and Wöhler, which is undoubtedly the best at present known both as regards ease and accuracy, and which we have not the slightest doubt Dr. Taylor himself would adopt, could he be induced to submit it to the test of experiment.

The following quotations from Dr. Taylor's work, page 365 *et seq.*, will serve as a basis for some remarks on the subject of the extraction of arsenic from organic tissues:—"MM. Danger and Flandin recommended the complete carbonization of the organic matter by heating it in a quantity of strong sulphuric acid (proved to be free from arsenic) equal to about one-third of the weight. It thus forms a tarry looking mixture, which should be brought to dryness. The vapours evolved during this operation are of the most offensive and persistent description."

"If sulphuric acid can be obtained pure, there is no doubt that this is the best mode of carbonizing organic matter. The carbonaceous mass should not be too strongly heated, or, as pointed out by Blondlot, there will be a loss of arsenic. It will be found better for the conversion of the arsenious into arsenic acid, to use strong nitric instead of nitro-muriatic acid, (as recommended by Orfila,) as this will avoid the volatilization of arsenic as chloride. After heating the mixture to expel all nitric acid, the ash may be drenched with water until all that is soluble is removed. This may be brought to dryness in a porcelain vessel, and again treated with nitric acid several times.

The acid residue dissolved in water should be neutralized by pure carbonate of potash, and again brought to dryness, the arseniate of potash thus produced (if arsenic were present) may be separated from the other salts by a small quantity of water. This solution may be introduced into Marsh's apparatus. When Marsh's process is employed I have found this to be the best plan of proceeding for destroying organic matter and avoiding a loss of arsenic."

"In the event of Reinsch's process being selected at this stage, it will be necessary to reconvert the arsenic into arsenious acid. This is effected by evaporating to dryness with a strong solution of sulphurous acid."

"Fresenius and Babo destroy the organic matter by hydrochloric acid and chlorate of potassa, and advise a series of proceedings of a most minute and elaborate kind. In fact this mode of detecting arsenic may be designated an exhaustive process. It provides for the exclusion of lead, bismuth, mercury, copper, tin, antimony, and other metals; but in thus excluding many bodies which are never likely to be found, it encumbers the investigation with the employment of so many chemicals that a question might fairly arise whether arsenic had not been actually introduced into the organic matter during the operation. I have known only one case in which it has been medico-legally employed in this country, that of Reg. v. Wooler, and there fortunately the proof of death from arsenic was so clearly made out from other facts, that it was unnecessary to make this elaborate mode of testing a subject of cross-examination. The reader who is curious about this process, the complication of which, according to Orfila, surpasses all credibility, will find the details in, &c. &c."

Dr. Taylor then goes on to say, that he has found Reinsch's process, without previous carbonization, well adapted for the separation of absorbed arsenic. The substance is digested with dilute muriatic acid (proved to be free from arsenic), &c. &c.

The reasons for Dr. Taylor's preference seem to be that the first process is more simple, requires fewer chemicals, and thus avoids the risk of extraneous arsenic, destroys organic matter completely, and causes no loss of arsenic, while the second process is incredibly elaborate and complicated, is rendered unsafe by the number of substances employed, and is altogether so ridiculous, that, although recommended by Rose, Wöhler, and especially by Otto, who occupies

in Germany the same position that Dr. Taylor does in England, it is not worthy of even a brief description in our standard work on Toxicology.

In endeavouring to prove that our author is incorrect in all these assumptions, and has been far too hasty in forming a decision without the test of experiment, it appears to be desirable to compare each step of the two processes, the chemicals employed, and the results obtained; but it may be remarked that the objection with regard to the number of chemicals used is of very little value to any one much engaged in these investigations, because he would naturally provide himself with a large stock of materials proved by himself to be pure, and would keep them for such purposes solely.

The process recommended by Dr. Taylor may be designated as I., that to which he objects so strongly as II., and each operation will be placed side by side, so that an idea may be obtained of the comparative complexity of the two processes, together with observations on each; it may be remarked also that the process II. is not exactly that recommended by Fresenius and Babo, but is the improved plan described by Otto, but which is by no means simpler than the original one:—

A I. The mass is heated with sulphuric acid. Very offensive odours are given off, and the operation is a lengthy one. The organic matter is not entirely removed even by long digestion, and there is great danger of a loss of arsenic. If chlorides be present, and they almost always are, the action of sulphuric acid will be to form volatile chloride of arsenic. It must be remembered that the quantity of poison present in the solid tissues is usually very small.

II. The mass is gently heated in a water bath with hydro-chloric acid and chlorate of potassa added. Chlorine is evolved and the operation can be finished in half an hour, or with the liver and kidneys in one hour at most. The organic matter is not entirely destroyed, but no arsenic can be volatilized.

The sulphuric acid used in No. I. must be pure, and the hydrochloric acid in No. II. must be the same. Here we have, however, an extra chemical, chlorate of potassa, the purity of which has to be ascertained, but as this salt never does contain arsenic, and is one of the purest salts in general use, the objection is not of much value.

B I. The carbonaceous mass is evaporated (carefully) to dryness, which operation will certainly occupy some hours.

II. The solution is filtered, and the residue washed out, which requires one hour at most.

C I. The carbonaceous mass is heated with nitric acid, which must of course be free from arsenic, and, as Dr. Taylor recommends, also free from hydrochloric acid.

II. Hydro-sulphuric acid is passed through the solution. No impurities can get into the mixture.

D I. The ash is washed with water, filtered, and washed out.

II. The precipitate is thrown onto a filter, and washed out.

E I. The solution is evaporated to dryness, treated with nitric acid, and evaporated several times (the term *several* may be assumed to mean three or four).

II. The precipitate is treated with ammonia, and the filtrate evaporated to dryness. Here we have an extra chemical, which must be proved to be free from arsenic. There does not seem, however, to be any possibility of its containing that substance; and among the numerous bodies in which that poison has been detected, to the best of the writer's recollection, ammonia has never been mentioned, although this of course does not preclude the necessity of proving its purity.

F I. The acid residue is neutralized with pure carbonate of potassa.

II. The residue is dissolved in nitric acid; long digestion is not necessary, and the operation is finished in a few minutes. Here the salt of potassa on the one hand, and the nitric acid on the other, must be free from arsenic.

G I. The solution is evaporated to dryness.

II. The solution is neutralized with carbonate of soda. The carbonate of soda used in the second process must be free from arsenic and from chlorine, which the ordinary pure salt used by chemists almost always is.

H I. The dry mass is washed with a little water, to extract the arseniate of potash (and filtered?).

II. The solution is evaporated to dryness.

In I. a loss of arsenic may ensue from imperfect washing; it would be better to dissolve the whole.

I I. The solution can now be used in Marsh's test.

II. The residue has still to go through three operations, all of which are of the simplest kind, viz.: fusion in a porcelain crucible, treating with sulphuric acid until all the nitric acid is evolved, and solution in water. These, as the writer can testify, can all be completed in half, or at most, three-quarters of an hour, and the solution is then ready for Marsh's test.

It will be seen, therefore, that this incredibly complicated process consists of almost exactly the same number of operations as the one which Dr. Taylor so much prefers, inasmuch as the excess of three in the one mentioned in the last paragraph is counterbalanced by the repeated evaporations with nitric acid in the other. The time required would probably be about the same in both.

If we next examine into the number of chemicals employed, we find that sulphuric and nitric acids, and alkalic carbonate, are used in both cases, but in the process which is to be rejected on account of the enormous number of chemicals, three more are required, viz. hydrochloric acid, ammonia, and chlorate of potassa; the first is used by Dr. Taylor, in Reinsch's test, and must consequently be pure; the second is recommended by him in the process for the quantitative determination of arsenic (page 368), and must of course be equally pure, and there consequently only remains one extra chemical, chlorate of potassa, which as far as we know never contains arsenic, but be that as it may, the proof of its purity need not form an insurmountable difficulty.

Danger and Flandin allow that the carbonization process may cause a loss of arsenic, and Heinrich Rose, in his Handbook, distinctly states such to be the case. *In the other process none can take place*, as it has been shown by Schacht and others that no arsenic is evolved from its mixture with chlorate of potassa and hydro-chloric acid, unless the temperature be raised above that of boiling water. The arsenical solution finally obtained, is absolutely free from organic matter, which is of great importance, both in Marsh's test, and in the quantitative determination of the sulphide, while in the first process its complete removal depends on the repeated treatings with nitric acid, and this cannot be quite relied on.

Dr. Taylor recommends Reinsch's process as "applicable to the separation of arsenic from organic tissues without previous carbonization, the substance being digested with dilute hydrochloric acid, and then

boiled with copper gauze, this is introduced into a tube and heated, when a ring of arsenious acid is formed." The process is undoubtedly an excellent one where considerable quantities of arsenic are present and in experienced hands, but where the reverse condition occurs, the results are often very unsatisfactory. At page 367, Dr. Taylor allows that from the experience of Dr. Geohegan it appears that much arsenic is lost, and only one half is re-obtained in a crystalline form; this of itself should form an insuperable objection to the sole employment of this method where the amount of poison is small, and more particularly when it is desirable to ascertain its quantity. Moreover, in cases where sulphide of arsenic is present the test is inapplicable, as that compound is insoluble in hydro-chloric acid. It is also well known that various substances interfere with and prevent the reaction, although it is true they are not likely to be present in the case under consideration.

Dr. Taylor very correctly remarks that "the value of chemical evidence does not depend on the discovery of any particular quantity of poison in the stomach," and also, that "there is a strong prejudice among lawyers that the chemical evidence is defective, unless the quantity found is sufficient to cause death." The objections often raised in courts of law are unquestionably absurd, but they are raised, and if the chemist can meet them by determining with absolute certainty the quantity of poison existing in the viscera, it is his duty to do so, and as the votary of an exact science and in the discharge of a most responsible office, he will adopt that process which will enable him to report on this point with perfect accuracy, from the results of his own experiments, from absolute weighings, rather than one in which at the end he is obliged to make a mere estimate or to rely to a great extent on the assertions of others.

In regard to the quantitative determination, the second process leaves nothing to be desired, a measured portion of the final solution being treated with sulphurous acid, and the arsenic precipitated as sulphide, collected and weighed, or dissolved in ammonia, and the solution evaporated, &c. (The arsenic acid might also be determined as the ammonio-magnesian salt.) The same process is recommended by Dr. Taylor, but without previous destruction of organic matter, and hence the sulphide will scarcely ever be pure. "When we are dealing with the tissues the quantity of arsenic is generally too small for the application of this method, the liver containing only a few grains";

to this we must decidedly demur, as there is no difficulty whatever in determining the amount in a few ounces. The only real objection would be the question whether the arsenic is equally diffused throughout the whole mass of the organ, but this is believed to be the case. (See Orfila and Flandin.) "In order to determine the proportion of absorbed arsenic in an organ, (*e. g.* the liver) which under any circumstances can be done only approximately, we take a weighed quantity (four ounces), slice it and treat it by Reinsch's process, separate the whole of the arsenic by copper gauze, (may not some be lost during the boiling?) and determine or estimate the weight of the sublimates obtained, doubling this weight to allow for unavoidable loss, &c. I believe the quantity thus determined is always below the amount actually present. Some prefer to determine the quantity by passing the arsenuretted hydrogen generated in Marsh's apparatus through a weak solution of nitrate of silver, &c., &c., or of chloride of gold, &c., &c. In pursuing these methods, there may be a loss of arsenic in carbonizing and heating to dryness the organic matter with sulphuric acid, a portion of the arsenic is liable to be separated and deposited in the apparatus used; and it is not improbable that a portion combines with the reduced silver and gold."

It is to be hoped Dr. Taylor does not regard these as the latest improvements furnished by chemistry to medico-legal investigations, for anything more loose and unsatisfactory it would be difficult to conceive.

In conclusion, the writer in venturing to differ as to the value of a process from so eminent an authority as Dr. Taylor, is aware that the weight of greater experience is against him; but on the other hand the same opinion is entertained by several of the most distinguished German toxicologists with whom the process originated, and an experience of nearly all the poison cases which have occurred in Upper Canada during the last sixteen years, and a careful practical examination of all the methods hitherto proposed, may give some weight to the conviction that the process originated by Duflos, and improved by Wöhler, Fresenius and Otto is the best, the most reliable and the easiest of execution of all those proposed for the detection and determination of arsenic. Like all other untried operations it seems at first sight very complicated, the first trial may appear difficult, but every successive one will be easier, and the writer can

testify that, with proper diligence one person may effect the complete analysis of two or three substances in a couple of days. Even if the process were more difficult and more tedious, the heavy responsibility attaching to the experiment should lead us to adopt a process which will enable us to *give our evidence with absolute confidence.*

Since writing the above a trial has taken place in England of a Mr. Smethurst, on charge of administering arsenic, from the evidence on which, the objectionable character of Reinsch's test becomes very evident, and it is highly probable that had the examination, according to this process, been made by a less experienced and accurate investigator than Dr. Taylor, the arsenic would have escaped detection.

A certain solution was examined by Dr. Taylor by all the tests for arsenic which he thought proper, and none was found. Reinsch's test failed completely, for the gauze was destroyed. Eventually, however, in conjunction with Dr. Odling, the liquid was proved to contain arsenic and chlorate of potassa, and in the trial great stress seems to have been laid upon the action of this salt in "depositing the poison more fully and fatally on the coats of the stomach, and of preventing its detection in the viscera!"—(*Morning Star*, May 21st.)

Drs. Taylor and Odling, on failing to obtain reliable indications on the first application of Reinch's test, proceeded to remove the chlorine by repeated additions of copper gauze, the first experiments all failed, and yet Dr. Odling, in his evidence, states that "Reinsch's is the most certain of all tests."

It is impossible to imagine why the tests applied by Dr. Taylor did not succeed, for on making some experiments with a solution of one quarter of a grain of arsenious acid in four ounces of a saturated solution of chlorate of potassa, no difficulty whatever was experienced in detecting it by the sulphate of copper, the nitrate of silver, and the hydro-sulphuric acid tests. Even the test with sulphate of copper and potassa succeeded partially; when more arsenic was added it answered perfectly. Reinsch's test, however, as found by Dr. Taylor, did not succeed, but if the other tests failed in his hands, it must have been from some other cause than the presence of chlorate, for the solution on which the above experiments were made, was sixteen times more dilute than that used by him. It is quite evident, however, that where chlorate of potassa is present, Reinsch's process is of no value, but it in no way hinders the separation of the arsenic by hydro-sulphuric

acid, and if the sulphide be converted into oxide, by means of potassa and oxide of bismuth, there would then be no difficulty in applying the copper test. Its presence in organic matter containing arsenic would of course prevent the application of Reinsch's process, but would in no way interfere with the other.

H. C.

The Ballads of Scotland. Edited by William Edmonstoune Aytoun, D.C.L. Edinburgh: Wm. Blackwood & Sons. 1858.

The author of the "Lays of the Scottish Cavaliers," has here devoted himself to a task alike honorable and ambitious; for it is none other than to arrest the fleeting echos of tradition, and sift out from the labours of previous collectors and editors a standard and enduring text of the ballad literature of his native land. And no national minstrelsy is more worthy of such devotion. The songs of the Cid, and the metrical romances of Spain's Moorish era, have long been set forth in a recognized and standard text. Germany has her "Volkslieder der Deutschen;" Denmark her "Danske Viser;" Sweden her "Svenska Fornsänger." Nor is Scotland without her Song and Ballad Literature: from the "Miscellany" and "Evergreen" of Allan Ramsay, to the "Minstrelsy" of Scott, the "Ballads" and "Songs" of Chambers, and all the varied contributions of Ritson, Herd, Jamieson, Laing, Motherwell, and a host of minor workers in the same popular field of research. Not only is this the case, but so popular have been those ballads in earlier times, that—as we have English and Scottish versions of Border songs and ballads adapted to the prejudices and sympathies of rival nationalities, as where, in "The Flowers of the Forest,"

"The English by guile for ance wan the day,"—

so also we have traditional variations of the more popular ballads, adapted to special sympathies, localities, and personal characters, in the North, the Lothians, Ayrshire, and the Border dales. To say that one version is truer or more correct than another is now impossible. Each indeed has a local truth of its own; and it is only when, in the patch-work process of editorial collation, a jumble is made of all the diverse local variations of a favourite ballad,—and that, too,

rarely without the greater wrong of editorial liberties with such versions, in the inevitable cobbling which such a process involves,—that those ancient local adaptations in reality corrupt the text.

From his earliest years familiar with the traditionary poetry of his native country, and admitting its vigorous snatches to a stronger hold alike on his memory and his feelings than the epigramatic couplets of the poets of Queen Anne, or the most favourite lines of Horace: the author of the "Lays of the Scottish Cavaliers," and of some among the most piquant of our modern comic ballads, possesses many special qualifications for the task he has undertaken. Still further, he says, "I may add, that the idea of collecting and restoring, in so far as that was possible, the scattered fragments of the Scottish ballad poetry, in a complete form, has long been present in my mind, and has at various times, when leisure permitted, occupied much of my attention." With the natural indignation alike of a true poet and an enthusiastic literary antiquary, Professor Aytoun gives expression, in his introduction, to the disgust with which he has observed that much of the genuine floating minstrelsy of elder centuries, which had been gathered in various localities by diligent and faithful hands, but with little or no method or arrangement, "was being quietly pilfered for the purposes of transmogrification, and that various old favourites had been furbished, dressed up, and exhibited to the public, with applause, as novelties; and knowing well the value of much that remained," he adds, "I was not without apprehension that in the course of time the whole stock would be absorbed, to reappear in modern glitter and resonance, just as if a hidden treasure of unicorns, bonnet pieces, and Jacobuses, were to be discovered by a sly appropriator, and by him to be recast as medals bearing his own name and legend."

Those ancient ballads have gone through a curious process from first to last. *Published* originally in venerable Homeric style by recitation of the author himself, they have been subjected to such unintentional variations as are the inevitable consequence of oral tradition, and to this—more than to purposed change,—may be ascribed much even of that local variation, which makes the Aberdeenshire, the Ayrshire, and the Border versions of the same ballad so diverse. Again, the most popular ballads transmitted orally from generation to generation, partook inevitably of the changing fashions of the age, until we find the old song of the Percy and the Douglas,

in Sir Philip Sydney's words: "So evil apparelled in the dust and cobweb of an uncivil age."

The Percy out of Northumberland
And a vow to God made he,
That he would hunt in the mountains
Of Cheviot within days three,
In the mauger of doughty Douglas,
And all that ever with him be.

So sang the old English Minstrel of the fifteenth century, with graphic force and rough vigour, stirring the hearts of all as with the sound of a trumpet. Towards the end of the seventeenth and in the eighteenth century, readers congratulated themselves on possessing, in lieu of this, the refined and genteel paraphrase which delivered itself in such long-winded sing-song dogrel as follows; even Bishop Percy thinking it in many respects an improvement on the rugged simplicity of the elder minstrel:—

God prosper long our noble King
Our lives and safeties all;
A woefull hunting once there did
In Chevy-chace befall;

To drive the deer with hound and horn,
Earl Percy took his way;
The child may rue that is unborn
The hunting of that day.

The stout Earl of Northumberland
A vow to God did make,
His pleasure in the Scottish woods
Three summer days to take;

The chiefest harts in Chevy-chace
To kill and bear away;
These tidings to Earl Douglas came
In Scotland where he lay;

Who sent Earl Percy present word
He would prevent his sport;
&c. &c. &c.

This is an unquestionable ballad of England, alike in its ancient and modern forms; and takes its tone from the auditors it was designed for. But Scotland has her historical ballad of "The battle of

Otterburn" to set against it, opening with as rough and picturesque a vigor as old "Chevy Chace:"—

It fell about the Lammas tide,
When Muirmen win their hay,
That the doughty Earl o' Douglas rade
Into England to fetch a prey.

And he has ta'en the Lindsays light,
With them the Gordons gay;
But the Jardines wouldna with him ride,
And they rue it to this day.

The diverse Scottish and English variations of the same ballad are exceedingly curious, and frequently of great interest and value to the historian; but besides these, originating in the same national pride and rivalry which finds its modern expression in bulletins and professed histories,—like the French and English versions of Waterloo,—we have another set of ballad variations originating in an ancient literary piracy, somewhat akin to that black-mail levied by the modern American publisher on the English poet. After describing this species of "poetical foray," as practised between the minstrels of one district and another, Professor Aytoun thus proceeds in his discriminating introductory remarks:—

"Still more was larceny practised when the story was of foreign framing,—in other words, when it belonged to England. To make spoil of an English ditty was accounted perfectly fair; but the mere act of conveyance and appropriation did not suffice. It was necessary to recast the ballad in the Scottish dialect, and to give it a new locality, and sometimes names, so as to render it more agreable to a northern audience; and while engaged in the work of reconstruction the minstrel, as a matter of course, would give full scope to his ingenuity, and would use every means in his power to render the disguise effectual. Nor was this a one-sided practise only; for the English minstrels were in the habit of helping themselves freely from the stores of Scottish poesy. I have no doubt that several of the ballads included in the following series were originally English—in particular I would specify 'Lord Buchan,' 'Earl Richard,' and 'The Border Widow's Lament.' As a set-off to these, I think we may fairly consider the following ballads, which are current in England, 'The Three Knights,' 'The Outlandish Knight,' and 'The West

Country Wager,' as altered versions of 'Fine Flowers i' the Valley,' 'May Colleau,' and 'The Broomfield Hill.' I am also inclined to give England credit for 'Hugh of Lincoln,' claiming for Scotland in return, an original right of property in 'The Heir of Linne.' It is possible that, if thorough restitution were to be made, the exchange would be on a much larger scale; but the above instances are sufficient to show that, independent of the pure Border ballads, a good deal of popular poetry has passed from England into Scotland, and *vice versâ*, and in the process of time has become acclimated in the soil of transference."

And as our Editor thus boldly discriminates between ballads of English and Scottish origin; so also he freely excises and cancels, with the view of producing a standard text of Scottish Ballad poetry, divested of the patch-work borrowed from other ballads of early date, and free from those modern interpolations, which, like the "new piece on an old garment," only make the rent worse. But after all the deteriorating influences of oral tradition, the vulgarising changes of a sorry reciter adapting himself to a rude auditory, and of the artificial tastes of later transcribers in displacing the racy homeliness of the older minstrelsy for polished phrases suited to ears polite; it is with great justice that Professor Aytoun remarks: "The marvel is, that we can still show so many fine ballads upon such a variety of subjects, considering the many changes which have taken place in Scotland since the period of their production."

This indeed is singularly interesting on many accounts. Since the oldest of these ballads were written Scotland has become one with her "auld enemy of England;" has changed from Catholic to Protestant, from a transitional episcopacy, with its tulcan Bishops and Abbots, to a rigid and severely minute discipline of Presbyteries and Synods; back again to an enforced Episcopacy, with Stuart dragonnades, and a death-defying fidelity to the Covenants and League, which finally secured the restoration of Presbytery, as a fruit of the Revolution settlement. But in spite of all these changes, popular tradition has been faithful to its poetic trust; while the genius which begat such historic lays, has survived to produce under strangely altered circumstances the like memorials of Union jealousies, Jacobite revolutions, and the changing manners of the eighteenth century. Commenting on some of the most marked characteristics of Scottish ballad-poetry, Professor Aytoun remarks: "A large portion of these ballads was undoubt-

edly composed previous to the Reformation; and in many of them we find traces of the prevailing mode of worship. Thus there are frequent references to the mass, to the virtue of holy water, and to the power of bells; but, on the whole, the allusions to religious ceremonies are less numerous than we might expect." In regard to this it is curious to note how ineradicable has been the impression produced on the national mind by the institutions of the ancient faith, in spite of the vigorous crusade of ecclesiastical discipline and public opinion conjoined, for upwards of three centuries. Pasch, Yule, Halloween, Beltane, Rude-day, Whit-Sunday, Candlemas, and various other rustic anniversaries, all survive as relics of the ancient faith, and are mostly commemorated still, by an unpremeditated but universal popular consent, according to the old style. Such a faithful popular tradition, in spite alike of modern creeds and almanacs, gives additional confirmation to the authenticity of those ancient ballad poems, transmitted with like fidelity through so many generations. It is quite in accordance with this tenacity of ecclesiastical traditions, that the oral poetry of the Scottish people should likewise "disclose a vast extent of popular superstition. In 'Tamlane' and 'True Thomas,' we have the apparition of the Queen of Elfin, that mysterious feudatory of Hell, whose temptations and delusions were made matter of evidence before the Presbyteries, long after the downfall of the Church of Rome,—who was supposed to have carried away from the field of Flodden our own valiant King James, not slain, but wounded, as Arthur had been conveyed by fairy hands to the vale of Avalon. Then there are the apparitions of the dead, whose repose in the grave has been disturbed, either because they have still to expiate some deadly sin, or because they have to recover their troth, or because they are disquieted by the voice of heavy mourning. Most beautiful, indeed, and pathetic is the manner in which these visitations are narrated. The 'Wife of Usher's Well,' in her agony for the loss of her sons, rebels against the chastisement of God, and lo—

It fell about the Martinmas,
When nights are lang and mirk,
The Carline wife's three sons cam' hame,
And their hats were o' the birk.

It neither grew in syke nor ditch,
Nor yet in ony sheugh;
But at the gates o' Paradise,
That birk grew fair eneugh."

And so they remain, these three drowned men, till the dawn approaches, with their mother tending on them in her short-lived joy, as seemingly her living sons returned. She wraps her mantle about them, and sitting down at their bedside, at length yields to sleep, ere the red cock crows, which warns them to be gone. A slight emendation on the text, as adopted by Professor Aytoun from the version given in "The Border Minstrelsy," seems here almost indispensable; as it is obvious from the second last stanza that—in the homely simplicity of this touching ballad,—before they depart, the dead sons hang up the mantle with which their mother has happed them:

And she has made to them a bed,
She's made it large and wide;
And she's *happ'd* her mantle *them* about,
Sat down at the bed-side.

Up then crew the red cock,
And up and crew the gray;
The eldest to the youngest said:
"Tis time we were away.

"The cock doth craw, the day doth daw,
The channerin' worm doth chide;
Gin we be miss'd out o' our place,
A sair pain we maun bide."

"Lie still, lie still but a little wee while,
Lie still but if we may;
Gin my mother should miss us when she wakes,
She'll go mad ere it be day."

O its they've ta'en up their mother's mantle,
And they've hung it on a pin:
"O lang may ye hing, my mother's mantle,
Eere ye hap us again!"

In the curious mixture of the birch gathered at the gates of Paradise, the pennance dreaded in case of their absence being discovered, and the grave's "channerin' worm;" there are striking illustrations of the undefined admixture of ancient superstition with the difficulty, which the popular mind still experiences, of conceiving any clear realization of a disembodied spirit, or of death distinct from "the wormy grave." The same homely pathos and tenderness mark the second part of "Clerk Saunders," a noble lover who is slain in the arms of May Margaret the King's daughter, and returns "a twelvemonth and a day"

thereafter, to claim his faith and troth, without which he cannot rest in his grave. She insists on her lover kissing her, though he warns her, that his mouth is cold and smells of the grave, and then in the same simple style of homely pathos as in the one already noted, the ballad proceeds thus, chiefly in dialogue :—

"Thy faith and troth thou sall na get,
And our true love shall never twin,
Until ye tell what comes of women,
I wot, wha die in strong travailing?"

"Their beds are made in the heavens high,
Down at the foot of our good Lord's knee,
Weel set about wi' gillyflowers;
I wot sweet company for to see.

"O cocks are crowing a merry midnight,
I wot the wild-fowl are boding day;
The psalms of heaven will soon be sung,
And I, ere now, will be missed away."

May Margaret then, by a curious process, returns her lover's troth, and he leaves her with the tender assurance, that :—

Gin ever the dead come for the quick,
Be sure, Margaret, I'll come for thee."

But she follows the departing spirit, without waiting to cover her naked feet; and still we find the same simple and child-like confusion of ideas which makes the grave not only the portal to the spirit-land, but the sole spirit-world:

"Is there ony room at your head, Saunders?
Is there ony room at your feet?
Or ony room at your side Saunders,
Where fain, fain, I wad sleep?"

"There's nae room at my head, Margaret,
There's nae room at my feet;
My bed it is full lowly now:
Among the hungry worms I sleep.

"Cauld mould is my covering now,
But and my winding sheet;
The dew it falls nae sooner down,
Than my resting-place is weet.

"But plait a wand o' the bonnie birk,
And lay it on my breast;
And gae ye hame, May Margaret,
And wish my saul gude rest."

Of a different and more elevated character, yet marked by the same genuine simplicity, is the allegorical ballad of "The bluidy Sark," written by Robert Henryson, in the fifteenth century. The plot of this ancient ballad is in the style of medieval romance, and represents the rescue of a royal maiden from the dungeon of a foul giant; but the prince who rescues her perishes in the encounter, and she ever after preserves his "bluidy sark" as the memorial of her faithful knight. The ballad thus concludes:—

So well the ladye loved the knight,
That no man would she take;
So should we do our God of might,
That did all for us make:
Who fullyly to death was dight,
For sinful manis sake;
So should we do, both day and night,
With prayers to Him make.

There then follows a "Moralitas" or interpretation of the allegory, of which one stanza will suffice:—

The soul is Godis daughter dear,
And eke His handywark,
That was betrayed by Lucifer,
Who sits in hell full mirk;
Borrow'd by Christ his angel clear,
Hain'd men! will ye not heark?
For his love that bought us dear,
Think on the Bluidy Sark!

The curious old ditty "Allan-a-maut," presents us with a more popular phaze of allegory; while "Jamie Telfer o' the fair Dodhead," "Kinmont Willie," "Dick o' the Cow," and other rough spirited ballads of the old Border riders illustrate another aspect of the minstrel muse, and are full of life and vigour. A tragic tenderness mingles with the bold epic narrative of "Johnie Armstrong," the Border freebooter, hanged by James V. in 1528, under circumstances little consonant to the ideas of right and wrong among the Scottish borderers of the sixteenth century. Johnie Armstrong in vain sought to win the royal favour by offers of duty and service, such as abun-

dantly consorted with the feudal relations which had constituted the social bond throughout Europe for some five centuries, but were then beginning to give place to the germs of modern rule and subjection. When all hope of mercy was passed, tradition represents the Borderer to have said proudly to the King, nearly in the words of the ballad:—

"To seek hot water beneath cauld ice,
I trow it is a great follie;
I have asked grace at a graceless face,
But there is nane for my men and me:

"But had I kenn'd, or I cam fra hame,
How thou unkind wad'st been to me,
I would have kept the Border side,
In spite of all thy peers and thee.

Thus varied are the themes and modes of treatment of the ballads of Scotland, some of which have been the delight of fully fifteen generations, and still retain an undiminished hold on the national sympathies.

Whether ballad-editors will ever be agreed as to a precise version of our old favourites may admit of question; but it is certain that in this collection we have a carefully collected series of nearly all that are worth preserving, brought together, after the most cautious and discriminating revision of each, by an editor who combines the jealous acumen of the critic, the taste of the national poet, and the loving veneration of the antiquary. No better qualifications could be brought to the task, and the results fully accredit their diligent application.

To show how great a latitude the compass of editorial discretion can command, we shall refer to some of the changes that popular ballads have undergone in the new editor's hands. In Professor Aytoun's version of "Clerk Saunders," for example, we have eight stanzas omitted, which appear in Sir Walter's edition of it, while in lieu of these eleven others are introduced, derived from versions of Kinloch and Buchan; and the whole is, for the first time, divided into two parts. So again, in "The Wife of Usher's Well," considerable changes and additions occur, derived and modified from stanzas recovered by Mr. Robert Chambers; while it is divorced from an alliance which the latter had sanctioned between it and "The Clerks of Owsenford," and this again is relieved of sundry stanzas which its new

editor restores to "Gil Morrice." It manifestly requires a bold, yet discriminating hand thus to deal with the favourite versions of a national literature, only secondary in the strong hold which it retains on the affections of the people, to the songs which have been wedded to national airs. But while editorial critics will not be wanting hereafter with their conjectural emendations, new casts, and revised reconstructions; and infallibility is beyond the reach of the shrewdest diligence: it will be difficult to surpass the present editor in judicious critical acumen, or the no less indispensable elements of genuine poetic taste and reverential conservatism of the minutest fragment of the true antique.

His restoration of "Gil Morrice" is a good example of his mode of dealing with a hopelessly "ravelled skene." First, the "ingenious interpolations" of the contributors to Bishop Percy's "Reliques,"—which so roused the ire of old Ritson,—are expunged by wholesale; and no one can regret the erasure of such spurious antiques as the following:

> "His hair was like the threeds of gold
> Drawne frae Minerva's loome;
> His lipps like roses drapping dew,
> His breath was a' perfume!"

But besides such manifest interpolations, Mr. Jamieson's version had undergone a readaption to popular taste, by suiting it to the style of an age, prior to 1755; and this consisted not in verbal alterations, but in a recasting of the whole. It had been pieced with stanzas from other ballads, and eked out with counterfeits in the worst style of the eighteenth-century. The process of its restoration is thus described by its present editor: "I have taken as a foundation the popular version recovered by Mr. Motherwell, from which many of the artificialities have disappeared. I have weeded from it every stanza which I consider to have been fabricated in the copy of 1755, replacing them, when that was possible, by stanzas from the imperfect old version printed by Mr. Jamieson; and I have cancelled the larcenous verses transferred from 'Lady Maisry.' The ballad, thus divested from its gauds, is at all events simple and unexaggerated."

To weed our ballad literature of all that is spurious, however, needs a singularly cautious and discriminating acumen, when we bear in remembrance the history, for example, of Cromek's adventures in search of Nithsdale and Galloway song. The author of the newer

"Reliques" bent on signalizing himself in the same field of literary adventure in which Percy, Scott, Ritson and others had already achieved so much, visited Dumfries in 1809, found out a young Scottish stonemason, then earning some eighteen shillings a week by his handicraft, but deeply versed in all the traditional and published poetry of his country, and as patriotically enthusiastic on the theme as ever the Ayrshire ploughman himself had been. The stonemason—long after familiar to all men as Allan Cuningham,—was himself a poet, and ventured modestly to show to the London critic some of the productions of his muse; but they were put aside with such a patronising condecension as sufficed to divert the disappointed poet's ingenuity into another vein. Cromek, returning to London, maintained a frequent correspondence with this Dumfrieshire peasant, and received from time to time the most wonderful fragments of ballads and songs, all welcomed by the delighted critic as precious relics of antiquity snatched from oblivion by his own sagacious skill, but every one of them the product of his despised protegee. the unknown Dumfrieshire mason! The credulous editor at length issued the collection, in 1810, under the title of "Remains of Nithsdale and Galloway Song;" and, as the son of the poet has since said: "No one suspected a cheat; Cromek's reputation, through the Reliques and the select Scottish songs, seemed sufficient security against that; and, as for the mason mentioned in the Introduction, no one could suspect for a moment that he could have written anything one-half so good." But the sport and the knavery did not end here. Jacobite songs played a prominent part in those wonderful fragments recovered from the recesses of Nithsdale and Galloway. The Ettrick Shepherd by and by published his *Jacobite Relics*, and took advantage of the treasures of Cromek's collection to enrich his own. Here and there he betrayed his suspicions of Allan's own genius discernible in the modern antiques; but neither Hogg's sagacity nor his honesty was proof against the clever deception, and, accordingly, we find him not only accepting some of them as genuine antiques, but even recovering new readings from "an older collection," or from other sources equally genuine with the originals! Allan Ramsay had taken like liberties at an earlier date, though with a less skilful hand, and in a far more artificial age; but the ablest critic must sometimes be at fault in sifting the grain of the true poet of modern times from that of his elder brother.

Some curious and exceedingly interesting notices regarding the

Scottish Minstrels, especially of the reign of James IV., are given in the Introduction, from the researches of Mr. Joseph Robertson in the books of the Lord High Treasurer of Scotland, including references to "Blind Harry," and many others now forgotten. "I doubt," adds the editor, "whether the Court of good King René of Provence was more minstrel-haunted than that of James IV. of Scotland." But we must find room for one or two of our old familiar favourites of which we never tire; and here is the authenticated antique version of one of the most touching of Scottish ballads, and one which has been repeatedly imitated, but never so successfully as to equal the touching and simply natural pathos of the original. The story is still preserved among the local traditions of Dumfrieshire, where the graves of Helen and her lover are pointed out. During one of their interviews on the banks of the river Kirtle, a rejected suitor, whose addresses were favoured by the lady's friends, suddenly appeared on the opposite bank of the stream, and, in his jealous rage, levelled his carabine at the breast of his rival. Helen, throwing herself before her lover, received the bullet in her bosom and died in his arms. A desperate combat immediately ensued, which only terminated by the fall of the murderer, who was cut to pieces by his maddened foe. The lover's moan was thus pathetically rendered by some true but nameless old minstrel, and tradition has been faithful to the trust:—

HELEN OF KIRKCONNELL.

I wish I were where Helen lies!
Night and day on me she cries;
O that I were where Helen lies,
On fair Kirkconnell lee!

Curst be the heart that thought the thought,
And curst the hand that fired the shot,
When in my arms burd Helen dropt,
And died to succour me!

O think ye na my heart was sair,
When my love dropt down and spake nae mair!
There did she swoon wi' meikle care,
On fair Kirkconnell lee.

As I went down the water side,
None but my foe to be my guide,
None but my foe to be my guide,
On fair Kirkconnell lee—

I lighted down, my sword did draw,
I hacked him in pieces sma',
I hacked him in pieces sma',
For her sake that died for me.

O Helen fair, beyond compare!
I'll weave a garland of thy hair,
Shall bind my heart for ever mair,
Until the day I dee!

O that I were where Helen lies!
Night and day on me she cries;
Out of my bed she bids me rise,
Says "Haste and come to me?"

O Helen fair! O Helen chaste!
Were I with thee I would be blest,
Where thou lies low and takes thy rest,
On fair Kirkconnell lee.

I wish my grave were growing green;
A winding-sheet drawn o'er my e'en,
And I in Helen's arms lying
On fair Kirkconnell lee.

I wish I were where Helen lies!
Night and day on me she cries,
And I am weary of the skies,
For her sake that died for me!

It may seem almost superfluous to quote this old familar piece; but his ear must be strangely jarred to whom its recurrence is unwelcome. So too is it with the fine old ballad of "Sir Patrick Spens" here given, with a slight but judicious conjectural emendation, and assigned, in theme at least, to the year 1281;—with the curious old fairy ballad of "Tamlane," another relic of undoubted antiquity, referred to in the "Complaynt of Scotland," printed in 1549;—and with the singularly tender "Lament of Lady Ann Bothwell," the daughter of Adam, Bishop of Orkney, who performed the marriage ceremony between Queen Mary and the Earl of Bothwell. Instead of these, however, we prefer selecting an exceedingly simple and less familiar ballad, which has, nevertheless, gone through sundry versions, and has furnished to its present editor an opportunity for some of his most judicious amendments and selected reconstruction:—

THE WOOD O' WARSLIN'.

"O will ye gae to the schule, brother,
Or will ye gae to the ba'?
Or will ye gae to the wood a-warslin',
And there we'll try a fa'?"

"It's I winna gae to the schule, brother,
Nor will I gae to the ba',
But I will gae to the wood a-warslin',
And its t' .e that ye maun fa'."

They warsled up, they warsled down,
Till John fell to the ground,
And there was a knife in Willie's pouch,
Gied him a deidly wound.

"O lift me, brother, on your back,
Tak' me to yon burn clear,
And wash the bluid frae aff my wound,
And it will bleed nae mair!"

* * * * * *

He's taken aff his holland sark,
And riv'd it gair by gair;
He's stapt it in the bluidy wound,
But aye it bled mair and mair.

"O brother dear, ye'll lift me up,
Take me to Kirkland fair,
And dig a grave baith wide and deep,
And lay my body there!"

"But what shall I say to my father dear,
When he speirs for his son?"
"Say that ye left him at Kirkland fair,
Learning in schule alone."

"But what shall I say to our ae sister
When its—'Willie, O where is John?'"
"Ye'll say ye left him in Kirkland fair,
The green grass growing aboon."

"And O what shall I say to our mother dear,
Gin she cry,—'Why tarries my John?'"
"O tell her I lie in Kirkland fair,
And hame will I never come!"

Professor Aytoun has restored the simple pathos and tender interest of this little ballad by ejecting an intruded stanza which made the

wound deliberate instead of accidental; and he has further improved on one of its current versions by getting rid of certain foreign ingredients mingled with its genuine stanzas, probably at a very early date; and derived from the ballad of "Edward" one of the most powerful and sternly tragic of all the ancient traditional poems of Scottish folk-lore. It thus opens:—

"Why does your brand sae drap wi blude,
Edward, Edward?
Why does your brand sae drap wi blude,
And why sae sad gang ye, O?"

To these inquiries of his mother, her son renders various evasive replies until at length he admits that it is the blood of his own father dear that drops from his sword; and, replying to her further interrogatories desparingly, that he means to fly far over the sea, and leave his hall and towers to crumble into ruin,—it thus concludes:—

And what will ye leave to your bairns and your wife,
Edward, Edward?
And what will ye leave to your bairns and your wife
When ye gang over the sea, O?
Mither, mither,
The warld's room: let them beg through life;
For them never mair will I see, O.

And what will ye leave to your ain mither dear,
Edward, Edward?
And what will ye leave to your ain mither dear?
My dear son now tell me, O?
The curse of hell frae me shall ye bear,
Mither, mither:
The curse of hell frae me shall ye bear,
Sic counsels ye gave to me, O!

That the task of the Scottish ballad collector is scarcely yet completed, is proved by the fact that the editor of these "Ballads of Scotland" has still, like his predecessors, ancient novelties to produce, as in his traditionary version of "The Battle of Harlaw;" a spirited historical ballad, replete with local names and allusions, and which is still popular in Aberdeenshire, where it was taken down, from recitation, some years ago. It is pleasant to believe that the field is not yet so thoroughly gleaned as to preclude all hope of still recovering more of such golden grain as this new-found version of

"The brim Battil of the Harlaw," even though it should prolong the period during which the forger of antiques may ply his ingenious frauds. Amid all the richness of Scottish traditionary song, extending from the thirteenth to the eighteenth century, it has frequently surprised us that so little survives of the genuine minstrelsy begot by the tragic incidents of Flodden's fatal field. It is not, indeed, the custom of any nation to celebrate its defeats in song; but we have good evidence that the tragic romance, which gathers around the close of the remarkable reign of James IV., was not all reserved for the the appreciation of "the last Minstrel." Professor Aytoun gives us Johnson's spirited version of the surviving fragment of "The Souters of Selkirk," believed to embody the popular anathema on Lord Hume's pusillanimity, or treachery, to which the Scottish defeat was ascribed on the Northern Border:

Up wi' the souters o' Selkirk,
And down wi' the fazart Lord Hume!
But up wi' ilka braw callant
That sews the single-soled shoon;
And up wi' the lads o' the Forest,
That ne'er to the Southron wad yield;
But deil scoup o' Hume and his menzie,
That stude sae abiegh on the field!

Then we have "The Flowers of the Forest," with its ancient tune and fragmentary lines, and the simple, affecting image surviving in its stray couplet:

"I ride single on my saddle,
For the flowers of the forest are a' wede away."

Sir Walter Scott tells us, in the notes appended to it in his "Minstrelsy:"—"The following well-known and beautiful stanzas were composed many years ago, by a lady of family in Roxburghshire. The manner of the ancient Minstrels is so happily imitated, that it required the most positive evidence to convince the Editor that the song was of modern date." The lady was Miss Jane Elliot, the daughter of Sir Gilbert Elliot, of Minto, who died in 1766, Lord Justice-Clerk of Scotland. But did Miss Jane Elliot really write this beautiful song, so admirably re-producing the spirit and feeling of the old Minstrels, and so little in unison with the verse of the eighteenth century, about the middle of which she is affirmed to have produced it? We confess we have long had our doubts. Mr.

Robert Chambers tell us in his "Notes," on the authority of one who was admitted, in youth, to the privileges of Miss Jane's conversation, "that she was a remarkably agreeable old maiden lady, with a prodigious fund of Scottish anecdote, but did not appear to have ever been handsome." We have talked of her with the late Charles Kirkpatrick Sharpe, who had known her in his earlier days; and on our expressing to him our belief in the antiquity of the song, he remarked, in his dry, sarcastic way: "I don't believe Miss Jane would tell a lie, and she said she wrote it; but if so, it was all she wrote, and she never seemed capable of anything half so good!" Neither of these recollections of the reputed poetess can be regarded as worth very much in their bearing on the actual question of authorship. But it does not appear to be known to such later editors of Scottish Songs and Ballads as we have access to, that this song—for which Sir Walter Scott confesses himself indebted to Dr. Somerville,—was in print nearly thirty years before. It is to be found in the appendix to a volume entitled "An exact and circumstantial History of the Battle of Floddon, in verse, written about the time of Queen Elizabeth: published from a curious M.S. in the possession of John Askew, of Palins-burn, in Northumberland, Esq. With Notes, by Robert Lambe, Vicar of Norham-upon-Tweed." This curious volume, printed and sold by R. Taylor, Berwick-upon-Tweed, 1774, includes pieces relating to Floddon, from Fulwell, Skelton, and other early poets; and among these, "The Flowers of the Forest," under the title of "An Old Scotch Song on the Battle of Floddon, fought A. 1513." As it differs in various points from the current version, and seems to have escaped the notice of modern editors, we give it here entire. The editor adds in his notes: "The tune to this song, called *The Flowers of the Forrest*, is a pretty, melancholy one:"

I have heard of a lilting, at our ewes milking,
Lasses a lilting, before the break of day;
But now there's a moaning, on ilka green loaning,
That our braw forresters are a' wede.

At boughts, in the morning, nae blyth lads are scorning;
The lasses are lonely, dowie, and wae;
Nae daffin, nae gabbin, but sighing, and sabbing;
Ilka ane lifts hae legien, and hies her away.

At e'en at the gloming, nae swankies are roaming,
Mong stacks, with the lasses, at bogle to play;
But ilka ane sits dreary, lamenting her deary,
The Flowers of the Forest that are a' wede away.

At harrest, at the shearing, nae youngsters are jeering,
The bansters are runkled, lyart, and grey,
At a fair, or a preaching, nae wooing, nae fleeching,
Since our braw forresters are a' wede away.

O dool for the order, sent our lads to the border:
The English for anes by guile gat the day.
The Flowers of the Forest, that ay shone the foremost,
The prime of our land, lies cauld in the clay.

We'll hear nae mair lilting, at our ewes milking,
The women and bairns are dowie, and wae.
Sighing and moaning, on ilka green loaning,
Since our braw forresters are a' wede away.

The same volume from whence this copy of "The Flowers of the Forest" is derived, has a version of "Sir James the Rose," or "The Buchanshire Tragedy" as it is called, differing both from the one given in Professor Aytoun's volumes, and from others referred to in his note. It is stated to be the production of "a very ingenious young lady, Miss Christian Edwards, daughter of a gentleman in Stirlingshire," and it fully bears out, in its style, the date assigned to it. Nor need any one question the date or authorship of Mrs. Cockburn's version of "The Flowers of the Forest," which is said to have referred directly to pecuniary losses which weeded out some of the popular land owners, the "Flowers of the Forest" of the authoress's own day. Beautiful as it is, it manifestly belongs in its mode of thought to the eighteenth century. No one familiar with our old ballad literature would ascribe to ancient Scottish minstrelsy the fine stanza, so expressive when heard wedded to its plaintive music:

Oh, fickle Fortune,
Why this cruel sporting?
Oh, why still perplex us, poor sons of a day?
Nae mair your smiles can cheer me,
Nae mair your frowns can fear me,
For the flowers of the forest are a' wede away.

But no such modern mode of thought is discernible in the older version, of which this was confessedly an imitation; and we strongly

incline to the belief that, if Jane Elliot had any hand in it, it was merely that of a transcriber from tradition, retouching a genuine ancient lyric orally preserved through successive generations, and giving it permanent currency in the fine form now familiar to all. It is curious, nevertheless, how many of our best modern Scottish songs and ballads are due to Scotland's daughters. To Lady Nairne we owe that exquisitely tender song, "The Land of the Leal," and the humourous and piquant "Laird o' Cockpen" and "John Tod;" while Lady Anne Barnard—one of the Lindsays,—gave us "Auld Robin Gray;" and Lady Grisel Baillie, daughter of the first Earl of Marchmont, wrote "Were nae my heart light I wad die." A melancholy interest has been added to the genuine mixture of humour and pathos in this fine song, from the application by Burns of one of its verses to his own condition, when, neglected by his country, his sun was setting ere it was noon. Besides these, such names as Miss Jenny Graham, Miss Blamire, Mrs. Grant, of Carron, Miss Cranston,—afterwards the wife of Professor Dugald Stewart,—with others of lesser note, occur among the writers of some of the best Scottish songs or ballads; not to mention Burns's Jean Glover, the authoress of "Ower the muir amang the heather;" and, according to the poet: a thief, and something worse! Mrs. Catharine Cockburn,—already referred to as the authoress of the later version of "The Flowers of the Forest,"—furnished other contributions to Scottish song, among which is the clever Jacobite version of "Clout the Caldron:"

Hae ye ony laws to mend?
Or hae ye ony grievance?

The Scottish poetesses, indeed, excel in humorous pieces, though also—as some of the above-named productions prove,—no less successful in the more congenial vein of tenderest pathos.

The following fragment of a ballad, relating to one of the old Flodden traditions, has already been printed in the "Memorials of Edinburgh," with a note stating its discovery in an interleaved copy of "Dalrymple's Remarks on the History of Scotland." We well remember, on showing the original to the late Charles Kirkpatrick Sharpe, his pouncing on the "shrowd" of the third stanza as an anachronism, betraying a modern hand,—at least in its latest transcriber. Imperfect and disconnected as it is, it seems worth preser-

ving, as, perhaps, a fragment of which other portions remain, giving shape to the ancient tradition of the escape of James IV. from Flodden, and his accomplished pilgrimage to the Holy Land, in accordance with early vows:

An' about the mids o' the night
He crap to the field o' the bluid;
Laigh he bowit, an' dour he lookit,
But never a worde he spak.

He turned the dead knight round about,
Till the moon shone on his bree;
But his soth was tined with a bluidy gash,
Drumbelce grew his ee.

"Up and awa, my lither foot-page,
An Scotland and I maun part;
But sweere by the dead, in ilk bluidy shrowd,
That thou layn my lare i' thy hart.

"Giffe I were a king, as now I'm nane,
Ille battell wold I prove,—
My birdie ladie in Holyroode;
Wae worth the wyt o' luve."

Sanct Giles sall ring ilk larum belle,
Wauk up the craimes and bowse,
Earl Angus has taen him to Floudenne,
* * * *

He cut the crosse on his right shoulder
O' claith o' the bluidy redde,
An' he's taen his ways to the holy land
Whereas Christe was quick and dead.

The line of distinction cannot always be clearly drawn between the song and the ballad. Many Scottish songs are truly epic, and even dramatic; while some of the pieces admitted into this critically digested collection are no less genuine lyrics. A further selection from the Scottish Song Book would be welcomed by the most fastidious admirer of the epic department of Scottish minstrelsy, in another edition of "The Ballads of Scotland," which we doubt not will be demanded ere long. To give to Scotland a standard edition of the grand, pathetic, and humorous fragments of elder song and tradition, for which she has been so long and justly celebrated, is an ambition worthy of the highest intellect. To this task Professor

Aytoun has evidently devoted himself lovingly, faithfully, conscientiously; and the result appears in these volumes, which cannot fail to be welcome to all who can appreciate true poetry, warbled in the wild wood notes and rude epics, of those simple and unlettered elder sons of song: the Scottish Makars.

D. W.

SCIENTIFIC AND LITERARY NOTES.

GEOLOGY AND MINERALOGY.

ATRYPA HEMIPLICATA.

Mr. Billings of the Geological Survey has discovered, by grinding off the beaks of several specimens, that Hall's *Atrypa hemiplicata* of the Trenton Limestone, is a true *Pentamerus*. Mr. Billings requests us to state also, that his *P. reversus* from the Middle silurian Series, is simply a large variety of the first named species [*P. hemiplicatus*].

AMERICAN TRILOBITES.

Mr. Salter has communicated to the Geological Society of London (Feb. 23, 1859) a brief notice of a new species of *Paradoxides*, *P. novo-repertus* (Salter), forwarded to him from Newfoundland by Mr. Bennet. It appears to be the largest species of that genus yet known, the example in question being 9½ inches broad. Mr. Salter has also described in the same communication a new species of Conocephalus, *C. antiquatus* (Salter) from a specimen brought from Georgia in 1851, by Dr. Feuchtwanger. These trilobites, in Mr. Salter's opinion, indicate the presence of Barrande's "Zone Primordiale," (hitherto of doubtful recognition) in our Western Continent. The imperfect trilobite from the Calciferous Sand Rock of Canada, formerly referred by Mr. Salter to *Paradoxides*, he now considers to be an *Asaphus*.

DEVONIAN PLANTS FROM GASPE.

Professor Dawson, Principal of McGill College, Montreal, has recently presented to the Canadian Institute a series of interesting fossil plants from the devonian rocks of Gaspé. The conditions of occurrence and general relations of these plants are described by Professor Dawson in a paper communicated to the Geological Society of London, on the 5th of last January. The following summary of this paper is quoted from the *Philosophical Magazine* of the ensuing month. "The plant-bearing rocks in the peninsula of Gaspé were first noticed by Sir W. E. Logan in 1843. To determine the fossil plants accurately, it was necessary to study them in place. With this view Dr. Dawson visited Gaspé last summer, and carefully examined the localities by the aid of the plans and sections of the Geological Survey of Canada. The strata referred to have a vertical thickness of 7000

feet, as estimated by Sir W. E. Logan. They rest on Upper Silurian rocks, and underlie the Carboniferous conglomerates; and some beds contain Lower Devonian brachiopods, &c.

Among the vegetable remains determined by Dr. Dawson is a curious genus termed by him *Psilophyton*, which belonged to the *Lycopodiaceæ*, [and was related in some respects, according to the author, to the modern genus *Psilotum*]. It had minute ad-pressed leaves on slender dichotomously-branching stems, with circinate vernation, and springing from a horizontal rhizome which had circular areoles with cylindrical rootlets. Some of the shales are matted with these rhizomes. Obscure traces of fructification are observable in cuneate clusters of bracts. The fragments of the different parts of this interesting plant might easily be mistaken for portions of fucoids, or of other and very distinct plants, such as *Karstenia, Halonia, Stigmaria, Schizopteris, Trichomanites*, &c. The author describes two species of *Psilophyton, P. princeps* and *P. robustus*. Dr. Dawson further described a new form of *Lepidodendron* (*L. Gaspeanum*); also some specimens of coniferous wood related to the *Taxus* (*Prototaxites Logani*), and some less clear forms belonging to *Knorria, Poacites*, &c. The author also noticed the occurrence of *Entomostraca* (*Beyrichia*), *Spirorbis*, occasional fish-remains, some brachiopods, and also rain-marks and ripple-marks in these Devonian beds."

Professor Dawson has also communicated to the Geological Society a paper of much interest, on "the Vegetable Structures" in Coal, an abstract of which will be found in the April number of the *Philosophical Magazine*.

POST-TERTIARY DEPOSITS OF THE ST. LAWRENCE VALLEY.

In the last number of the *Canadian Naturalist*, Professor Dawson makes some further additions to our knowledge of these interesting deposits, and figures many new forms of Bryozoa and Foraminifera obtained from them. Taken in connexion with the author's former researches on this subject, the present paper will be found of no ordinary value to the student of Canadian Geology. The following extract conveys some additional information respecting the well-known Beauport beds: "I visited this celebrated deposit for the first time last autumn. At first sight it consists of a mass of stratified sand and gravel, equivalent to the Saxicava sand of Montreal, and resting on boulder clay. The overlying mass is filled with *Saxicava, Tellinæ*, &c.; and the underlying boulder clay as usual contains no fossils. My experience in the Montreal deposits, however, led me to expect a bed, however thin, representing the Leda clay, between these; and on searching at the junction of the two great beds above mentioned, I was gratified by finding a layer of sand about three inches in thickness, filled with the rarer shells of the deposit, characteristic of its deeper waters, such as *Fusus tornatus, Pecten Islandicus, Buccinum ciliatum, Modiolaria discors*, &c.* The *Rhyneonella psittacea* occurs only in this layer, and in such a manner as to leave no doubt that it is buried here in situ, in the very spot where it lay anchored to the stones of the surface of the drift. On these stones, however, I found a new and interesting field for observation. In the thin layer above referred to, all the stones, as well as those that lay on the surface

*Sir C. Lyell notices the fact that these shells are more abundant in the lower part of the mass than above.

of the boulder clay or partly imbedded in it, were covered with the remains of marine creatures, especially *Balanus crenatus*, *Spirorbis sinistrorsa*, *Spirorbis spirillum*, *Lepralia* and *Hippothoa*. This layer, in short, evidently represented a time when the surface of the boulder clay, covered only by a thin layer of sand and stones, constituted the bottom of clear and deep water, before it became covered by the Saxicava sand. This bottom, although no clay has been deposited on it, represents the Leda clay at Montreal, and is exceedingly rich in the fossils usually found at the surface of that bed. *Foraminifera* occur in it, but they are comparatively rare, and so far as I could find, only of species common at Montreal." These facts, with others detailed in the paper, appear to confirm fully the threefold subdivision of our Post-Tertiary deposits, as established by the author from his previous researches, viz.: an underlying non-fossiliferous boulder clay; a deep-water bed of clay or sand, the "Leda clay" of Montreal, and the overlying shallow-water sands and gravels, the "Saxicava Sand" of Professor Dawson's original classification. Exclusive of doubtful forms, no less than sixty-three species of marine invertebrata have been obtained, chiefly by the author's explorations from these Post-Tertiary beds of the St. Lawrence Valley.

GEOLOGY OF CANADA, &c.

The May number of the Journal of the Geological Society of London contains an interesting sketch from the pen of Professor Ramsay, of our Surface Geology and Drift formation generally. Although containing nothing absolutely new, this paper may be consulted with much profit, as an able *resumé* of the known facts of the subject, classified and discussed with great perspicuity. To European Geologists it will be especially acceptable. The following is Professor Ramsay's summary of its contents: Glacialized condition of the Laurentine Mountains, and the drift-deposits of Montreal. Glacial drift of the plains; striæ; and roches moutonnées. Drift and striæ in the Valley of the Hudson, including the Canaan Hills and the Catskill Mountains. Probable equivalency of the upper clay drift of the Hudson Valley with that of Lake Champlain and of Montreal. Probable date of the Niagara Falls. Drift and other late Tertiary deposits at Niagara.

GNATHODON DEPOSITS OF MOBILE BAY.

In a brief notice, in the May number of *Silliman's Journal*, of the "Second Biennial Report on the Geology of Alabama" by the late Professor Tuomey, it is stated that the celebrated "gnathodon beds" of Mobile Bay, regarded as fossil deposits by Sir Charles Lyell and other geologists, "are, beyond doubt, accumulations made by the aborigines of the country. They are often in heaps, and contain ashes, burnt shells and charcoal, and bear no evidence of accumulation by wave action." The Report is edited by Professor Mallet, Chemist of the Alabama Survey.

CRETACEOUS FORMATION OF KANSAS AND NEBRASKA.

Most of our readers are probably acquainted with the fact that certain strata containing dicotyledonous leaves in great profusion and variety, have been recognized in different parts of Kansas and Nebraska. The true age of these fossil leaves, and their associated beds, is a question of so much geological importance,

that we are induced to give insertion to a somewhat copious extract from a paper on the subject, communicated to the Academy of Natural Sciences of Philadelphia, by Messrs. F. B. Meek, and F. V. Hayden. The presumed Tertiary age of these remains is disproved by the authors, on evidence of the most conclusive character. The beds in which they occur are shown, in many places, actually to underlie deposits containing *ammonites (!)* and *inoceramí (!)*; and these leaves, moreover, differ completely from those belonging to the true Tertiary deposits of the country. But we will let our authors speak for themselves:—

The Cretaceous system, as developed in Nebraska, is clearly divisible into five distinct formations, which have, for the sake of convenience, been numbered 1, 2, 3, &c., from the base upwards. Although at first entertaining some doubts as to whether No. 1, or the lowest formation, might not be older than Cretaceous, we always placed it provisionally, in our own published sections, in the Cretaceous system. More recently, after a careful review of the subject, we became satisfied, from the modern affinities of numerous dicotyledonous leaves found in this formation, that we hazarded little in regarding it as a settled question that it could not be older than Cretaceous, and so expressed ourselves in our paper read before the Academy of Natural Sciences, Philadelphia, March, 1858.

The reference of this formation to the Cretaceous, however, was not without some exceptions generally admitted, for Professor Jules Marcou, in his work on the "Geology of North America," page 143, refers it to the New Red Sandstone, and in a subsequent publication,* he places it in the Jurassic; while some investigators in this country also inclined to the opinion that it must be Triassic. In the midst of these conflicting opinions, although satisfied we were right, we wished, in order to remove all doubts from the minds of others, to have the opinion of some good authority in fossil botany, (a department of palæontology to which we have given little attention,) respecting the fossil leaves on which we mainly based our views in regard to the age of this formation. Consequently, we sent outline sketches of a few of them to Professor Oswald Heer,† the distinguished authority in fossil botany at Zurich, Switzerland, informing him they were from a formation we regarded as Cretaceous, and requesting him to let us know to what genera and geological epoch he would refer them. This letter was sent to Professor Heer in August last, before we started to Kansas, and on our return, in the latter part of October, we were disapointed at finding no reply from him. After waiting some days longer, and receiving no answer from Professor Heer, we concluded our letter had either failed to reach him, or that he was unwilling to express an opinion based upon mere sketches of the leaves; consequently we submitted the whole to Dr. Newberry, who had then returned to Washington, and in whose opinion on this subject we have the fullest confidence.

After examining the specimens, Dr. Newberry gave us a written statement bearing date Nov. 12, containing a list of the genera to which he had referred the leaves, together with some interesting remarks and generalizations, in which he expressed the opinion that they are certainly Cretaceous, some of them belonging

* Notes pour servir a une description geologique des Montagnes Rocheuses, page 20.

† Our friend Dr. Newberry was then in New Mexico.

to genera peculiar to that epoch, and that the whole belong to more highly organized plants than anything known in the Triassic or Jurassic flora.

Knowing as we did that the rocks from which these plants were obtained—beyond all doubt,—hold a position beneath, at least, eight hundred feet of Cretaceous strata, containing great numbers of *Ammonites, Scaphites, Baculites, &c.*, it of course never once occured to us that any person might suppose it Tertiary.

About the thirteenth of November we sent to the American Journal of Science, a communication containing Dr. Newberry's list of the genera to which he had referred our plants, with some extracts from his remarks, all of which have appeared in the January number of that Journal. Some two or three weeks after we had corrected the last proof of this paper, we received (13th of Dec.) a letter from Professor Heer, bearing date of Nov. 20, in which he informed us that our letter had reached him at a late date, in consequence of his absence from home, and that after his return, other engagements had prevented him from replying sooner. In this letter Professor Heer, in accordance with our request, sent us a list of the genera, as near as it was possible for him to make them out from hastily drawn sketches, and also kindly furnished brief diagnoses of the species, stating at the same time that although one of the outlines resembles a Cretaceous genus (Credneria,) the nervation being obscure, and the others being more like Tertiary forms than anything known in the Cretaceous of the old world, he was inclined to the opinion that they are Tertiary.

Along with Professor Heer's letter, we also received a printed pamphlet entitled "*Letters on some points of the Geology of Texas, New Mexico, Kansas and Nebraska;* addressed to Messrs. F. B. Meek and F. V. Hayden, by Jules Marcou." In this pamphlet Professor Marcou quotes Professor Heer's conclusions in regard to our fossil plants, and expresses the opinion that No. 1, of the Nebraska section, is both Miocene and Jurassic, or in other words, that we have included in it strata belonging to each of these two widely different geological epochs.

Having a very high regard for Professor Heer's opinions on any question in fossil botany, where he has had an opportunity to examine the specimens themselves, or to study good figures and descriptions, we are quite sure, had the whole collection been submitted to him, instead of mere sketches of a few of the species, his opinion would have been very different. At any rate, we can assert with the fullest confidence it is absolutely *impossible* that this formation, or any part of it, can be Tertiary, for we know it passes, as already stated, beneath at least eight hundred feet of Cretaceous strata. This is not mere conjecture, nor an inference drawn from having seen this formation under circumstances leading us to *suppose* from the dip of the strata, that it must pass beneath the Cretaceous if continued in a given direction at the same angle of inclination, but from the fact that it has actually been seen, directly beneath the other Cretaceous rocks, not merely at one place, and by one observer, but by several persons at numerous localities.

In order to satisfy others we are not mistaken in this, we will give a few of the many facts in our possession, bearing on this question. In the first place, we would remark that the farthest point towards the south at which we have seen this formation, is near Smoky Hill river, in Kansas, latitude 38° 30′ north, and

longitude 97° 30' west. Here we found it forming the upper part of several isolated elevations known as the "Smoky Hills," at an altitude of about 1200 feet above the Missouri at Fort Leavenworth. At this locality, however, we saw no rocks overlying it, and consequently have no *stratigraphical* evidence that it is the same rock seen by us at other localities under Cretaceous beds; but our lithological and palæontological evidence is quite conclusive on this point, for this rock in color, composition, and all other respects, is undistinguishable from No. 1, of the Nebraska section, as seen near the mouth of Big Sioux river on the Missouri, and contains numerous fossil leaves, some of which are identical with those occurring in No. 1, at the last mentioned localities. Amongst these leaves Dr. Newberry has also identified at least one genus! (*Ettingshausiania*) peculiar to the Cretaceous system,

Bearing in mind that all the rocks here have a gentle but uniform inclination or dip to the north west; and that the formation under consideration consists of red and yellowish sandstones, and colored clays, with generally more or less impure lignite and ferruginous concretions, we will be prepared to recognize it at lower and lower elevations as we proceed northward.

Without undertaking to mention in detail the intermediate exposures, we will pass northward at once to localities where it has been seen beneath Cretaceous rocks by three different observers at various times; this is near the Kansas and Nebraska line—latitude 40° north, and in the vicinity of 97° of west longitude. Here at an elevation of above seven hundred feet above the Missouri at Fort Leavenworth, or some five hundred feet below the level of the exposures mentioned at the Smoky Hills, our deceased friend, Mr. Henry Prattan, saw near Wyeth's creek, in 1853, the following exposures in descending order:

1st. Slope, thickness not given.

2nd. Yellow and whitish limestone filled with casts of *Inoceramus*, referred by him to *I. mytiloides* =*I. problematicus*. } No. 3, Nebraska Sec.

3rd. Slope, thickness not given. No. 2, Nebraska Sec.

4th. Red ferruginous sandstone with leaves of dicotyledonous trees. } No. 1, Nebraska Sec.

A short distance west of this exposure Dr. J. G. Cooper informs us he saw outcrops of red sandstone in the valleys at about the same elevation; and above this, exposures of dark gray laminated clay answering exactly the description of No. 2, of the Nebraska section, while above the latter, near the tops of the hills, he met with outcrops of light colored limestone containing numerous casts of *Inoceramus*.

At other localities not far to the southwest of the foregoing, Mr. Hawn saw exposures of light coloured limestone forty-five feet in thickness, containing great numbers of *Inoceramus* which we referred, from specimens sent by him, to *I. problematicus*. Below this there was a slope of twenty-seven feet in which he saw no exposures, while still lower he observed outcrops of dark ferruginous and yellow sandstone, and various colored clays with impressions of leaves resembling, as he supposed, those of oaks and willows. (See his section published by us in the Proceedings of the Academy of Natural Sciences of Philadelphia. May. 1857.)

Proceeding northward from the last mentioned localities, we find on reaching the Loup fork of Platte river, near the eastern limits of the Pawnee reservation, outcrops of the light colored *Inoceramus* beds already mentioned, (No. 3, Nebraska section,) near the water's edge; and at the mouth of Loup fork, on the Platte, the red sandstone No. 1, so often referred to, crops out near the river margin, while the *Inoceramus* beds are seen in the bluffs above it. Going down the Platte in a direction nearly contrary to the dip of the strata, we find this sandstone rising up so as to form near the mouth of Elk Horn river, bluffs some sixty feet in height. Here it seems to rest directly upon upper Carboniferous rocks. Continuing on down the Platte, we find this red and yellow sandstone rising higher and higher in the hills until we come within five or six miles of the Missouri, where it is seen with its base elevated near sixty feet above the Platte; and there are probably outliers of it between that point and the Missouri at greater elevations. So that we here find the same formation which at Smoky Hill river is elevated about twelve hundred feet above the level of the Missouri at Fort Leavenworth, and seven hundred feet above the same horizon near Little Blue river, has by the gradual north-westward dip of the strata, sunk to within about one hundred feet of the Missouri at the mouth of the Platte.*

Ascending the Missouri from the localities just mentioned, we see occasional exposures of the upper Carboniferous rocks, which gradually sink lower and lower until they pass beneath the river near Florence, to be succeeded by the reddish and yellow sandstones, &c., of No. 1,—(Nebraska section.) Above this, occasional exposures of this formation are seen with its characteristic fossil leaves, along the river; and at several localities, some thirty miles below the mouth of Big Sioux river, it forms perpendicular escarpments of yellowish sandstone, rising from the water's edge to an elevation of about eighty feet; while at a higher point, back on the summits of the Hills, the same calcareous beds are seen containing *Inoceramus problematicus*. Here at a quarry in the sandstone (formation No. 1,) some twenty feet above the level of the river, one of us (Dr. H.) collected a large number fossil leaves, some of which are identical with species found by us in this rock at the Smoky Hill locality already mentioned. The sketches of leaves sent by us to Professor Heer were mostly drawn from specimens collected at this locality.

At the mouth of Big Sioux river a low bluff of this formation, not more than fifteen or twenty feet in height, is seen, and on the hills back a little from the river at a higher elevation the same *Inoceramus* bed crops out at several places, and is used for making lime. At another locality, about eight or ten miles up Big Sioux river, which comes in from the north west, one of us (Dr. H.) saw No. 1, containing its characteristic fossil leaves, *directly beneath* No. 2, of the Nebraska section.

* The gradual descent of the Missouri river makes its surface at Fort Leavenworth, about three hundred feet lower than at the mouth of the Platte, hence the exposures of No. 1, seen at the latter locality, one hundred feet above the Missouri, are some four hundred feet above the level of the Missouri at Fort Leavenworth, and of course about three hundred feet lower than the Little Blue river outcrops. The dip, however, is greater than this would indicate, for the strata incline towards the north *west*, while the mouth of Platte river, is north *east* of the Blue river localities.

This exposure presented the following beds in the descending order:

1st. 20 feet exposed of light gray limestone and marl, containing *Inoceramus problematicus.*	No. 3 of Nebraska Sec.
2nd. 45 feet dark laminated clay with ferruginous concretions containing fish scale.	No. 2 of Nebraska Sec.
3rd. 15 feet exposed above the edge of the water, consisting of yellowish friable sandstone, with a thin bed of impure lignite above, and some layers of various colored clay below, containing dicotyledonous leaves.	No. 1 of Nebraska Sect.

One of the sketches of a long lanceolate leaf, like some of the existing species of Salix, sent by us to Prof. Heer, was drawn from a specimen collected from one of the lower sandstones here.

Again at another locality on the Missouri, about thirty miles above the mouth of Big Sioux river, No. 1. was seen by one of us (Dr. H.) only five feet above the water's edge, and *immediately overlaid* by No. 2, of the Nebraska section, containing its characteristic species of *Ammonites:* and directly over the latter, he saw No. 3, containing *Inoceramus Problematicus.** At this locality he also found in No. 1, some of the same fossil leaves characterizing it at the other places already mentioned.

In ascending the Missouri, the last above named locality, formations Nos 2, 3, 4 and 5 are seen to sink at the same gradual uniform rate of dip, in regular succession, beneath the level of the Missouri; so that on reaching Heart river, we find the top of No. 5 nearly down on a level with the water's edge, and a short distance above that locality it passes out of sight, to be succeeded by the Great Tertiary Lignite basin of the upper Missouri, which overlaps it on the hills along the river for some distance below.

From the foregoing statement, we think it will be clearly understood, that formation No. 1 of the Nebraska section holds a position *beneath* the other cretaceous deposits of that region; while the occurrence in it of highly organized angiosperm dicotyledonous plants proves that it cannot be older than Cretaceous. It may be argued, however, that it may in part be Cretaceous, and part Tertiary, or at any rate that *some* of these leaves may have been obtained from overlying Tertiary beds which we have confounded with the Cretaceous below. This, however, is impossible, simply because specimens of nearly all the species found at the various localities, have been quarried from the same bed at Blackbird Hill, and the whole —not a part only of this formation—passes beneath all the other Cretaceous rocks of the North west. In addition to this, we have extensive collections of plants from the Tertiary of Nebraska, not a single species of which is identical with those from No. 1.

When we stated in some of our papers that it was possible we might have included in this formation beds not belonging to the Cretaceous, it was not because we thought any part of it might be Tertiary, but because we suspected some of the

* It is of course unnecessary for us to inform geological readers that a rock overlaid by strata containing *Ammonites* and *Inoceramus* cannot be Tertiary, because these genera became extinct at the dawn of the Tertiary epoch.

ower beds referred to it in Kansas might possibly be Jurassic; and we are even now prepared to believe it may yet be found to repose on Jurassic rocks in that Territory, as it does at the Black Hills in Nebraska.

FORMATION OF OOLITIC LIMESTONES BY ORGANIC AGENCIES.

We translate the subjoined curious details respecting the formation of certain recent limestones in Mexico, from a paper by M. Virlet d'Aoust, contained in a late *Bulletin* of the Geological Society of France. After describing the well known position of the city of Mexico, and the lowering of the salt water lake of Tezcuco by artificial drainage, the author proceeds as follows:—"The lowering of this lake has necessarily exposed around its margin, the limestone deposit which constitutes its bed. This limestone, slightly marly and of a greyish or pure white color, is entirely of recent formation, as proved by the numerous fragments of obsidian knife-blades (*navajas de itztli*) which occur in the neighbouring soil, and which I have myself found imbedded in it, especially in the excavations at the west of the city, made by M. Griffon the architect, for the foundations of a new jail. I was struck by the oolitic texture which this limestone often presents, a character not observed by me in the fresh water limestone deposit of Lake Chalco. The oolitic granules appear identical in aspect, form and size, with those of many of the Jurassic oolites. I soon obtained an explanation of this structure. Being one day with M. Guillemain at the house of a mutual friend, Mr. J. C. Bowring, the distinguished chemist and superintendent of the salt-works of Lake Tezcuco, and calling attention to the structure in question as seen in certain excavations which were then being carried on, Mr. Bowring informed me that the oolitic granules were nothing more than the eggs of a kind of fly, encrusted and cemented together by the calcareous sediment of the lake, which is constantly under process of deposition. . . . . This fact, the geological bearings of which were manifest, appeared to me so important, that I determined to verify it by personal observation. I therefore returned to the lake in the month of October, the time at which the eggs are chiefly deposited. I was accompanied by M. Guillemain, and by the chemists M. Ernest Craveri and M. Poumarède, who were no less anxious than myself to witness this novel formation. We were enabled to perceive perfectly, in the shallower parts of the lake, the manner in which the eggs were deposited. Myriads of little amphibious insects appeared upon the wing in countless numbers, and plunging, from time to time, beneath the surface of the water to the depth of several feet or even fathoms, they deposited their eggs upon the bottom of the lake or on objects more conveniently within their reach; after which they withdrew themselves from the water and probably died. These insects belong to the order *Hemiptera*, and constitute, according to M. Guérge Meneville, two distinct species, belonging, indeed, to different genera. One, and by far the more abundant of the two, is the *Corixa femorata*. The other, the eggs of which are larger, is the *Notonecta unifasciata*." M. Virlet d'Aoust remarks also in the course of his memoir, that the encrustation of the eggs is facilitated by the circumstance that each egg is attached to its sub-aqueous support, not directly, but by the intervention of a short pedicel. The eggs, furthermore, are collected by the natives in large quantities, and sold in cakes, as an article of food, under

the name of *haoutlé*. This substance was formerly considered to be a kind of marl or earth; and probably the greater number of the so-called "edible earths" of Central and South America are of an analogous composition.

MINERALOGICAL NOTICES.

Tetradymite (*Telluric Bismuth.*)—Dr. C. T. Jackson (*Silliman's Journal*, May, 1859) announces the occurrence of *Tetradymite* in Field's gold mine, *Dahlonega*, Georgia. It occurs in thick foliated masses, associated with native gold and auriferous iron pyrites in a quartz vein traversing hornblende slate. Color, steel-grey. Flexible, sectile, and soiling the fingers like graphite. H=2·25; Sp. gr. 7·868. One gramme yielded: Bismuth 0·7938; Tellurium 0·1800; Selenium 0·0118 Gold (mechanically mixed) 0·0060; Loss 0·0114.

Alisonite.—Under this name F. Field describes in the May number of *Silliman's, Journal*, a new species (?) from the Mina Grande near Coquimbo, Chili. Color; indigo-blue. Massive, with conchoidal fracture. H=2·5—3; Sp. gr. 6·10. Composition=Copper 53·63; Lead 28.25; Sulphur 17.00; corresponding to $3\,Cu^2S$, PbS. Plattner's *Cupro-Plumbite* also from Chili, gives Cu^2S, 2PbS. Mr. Field states, further, that the substance formerly described by him as new, under the name of *Guaycanite* (Sill. Jour. vol. xxvii, p. 52) proves to be the rare *Enargite* (Breithaupt.)

Boltonite.—Professor George J. Brush, in the above mentioned number of *Silliman's Journal*, has shewn in support of the views of Professor J. Lawrence Smith and in opposition to those of Kengott, that the *Boltonite* of Shephard, from Massachussetts, &c., is really identical in composition with *Chrysolite:* the combined MgO and FeO of ordinary chrysolite being represented in Boltonite by MgO alone. An analysis of a pure specimen, furnished by Prof. Shephard, afforded Prof. Brush the formula $3\,MgO, SiO^3$.

Saussurite.—Professor T. Sterry Hunt in an elaborate paper (also in the May number of *Silliman's Journal*) on *Euphotide* and *Saussurite*, has determined the latter substance, long considered an impure feldspar, to be a zoizite or "lime-alumina epidote"; or, at least, to be closely related to that species. The *Saussurite* analysed by Mr. Hunt was presented to him by Prof. Guyot. It formed a portion of the *Euphotides* of Mt. Rose, on which the original descriptions of de Saussure and Haüy were founded The analyses show the oxygen ratios of the protoxides, peroxides and silica, to be nearly as 1: 2: 3, yielding the epidotic formula (as commonly received) $3\,RO, SiO^3 + 2\,(R^2O^3, SiO^3)$. The following are the principal physical characters, according to Mr. Hunt:—Massive and very tough, with fine granular or compact structure, and sub-conchoidal or splintery fracture. Color, white, passing into greenish, bluish, and yellowish-white, rarely with flesh-red stains. Sub-translucent, with feeble, waxy lustre. H=7·0 (scratches quartz.) Sp. gr. 3·33—3·38. These characters coupled with Mr. Hunt's analyses, incline us in the present state of the question to look upon *Saussurite* as an epidote somewhat altered physically by prolonged metamorphic action, rather than as a distinct species. The blow-pipe comportment is not stated, but it would be interesting to ascertain it, as in the epidotes, both *per se* and with the ordinary reagents, the

blow-pipe characters are very peculiar. Of course the so-called *Saussurites* of many authors are still to be looked upon as mere feldspathic or rock mixtures.

Uranite.—M. Descloizeaux, in a long and valuable communication (*Sur l'Emploi des Propriétés Optiques Biréfringentes, pour la détermination des Espèces cristallisées: 2e. mémoire*) published in the 5th part, for 1858, of the *Annales des Mines*, announces the Uranite of Cornwall and Autun to belong to the Trimetric system of crystallization. This fact, first revealed by optical characters, was confirmed by the actual measurement of crystals. The crystals examined, although apparently combinations of tri-axial and bi-axial Dimetric pyramids with the largely developed basal plane, proved to be combinations of the latter with a rhombic octahedron and two domes, a macrodome and brachydome. The measured difference was, however, exceedingly slight. The base on the macrodome gave 109°6′, and on the brachydome 109°19′. The calculated prism-angle, also, only differs from a right-angle by 43′, so that M. Descloizeaux's determination must be considered to rest principally on optical characters. If, as maintained by M. Descloizeaux, *Uranite* and *Chalkolite* belong really to different systems, we strongly suspect that this will be found to apply to certain specimens only, in which the water atoms depart from the normal eight-atom type; and that, if Trimetric *Uranites* occur, Trimetric *Chalkolites* will be found also.

Liroconite (*Linsenerz*, Wern).—This mineral, hitherto regarded as belonging to the Trimetric system of crystallization, is stated by Descloizeaux (*loc. cit.*) to be Monoclinic. He makes the prism-angle $(\infty : \infty) = 74°21'$, and the axial inclination $= 91°27'$ and $88°33'$.

RIB FORMULÆ IN BRACHIOPODS.

At an evening meeting of the Canadian Institute, and afterwards in a note inserted in the January number of this Journal, we described a convenient method of denoting the number and situation of the ribs or plications on *Brachiopod* shells. In doing so, we were altogether unaware that a plan of a similar character had been previously adopted. We have since found, however, that a method essentially the same, was employed incidentally by Professor Hall, in his description of *Orthis* (*Delthyris*) *lynx*. We hasten, therefore, to make this acknowledgment, and to disclaim any intentional piracy. The method proposed by us, is merely an extension of a plan already followed, although, we believe, only in the instance referred to above, by Professor James Hall. This will be seen by the subjoined extract from Professor Hall's description of *Orthis lynx*.—"The smaller specimen 1*a*, has three plaits in the sinus and four on the mesial lobe, with seven on each side, thus: $7 \frac{4}{3} 7$. In figures *c* and *d*, there is a full development of the $\frac{9}{4}$ medial plications and 10 lateral ones." The reader is requested to compare this with our note on page 53 of the present volume.

CANADIAN ORGANIC REMAINS.

Decades I. and IV. of this important publication have just been issued by the Geological Survey of Canada. We hope to notice these Decades in detail in an early number of the Journal. In the mean time we can remind our readers that copies can be obtained through any bookseller.

E. J. C.

CHEMISTRY.

VEGETABLE PARCHMENT.

The investigation of the action of acids on vegetable fibre has led to some very interesting discoveries, which promised at first to be of great technical importance, and although with some of them the expectations at first entertained have not been completely fulfilled, the most recent one seems likely to form the basis of an extensive branch of manufacture. It is well known that the action of strong nitric acid is to convert vegetable fibre into the so-called gun-cotton, a body which it was once supposed might replace gunpowder, but which is now used almost solely in the manufacture of collodion for photographic and surgical purposes. The long continued action of dilute acid converts vegetable fibre into grape sugar, which it was once supposed might be used as a substitute for cane sugar; although this has not been found to be the case, large quantities of it are manufactured for other purposes. It is also well known that the action of strong sulphuric acid on fibre, as in the form of paper, is to char or blacken it; but it is a discovery of only recent origin, that the action of sulphuric acid (diluted with a certain amount of water and properly cooled) on unsized paper is to convert it into a substance perfectly resembling animal parchment, and possessing many of its valuable properties. We have now before us a "Report on Vegetable Parchment, by Professor George Wilson of Edinburgh," printed on the parchment itself.

The altered paper resembles parchment, having more or less of a mottled appearance, which, to a certain extent, interferes with the distinctness of fine print; it is quite free from acid, has no gelatinous or amylaceous substance on its surface, is immensely strong, requiring great force to tear it, can be manufactured much cheaper than parchment, and perhaps even than sized paper, possesses apparently great durability, is not altered by boiling water as is the case with animal parchment, is scarcely acted on by any chemical re-agent, and being converted into the hard substance only on the surface, an attempt at erasure would expose the unaltered blotting paper below, which would at once reveal any attempt to write on the new surface. Prof. Wilson also states that it is free from the greasy surface which parchment often presents, to which we cannot quite agree, as the specimen before us is in some parts almost as difficult to write on as animal parchment.

The objections to this substance appear to be its liability to tear into two sheets owing to the existence of unaltered paper in the middle, its liability to decrepitate when strongly heated, and its power of resisting chemical re-agents which might be capable of entirely removing the marks of ink. The first defect, it is stated, may be remedied by using exceedingly thin paper, so that the whole mass of it may be changed; in that case, however, it seems probable that its property of exhibiting writing over an erasure would be destroyed.

Although not applicable to bank notes, it certainly is well adapted for all documents required to be durable, and which are not liable to erasure, alteration, or forgery.

RUTINE.

Schunck has obtained this yellow colouring matter which seems applicable to dying purposes, from the leaves of the buckwheat (*Polygonum fagopyrum*). He denies the existence of indigo in this plant. It appears to be the same substance as Rutine, Ilixanthin, and the body obtained from capers. The leaves contain about one thousandth part of the colouring principle.

SULPHATE OF BARYTA.

It has been mentioned in a former number that this salt is now extensively used as a substitute for white lead, but in order that it may be so employed it must be obtained by precipitation in an amorphous condition. In the process mentioned ante vol. iii., p. 521, the native sulphate is employed, but the carbonate may be dissolved in hydrochloric acid and precipitated by sulphuric acid. Pelouze has shown that the solid carbonate, without previous pulverization, may readily be converted into sulphate of the greatest tenuity, by digesting it with dilute sulphuric acid to which three or four per cent. of hydrochloric acid have been added.

This latter acid acts as a carrier of the baryta to the sulphuric acid, without it the process soon stops; its action is similar to that of the acetic acid in the Dutch process for manufacturing white lead.

It is curious that marble is not acted on in the same way, even a large quantity of hydrochloric acid scarcely increases the action at all.

DETECTION OF BLOOD STAINS.

Teichmann discovered that by the action of acetic acid upon blood crystals of the colouring matter may be obtained. Brücke finds that this test can be employed on exceedingly minute traces, the course adopted being as follows:

Some of the fluid obtained by extracting the spot with distilled water is put into a watch glass, mixed with a few drops of solution of chloride of sodium, and left to dry under the air pump with sulphuric acid. It is then inspected under the microscope to ascertain that nothing is there that could be confounded with Teichmann's crystals. The residue is then treated with glacial acetic acid and evaporated to dryness at a temperature of 212° F. A few drops of water are added, and the whole placed under the microscope. Crystals will then be apparent if blood were present.

OZONE.

Tait and Andrews have found if electrical sparks be passed through dry oxygen not more than one hundredth part is converted into ozone. A greater effect is produced by the silent discharge and a diminution of volume takes place amounting in one case to one thirty-fifth. On heating to 250° C., so as to destroy the ozone, the gas re-acquired its original volume. Hence the density of the modified oxygen thus obtained must be greater than in its unchanged condition, and it appears that it is also greater than it is in the ozone procured by electrolysis.

Mercury in contact with ozone loses its mobility to a great extent, and may be made to cover the surface of the tube with a fine reflecting surface.

The authors state that the discharge from the induction coil produces very insignificant ozonic effects. (This statement seems to require verification, as all who

have experimented with these instruments must have noticed a remarkably strong smell of ozone, which is frequently evolved. H. C.)

ICE.

It is well known from the experiments of Faraday and others, that during the freezing of water containing foreign ingredients many of them are eliminated, so that the ice produced is nearly if not entirely free from them; and it has been stated by the lamented Dr. Kane, that if the ice be formed from sea water at a sufficiently low temperature, it is so free from salt as to be available for the production of water for domestic purposes. This has been denied by Dr. Sutherland, who affirms that the ice contains one-fourth of the salt existing in the original water, and Dr. Walker, who acted as Surgeon and Naturalist to the Arctic Discovery Expedition, has communicated the results of his experiments to the Royal Society. He found that the quality of the ice varied with the temperature at which it had been formed, but in no case was its density less than 1.005 (in the form of water), and always contained so much chloride of sodium as to render it unfit for domestic use. He explains Dr. Kane's observation by supposing that his experiments were made upon ice formed from water generated by the melting of bergs, and which had flowed over the surface of the salt-water ice. Dr. Walker once observed a stratum of fresh water two or three inches in depth floating like oil on the surface of the sea water, this being in the neighbourhood of a glacier surrounded by bergs. Hummocks are often found, the upper portions of which yield fresh water, but in digging deeper into them the ice is always found to lose its freshness.

CLEANING PAINT BRUSHES.

Brunner recommends the following simple process for cleaning brushes used in oil painting and which have been allowed to dry. They are suspended for 12 or 24 hours in a solution of one part of crystalized carbonate of soda in three parts of water, kept at a temperature not exceeding 158° F. They can then be cleaned by washing with soap and water. H. C.

MISCELLANEOUS.

THE ATLANTIC TELEGRAPH.

BY J. A. BOYD,
*Undergraduate of Toronto University.**

I.

Bright skies shine on the placid deep;
'Thwart ocean be there not a breeze;
Let calmness brood upon the seas,
Peace on the charmed water sleep.

* To this poem the prize for English verse was awarded by the Vice-Chancellor, at the Convocation, held on the 8th June last. The author appends to it the accompanying note:—"The following composition has been written rather with the feelings of a contemporary

Ye winds, sheathe every harshest blast;
Lap round, all softest atmospheres,
The masts of those lone mariners:
So shall the work be done at last.

So shall the mystic coil be spun
That weds the Old World with the New,
And channeling vast ocean through,
One throb of common life shall run.

So shall be laid, with easy skill,
A clue for lightning-feet of Thought:
Safe through sea-mazes shall be brought
Each messenger of good and ill.

Hereby shall flash whate'er man saith
O'er wave-crowned Alp, wave-scooped ravine,
O'er wave-smoothed wastes of changeless green,
In folded words of Life or Death.

II.

They talk of empery o'er the wave
In high-toned, swelling words of boast;—
How oft man's brief rule with the coast
Ceaseth,—beyond slopes deep his grave!

O! pray ye for those outbound ships,
That they may slide through balmy noon
Of day and night; pray that our moon—
Full moon of Hope,—have no eclipse.

Pray that they bridge the dread abime;
Pray that the century's work be done—
One cycle of events be run;
A better term begin of time.

And yet our hearts misgive for fear
Lest they have sailed, and thrice! in vain;
Our opening joy folds up again
And blooms not till a happier year.

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observer than in the spirit of cold criticism, which looks from a vantage-ground of some six or eight months, upon the practical inefficiency of the Ocean Telegraph. However much this work has fallen short of the expectations expressed in the subjoined pages, it may not be doubted that the writer's words are prophetic of a triumph which this generation shall see. It is only a comfortable stretch of poetic license to keep our thoughts fixed on the glorious fact, that there have been subaqueous dialogues between Europe and America; and, if this be not enough, we can easily overleap the disappointments of a few months or years, and cast our eyes on that certain and not distant future, when the interrupted communication shall be resumed."

Oh, heart! they cannot, must not fail,—
Man is of God, even if of dust.
Science and Toil, with mutual trust,
Move forth—and nought may countervail.

For, skill of head and skill of hand,
Heroic strength and godlike mind,
In oneness for one task combine,
Have earnest thought and careful planned.

III.

Ah, woesome sight! with battered spars,
Our ships from their mid-ocean cruise
Return,—with seamen's wearied thews
And eyes that bless the peep of stars.

"And is your sea-craft foiled again?
And come ye back even as ye went,—
With all your precious stores unspent,
That else had dowered the homes of men?"

"Nay, nay! we come not as we went.
We braved the storm, and did not shirk;
We stemmed the waves and did our work,—
Our work hath full accomplishment."

"Now, welcome home, ye sons of toil!
Ye valorous riders of the sea,
Ye knights of modern errantry,
Fouled with no streak of battle-soil.

"This hard-won victory ye have gained
Exceeds all sung of ancient time;
Your names shall be in every clime,
Your bright renown by no blood stained.

"Bold offspring of those Vikings bold,
Whose baby limbs the billows nursed,
Stand forth confessed among our first—
Among the manliest of earth's mould."

IV.

Well spake the heart of Britain then,
Casting her voice adown the sea:
"To God, the Highest, let glory be,
And peace on earth, good will towards men."

Well uttered was that heaven-made hymn,
  Sung first to hail our SAVIOUR'S birth,—
  That so, the peoples of the earth
Might join in praise the Seraphim.

From ocean-deeps, lo! pure and meek,
  As washed from earthly soil or taints,
  The words meet those of quiring saints:
Angels and men one language speak!

O! far-off-echoing song of praise,
  That swelled through Heaven's unpillared dome,
  For joy that CHRIST made earth his home
To teach upon the world's highways;

And sung once more full joyously,
  For that the foremost nations two—
  Who lead the Old World and the New—
Clasp earnest hands across the sea!

The strain from angel-harps began
  When Heaven and Earth were linked in one;
  And we prolong it, as the Sun
Sees world join world, and man join man.

V.

Meseems, the Atlantic's heaving floor
  Shrinks to a narrow, span-breadth water;
  Glad England greets her long-lost daughter,
And they shall sunder— never more!

O you! ye twain of kindred blood,
  Whom Science' hand has drawn so near,
  That each into the other's ear
Can whisper o'er the mediate flood;—

Ye twain of common kith and blood,
  By *Thought*, no less, together bound,
  Guide through long ages circling round
The following nations on to God!

Apostles of the Old and New!
  In actions preach the Word of Life:—
  With robes unstained by sordid strife,
Prove ye to your "high calling" true.

CANADIAN INSTITUTE.

(Continued from last No.)

SEVENTH ORDINARY MEETING—SESSION 1858-59.

5th February, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following Gentlemen were elected Members:*

HENRY G. BOHN, York Street, Covent Garden, London, *Life Member.*

RICHARD A. HOSKIN, Esq., Toronto.

II. *The following donations for the Museum were announced, and the thanks of the Institute voted to the donor:*

T. C. WALLBRIDGE, ESQ., BELLEVILLE.

Two Geological Specimens.

III. *The following Papers were read:*

1. By Professor G. T. Kingston, M.A.
   "Meteorological Report for 1858."
2. By Professor D. Wilson, LL.D.
   "On the supposed evidences of an Ante-Columbian discovery of America."

EIGHTH ORDINARY MEETING—SESSION 1858-59.

12th February, 1858.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following donations to the Museum were received and the thanks of the Institute voted to the donors:*

1. FROM C. J. BETHUNE, ESQ., TRINITY COLLEGE, TORONTO.

A Box of Fossils.

2. FROM REV. V. CLEMENTI, B.A., PETERBOROUGH.

A specimen of the Beaver, stuffed.

II. *The following Papers were read:*

1. By T. J. Cottle, Esq., Woodstock.
   "On the Cranes of Canada."
2. By Prof. Chapman.
   "Remarks on certain specimens of Canadian Marble."
3. By Professor D. Wilson, LL.D.
   Notice of the Quigrich, an ancient Scottish Crozier, now in Canada.
   The relic, which is a large and beautiful object of silver gilt, was exhibited.

NINTH ORDINARY MEETING—SESSION 1858-59.

19th February, 1859.

JOHN LANGTON, M.A., Vice-President, in the Chair.

I. *The following donations to the Library were announced, and the thanks of the Institute voted to the donors:*

1. FROM R. S. M. BOUCHETTE, ESQ., TORONTO.

Bouchette's British Dominions in North America. 4to. Vols. 1 & 2.
Bouchette's Topographical Dictionary of Lower Canada. 4to.

2. FROM THE UNIVERSITY OF CHRISTIANIA.

Physikalsee Meddelesser, 1858.

Olaf den Helliges Saga.
Aslak Bolts Jordebog, 1832–1849.
Morphologie Végétale. J. M. Norman, 1857.
Sur Les Phenomenes d' erosion.
Inversio Vesicæ Urinareæ. L. Voss.
Zulu-Sprogets Grammatik, 1850.
Aubert Lateinischen Grammatik, 1857.
Symbolæ ad Historiam Antiquiorem Rerum Norvigicarum. P. A. Munch, Hist. Prof.
Graphlolitherne.
Forhandlinger ved de Skandinaviske Naturforskeres Syvende Möde, 1. Christiania, Juli 1856.
Stastiske Tabeller for Kongeriget Norge, 1857.
Udtog of Norges Regia Historie Christiania.

II. *The following Papers were read:*

1. By E. Billings, Esq.,
"On the Fossil Corals of the Devonian Rocks of Canada."
2. By the Rev. Professor Young, M.A.
"The exact solution of general algebraical equations of every degree, in all cases where the roots or any number of them admit of being algebraically represented."
3. By the Rev. J. McCaul, LL.D.
"On some Mint Marks of the Lower Empire."

TENTH ORDINARY MEETING—SESSION 1858–59.

26th February, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following Papers were read:*

1. By the Rev. Professor W. Hincks, F.L.S.
"The Sensational Philosophy respecting the Human Mind and its operations; the treatment it has met with, and its real character and pretensions."
2. By W G. Tomkins, Esq., C.E.
"On Comparative Tabular Meteorological Observations in Canada, England and Russia."

ELEVENTH ORDINARY MEETING—SESSION 1858–59.

5th March, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following Gentleman was elected a Member:*

GEORGE REDPATH, ESQ., MONTREAL.

II. *The following donation for the Museum was announced and the thanks of the Institute voted to the donor:*

FROM PROFESSOR DAWSON OF MONTREAL.

Twelve specimens of Fossil plants from the Devonian Rocks of Gaspé.

III. *The following Papers were read:*

1. By William Hay, Esq., Architect.
"Some Remarks on Iron Construction as applied to Street Architecture."
2. By T. J. Cottle, Esq., Woodstock.
"On Two Rare Birds observed in Canada."

TWELFTH ORDINARY MEETING—SESSION 1858-59.

12*th March*, 1859.

JOHN LANGTON, Esq., Vice-President, in the Chair.

I. *The following donations for the Library and Museum were announced and the thanks of the Institute were voted to the donors:*

FOR THE LIBRARY.

1. FROM THE GEOLOGICAL SOCIETY OF FRANCE.

Bulletin de la Société Géologique de France. 7 Parts.

Annales des Mines, etc., in 1856 et 1857. 7 Parts.

2. FROM THE ROYAL SOCIETY OF DUBLIN.

Journal of the Society.

3. FROM J. M BRODHEAD, ESQ.

Vol. 9 of Explorations for a Railroad route from the Mississippi Valley to the Pacific Ocean.

4. FROM LA SOCIÉTÉ ROYALE DES ANTIQUAIRES DU NORD, COPENHAGEN.

Mémoires des Antiquaires du Nord pour 1840-1849. 2 Vols.

Saga Jatvardar Konungs hins helga.

Sur la Construction des Salles dites des Geants, par S. M. le Roi Frédéric VII de Denmark.

The Discovery of America by the Northmen.

Inscription Runique du Finée interpretae par C. C. Rafn.

Extract des Antiquités de L'Orient.

Cabinet des Américaines à Copenhague.

Mémoire sur la Découverte de l' Amerique au Dixéme Siecle, par C. C. Rafn.

Société Royale des Antiquaires du Nord. Le Premier Janvier 1858.

FOR THE MUSEUM.

FROM JAMES WRIGHT, ESQ, TORONTO.

An Indian Pipe found in the Grave Mound of Bighead, Chief of the Pottawatamies at the Mouth of Bighead River, Meaford, C.W.

II. *The following Papers were read:*

1. By Dr. Morris.

"On the Luminous Appearance of the Sea, commonly called Phosphorescent."

2. By Rev. J. McCaul. LL.D.

"On some Ancient Inscriptions."

Mr. Armour gave the requisite notice of motion respecting certain payments due to the Society, to be brought forward at a subsequent meeting.

THIRTEENTH ORDINARY MEETING—SESSION 1858-59.

19*th March*, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following Gentlemen were elected Members:*

EDWARD MILES, ESQ., C.E., TORONTO.

T. WARDLAW TAYLOR, ESQ, M.A., Barrister.

W. G. THOMPSON, ESQ, C.E., TORONTO.

OWEN ALEX. VIDAL, ESQ., TORONTO.
BEAUFORT HY. VIDAL, ESQ., TORONTO. } as Junior Members.

II. *The following donation for the Museum was announced and the thanks of the Institute voted to the donor:*

FROM G. B. WYLLIE, ESQ., TORONTO.

Fine Canadian specimen of the Lynx, stuffed.

III. *The following papers were read:*

1. By Professor Hind, M.A.

"On the Qu'apelle or Calling River, and the diversion of the waters of the South branch of the Saskatchewan down the Qu'apelle Valley to the Assinniboine River, and past Fort Garry into Red River, with a view to the establishment of direct Steam Communication from Red River to the foot of the Rocky Mountains, in a line nearly due west from Fort Garry."

2. By Rev. Professor W. Hincks, F.L.S.

"On the Canadian Species of Lynx."

3. By Professor Croft, D C.L.

"Remarks on the more familiar experiments with Ruhmkoff's Induction Coil."

FOURTEENTH ORDINARY MEETING—SESSION 1858–59.

26th March, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following Gentleman was elected a Junior Member:*

ROBERT MCINTOSH, ESQ., TORONTO.

II. *The Committee of Council appointed for the consideration of the question of arrears reported to the following effect:*

REPORT.

"The Committee to whom was referred the consideration of defaulters due their subscriptions for upwards of two years, report the following list of such, and recommend that notice be sent to each, intimating that unless the arrears are immediately paid up their names will be struck off the roll of members. The Committee further recommend that the *Journal* be forthwith stopped to all such members."

(Signed,) D. CRAWFORD, Convener.

(The list of defaulters was laid on the table with the report.)

The following papers were read:

By the Rev. C. Dade, M.A.

"On the Law of Storms."

2. By the Rev. J. McCaul, LL.D.

"New Readings of Old Inscriptions."

FIFTEENTH ORDINARY MEETING—SESSION 1858–59.

2nd April, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following Gentleman was elected a Member:*

HON. ALEX. KIERSKOWSKI, M.L.C.

II. *The following donations were announced and the thanks of the Institute voted to the donors:*

FROM REV. V. CLEMENTI, B.A., PETERBOROUGH.

A Skin of the Star Nosed Mole, and eleven specimens of Fossils.

III. On the nomination severally, of the President and the Members, Messrs Spreull and Cockburn were appointed Auditors.

IV. *The following Papers were read:*

1. By J. F. Smith, Jr., Esq.

"Notes on some of the more Characteristic Fossils of the Hudson River Group of Western Canada."

2. By Professor D. Wilson, LL.D.

"Notes on the Development of new Varieties among the Intrusive Populations of America."

SIXTEETH ORDINARY MEETING—SESSION 1858-59.

9th April, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following donations for Library and Museum were announced and the thanks of the Institute voted to the donors:*

FOR LIBRARY.

1. FROM SMITHONIAN INSTITUTION.

Smithonian Contributions to Knowledge. Vol. X.

2. FROM T. D. HARRINGTON, ESQ.

Teneriffe, by Professor C. Piazi Smith.

FOR MUSEUM.

1. FROM T. D. HARRINGTON, ESQ.

A Collection of specimens of Mineralogy and Indian Pottery; one ancient Greek Coin found on the Eastern Coast of Sicily.

II. The following Report from the Council, prepared by the Committee to whom had been referred a proposed change of Name of the Institute, was read, and the President announced that the question would stand over for discussion till the general Meeting to be held on Saturday next:

REPORT.

"*To the Council of the Canadian Institute.*

"Your Committee having had under consideration the reference to them relative to the injuries already resulting, or likely to result to the Canadian Institute from its correspondence in name to the Mechanics' Institutes, 'The Institut Canadien,' and other bodies of a purely local nature, or formed for purposes altogether different from those aimed at by this Society, beg to report that: owing to the peculiar circumstances in which the Canadian Institue originated, the special objects most prominently set forth in its Charter of Incorporation pertain to the profession of the Land Surveyor, Civil Engineer, and Architect, although the Institute has long since abandoned this exclusively professional character, and become a strictly scientific society.

"Your Committee would therefore recommend that application be made for a New Charter, with extended privileges; and whereas the present charter was granted by His Excellency the Earl of Elgin, Governor General of the Province, Your Committee suggest that application be made for *a Royal Charter, under Her Majesty's own hand and seal;* and that in consideration of this, and to prevent any future confusion with other Canadian Institutions, Local or Provincial, the Institute

obtain authority therein for assuming, and using solely and exclusively within the United Province of Canada, the name of *The Royal Society of Canada, The Royal Academy of Sciences of Canada,* or such other special designation as shall seem best fitted to effect the object aimed at by a change of name.

"Your Committee would also submit for the consideration of the Council, whether, in preparing the draught of such a charter, provision should not be made for *a class of Fellows*, to be elected from among the working members of the standing of some fixed term of years, and under such restrictions as shall give a just value to the distinction, and reflect credit on the Institute, as representing the Science of the Province.

"All of which is respectfully reported."

(Signed,) G. W. ALLAN, Convener.

8th April, 1859.

III. *The following Papers were read:*

1. By John Langton, M.A.

"On the Age of Trees, and the future preservation of Canadian Timber."

2. By Professor C. Smallwood, M.D., LL.D.

"On the Meteorological Phenomena of Lower Canada, 1859."

EXTRAORDINARY GENERAL MEETING.

16th April, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. The President called attention to the Report of the Council relative to the proposed change of name of the Institute, and requested the opinion of the members thereon, when it was moved by Dr. Hodder, seconded by Thos. Brunskill, Esq., and carried, "That it be remitted to the Council to carry out the details of the report, relative to a new charter, and to adopt all steps relative to the change in the constitution of the society therein recommended."

II. *The following Papers were then read:*

By Edward Hodder, M.D.

"On the influence of the storms during the winter of 1858–1859 on the Peninsula, and the probable effects on the Esplanade and Harbor of Toronto."

On the motion of S. Fleming, Esq., seconded by F. W. Cumberland, Esq., the thanks of the Institute were then given to Dr. Hodder and the Gentlemen of the Toronto Yacht Club, under whose directions the investigation had been carried out.

It was then moved by F. W. Cumberland, Esq., seconded by W. Hay, Esq., and carried, that Messrs. Hind, Fleming, the President of the Institute and the mover, be a Committee to co-operate with the Yacht Club in devising measures for the preservation of the Peninsula.

2. By Sanford Fleming, Esq., C.E.

"On the Settlement of Wild Land."

III. The President drew the attention of the members to this, as the closing meeting of the session, and availed himself of the occasion to congratulate them on the prosperous condition of the Institute, and on the success which had attended the meetings of the season. In conclusion, he invited the members to a conversazione to be given at Moss Park, on Wednesday the 27th Instant.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—APRIL, 1859.

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

Days.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above 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	10PM	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	10PM	Resul't.	ME'N		
					°	°	°	°	°																			
1	29.852	29.800	29.841	29.8370	27.7	40.7	33.5	34.70	— 1.53	.135	.153	.162	.150	.89	.60	.84	.75	N b W	E b S	N b E	N 49 E	0.4	8.2	5.5	4.68	6.05	.....	...
2	803	.715	.342	.5868	33.2	35.3	36.6	35.35	— 1.28	.129	.113	.142	.126	.68	.54	.66	.61	N N E	E	E b N	N 78 E	7.4	12.8	19.8	16.03	16.13	0.055	Inap
3	.030	.120	—	—	36.8	44.4	—	—	—	.162	.201	—	—	.74	.68	—	—	W	W b S	W b S	S 75 W	7.0	29.7	23.0	19.85	20.78	Inap	...
4	.230	.340	.434	.3375	30.1	31.0	29.9	30.27	— 7.07	.137	.075	.095	.101	.81	.42	.57	.59	W	W N W	W	N 78 W	20.4	25.5	10.5	16.91	17.07	.....	0.3
5	.406	.361	.468	.4185	28.3	31.0	29.9	29.13	— 8.58	.115	.089	.117	.103	.81	.51	.70	.64	N W b W	W b N	W b S	N 74 W	6.2	22.5	19.8	13.90	14.32	.....	0.2
6	.496	.502	.540	.5147	29.2	38.9	35.3	34.22	— 3.82	.113	.092	.139	.116	.70	.39	.67	.60	W b S	N W b W	W S W	N 85 W	8.4	18.2	9.2	9.96	10.22	.....	Inap
7	.482	.357	.517	.4552	32.4	43.3	35.9	37.53	— 1.03	.157	.207	.163	.171	.85	.74	.77	.76	W S W	W b N	W	S 88 W	0.4	19.8	15.5	9.08	11.12	0.085	0.3
8	.586	.664	.905	.7295	31.0	36.1	27.4	31.50	— 7.22	.140	.125	.095	.108	.80	.58	.63	.61	N W b W	N W b N	N N W	N 45 W	10.2	24.8	4.4	14.64	15.13	.....	...
9	30.020	.936	.878	.9563	23.9	35.3	34 2	31.35	— 7.18	.109	.105	.139	.112	.85	.51	.71	.63	N N W	S	E	S 71 E	4.4	10.2	6.6	4.66	8.53	.....	...
10	29.750	.635	—	—	34.2	36.1	—	—	—	.152	.129	—	—	.77	.60	—	—	E b N	E b N	E b N	N 78 E	20.0	19.6	20 0	21.28	21.30	1.145	...
11	.050	.056	.274	.1317	37.1	44.7	42.2	41.20	+ 1.47	.217	.273	.257	.238	.98	.92	.95	.92	E b N	E N E	N b E	N 65 E	25.2	8.8	2.8	7.09	9.37	0.250	...
12	.479	.531	.638	.5577	42.2	52.1	39.3	45.25	+ 5.12	.203	.156	.206	.189	.75	.39	.86	.66	W S W	W	N E b N	N 66 W	5.2	14.8	3.2	5.28	8.91	.....	...
13	.633	.632	.652	.6310	37.1	44.7	42.2	41.88	+ 1.45	.139	.171	.222	.179	.63	.57	.82	.67	N E b N	E	E b N	N 77 E	8.5	10.0	15.2	14.24	14.32	0.215	...
14	.270	28.993	.257	.1717	38.6	50.3	39.1	42.92	+ 2.18	.223	.331	.068	.179	.95	.91	.27	.63	E b N	S b W	W S W	S 16 W	25.5	6.5	10.4	3.81	17.02	0 685	...
15	.127	29.109	.169	.1282	38 0	42.5	36.4	39.08	— 1.97	.207	.127	.136	.157	.88	.44	.63	.65	S S E	S W	N N W	S 49 W	12.0	19.5	7.6	11.65	13.85	.....	...
16	.234	.318	.478	.3563	33.2	3.3	27.1	37.68	— 3.80	.112	.138	.166	.132	.58	.47	.75	.58	S W b W	W	W N W	S 87 W	9.8	21.0	8 5	11.70	12.09	.....	...
17	.592	.558	—	—	32.8	40.2	—	—	—	.148	.172	—	—	.79	.68	—	—	W N W	S	N N W	N 56 W	3.5	6.2	10 0	3.59	7.19	.....	Inap
18	.726	.689	.652	.6835	33.7	46.9	39.8	40.65	— 1.42	.131	.159	.152	.147	.67	.49	.61	.59	N W b N	S	W S W	S 27 W	12.0	11.5	6.0	4.47	7.31	.....	...
19	.616	.574	.651	.6137	38.2	48.3	37 5	40.90	— 1 45	.193	.207	.177	.190	.84	.60	.79	.75	W b S	S b E	N W b N	N 33 W	0.4	5.2	8.6	5.60	7.85	Inap	...
20	.636	.554	.498	.5550	38.9	48 9	40.0	42.93	+ 0.15	.143	.194	.209	.190	.60	.55	.85	.69	N b W	E S E	Calm.	S 67 E	9.0	2.0	0.0	0.99	1.54	.....	...
21	.461	.443	.453	.4512	41.8	45.8	43.3	43.78	+ 0.68	.174	.147	.226	.180	.64	.47	.80	.63	Calm.	E b S	N E b E	N 70 E	0.0	8.2	5.0	3.98	4.66	.....	...
22	.426	.371	—	—	41.6	45.8	—	—	—	.159	.152	—	—	.59	.49	—	—	N b E	E b S	N b E	N 37 E	4.0	7 2	14.0	9.11	11.00	.....	0.1
23	.197	.098	.126	.1385	35.3	36.8	40.7	37.55	— 6.15	.181	.152	.085	.147	.88	.69	.32	.67	N b E	N N W	N W b N	N 28 W	19.8	22.0	25.2	22.57	24.15	.....	0.3
24	.262	.324	—	—	36.4	50.8	—	—	—	.070	.075	—	—	.31	.19	—	—	W b N	W b W	W N W	N 70 W	18.4	20.5	2.0	11.79	12.49	.....	...
25	.594	.584	.611	.5985	31.5	48.0	39.3	39.82	— 4 58	.149	.150	.222	.175	.84	.45	.93	.73	W N W	S S E	E b S	S 30 E	1.0	9.2	2.0	2.67	3.97	0 092	...
26	.557	.507	.472	.5097	39.7	45.8	42.9	43.28	— 1.42	.214	.234	.138	.192	.87	.75	.49	.68	E	S E b S	N W b N	N 73 E	3.8	8.0	7.0	1.75	5.86	.....	...
27	.651	.716	.772	.7197	35.1	39.7	35.7	37.05	— 7.97	.192	.105	.092	.126	.94	.43	.43	.57	N E b N	S S E	N E b N	N 65 E	11.5	11.4	5.0	5.60	7.78	.....	..
28	.842	.871	.823	.8450	38.4	50.3	40.4	44.00	— 1.40	.190	.053	.106	.086	.43	.14	.41	.31	N N E	E b S	S E b E	N 88 E	5.2	8.8	1.8	4.57	5.21	.....	...
29	.811	.748	.684	.7438	43.3	59.9	47.2	51.23	+ 5.50	.148	.198	.183	.173	.52	.38	.56	.46	N E	E S E	E S E	N 66 E	1.8	4.6	0.5	2.20	3.57	.....	...
30	.691	.702	.708	.7053	51.6	61.3	49.1	54.67	+ 8.62	.162	.218	.191	.180	.42	.40	.54	.42	N b E	S E b S	S E b S	N 84 E	10.2	4.2	1.5	4.16	5.18	.....	...
M	29.5378	29.5140	29.553	29.5350	35.52	44.04	38.20	39.5.	— 1.46	.187	.159	.156	.154	.75	.53	.66	.63	.....	.....	.....	.....	9.05	13.36	8.72	.....	10.79	2.527	1.2

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR APRIL.

Highest Barometer..... 30.046 at 8 a. m., on 9th } Monthly range=
Lowest Barometer ..... 28.693 at 2 p.m. on 14th } 1.053 inches

Self-registring Thermom.
- Maximum Temperature ..... 64°8 on p. m. of 30th } Monthly range=
- Minimum Temperature ..... 22°6 on a. m. of 9th } 42°2
- Mean maximum Temperature ..... 46°54 } Mean daily range=
- Mean minimum Temperature ..... 32°92 } 13°62.
- Greatest daily range ..... 27°2 from a. m. to p. m. on 29th.
- Least daily range..... 5°9 from a. m. to p. m. on 2nd.

Warmest day..... 30th ... Mean temperature..... 54.67 } Difference = 25°54.
Coldest day ..... 5th ... Mean temperature..... 29°12 }

Maximum Radiation. { Solar..... 78°0 on p. m. of 30th } Monthly range=
{ Terrestrial ..... 14°0 on a. m. of 9th } 64°0.

Aurora observed on 7 nights, viz.. on 7th, 8th, 12th, 21st, 23rd, 28th and 29th.

Possible to see Aurora on 17 nights; impossible on 13 nights.

Snowing on 8 days,—depth, 1.2 inches; duration of fall 21.3 hours.

Raining on 9 days,—depth 2.527 inches; duration of fall 36.7 hours.

Mean of cloudiness = 0.59.

Most cloudy hour observed, 8 a. m., mean = 0.66; least cloudy hour observed, 10 p. m., mean, = 0.52.

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

North.	South.	East.	West.
2420.73	1060.59	2533.62	3518.76.

Resultant direction N. 36° W.; Resultant Velocity 2.33 miles per hour.

Mean velocity..... 10.79 miles per hour.
Maximum velocity ..... 32.2 miles, from 8 a. m. to 9 a. m. on 14th.

Most windy day..... 23rd...Mean velocity 24.15 miles per hour.
Least windy day ..... 20th...Mean velocity 1.54 ditto.

Most windy hour ..... 11 a. m. to noon ... Mean velocity 14.42 ditto. } Difference
Least windy hour ..... 9 p. m. to 10 p. m. Mean velocity 8.17 ditto. } 6.25 miles.

1st—Faint Solar Halo, from 11 a. m. to 1 p. m.
2nd—Hail shower, from 10 p. m.—3rd. Fog at 6 a. m.
8th—Solar Halo at 8 a. m.—11th. Dense Fog from 6 p. m.
12th—Perfect Lunar Halo, from 7 to 9 p. m.
14th—Fog, 1 to 2 p. m. Hail shower, 4 p. m., and Rainbow at 6.15 p. m,
20th—Perfect Solar Halo, from 7.20 to 10 a. m.
23rd—Very cold stormy day.
25th—Perfect Solar Halo, from 10 a. m. to 1 p m.
26th—Solar Halo, from 1 to 2 p. m.
28th—Brillant display of Aurora, from 9 p. m. to 2 a. m. of 29th.
29th—Solar Halo, from 5.45 to 7.20 a. m.

The Resultant Direction and Velocity of the Wind for the month of April from 1848 to 1859 inclusive, were respectively N 20° W and 1.90 miles.

April, 1859, was cold and windy; the mean temperature having been 1°47 below the average of the last 20 years.

The depth of rain and snow differed very little from the usual amount.

The Velocity of the Wind was 3.21 miles per hour above the average of the last 12 years, and was absolutely the greatest for any April during that period.

COMPARATIVE TABLE FOR APRIL.

Year.	Temperature.					Rain.		Snow.		Wind.		
	M'n.	Diff. from Aver.	Max ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant Direction.	Resultant V'y.	Mean Force or Velocity.
	°	°	°	°	°							
1840	42.4	+1.4	65.9	25.3	40.6	14	3.420	2	...	...	...	.....
1841	39.2	—1.8	62.9	22.1	40.8	3	1.370	3	...	...	...	0.51 lbs.
1842	43.1	+2.1	89.5	21.6	67.9	8	3.740	2	...	...	...	0.57
1843	40.9	—0.1	70.0	15.1	54.9	7	3.185	3	0.1	...	...	0.46
1844	47.5	+6.5	74.5	17.2	57.3	10	1.515	1	Inap.	...	...	0.24
1845	42.1	+1.1	66.0	14.8	51.2	11	3.290	4	1.5	...	...	1.00
1846	44.0	+3.0	79.4	24.4	55.0	10	1.300	2	1.3	...	...	0.55
1847	39.2	—1 8	65.6	8.4	57.2	8	2 870	2	4.0	...	...	0.59
1848	41.5	+0.3	65.4	26.5	38.9	5	1.455	1	0.5	N 77° W	1.46	4.89 mls.
1849	39.0	—2.0	70.9	23.2	47.7	10	2.655	2	1.7	N 43° W	3.14	7.50
1850	37.9	—3.1	63.2	18.2	45.0	7	4.720	2	1.1	N 39° W	1.12	7.64
1851	41.3	+0.3	59.2	25.8	33.4	11	2.205	3	1.2	N 14° E	2.52	8.07
1852	38.2	—2.8	53.8	19.8	34.0	6	1.900	4	9.4	N 23° E	2.44	6.68
1853	41.9	+0.9	65.7	27.0	38.7	10	2.625	1	1.0	N 12° W	1.90	5.20
1854	41.0	0.0	65.1	22.3	42.8	12	2.685	4	2.7	N 50° E	2.57	6.81
1855	42.4	+1.4	63.8	12.2	51.6	8	2.030	3	1.6	N 36° W	3.99	7.57
1856	42.3	+1.3	69.8	15.1	54.7	13	2.780	3	0.1	N 29° E	1.64	6.05
1857	35.4	—5.6	51.9	10.0	41.9	10	1.775	11	12.9	N 60° W	4.15	10.24
1858	41.5	+0.5	61.5	23.8	37.7	13	1.642	2	0.1	N 14° W	1.64	9.57
1859	39.5	—1.5	62.1	23.9	38.2	9	2.527	8	1.2	N 36° W	2.33	10.79
M	41.00	...	66.31	19.83	46.48	9.2	2.492	3.1	2.38	.....	...	7.58 Mls.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—MAY, 1859.

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

Day.	Barom. at temp. of 32°.				Temp. of the Air.				Excess of mean above Average	Tens. of Vapour.				Humidity of Air.				Direction of Wind.			Resul't. Direction.	Velocity of Wind.					Rain in inches.	Snow in inches
	6 A.M.	2 P.M.	10 P.M.	Mean.	6 A.M.	2 P.M.	10 P.M.	M'E'N		6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.	M'N	6 A. M.	2 P. M.	10 P. M.		6 AM.	2 P.M.	10 P.M.	Re-sult'.	M'E'N		
					°	°	°	°	°												°							
1	29.808	29.800	—	—	49.1	55.5	—	—	—	.204	.160	—	—	.58	.37	—	—	N E b E	E b S	N E b E	N 86 E	4·3	6.5	2 5	4.44	4.77	...	...
2	.818	.848	29.900	29.8635	46.2	56.6	48.3	52.33	+ 5.62	.177	.148	.159	.155	.56	.32	.46	.40	Calm.	E S E	E N E	N 82 E	0·0	8.2	5.8	7 02	7.56	...	...
3	.958	.946	.912	.9385	48.3	54.5	47.6	49.82	+ 2.77	.149	.171	.149	.156	.44	.40	.45	.44	E N E	E	N E b E	N 76 E	9·0	11.2	5.8	9.21	9.37	...	...
4	.876	.838	.797	.8377	49.4	62.1	55.0	55.75	+ 8.33	.182	.304	.300	.266	.51	.54	.69	.59	E b N	E b S	E N E	N 83 E	8·6	7.0	2.2	3.88	5.05	inap.	...
5	.816	.755	.715	.7578	51.2	68.9	54.6	58.68	+10.95	.318	.322	.338	.321	.85	.45	.79	.67	S W b S	E	E	S 51 E	2·2	7.2	0.2	2.29	3.28	...	...
6	.730	.682	.620	.6742	53.4	75.1	60.6	64.47	+16.43	.321	.444	.406	.385	.79	.59	.76	.65	E	S b E	Calm.	S 46 E	1·5	4.0	0.0	1.81	2.57	...	...
7	.620	.517	.475	.5292	56.6	76.2	62.1	65.92	+17.50	.389	.416	.513	.434	.85	.46	.92	.71	N N W	S	Calm.	S 28 W	1·5	11.2	0.0	3.47	4.52	...	...
8	.448	.328	—	—	56.3	72.2	—	—	—	.348	.354	—	—	.77	.44	—	—	Calm.	S W b S	W b N	N 35 W	0·0	8.0	4.0	2.15	5.13	0.215	...
9	.461	.517	.543	.5113	48.0	46.9	43.3	45.48	— 3.68	.285	.239	.252	.263	.85	.74	.90	.86	E	E b N	E	N 58 E	9·7	7.8	3.3	5.01	5.83	0.535	...
10	.590	.614	.687	.6302	46.2	55.0	47.2	49.55	+ 0.05	.195	.185	.174	.182	.63	.42	.52	.51	N b E	S S E	E S E	N 78 E	9·8	10.0	3.5	6.32	7.50	...	...
11	.726	.712	.700	.7127	47.2	53.6	50.1	50.75	+ 0.85	.210	.266	.292	.263	.64	.65	.80	.70	N E b E	E b N	E b N	N 85 E	6·2	12·0	4.8	8.18	8.22	...	...
12	.760	.725	.658	.7063	49.8	61.3	54.8	55.67	+ 5.50	.297	.391	.347	.350	.85	.72	.80	.79	E	E	E b N	S 88 E	3·4	9·0	5.2	4.92	4.98	...	...
13	.689	.745	.903	.7918	53.4	69.6	46.2	56.22	+ 5.65	.375	.375	.150	.278	.92	.52	.48	.58	Calm.	N N W	N W b N	N 30 W	0·0	8.0	3.0	7.38	9.36	...	...
14	.972	.956	.927	.9492	41.5	55.6	50.5	50.22	— 0.67	.160	.209	.152	.168	.60	.48	.41	.43	N N W	S	N N W	N 29 E	6·5	8·8	6.2	0.90	5.31	...	...
15	.970	.921	—	—	44.7	57.2	—	—	—	.171	.208	—	—	.57	.43	—	—	N b W	S b W	S b W	S 15 E	1·3	7.5	5.5	1 35	5.30	...	...
16	.744	.536	.322	.5140	46.2	58.1	52.3	52.63	+ 2.05	.195	.297	.357	.291	.63	.60	.91	.70	N E	N E b E	S b E	S 63 E	7·5	7·5	2.8	3·47	6·65	0.945	...
17	.293	.293	.317	.3027	52.7	59.5	52.7	55.05	+ 3.07	.363	.409	.351	.377	.91	.80	.88	.87	S b W	E b S	N E	S 77 E	6·8	4·5	0 8	2·64	3·65	...	...
18	.357	.332	.383	.3635	51.9	62.1	60.6	59.07	+ 6.78	.341	.450	.455	.421	.88	.81	.86	.83	N E	E b S	N b W	N 39 E	2·8	10·5	6.0	3·75	7·25	...	...
19	.517	.624	.723	.6307	50.7	59.3	50.1	53.47	+ 0.35	.304	.364	.221	.297	.82	.72	.60	.71	N b W	S b E	N	N 8 W	10·5	3.0	6.8	4·03	4·61	...	...
20	.751	.725	.661	.7040	50.5	57.0	51.9	54.00	+ 0.98	.244	.328	.299	.294	.66	.70	.77	.70	N b W	E b S	E N E	N 89 E	1·8	5·4	1.5	4·17	4·28	...	...
21	.514	.356	.431	.4253	51.2	61.3	53.8	55.15	+ 1.83	.332	.445	.326	.376	.88	.82	.79	.85	E b N	E b S	W N W	N 62 W	1·4	2·0	4.6	1·61	2·78	0.595	...
22	.465	.479	—	—	48.7	54.8	—	—	—	.268	.232	—	—	.78	.53	—	—	N W	N W	N b W	N 53 W	3·2	14·0	3.5	6·04	7·35	0.035	...
23	.737	.774	.733	.7672	45.1	57.4	51.0	52.10	— 1.87	.202	.258	.260	.245	.67	.54	.69	.63	Calm.	S E b S	Calm.	S 26 E	0·0	6·0	0.0	2·43	2·63	...	...
24	.767	.765	.707	.7462	49.8	59.9	55.6	56.23	+ 1.95	.276	.289	.255	.280	.77	.56	.57	.62	Calm.	S b E	E N E	S 89 E	0·0	7·2	0.5	2·79	2·87	...	...
25	.753	.737	.717	.7322	55.2	67.1	60 4	62.27	+ 7.58	.330	.394	.403	.384	.75	.59	.73	.69	E N E	E	E b S	S 88 E	0·5	5·4	0.4	1·64	2·70	0.050	...
26	.709	.633	.527	.6145	61.9	69.8	59.2	64.73	+ 9.75	.489	.502	.366	.466	.88	.69	.72	.75	N N W	S E b S	Calm.	S 83 E	9·0	4·0	0.0	0·21	2·05	0.035	...
27	.353	.224	.304	.2393	59.9	63.9	52.3	58.58	+ 3.30	.497	.369	.379	.392	.96	.61	.96	.81	E b S	S S W	S W b S	S 39 W	1·2	22·0	17.6	11·69	13·16	0.215	...
28	.382	.509	.513	.4622	49.2	62.1	53.4	55.00	— 0.65	.334	.245	.381	.301	.95	.43	.93	.72	S W b W	N W b W	S W b S	S 79 W	10·0	15·8	4.2	6·64	8·63	0.735	...
29	.396	.572	—	—	50.1	61.9	—	—	—	.334	.339	—	—	.92	.61	—	—	S W b W	W b N	N b W	N 43 W	5·2	13·5	8.5	7·36	8·92	inap.	...
30	.897	.940	.906	.9180	46.5	53.0	45.8	48.50	— 7.75	.211	.125	.146	.160	.66	.30	.47	.48	N E b N	E	E	N 83 E	1·0	2·4	0.4	3·67	3·96	...	...
31	.861	.779	.736	.7817	47.6	52.3	51.2	51.58	— 4.07	.214	.253	.303	.263	.64	.64	.81	.69	E N E	E N E	E b N	N 68 E	10·0	6·5	1.0	6·08	6·37	...	...
M	29.6799	29.6570	29.6467	29.6593	50.37	60.70	52.72	55.16	+ 3.68	.284	.315	.298	.298	.75	.58	.72	.67	.....	.....	.....	.....	.....	4.35	8.26	3.57	.....	5.70	3.410	...

Highest Barometer . . . . . 29.986 at 8 a. m. on 14th, } Monthly range=
Lowest Barometer . . . . . 29.224 at 2 p. m. on 27th, } 0.762 inches.

Self-registering Thermometers:
- Maximum temperature . . . . 79°6 on p.m. of 8th } Monthly range=
- Minimum temperature . . . . 39°5 on a. m. of 11th } 40°1
- Mean maximum temperature . . 63°49 } Mean daily range = 16°26.
- Mean minimum temperature . . 47°13 }
- Greatest daily range . . . . . 25°4 from a. m. to p. m. of 8th.
- Least daily range . . . . . 4.4 from a. m. to p. m. of 9th.

Warmest day . . 7th ... Mean Temperature . . . 65°92 } Difference=20°44.
Coldest day . . . 9th ... Mean Temperature . . . 45°48 }

Maximum Radiation { Solar . . . . . 90°8 on p. m. of 8th } Monthly range=
{ Terrestrial . . . . . 27.6 on a. m. of 23rd } 63°2.

Aurora observed on 4 nights, viz.: 10th, 19th, 22nd, and 24th; possible to see Aurora on 22 nights; impossible on 9 nights.

Raining on 11 days; depth, 3.410 inches; duration of fall, 50.6 hours.

Mean of cloudiness=0.41; most cloudy hour observed, 6 a. m., mean=0.49: least cloudy hour observed, 10 p. m., mean=0.27.

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

North.	South.	East.	West.
1269.87	906.32	2080.40	956.00

Resultant direction, N 72° E; Resultant Velocity, 1.59 miles per hour.
Mean velocity of the wind 5.70 miles per hour.
Maximum velocity . . . 24.8 miles per hour, from 2 to 3 p.m. on 27th.
Most windy day . . . . . 27th—Mean velocity, 13.16 miles per hour.
Least windy day . . . . . 26th—Mean velocity, 2.05 do
Most windy hour, noon to 1 p. m.—Mean velocity, 8.96 do } Difference
Least windy hour, 11 p.m., midnight—Mean velocity, 3.48 do } 5.48 miles.

4th. Perfect solar halo from 7 a. m. to 2 p. m.
8th. Thunderstorm, with heavy rain, from 4 to 5 p. m.
11th. Hoar frost at 5 a. m.
13th. Lunar corona from 8 p. m. to midnight.
14th. Lunar halo from 9 to 11 p. m.—very perfect.
16th. Solar halo from 7 to 8 a. m.
17th. Thunderstorm from 1 to 4 a. m., dense fog from 4 p. m. to midnight, and lunar corona at 11.50 p. m.
18th. Solar halo with brilliant colors at 2 p. m., and sheet lightning from 9 p. m.
21st. Thunderstorm from 2.15 to 4 p. m.
22nd. Shower of hail and rain at 10.30 a. m.
23rd. Hoar frost at 6 a. m.
25th. Sheet lightning round the horizon from 9 p. m.
26th. Thunderstorm from 5.40 to 6 a. m.
27th. Thunderstorm from 5.55 to 6.20 a. m.
29th. Sheet lightning in S. W. at 11 p. m.

The mean temperature of May, 1859, was 3°78 above the average of 20 years, and it was the warmest May but one (1846) during that period.

The Resultant Direction and Velocity of the Wind for the month of May, from 1848 to 1859 inclusive, were respectively N. 4° E., and 1.34 miles.

COMPARATIVE TABLE FOR MAY.

YEAR.	TEMPERATURE. Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	RAIN. No. of days.	Inches.	SNOW. No. of days.	Inches.	WIND. Resultant Direction.	Resultant Velocity.	Mean Velocity
	°	°	°	°	°					°		
1840	53.8	+ 2.4	74.5	30.8	43.7	9	4.150	...	not	...	...	...
1841	50.5	— 0.9	76.2	26.6	49.6	11	2.350	1	recor	...	...	0.35 lbs
1842	49.1	— 2.3	74.3	30.0	44.3	7	1.275	...	ded.	...	...	0.53 "
1843	49.1	— 2.3	79.6	28.9	50.7	5	1.570	...	...	...	...	0.52 "
1844	53.6	+ 2.2	77.7	29.0	48.7	14	5.670	...	...	...	...	0.30 "
1845	49.6	— 1.8	76.6	29.4	47.2	8	2.300	...	...	...	...	0.35 "
1846	55.5	+ 4.1	78.1	34.3	43.8	9	4.375	...	...	...	...	0.46 "
1847	54.4	+ 3.0	72.5	27.8	44.7	12	2.040	...	...	...	...	0.29 "
1848	54.1	+ 2.7	78.5	31.9	46.6	13	2.520	...	...	N 40 W	1.31	4.93ms.
1849	48.0	— 3.4	72.5	32.7	39.8	16	5.115	...	...	N 51 E	1.97	5.33 "
1850	47.6	— 3.8	76.3	31.1	45.2	7	0.545	1	Inap.	N 64 W	2.05	6.32 "
1851	51.3	— 0.1	73.2	28.7	44.5	12	2.950	1	0.5	N 32 W	1.59	6.34 "
1852	51.4	0.0	73.3	34.5	38.8	7	1.125	1	Inap.	S 82 W	0.99	4.00 "
1853	50.9	— 0.5	78.4	38.4	40.0	17	4.420	1	Inap.	N 2 W	0.83	5.16 "
1854	52.2	+ 0.8	69 0	27.6	41.4	11	4.630	...	...	E	0.40	5.38 "
1855	53.1	+ 1.7	74.8	33.9	40.9	6	2.565	2	0.9	N 1 W	2.76	5.93 "
1856	50.5	— 0.9	80.1	35.5	44.6	14	4.580	1	Inap.	N 4 E	3.99	9.81 "
1857	49.9	— 2.5	72.5	27.9	44.6	15	4.145	1	Inap.	N 23 W	1.14	8.13 "
1858	49.9	— 2.5	66.0	35.0	31.0	17	6.367	...	...	N 42 E	3.33	9.30 "
1859	55.2	+ 3.8	76.2	41.5	34.7	11	3.410	...	...	N 72 E	1.59	5.70 "
Mean	51.38	...	75.02	31.78	43.24	11.5	3.305	0.5	0.08	...	...	6.36

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—FEBRUARY, 1859.

(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 Vapour.			Humidity			Direction of Wind.			Velocity in miles per hour.			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.	6A.M.	2P.M.	10PM	6 A. M.	2 P. M.	10 P. M.	6 A.M.	2 P.M.	10P.M.			6 A. M.	2 P. M.	10 P. M.
1	30.023	30.029	30 091	8.2	24.9	10.1	.048	.088	054	.77	.67	.78	s w	N by E	N N E	0.15	0.22	0.78	...	Inap	Snow.	Cirr. Str. 6.	Clear, ft.Au.B.
2	.080	.006	.029	—8.4	10.0	—4.3	.021	.054	.024	.62	.78	.65	N by E	N by E	N E	2.98	1.33	0.81	...	...	Clear.	Clear.	Do. Zo. L v.B.
3	29.825	29.719	29.606	—4.1	13.6	9.0	.027	.063	.037	.70	.81	.88	N E b E	N E b E	N E b E	21.27	19.26	20.20	...	4.30	Snow.	Snow.	Snow.
4	.491	.597	.730	8.9	26.2	20.1	.057	.117	.101	.89	.82	.85	N E b E	W S W	S by W	20.20	2.28	0.21	...	3.00	Do.	Cirr. Str. 6.	Cirr. Str. 10.
5	.903	30.025	30.233	10.8	19.8	16.3	.048	.081	.074	.70	.77	.83	W S W	S W	W S W	1.85	3.63	2.82	...	...	Clear.	Do. 2.	Do. 10.
6	30.088	.034	.092	15 0	18.9	6.7	.074	.077	.049	.85	.76	.87	N N E	N E b E	N W b N	0.86	6.52	0.12	...	1.72	Snow.	Snow.	Clr., ft. Au.Bo.
7	.174	.234	.202	—5.1	20.3	1.0	.042	.065	.034	.76	.62	.71	W	S by E	E	...	...	...	...	...	Clear.	Clear.	Do.
8	.076	29.930	29.987	—4.2	20.9	23.0	.029	.085	.106	.80	.78	.86	N N E	N E b E	S E by S	2.77	0.43	0.03	...	...	Do.	Cirr. St. 6	Do.
9	29.654	.501	.500	21.4	37.8	31.2	.090	.196	.161	.78	.86	.95	S by E	S E b S	W by S	0.36	...	...	...	3.04	Cir. Str. 10.	Snow.	Cirr. Str. 10.
10	.773	.779	30.066	1.0	6.9	—6.1	.034	.045	.028	.71	.68	.80	W N W	W S W	S W	13.16	4.57	7.71	...	...	Clear.	Clear.	Clear.
11	30.143	30.460	.213	—18.7	13.6	0.5	.013	.057	.036	.60	.72	.84	S S W	S S W	S W	0.01	0.01	0.01	...	...	Do.	Do.	Cirr. 10 L. Ha.
12	.127	.025	.161	—10.6	26.0	—5.5	.015	.105	.031	.58	.75	.80	S W	S S W	E	...	...	...	...	...	Str. 2.	Do.	Clear.
13	.141	30.000	29.894	—23.·	22.2	9.1	.010	.084	.051	.59	.71	.75	S S W	S	S by E	...	...	0.13	...	...	Clear.	Do.	Lt. Cirr. L. Ha.
14	29.874	29.767	.881	10.6	29.1	14.3	.054	.123	.017	.78	.77	.81	S W	W by N	S S W	3.97	11.40	2.00	...	...	Cir. Str. 10.	Do	Str. 4.
15	.776	.639	.541	15.2	22.2	24.2	.065	.095	.115	.74	.79	.88	N E b E	N E b E	E	0.11	0 16	0.21	..	0.49	Do. 9.	Snow.	Cirr. Str. 10.
16	.670	29 737	.971	32.4	39.8	24.1	.156	188	.105	.85	.77	.80	W S W	W S W	N	3.07	3.08	8.25	Inap.	...	Do. 9.	Cirr. Str. 8.	Clear.
17	30.154	30.140	30.025	15.1	33.5	19.9	.063	.160	.091	.81	.79	.85	E by N	N E b E	N E b E	...	...	4.56	...	...	Clear.	Do. 6.	Cirr. Str. 4.
18	29.814	29.791	29.917	30.4	43.0	37.0	.148	.237	.201	.89	.87	.86	S S E	S W b W	S S W	13.76	2.31	2.17	...	1.30	Snow.	Do. 8.	Do. 4.
19	29.934	.827	.661	17.3	44.9	38.1	.078	.203	.208	.85	.80	.90	S	N E	E S E	0.68	0.76	5.10	...	...	Clear.	Cirr. Str. 3.	Do. 10.
20	.178	28.872	.010	35.7	43.0	32.3	.183	.261	.156	90	.96	.89	S E b E	S S W	W S W	7.85	6.32	20.70	0.512	Inap	R'n, with thu.	Cirr. Str. 10.	Clear.
21	.347	29.471	.734	10.1	15.0	14.0	.039	.055	.067	.57	.64	.81	W by S	W S W	W	42.90	20 47	21.06	...	...	C. Str. 8.	Do. 9.	Cirr. Str. 6.
22	.855	.861	29.804	13.5	21.4	12.0	.072	.085	.057	.91	.78	.74	S W	S W	E N E	20.21	2.66	9.63	...	..	Clear.	Clear.	Clear. Au. Bo
23	.878	.797	.781	8.9	27.0	25.0	.051	.117	105	.77	.82	80	N E b E	N E b E	S S E	1.22	3.16	...	...	...	C. Str. 3.	Cirr. Str. 10.	Cirr. Str. 10.
24	.764	.850	30.246	18.1	27.0	10.1	.100	.111	.057	.74	.75	.70	W by S	N N W	N N W	0.03	5.47	14.32	...	...	Do. 3	Do. 8.	Clear, Au. Bo.
25	30.335	30.260	.227	—6.7	14.1	4.7	.021	.057	.043	.62	.72	.75	N N E	E	N E	9.05	4.62	1.08	...	...	Clear.	Clear.	Do. do.
26	.000	29.703	29.624	—6.6	11 0	21.8	.021	.062	.101	.64	.89	.86	N N E	N E b E	S S E	12.70	13.57	10.75	...	8.60	Do.	Snow.	Cirr. Str 10.
27	29.779	.615	.557	10.4	39.0	30.1	048	.216	.148	.69	91	.89	S S E	S S E	S W	2.86	1.73	0.15	...	...	Do.	Cirr. Str. 9.	Snow.
28	.500	.697	.794	27.6	28.0	16.1	.123	.117	.065	.82	76	.74	W by S	W	W S W	0.28	15.43	9.72	...	1.10	Snow.	Do. 9.	Cirr. Str. 9.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—MARCH, 1859.

(NINE MILES WEST OF MONTREAL.)

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

Latitude—45 deg. 32 min. North. Longitude—73 deg. 35 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32°			Temp. of the Air.			Tension of Vapour.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			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	30.161	30.166	30.316	—7.8	7.9	0.8	.020	.034	.036	.70	.54	.84	w by s	w	s w b w	19.90	11.55	1.22	...	...	Clear.	Clear.	Clear, Au. Bo.
2	.492	.422	.414	—18.7	23.0	0.0	.013	.089	.036	.69	.72	.84	s s w	s	s	19.20	0.56	2.32	...	...	Do.	Do.	Do. do.
3	.234	29.951	29.772	—10.6	17.1	21.9	.021	.068	.102	.77	.75	.92	N E	N E b E	S E	0.31	7.37	11.67	...	...	Do.	Cirr. Str. 10.	Snow.
4	29.361	.250	.315	21.7	33.0	29.6	.090	.168	.154	.78	.89	.94	E S E	S S E	N E b E	17.70	5.52	1.75	...	5.50	Snow.	Snow.	Cirr. Str. 10.
5	29.354	.418	.657	26.2	40.6	34.5	.123	.188	.169	.87	.77	.84	N E b S E	E S E	w by s	11.93	6.31	12.16	...	Inap.	Cirr. Str. 10.	Cirr. Str. 10.	Do. 10.
6	.050	30.102	30.114	30.6	35.1	35.0	.142	.177	.156	.84	.85	.85	w	w	w s w	10.98	5.40	8.08	...	...	Do. 9.	Do. 8.	Do. 10.
7	30.047	29.932	29.975	27.9	38.6	19.0	.123	.186	.087	.82	.81	.81	N E b E	N E b E	N E	3.60	3.32	3.40	...	...	Do. 10.	Str. 2.	Clear.
8	29.589	.560	.669	18.7	31.5	24.2	.077	.149	.105	.76	.84	.80	N E b E	N E	N E	24.21	21.95	12.82	...	...	Do. 10.	Cirr. Str. S	Do. Aur. Bor.
9	.789	.874	.950	12.4	>2.9	23.1	.154	.215	.103	.71	.79	.85	w by s	s w b s	N w b w	5.47	2.46	0.31	...	...	Clear.	Clear,	Clear.
10	30.033	.021	30.065	11.2	19.1	20.7	.057	.200	.117	.79	.82	.82	s by w	s E b s	S E	0.34	0.37	0.27	...	...	Do.	Do.	Cirr. Cum. 4.
11	.014	.072	29.842	21.4	46.5	38.1	.090	.251	.208	.78	.81	.91	N N E	N N E	S E b S	4.30	5.33	10.16	...	...	Do.	Do.	Cirr. Str. 10.
12	29.617	.742	.804	40.1	47.5	41.6	.225	.291	.228	.91	.89	.87	S E b S	S	w s w	19.73	14.40	4.76	0.262	...	Rain,	Cirr. Str. 10.	Do. 8.
13	.860	.994	30.110	36.7	47.0	36.6	.184	.283	.184	.85	.85	.85	S	w s w	s w	13.42	14.26	3.80	...	...	Cirr. Str. 4.	Str. 2.	Do. 8.
14	30.152	.094	29.879	24.2	44.5	29.7	.109	.231	.210	.83	.80	.86	E by s	N E b E	N E b E	0.50	3.20	5.73	...	...	Do. 4.	Cirr. Str. 6.	Do. 10.
15	29.458	.439	.476	38.2	46.0	37.0	.201	.248	.199	.87	.88	.89	S E	S E b E	S W	13.90	9.60	5.40	0.230	...	Rain.	Cirr. Str. 10.	Do. 9.
16	.600	.819	.930	32.0	36.1	34.1	.149	.170	.162	.84	.80	.84	w s w	w by s	S W	2.22	20-38	20.45	...	...	Cirr. Str. 9.	Do. 4.	Clear.
17	.999	.967	.911	20.4	48 3	37.4	.136	.285	.193	.85	.84	.86	s s w	S E b S	S E b S	5.76	0.77	0.01	...	...	Clear.	Cirr. Str. S.	Cirr. Str. 10.
18	.950	.204	.194	36.3	44.7	37.7	.184	.258	.198	.88	.88	.86	E	N E b E	N E	2.33	8.81	3.37	0.217	...	Cirr. Str. 10.	Rain.	Do. 10.
19	28.620	28.635	.078	42.6	46.1	22.5	.137	.290	.084	.87	.92	.71	s w	s by E	w b s	11.07	6.88	19.72	0.346	Inap.	Rain.	Cirr. Str. 8.	Do. 8!
20	29.317	29.525	.759	19.8	27.2	26.3	.087	.111	.117	.84	.78	.82	w by N	w by N	w by N	29.98	32.22	16.60	...	...	Cirr. Str. 8.	Do. 9.	Clear.
21	.924	29.932	.998	19.7	40.1	30.4	.081	.203	.142	.77	.82	.84	w by N	s w	s s E	20.20	11.60	0.87	...	...	Clear.	Cirr. Str. 2.	Do. Aur. Bor.
22	.907	.850	.700	25.5	34.2	30.1	.111	.155	.148	.81	.78	.89	N E b E	N N E	N N E	2.45	10.23	10.45	...	2.90	Str. 4.	Snow.	Cirr. Str. 10.
23	.762	.798	.846	28.2	44.0	36.3	.129	.241	.170	.84	.85	.80	s w b w	w s w	s s w	4.16	8.47	2.28	...	...	Cirr. Str. 10.	Cirr. Str. 4.	Clear.
24	.771	.567	.516	26.7	34.4	38.7	.123	.169	.223	.87	.84	.98	N E b E	E N E	E N E	3.22	6.62	8.47	0.610	...	Do. 10.	Rain.	Cirr. Str. 9.
25	.437	.421	.547	34.0	52.1	36.5	.182	.270	.191	.95	.72	.89	N E b E	s w b w	s by w	11.33	3.51	2.13	0.230	...	Rain.	Cirr. Str. 4.	Do. 9.
26	.530	.544	29.624	33.2	37.0	32.0	.168	.176	.162	.89	.81	.89	s w b w	s w b w	s w b w	1.46	7.65	2.22	...	Inap	Cirr. Str. S.	Do 6.	Do, 4.
27	.524	.567	.661	25.2	38.2	32.5	.105	.168	.149	.80	.81	.84	w s w	w by s	s w	24.22	0.97	12.59	...	...	Clear.	Cirr. 3.	Clear, Au. Bo.
28	.751	.671	.600	27.4	40.9	34.3	.128	.175	.155	.82	.69	.79	E N E	N E b E	N E b E	0.46	4.08	9.76	...	...	Do.	Cirr. Str. 6.	Do.
29	.397	.200	.144	34.2	50.1	40.2	.162	.309	.219	.84	.85	.87	N E b E	S E	S W	8.84	2.73	13.80	0.570	...	Cirr. Str. 8.	Rain.	Cirr. Str. 9.
30	.360	.467	.580	33.1	40.0	34.1	.156	.167	.155	.85	.68	.79	s w b s	w s w	w s w	22.80	18.61	14.63	...	...	Do. 8.	Cirr. Str. 2.	Str. 2. Au. Bo.
31	.534	.514	.760	30.1	38.5	29.6	.130	.180	.136	.78	.77	.83	w s w	w	w	9.57	16.02	20.14	Inap.	...	Do. 4.	Do. 8.	Clr. ft. Au. Bo.

REMARKS ON THE ST MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR FEBRUARY, 1859.

Barometer	Highest, the 11th day	30.460
	Lowest, the 20th day	28.872
	Monthly Mean	29.857
	Monthly Range	1.588
Thermometer...	Highest, the 20th day	43°.1
	Lowest, the 13th day	-23°.6
	Monthly Mean	15°.62
	Monthly Range	66°.7
Greatest Intensity of the Sun's Rays		58°.7
Lowest point of Terrestrial Radiation		-23°.9
Mean of Humidity		.776

Rain fell on 2 days, amounting to 0.512 inches; it was raining 9 hours and 15 minutes, and was accompanied by thunder on 1 day.
Snow fell on 10 days, amounting to 23.55 inches; it was snowing 92 hours 45 minutes.
The most prevalent wind was N. E. by E.
The least prevalent wind was N.
The most windy day was the 21st; mean miles per hour 23.14.
The least windy day the 12th; mean 0.00.
Aurora Borealis visible on 5 nights.
Lunar Halo visible on 2 nights.
Zodical Light very bright.
The electrical state of the atmosphere has indicated moderate intensity.
Ozone was present in moderate quantity.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR MARCH, 1859.

Barometer	Highest, the 2nd day	30.492
	Lowest, the 19th day	28.620
	Monthly Mean	29.686
	Monthly Range	1.872
Thermometer...	Highest, the 24th day	47°.5
	Lowest the 3rd day	-11°.6
	Monthly Mean	30°.93
	Monthly Range	59°.01
Greatest Intensity of the Sun's Rays		77°.6
Lowest point of Terrestrial Radiation		-11°.9
Mean of Humidity		.823

Rain fell on 8 days, amounting to 2.498 inches; it was raining 59 hours and 50 minutes.
Snow fell on 4 days, amounting to 8.40 inches; it was snowing 11 hours and 45 minutes.
The most prevalent wind was N. E. by E.
The least prevalent wind was E.
The most windy day was the 20th; mean miles per hour 26.26.
The least windy day was the 10th; mean miles per hour 0.32.
Aurora Borealis visible on 7 nights.
The electrical state of the atmosphere has indicated very high tension.
Ozone was present in large quantity.
Woodpecker seen on 1st day.
Crows first seen on 8th day.
Song Sparrow first heard on 14th day.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—APRIL, 1859.

(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	29.900	29.870	30.030	26.7	37.0	30.2	.111	.164	.130	81	76	78	W N W	W N W	W N W	19.72	21.70	18.83	...	Inp.	...	C St. 8.	C. St. 2.	Clear ft. Au. Bor.
2	30.020	.942	29.924	23.0	41.1	42.5	.096	.197	.137	74	78	76	W b N	W b N	S	5.87	5.90	0.57	...	0.630	...	Clear.	Do. 4.	D. do. do.
3	29.350	.230	341	33.2	40.0	34.1	.161	.203	.182	85	82	95	NE b E	NE b E	W	5.72	9.38	10.14	...	0.030	...	C. St. 10.	Do. 8.	Rain.
4	.217	.260	.414	32.1	32.5	27.0	.162	.143	117	89	79	82	W	W N W	W N W	14.81	21.96	22.27	...	...	...	Do. 8.	Do. 8.	C. St. 4.
5	.426	.402	.479	21.0	32.0	27.2	.082	.143	.117	72	99	82	N W	W	W N W	22.92	49.90	19.70	...	...	...	Do. 4.	Cirr. 2.	Clear.
6	.534	.550	.697	21.9	38.4	28.2	.096	.186	.135	85	81	88	W b N	W	W b W	19.50	13.00	18.20	...	...	...	Do. 6.	C. St. 4.	Do. Aur. Bor.
7	.695	.564	.672	23.0	40.6	35.0	.090	.203	165	74	82	84	W S W	W	W S W	7.00	9.08	5.18	...	...	...	*Ligt.* Cr. 2.	Clear.	C. St. 4.
8	.750	.746	29.916	31.6	41.0	29.0	.136	.190	.129	79	74	82	N	W	N b W	3.85	9.05	12.20	...	...	...	Do. 4.	Do.	Clear ft. Au. Bor.
9	30.118	30.052	30.160	19.1	46.5	29.0	.077	.269	.129	78	88	82	W N W	W N W	N b W	18.77	16.90	10.57	...	...	...	Clear.	Do.	Do. do. do.
10	.157	29.974	.012	18.1	45.6	32.0	.072	.251	.149	75	84	84	N E	S b E	NE b E	4.22	1.35	1.06	...	...	...	Do.	Do.	C. C. St. 8.
11	29.820	.716	29.675	29.1	34.4	33.1	.123	.169	.168	77	84	89	NE b E	S E	E b S	8.03	9.80	9.50	...	0.660	3.00	C. C. St. 9.	Snow.	Snow.
12	.700	.733	.966	34.2	39.4	36.7	.175	.195	.206	89	82	95	E b S	NE b E	N W	6.51	0.03	0.42	...	0.214	...	C. St. 10.	C. St. 8.	C. C. St. 6.
13	.951	.927	30.040	30.0	46.5	37.0	.136	.280	.184	83	88	85	W b N	W b S	NE b E	1.28	0.92	5.71	...	...	...	Clear.	Do. 9.	C. St. 2.
14	.934	.640	29.527	32.0	40.0	34.0	.162	.208	.182	89	82	95	NE b E	S E b E	S E b E	15.54	11.16	10.43	...	0.214	0.07	C. C. St. 8.	Rain.	Rain.
15	.500	.601	.397	38.0	45.6	41.0	.208	.234	.241	91	80	95	S W b S	S E b S	S b W	16.42	4.22	7.05	...	0.550	...	Do. 6.	C. St. 9.	Do.
16	.351	.347	.541	35.1	49.6	36.2	.190	.278	.190	95	81	88	W S W	W S W	W S W	8.30	4.46	15.42	...	0.563	Inp.	Sleet.	C C. St. 4.	Clear.
17	.610	.700	.851	32.1	49.0	38.6	.179	.258	.186	98	74	81	W	W S W	N b W	7.22	8.33	0.01	...	...	...	C. St. 8.	C. St. 6.	C. St. 4.
18	.857	.879	.914	38.9	49.5	38.0	.169	.253	.151	84	74	67	N N E	W S W	N W	5.65	5.73	2.07	...	...	...	Clear.	Clear.	Clear.
19	.817	.661	.711	28.2	54.4	43.0	.105	.165	.106	70	40	39	S W	N N W	N N W	1.05	4.71	11.60	...	...	...	Do.	C. St. 4.	Do.
20	.760	.600	.714	34.2	53.8	40.2	.175	.177	.145	89	45	60	W b N	W N W	N b W	7.68	11.22	13.40	...	...	...	C. Cirr. 4.	Clear.	Do.
21	.752	.621	.749	30.0	61.6	39.0	.130	.290	.195	78	53	82	N b W	S W	N b W	4.30	2.22	6.66	...	...	...	Clear.	C. St. 2.	Do, Aur. Bor.
22	.748	.670	.665	34.2	52.0	42.2	.155	.172	.221	79	52	82	N E b E	N E b E	N E b E	7.76	5.97	2.40	...	...	...	C. C. St. 4.	C. St. 6.	C. St. 10.
23	.497	.171	.030	35.4	40.4	37.9	.183	.203	.208	90	82	92	N E b E	N E b E	N E b E	12.09	32.85	21.00	...	2.221	Inp.	C. St. 10.	rain.	Rain.
24	28.923	28.999	.414	37.6	44.3	38.7	.214	.196	.193	95	68	86	S S W	W S W	W b S	20.00	8.00	0.00	...	...	...	Do. 10.	C. St. 8.	C. St. 2.
25	29.714	29.797	.842	36.0	54.0	43.1	.177	.237	.222	85	58	85	W b S	S S W	S E	0.00	4.14	7.90	...	...	...	Clear.	Clear.	Cirr. St. 6.
26	.774	.652	.676	43.0	64.2	45.0	.231	.446	.275	83	77	92	S b E	S b E	S S E	1.50	8.80	5.60	...	...	...	Do.	Cirr. Cir. 4.	C. St. 2.
27	.900	.903	.976	30.0	47.7	36.2	.148	.225	.173	90	70	78	N b W	W	W b S	12.85	9.11	0.96	...	...	...	Do.	Clear.	Clear ft. Au. Bor
28	30.100	30.005	30.007	35.0	63.0	39.1	.142	.327	.195	70	57	82	W N W	S b W	S b W	3.53	0.71	0.90	...	...	...	Do.	Do.	Do.
29	.000	29.802	29.840	44.0	76.3	54.6	.241	.436	.308	84	49	74	S W b S	S W	W S W	1.85	5.87	1.90	...	...	...	Do.	Do.	Do. ft. Aur. Bor.
30	29.937	.900	.930	41.1	69.1	45.6	.212	.529	245	82	75	80	E b S	E b S	N	4.52	0.56	12.47	...	...	...	Do.	Do.	Do.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—MAY, 1859.

(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.	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	30.026	29.948	29.915	42.2	66.3	52.2	.222	.348	.308	.83	.54	.79	w b s	w b s	s	3.45	2 61	5.36	...	...	...	Clear.	Clear.	Clear.
2	.034	30.044	30.145	42.1	61.7	47.0	.212	.290	.234	.82	.53	.73	N E b N	N W	N	7.65	10.22	3.73	...	...	...	Do.	Do.	Clear, ft. Au. B.
3	.187	.102	.170	38.1	69.1	50.2	.186	.398	.258	.81	.56	.71	N E	W S W	S W	6.41	3.13	0.86	...	...	...	Do.	Do.	Do.
4	.135	.064	.059	37.0	79.3	60.3	.189	.362	.262	.86	.36	.51	S E b s	S b E	S S E	0.01	0.47	0.33	...	...	...	Do.	Do.	Do.
5	29.983	29.990	29.841	45.7	76.1	66.5	.275	.470	.483	.92	.52	.72	S	S W	S W	0.00	0.82	0.00	...	Inp.	...	Hazy.	Hazy.	C. St. 9.
6	.810	.827	.840	66 0	82.0	70.6	.353	.541	.449	.56	.50	.61	S S W	S S W	S W	0.00	0.17	3.45	...	...	...	Clear.	Cir. St. 4.	Clear.
7	.740	.646	.640	63.0	83.0	72.1	.412	.601	.429	.75	.54	.55	S W	S W b W	S W b W	8.93	7.30	9.36	...	...	...	Do.	Hazy.	Hazy.
8	.634	.533	.667	56.0	65.1	44.0	.370	.337	.248	.84	.55	.8	N E b E	N E b E	N E b E	3.20	12.81	12.50	...	...	...	C. St. 3.	Cir. St. 8	Rain.
9	.734	.699	.670	39.7	64.2	44.0	195	.403	.211	.82	.67	.72	N E b E	N E	N N E	9.30	21.16	0 52	...	0.400	...	Do. 8.	Do. 6.	Cir. C. 4.
10	.797	.786	.835	35.5	74.2	49.6	.162	.680	.295	.80	.80	.85	N b E	N b E	N b E	0.37	2.18	1.60	...	...	...	Clear.	Clear.	Clear.
11	.989	.952	.997	43.0	72.1	55.2	.215	.296	.321	.79	.38	.74	N b E	S S E	S E	1.52	7.57	13.87	...	...	...	Do.	Do.	C. St. 4.
12	.999	.892	.897	51.1	76.2	62.7	203	.336	.399	.55	.57	.72	S S E	S E	S E	11 39	6.66	6.72	...	...	...	C. C. St. 10.	Cir. 2.	C. C. 4 Lr. H.
13	.830	759	.879	58.0	78.5	67.1	.394	.550	.480	.82	.58	.75	S S E	W S W	W b S	2.38	5.20	11.55	...	...	...	Do 8.	Cir. St. 10.	Clear.
14	30.107	30.100	30.075	45.0	65.0	50.5	.189	.244	.240	.64	.57	.68	N b E	S E b S	S E	10.87	8.26	0.57	...	...	...	Clear.	Clear.	Cir. Str. 4.
15	.081	.062	.040	44.2	70.3	53.1	.218	.293	.257	76	.40	.66	S S b E	S	S E b S	0.88	3.33	1.87	...	...	...	Ir. Str. 2.	Do.	Clear.
16	29.902	29.762	29.732	44.7	77.4	60.4	.241	.389	.255	.84	.42	.49	S b E	S S E	S S E	0.07	1.53	12.20	...	...	...	Clear.	Do.	C. St. 10.
17	.865	.620	.645	44.1	49.5	51.0	248	.332	.351	.88	.92	.96	S S E	S E b S	S E b S	19.60	9.81	5.26	...	0.703	...	Rain.	Rain,	Do. 8.
18	.645	.517	.644	51.2	70.0	61.1	.369	.581	.415	.89	.60	.89	S S E	S E	S E b E	0.98	0.32	13.55	...	...	...	Cir. Str. 8.	C 2.	Str. 4.
19	.637	.821	.936	59.3	50.4	49.0	.469	.328	.303	.94	.88	.89	S E b S	N b E	S S E	0.17	18.25	1.97	...	0.226	...	Rain.	Rain.	Clr. 4 Au. Br.
20	.991	.939	.994	44.0	62.5	56.0	.218	.363	.370	.88	.64	.84	N E b E	E b N	S E	7.71	11.07	0.42	...	...	...	Cir. Str. 10.	Cir. Str. 8.	Clear.
21	.957	.642	.612	54.6	74.1	59.0	.362	.568	.404	.87	.67	.79	E b N	S E b S S	E b S	3.86	15.73	1 91	...	...	...	Cirr. C. St. 6.	Do. 6.	C. St. 8.
22	.517	.556	.630	58.0	66.6	52.1	.429	.340	.308	.91	.52	.79	S W	S W	S S W	22.93	8 31	6.78	...	0.120	...	Rain.	Do. 6.	Cir. C. St. 6.
23	.806	.800	.877	49.0	64.7	55.5	.253	.314	.321	.74	.53	.74	S W	S W	S W	10.22	10.31	12.43	...	...	...	Clear.	Clear.	Clear.
24	.961	.914	.883	54 4	82.0	62.0	.528	.738	.390	.77	.60	.74	S W	S b E	S b E	1.97	3.93	0.00	...	...	...	Do.	Do.	Do.
25	.975	.885	.991	60.5	80.2	67.0	.396	.506	.425	.76	.43	.64	S E b S	S E	S E	0.18	4 32	4.37	...	...	...	Do.	Cir. St. 4.	Str. 2.
26	.921	.840	.885	63.7	91.0	68.3	.478	.687	.612	.83	.47	.96	S S E	S b W	S W	0.61	1.80	2.77	...	0.433	...	Do.	Clear.	C. St. 6 th. & l.
27	.674	.504	.491	66.4	80.0	64.5	598	.677	.623	92	60	.86	S W b S	S W	W N W	0.06	5.78	9.77	...	0.583	...	Fog.	Cir. St. 9.	Rain.
28	.425	.517	.650	59.2	62.2	53.0	.358	.420	.351	.73	.77	.90	w b s	W S W	W S W	4.35	12.05	19.85	...	0.269	...	Cir. C. Str. 6.	Do. 10.	Cir. 4.
29	.625	.537	.674	49.0	62.8	49.0	297	.455	.309	.85	.80	.89	S b E	W S W	N b W	3.42	5.07	8.76	...	0.863	...	Rain.	C. Cir. St. 4.	C. Str. 10.
30	30.000	.999	30.094	42.5	64.1	51.1	.222	.520	.270	.81	.89	.72	N W	W S W	S S W	6.45	5.30	8.16	...	...	...	Clear, frost.	Clear.	Clear.
31	.041	.917	29 928	51.0	73.0	59.9	.302	.416	.352	.82	.52	.70	S S E	S S E	S S E	0.15	1.81	1.37	...	...	...	Do. do.	Cir. 6	C. St. 9.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR APRIL, 1859.

Barometer	Highest, the 9th day	30.160
	Lowest, the 24th day	28.928
	Monthly Mean	29.638
	Monthly Range	1.232
Thermometer	Highest, the 29th day	76°3
	Lowest, the 10th day	16°1
	Monthly Mean	38°63
	Monthly Range	60°2
Greatest Intensity of the Sun's Rays		82°3
Lowest point of Terrestrial Radiation		26°0
Mean of Humidity		.792

Rain fell on 9 days, amounting to 4.422 inches; it was raining 41 hours and 48 minutes.
Snow fell on 4 days amounting to 3.97 inches; it was snowing 18 hours and 15 minutes.
The most prevalent wind was W. by S.
The least prevalent wind N.
The most windy day was the 5th; mean miles per hour, 34.17.
The least windy day was the 23th; mean miles per hour, 1.71.
Aurora Borealis visible on eight nights.
The electrical state of the atmosphere has indicated high tension.
Ozone was in rather large quantity.
First Steamer at Montreal 4th day.
Swallows (*Hirundo rufa*) first seen 19th day.
Frogs (*Rana Fontinalis*) first heard 21st day.

REMARKS ON THE ST MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR MAY, 1859.

Barometer	Highest, the 3rd day	30.187
	Lowest, the 27th day	29.491
	Monthly Mean	29.834
	Monthly Range	0.696
Thermometer	Highest, the 27th day	99°.2
	Lowest, the 1st day	30°.2
	Monthly Mean	59°42
	Monthly Range	69°.0
Greatest intensity of the Sun's Rays		104°.6
Lowest point of Terrestrial Radiation		25°.2
Mean of Humidity		.708
Amount of evaporation		2.93 inches.

Rain fell on 9 days amounting to 3.856 inches, it was raining 52 hours 5 minutes, and was accompanied by thunder on 3 days.
The most prevalent wind was S. E.
The least prevalent wind N.
The most windy day the 22nd; mean miles per hour 9.34.
The least windy day the 5th; mean miles per hour 0.27.
Aurora Borealis visible on 2 nights.
Lunar Halo visible on 1 night.
Solar Halo visible on 1 day.
Frost on 3 mornings the 1st, 30th and 31st.
Humming birds first seen the 18th.
Lampyris Corusca (Fire flies) first seen the 24th.
Alosa (Shad) first caught the 23rd.