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THE

CANADIAN

Naturalist & Geologist,

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VOL. VI. DECEMBER, 1861. No. 6.

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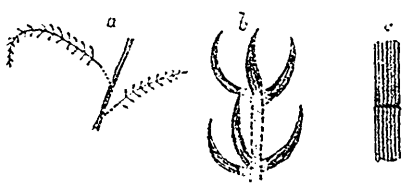

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ARTICLE XXX.—*On the recent discoveries of Gold in Nova Scotia.* By J. W. DAWSON, LL.D., F.G.S., &c.

(Read before the Natural History Society.)

The discoveries of gold recently made in Nova Scotia, are of much interest both in a geological and commercial point of view; and should they exercise an influence on the destinies of that Province, comparable with that which similar discoveries have produced in California and Australia, they will not be without importance to Canada, and will probably contribute to attract attention to other mineral resources of the Lower Provinces heretofore neglected. In the present paper, I propose to record the leading geological facts connected with these discoveries, using materials collected in my former geological researches in Nova Scotia, and the facts communicated to me by friends who have visited the localities.

In a paper on the Silurian and Devonian rocks of Nova Scotia, published in Vol. V of the *Canadian Naturalist*, p. 132, et seq., I referred very shortly to a series of metamorphic rocks extending along the Atlantic coast of the Province. I stated that it has afforded no fossils; but from its apparent relation to the fossiliferous Silurian rocks further inland, and to the older slate series of

Newfoundland, it may be inferred to belong to the lower part of the Lower Silurian system. The map attached to that paper and here reproduced, shews the geographical position of the beds, which extend along the whole Atlantic coast, from Cape Canso to Cape Sable.

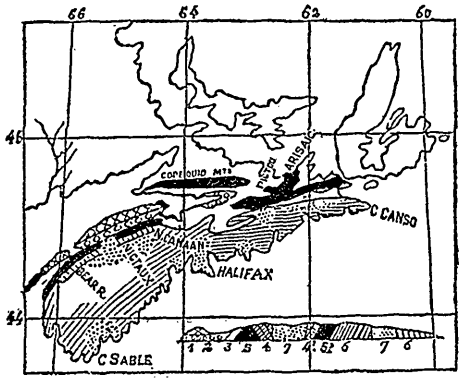

Fig. 1.—*Explanation of the Map and Section.*

(1) Secondary Trap.
(2) New Red Sandstone (Permian or Triassic.)
(3) Carboniferous. (In eastern part of Nova Scotia proper.)
(4) Devonian.
(5) Middle and Upper Silurian.
(6) Metamorphosed Lower Silurian. (Auriferous region.)
(7) Granite.

The numbers refer to the section and to the corresponding shades of the map.

In my "Acadian Geology," (1855) a more full description is given of this "Atlantic Coast Metamorphic District," extending from p. 346 to 365, and including some remarks on the probabilities of the discovery of gold and other metals in this formation. From this description I may condense the following notice of the rocks occurring in the district, and their distribution.

The prevailing stratified rocks are clay slate and quartz rock, the former of various degrees of coarseness, and usually of grey and black tints, and the latter in thick massive beds of a grey colour, locally named "whin." In some localities these are replaced by mica slate and gneiss, perhaps consisting of the same material in a farther state of metamorphism, and they are penetrated by veins and masses of intrusive granite, which from its relations elsewhere, would seem to be of Devonian age.

In passing from S.W. to N.E., and nearly in the strike of the beds, the following distribution appears. In the county of Yarmouth, quartz rock and slate alternate; the former constituting rocky ridges, the latter occurring in the valleys, and occasionally exhibiting beds of chloritic and hornblendic slate. Quartz veins abound in the slates. Along the coast of Shelburne and Queen's counties, granite, gneiss, hard quartzite, and mica slate, prevail; but inland the clay slates occur and occupy a considerable breadth of country. In Lunenburgh and Halifax counties, with the exception of the granitic bands of Aspatogen, Cape Sambro, and Musquodoboit Harbour, the clay slate and quartzite prevail, threaded as usual with small quartz veins, which in some parts of Lunenburgh, and in the country between Halifax and Musquodoboit Harbour, are very numerous and have proved auriferous. Eastward of the granite mass of Musquodoboit and Ship Harbour, the slates and quartzite reappear, and are auriferous, the former, however, being often micaceous, and between Country Harbour and Cape Canseau, presenting many beautiful varieties of perfect mica slates, for specimens of which, I was indebted many years ago to Mr. Whiteman, civil engineer, who visited this coast in connection with the railroad surveys. In the peninsula of Cape Canseau, gneiss appears to prevail, but there are also thick beds of slate, abounding in crystals of chiastolite.

The long range of outcrop above shortly sketched, and extending N.E. and S.W. along the coast, about 250 miles, and inland in some places from 20 to 30 miles, appears to belong to one geological system, and this probably the lower part of the Lower Silurian. It is thus on the geological horizon of the auriferous and cupriferous rocks of Lower Canada, as the age of these rocks has been recently settled by Sir W. E. Logan. These rocks in Canada were until lately referred to the Hudson River group; and on consulting my paper above quoted, and my "supplementary chapter," p. 53, it will be found that I was aware of the similarity in mineral character to these Canadian deposits, though I could not regard the Nova Scotia coast series as of so modern date as that assigned at that time, to what are now regarded as their Canadian equivalents.

No geological survey of Nova Scotia having as yet been made, and the Atlantic coast series, owing to its absence of fossils, and of interesting minerals, being on the whole uninviting to amateurs, little detailed information exists as to the precise order of its de-

posits. When least altered and disturbed, it appears to consist mainly of thick beds of quartzite and slate, alternating with each other, and presenting but little variation of mineral character, except in the greater or less coarseness of the slates, or the quantity of iron pyrites which they contain. The only evidence I have ever obtained of the occurrence of any calcareous rocks in this series, is a small specimen of impure crystalline limestone, which I saw in the possession of the late Titus Smith, many years ago, but he seemed to have no information as to its extent.

The first gold found in this formation was observed at Tangier, a harbour 40 miles east of Halifax, in 1860; but the excitement consequent on its discovery died away, and was renewed only by fresh discoveries in the spring of the present year. I have not visited Tangier, though I have examined portions of the country both east and west of it, and presenting apparently the same geological characters. Indeed the portion of country between Ship Harbour and St. Mary's River, including this place, is perhaps the part of this coast which has been least visited by geologists. I am indebted to Henry Poole, Esq., a corresponding member of this Society, for specimens of the auriferous rock, which seems to be the ordinary slate of the district, somewhat more soft and fine grained than usual, and associated with dark gray quartzite. I have also seen in the possession of Mr. Richardson, of the Geological Survey of Canada, specimens of the rocks, precisely of the same character with those which occur at Musquodoboit, Halifax, Lunenburgh, Northern Queens, and Yarmouth. The gold occurs disseminated in irregular grains and masses in white milky or translucent quartz, often stained by the hydrated peroxide of iron, derived from small quantities of iron pyrites present in the veins. The quartz occurs in small veins traversing the slate, apparently in the direction of its strike, and the gold seems to occur most abundantly at and near the walls of the vein. The gold appears to have been deposited in cavities of the quartz, for in some very rich specimens exhibited in Montreal by the Government Railway Delegation, and in a very fine though small specimen kindly presented to me by the Hon. Mr. Tilley, the gold is impressed by the faces of quartz crystals on which it has been moulded. Mr. Poole has also sent to me specimens of yellow "gossan," or oxide of iron, said to contain particles of gold. This is probably a result of the disintegration of

auriferous iron pyrites. Mr. Poole has also found at Tangier, in quartz veins similar to those containing the gold, small quantities of arsenical pyrites (Mispickel). No other metallic mineral has hitherto, in so far as I am aware, been discovered; though the analogy of other gold regions would suggest the probability that others may occur.

The Hon. Mr. Howe in an official report to the Lieutenant Governor of Nova Scotia, thus notices the later history of the Tangier "diggings."

"The discoveries made in 1860, your Excellency is aware, were unimportant. Some hundreds of persons, tempted by rumors of the existence of the precious metal, rushed into the woods near the head waters of the Tangier, ten miles from the sea coast, and proved the existence of gold, it is true, but in quantities so small, and such a distance from the roads and navigation, as to promise no return to the most industrious miner. The facts having been investigated and made public, the excitement subsided, and the people returned to their ordinary pursuits.

"In March this year a man, stooping to drink at a brook, found a piece of gold shining among the pebbles over which the stream flowed. He picked it up, and searching found more. This was about half a mile to the eastward of the debouchment of Tangier River, a stream of no great magnitude, taking its rise not very far from the sources of the Musquodoboit, flowing through a chain of lakes which drain, for many miles on either side, a rugged and wilderness country, and falling into the Atlantic about 40 miles to the eastward of Halifax.

"The locality was most favourable for mining operations, being within half a mile of navigation, and surrounded by a hardy population engaged in the fisheries, whose small craft could readily transport everything that the miners would require.

"Though gold was brought to the capital in small quantities in the spring, and some of it exhibited to the Legislature, nobody was sanguine enough to believe that it could be obtained in sufficient abundance to pay for the labor of industrious men, who could earn from four to six shillings sterling per day at almost any other employment. The feeling of the Legislature evidently was, that what might prove a delusion and a snare ought not to be over-estimated; and that the Government should proceed with caution, that the people might not be misled.

"It was necessary to make some arrangements, however, as per-

sons were rushing in, and the proprietors of the land claimed protection from the Government. Their acquiescence in any policy that might be adopted, was easily obtained, and a deputy surveyor was sent down to Tangier, with instructions to lay off a few lots, 50 feet by 20—to charge a rent of forty dollars for them—to keep the peace, and to report from time to time to the Commissioner of Crown Lands, to whose custody, by the act of last session, the mines of the Province have been transferred.

"Though the rent was high, and the areas small, some lots were taken up by the sanguine and adventurous, led by a few persons who had worked in California and Australia. Though no very great discoveries were made, confidence in the deposits steadily increased, and the pioneers worked on with cheerfulness and industry.

"Until recently only two attempts have been made, at Tangier, to work any but single claims. A small company, headed by William Chambers, Esq., have combined four or five lots, and are running a tunnel through them; and Mr. Robert Sibley, who acquired some experience, and made some money by mining in Australia, has leased from the Government three quarters of an acre, and is sinking a shaft to enable him to work his claim at all seasons of the year.

"The lowest depth yet reached is 45 feet, and the largest nugget found is valued at $300. The gold is got in quartz veins, running through slate or earth resting upon granite, in the form of scales, jagged and torn bits, like shot or bullets fired against a wall. It is sometimes globular, but seldom completely round. The veins run east and west. It is found in the soil immediately around the veins, but placer washing has not been very profitable at Tangier, or perhaps has not been attempted on a scale sufficiently extensive to command a fair return. A new lead has just been discovered, and there is every reason to anticipate that as capital and skill, aided by reliable machinery, accumulate at Tangier, the precious metal will be procured with less labor and yield a more abundant return.

"In other countries the discoveries of gold have attracted mixed multitudes to the mines, of which the reckless and dissolute often form a large proportion. Robbery, riot and murder have characterized these mixed communities, both in California and Australia. A strong police force is required to keep order, the treasure secured can only be transported over the roads, guarded

by mounted escorts; and in the gambling hells of the larger towns, the earnings of the successful are often dissipated in a night. In Nova Scotia, gold mining, like everything else, has developed itself in an orderly and law-abiding spirit. The improvised community at Tangier has been permitted to govern itself. There has been no resident magistrate or policemen, on the ground, during the five months that the mines have been worked. There has not been an act of violence, or a life lost, hardly a blow struck. Two men detected stealing, were drummed out of the settlement, and larceny is unknown. Men sleep and work unarmed, leaving their property secure in their huts; and the roads are as safe in the neighbourhood of Tangier as in the streets of Halifax."

The discoveries at Tangier were followed by others in Musquodoboit, in Laurencetown, and in the vicinity of Halifax. Near Lunenburg also, auriferous veins have been found, and at the latter place a curious and unusual kind of surface deposit has been observed on the beach in front of the auriferous slates, an instance of a gold alluvium actually in progress of formation under the action of the waves.

Still more recently similar discoveries have been made at and near Wine Harbor, fifty miles east of Tangier. Specimens from this place have been kindly forwarded to me by James Primrose, Esq., of Pictou; they are precisely of the same character with those from Tangier, and appear to have been taken from a narrow vein of white quartz in fine grained, glistening, black slate. The following account of the discoveries at this place and the neighbouring harbor is given in a letter accompanying the specimens.

"A fisherman and farmer residing at Indian Harbor and who knew of the Tangier gold, has been prospecting in his own vicinity for about two years, and some weeks ago discovered an auriferous vein of quartz at the shore at Wine Harbor, a little above and very near high water mark. There are no high lands in the vicinity; the surface is covered by a gravelly reddish earth, in some places to the depth of five or six feet, and in others the whin and slate rocks crop out at the surface. Where the first discovery was made these rocks cropped out thus, showing a small irregular vein of quartz which on trial proved auriferous. The strike of the whin rock is pretty regularly south 63° east, and the dip nearly vertical, sometimes inclining a little on either side of the perpendicular. The shores both at Wine and Indian Harbor

are low, and the distance between them, adding the portion which runs parallel to the shore of Wine Harbor, is about 1½ miles.

"The local surveyor has staked out on the surface the strike of the v .u, and along its whole length, at intervals, where it has been prospected, gold has been found. The surface is much covered with stones and boulders, consisting of whin of all hues from white to blue, slaty rocks, and large boulders of gray granite, showing in general a considerable quantity of mica. Under those is soil and undulated hard whin, interspersed with slaty rock of various degrees of hardness and in some instances resembling sandstone. At the diggings the *whin rock*, where laid bare, runs south 63° east: close to the side of this occur the quartz veins which are nearly vertical, but irregular and broken; the thickness being from a *line* to one, two, and three inches, with sometimes an irregular mass of quartz yielding gold. On the other side of the quartz occurs the slaty formation, of various degrees of hardness until it approaches nearly the hardness of the whin. This slaty matter, as well as the quartz veins, appear to be much disturbed, the slate however being vertical, and the quartz, in many places, fractured and brittle, and of all shades from white to deep black, although it is always accompanied by some of the white. Scarcely any of the diggers have got beyond the depth which has been disturbed by the action of the elements, and consequently have been able to get a good deal of gold with very common tools, but, when they get deeper, the vein, or rather the rocks enclosing it, become hard, and it will, in my opinion, only yield a profitable result when pursued expensively with the best appliances of practical science."

It thus appears that gold has been found on the south-east coast of Nova Scotia at points 130 miles distant from each other, along the line of strike of the same formation, and there can be no doubt that it will be found more or less abundantly throughout the intermediate country, as well as in the extension of the formation beyond these limits.

In the quartz at Wine Harbor and Indian Harbor arsenical pyrites occurs in the same circumstances as at Tangier, of the deposits at which place these rocks may be considered as merely the continuation eastward.

Many reports have gained currency as to the discovery of gold in the more inland Upper Silurian metamorphic district of the east and middle parts of Pictou, the Cobequid Mountains, &c.;

but hitherto, if the precious metal has really been found in these districts, the quantities appear to have been small. These rocks are of different geological age from those of the coast, so that the occurrence of gold in the latter affords no evidence that it will be found in the former. Yet quartz veins occur in these inland rocks very abundantly, and in slaty rocks not dissimilar from those of the coast, though geologically much younger. It is to be observed also that the age of the veins may be much less than that of the containing rocks, so that the veins of the newer formation may resemble in origin and date those of the older. It is interesting also to note, that heretofore, while the inland or newer metamorphic series has afforded ores of iron and numerous though small veins of copper pyrites, the coast series, until the recent gold discoveries, was regarded as quite barren of metallic minerals, with the exception of iron pyrites. The antecedent probabilities would thus be in favour of the inland series, more especially as copper and gold are associated in Canada. On the other hand, it is quite possible that the older or coast district may alone be auriferous, the newer or inland cupriferous instead.

It has been remarked that it is wonderful that in a district so thickly settled, and so much subjected to the operations of the urveyor, road-maker, and agriculturist, as the south coast of Nova Scotia, so numerous deposits of gold should so long have escaped observation. Geologists also and mineral explorers have repeatedly visited and passed through the district. Still, when it is considered that the country is netted with quartz veins, and that perhaps not more than one in a million of these is appreciably auriferous, the wonder ceases. Ordinary observers do not notice such things. A geologist not specially looking for useful minerals, soon becomes wearied of breaking up and examining barren veins of white quartz, and certainly cannot spare time to spend two years in "prospecting," like the persevering discoverer of the Wine Harbour deposit. My own field notes contain the record of many days of hard work among these unpromising rocks, and countless quartz veins have suffered from my hammer, without yielding a speck of gold. I believe I have visited all the localities of the discoveries, except Tangier, and in some of them, as at the St. Mary's River, Indian Harbour, and Wine Harbour, I have spent days in examining the rocks, not certainly with a special view to the discovery of gold, but often with the assistance of in-

telligent friends who were good observers. The truth is, that in cases of this kind it is difficult to make the initial discovery, but this once made, it is comparatively easy to trace the productive rocks over considerable districts, if the requisite knowledge of the geological character of these has been obtained.

The conditions under which gold occurs in Nova Scotia, are quite similar to those of other auriferous regions. The principal point of difference is the amount of gold found in rock veins, as compared with alluvial wastings derived from their waste—a mere accident of the deposits or of the mode of exploration. It is probable that the Nova Scotia deposits are strictly a continuation of those which run along the eastern Appalachian slope as far as Alabama, and which may throughout, as in Canada and the Ural Mountains, occur in altered members of the Lower Silurian series. It is to be anticipated that the connection with the auriferous deposits of the United States, may soon be effected by the discovery of gold in the metamorphic districts of New Brunswick. The quartz veins of Tangier and Wine Harbour, though small, are remarkably rich in gold; and it still remains to be proved whether, like gold veins elsewhere, they will be found to diminish in productiveness in following them downward.

There is little room to doubt that gold will be found throughout the coast metamorphic district of Nova Scotia: more especially the slaty rocks of southern Greysboro, Halifax, Lunenburgh, and the northern parts of Queens, Shelburne, and Yarmouth, may be expected to be auriferous. In short this applies to all the districts coloured *light blue* in the map attached to my "Acadian Geology." Careful examination may shew that the gold occurs chiefly or entirely, in the veins traversing certain bands of the thick beds of slate and quartz rock in these districts; and these may be recognised by their mineral character, especially if defined in their relation to the other beds by a detailed survey of the productive localities. Still the indications in one locality may not be unfailing when applied to another; and in the mean time it would be the best course for explorers to look at all quartz veins, and especially at those occurring in soft dark slaty beds, particularly near the junction of these beds with other rocks. Further, it would seem that the narrower veins, those following the strike of the rocks, and those stained with iron rust, are most likely to be productive. Minute examination should be made, as gold often occurs in very small grains which may still be suffici-

ently numerous to pay for extraction. Nor should the washing of the sands and gravels in the beds of rivers, and of the alluvial deposits on their banks be neglected, for it may happen in many cases that gold may occur in these, when the veins originally containing it have had their outcrops worn away or concealed. Exploring for gold in new localities cannot be expected to be remunerative, except in rare cases; but it would be well at least that persons residing in the district above referred to, would embrace such opportunities as may occur, of examining the quartz veins in their vicinity. It is to be hoped that in a short time a geological survey will place within their reach greater facilities than those which now exist, for making discoveries, and improving those already made.

Since writing the above I have received an interesting account of the gold discoveries in Nova Scotia contributed to Silliman's Journal by Mr. O. C. Marsh of the Sheffield Scientific School, Yale College. From this I take the following extracts:—

"The gold at Tangier occurs mainly in the quartz veins, which are in most cases less than a foot in width, but in one instance I noticed it in the argillite near its junction with the quartz. It is disseminated through the matrix in the usual manner,—frequently in isolated particles and masses, and where the quartz is white furnishes specimens of great beauty. One of the largest obtained was prized at three hundred dollars, which was but little above its intrinsic value. Gold has also been found in the soil, and in the bed of a small stream near the mines; but not in sufficient quantity to attract much attention.

"The minerals noticed in association with the gold at this locality were mostly iron pyrites and mispickel. The former appeared to be quite abundant, and, suspecting it to be auriferous, I have examined a specimen and find it contains a considerable quantity of gold. The exact amount was not estimated, but it is sufficient to make its separation profitable if conducted with skill and economy. The mispickel at Tangier is frequently found underlying the gold in the quartz veins, and in some cases enclosing it. Chalcopyrite, magnetite, hematite, and galena, also occur in small quantities.

"Among the specimens of gold obtained at Tangier I noticed three isolated crystals, which resembled in general appearance those brought from California. The largest of these was about one third of an inch in diameter. It was a rhombic dodecahe-

dron with its edges slightly beveled, and although its faces were marked with delicate striæ several of them were unusually brilliant. The other two crystals were octahedrons, with dull and somewhat rounded faces. One of these was flattened and also much elongated. The smallest crystal was about two lines in length and quite perfect.

"At Lunenburg, which is about seventy miles west of Halifax and one hundred and thirty from Tangier,* the gold also occurs in quartz veins traversing the clay slate, which here forms a high bluff, but it is most abundant in the sands of the adjacent beach. Those who first commenced explorations at this place obtained large quantities of gold with very little labor, and their success soon attracted others from all parts of the province. This locality is known in the neighbourhood as "The Ovens," from some deep caverns which have been worn in the bluff by the action of the sea. It is this denuding power which has torn the gold from its bed and collected it on the beach. There is some reason to believe that a large amount of gold derived from the same source exists in the bottom of the harbor, as the sea-weed which is washed on shore has occasionally small particles of the precious metal attached to it. This point will probably soon be decided; as a "Dredging Company" has been formed, and in a short time will commence operations.

"The strata at this place are similar in appearance and structure to those at Tangier, and seem to have been equally disturbed.

"At one point near the shore where they were well exposed the strike was S. 80° W., and the dip about 75° N. Quartz veins pass through the slate in many directions, and are generally found to contain gold, especially those running north and south. Several dikes of basaltic trap were also observed, one of which was seven feet in width and appeared to be conformable to the strata. The auriferous sand on the shore rests on the edges of the upturned slate, which has here been worn out into "pockets" of various sizes, well adapted to retain the gold as it is washed over them. After these cavities have been apparently exhausted a large amount of fine gold can be obtained, for several feet beneath them, between the thin laminæ of the slate.

"Nearly the same minerals which were noticed at Tangier also occur with the gold at this locality. The mispickel is more abundant, and is usually in very perfect octahedral crystals, some

*Only 80 miles in a direct line.—J.W.D.

of which are twins and highly modified. The large amount of this substance in the sand on the beach, makes the gold washing somewhat difficult, and with the rude apparatus employed much of the fine dust is lost. Mercury has not yet been used in separating the gold either here or at the other localities.*

"It is impossible to form any reliable estimate of the amount of gold obtained in Nova Scotia since its discovery there in March last, as in almost every instance the "claims" have been worked by private individuals who were generally disinclined to give information in regard to their own success. Nor would the amount alone, if ascertained, be a fair criterion by which to judge the value of the gold fields, since they have in most cases been explored by those who have had no previous experience in searching for gold, and only the rudest methods have been employed in obtaining it. I was informed that gold to the value of $2400 had been taken from one "claim" at Tangier, $1300 from another, and $480 from a third, although many other "claims" had yielded little or nothing. I saw in Halifax ingots and specimens of Tangier gold which were valued at about $2000, and at Lunenburg at least $250 worth of fine dust which it was said had been washed from a single "pocket" on the beach.

"I have recently analyzed some specimens of gold which I obtained at Tangier and Lunenburg, and the results are given below. The Tangier specimen was taken from a quartz vein, and is very remarkable for its purity. I find it is surpassed in this respect by the gold from only one other locality, viz., Schabrowski, near Katharinenburg, in Siberia.† The Lunenburg gold was in small particles, washed from the sand on the shore. In preparing for the analyses the gold was boiled in chlorhydric acid, fused twice with borax and hammered, and its specific

* While at Lunenburg I was informed of a circumstance connected with the discovery of the gold which illustrates the utility of even a little scientific knowledge, and the need of its more general diffusion. Some years since a farmer, living in the neighbouring town of Chester, thought he had discovered a valuable copper mine on his land, and at a great expense sunk a shaft about eighty feet in depth. Finding little copper to repay his labor, and having exhausted all his means, the work was finally abandoned. In his excavations he had cut through a large quartz vein richly stored with gold, which he had noticed, but supposed to be merely copper pyrites. The present owner works this copper mine for gold.

† Dana's Mineralogy, Fourth ed., page 9.

gravity taken. The quantity employed in each case was between one and two grammes, and the analyses were made according to the method used by Rose in his investigations on the gold of the Ural mountains.*

"An analysis of the Tangier gold, specific gravity 18.95, gave.

Gold	98·13
Silver	1·76
Copper	·05
Iron	*trace.*
	99.94

"An analysis of Lunenburg gold, specific gravity 18·37, gave.

Gold	92·04
Silver	7·76
Copper	·11
Iron	*trace.*
	99·91

"In some specimens of auriferous quartz from Lawrencetown, obtained of Mr. R. G. Fraser of Halifax, I found mispickel, iron pyrites, galena, and magnetite, associated with the gold in the same manner as at the other localities. In one instance a crystal of mispickel had a small particle of gold passing directly through its centre. The specific gravity of the gold from this place was 18·60, which would indicate a degree of purity between that of the Tangier and Lunenburg specimens. The quantity obtained was not sufficient for satisfactory analyses."

ARTICLE XXXI.—*On the origin of the name 'Canada.'* By Rev. B. Davies, LL.D., Member of the Council of the Philological Society of London.

(*Read before the Natural History Society.*)

The name by which the most extensive and valuable Province in British America is called, has a very uncertain, if not strictly unknown, origin. To this fact Dr. Trench, in his popular work on "the Study of Words" (p. 170, ed. 9th.), calls attention in these terms: "One might anticipate that a name like 'Canada', given, and within fresh historic times, to a vast territory, would be accounted

* Reice nach dem Urai, page 406. Berlin, 1842.

for, but it is not." Yet there have not been wanting attempts to account for what the learned Dean justly regards as still needing explanation; and the present paper is intended briefly to recount such attempts, and also to submit a new conjecture, not so much with the idea of fully satisfying as of directing inquiry.

Among the curious, who have investigated the early history of Canada, some have sought a native origin for the name, and others a foreign one.

1. Those who hold the name to be aboriginal derive it from the Iroquois language, or rather from a dialect of the same spoken by the Onondagoes, who (as we gather from the *Archæologia Americana*, vol. ii. p. 320) call a town or village *ganataje* or *kanathaje*, while the corresponding words in other Iroquois dialects are said to be *carhata* and *andate* (among the Wyandots) *nekantaa*, (among the Mohawks) and *iennekanandaa* (among the Senecas). It is supposed that Jacques Cartier, who first entered the St. Lawrence in 1535 and discovered the interior of the country, and in whose narrative the name 'Canada' first occurs, but without any explanation, might have heard the natives use the Iroquois word, in one of the above forms, when speaking of their primitive village, then called Stadacona, which stood near Quebec, and that he might have mistaken it for the name of the country and adopted it accordingly without note or comment.* And this is the explanation which appears now to find most favour; and though not satisfied with it myself, I must add that it is somewhat supported—as it has struck me—by the analogy of another term, namely *Canuc*, which is used vulgarly and rather contemptuously for Canadian, and which seems to me to come from *Canuchsha*, the word employed by the Iroquois to denote a 'hut' (see *Arch. Americana*, vol. ii. p. 322). Here a *Canadian* would mean a 'townsman' or 'villager', but a *canuc* would be only a 'hutter'.

2. Others have thought Canada to be a Spanish or Portuguese

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*Cartier gives in his vocabulary *Candata* as the name for village in the Algonquin tongue of Stadacona. In a M.S. dictionary of the Ottawa language in the Library of McGill College, village is represented by the word *outenau*, and house is *ouikwam*, the same with the Micmac *wigwam*, used in Nova Scotia. The word for *hut* in this dictionary is *ouach*, which is perhaps the first syllable of Hochelaga, the ancient name of Montreal; though it is also possible that this name may be derived from *ouatchioua*, mountain or precipice.—(Eds.)

name, derived from *ca* (here) and *nada* (nothing); and so "nothing here" would aptly express the mind of the first explorers when they found no gold or other treasures there to satisfy their greed. Yet it appears that some gold was discovered in the country by the new comers, and geologists now find auriferous deposits in the region south of Quebec, where silver also is to be found, but especially copper. A handful of Canadian gold was shown in the Great Exhibition of the Industry of all Nations in 1851.

3. A third conjecture on this point has occurred to my mind, which may possibly be worthy of attention. I fancy the name may be of oriental origin; for I met some years since with the word *Canada* in a very learned article on the Canarese language and literature in *Zeitschrift der Deutschen Morgenlandischen Gesellschaft* for 1848, p. 258, where the erudite author gives *Canada* as another form of the names *Canara*, and *Carnata*, from which we doubtless get the geographical names Canara and Carnatic in Southern India. The occurrence of the word in such a connection recalled to my mind the fact, that the first discoverers of the New World thought it was part of India, and so its natives were styled Indians and its islands were called the West Indies; and it also suggested to me the possibility, that a part of the mainland was in like manner called Canada in reference to the part of India that was so named, either because the voyagers took it for a portion of India, or because they fancifully chose to transfer the name to the new continent. Most likely other names in America may be accounted for in the same manner, such as *La Chine*, near Montreal, and such as *Chile* in South America, which is also the name of a large Province in China. Martiniere tells us in his Dict. Geographique et Critique, under article *Terre Neuve*, that the Grand Bank of Newfoundland was once called "le grand Banc des Moluques," after the Molucca Islands of the East. And Columbus, it appears, wrote from Haiti, to the king of Spain, saying that he had there found the renowned Ophir (Sopara), with all the treasures coveted by king Solomon. (See Kalisch on Genesis, p. 282).

ARTICLE XXXII.—*An account of the Animals useful in an economic point of view to the various Chipewyan Tribes.* By B. R. Ross, H. B. C. S.

While collecting and arranging a series of specimens of the industrial arts of the natives of McKenzie's River District, for the Royal Industrial Museum of Edinburgh, I was struck, not only with their number, but also with their importance to the domestic comfort of these races.

Though doubtless much of the skill of the Chipewyan tribes has been lost since the period of Sir Alexander McKenzie's visit, by the introduction of European manufactures, enough yet remains to prove interesting as exhibiting the arts and manufactures of a people still in the first stages of social existence and civilization; and the following notices may form a sequel to my paper "On the aboriginal tribes of McKenzie's River District," already printed in the *Canadian Naturalist*. The manufactures are in themselves rude, and, with the exception of porcupine work, I know of none that would obtain the name of art, or win in a Museum, the meed of more than a passing glance from any one, save an ethnologist. To the unreflecting, or to those who for mere pleasure visit these "repositories of science," they must indeed be *caviare*, but to the philosophic mind they would speak volumes, as showing the human intellect, though in its lowest stages, attempting, not unsuccessfully, to break through the surrounding crust of animalism, and struggling to emerge into a sphere of higher intelligence.

In the present sketch, I entirely exclude the Eskimos and Loucheux—though recent researches almost confirm me in the opinion that the latter tribe is a branch of the Chipewyan family—as it would swell the paper much beyond the limits to which I have restricted myself, to pass their handicrafts also in review.

The Chipewyan tribes—including the Montaignais, Yellowknives, Beavers, Dog-ribs, Slaves, Sickannies, Nehaunies, and Hare Indians—draw their resources from the animal, vegetable and mineral kingdoms; but I must at present restrict myself to the first of these great sections, hoping, at some future period, to have the pleasure of noticing the others.

In the manufactures of the Indians, no articles hold a more important or more conspicuous position, than those drawn from animals; but this must naturally be expected in a people who

subsist almost solely on the products of the chase. The climate of these regions moreover in a manner, prohibits agriculture, even were the natives willing to turn their attention to such pursuits, which they are not.

I shall pass briefly in review all the species of animals from which they derive any material, noting with each the various purposes to which it is applied.

Foxes.—(*Vulpes*).

The various species of Foxes found in this District are the red, cross, silver, white and blue. The latter is not, as some writers affirm, the young of the white, nor is it that animal in its summer garb, though it is closely allied to it. The only article furnished by these animals is a fine sinew thread for bead-work, and is taken from the tail.

Black, Grizzly, and Barren-ground Bears.

(*Ursus Americanus, U. horribilis and U. arctos*).

The Black Bear is found throughout the wooded portions of the districts; but is replaced, on the barren grounds, by a species bearing a strong resemblance to the *U. arctos* of Europe. The Grizzly bear dwells among the Rocky Mountains. From the black, and indeed from all, the natives derive food; they also cut the summer hides into cords. The prepared fat is extensively used as a pomatum; but I cannot coincide with those who state bear's grease to be a good hair renovator; on the contrary, it will in all likelihood, if used pure, cause the hairs to split and fall out. Grizzly and Barren-ground bears' claws are much prized for necklaces and coronets, by the Indians.

Marmots.—(*Arctomys*).

There are three, if not four, species of this animal in the McKenzie's River District, viz., *A. pruinosus*—inhabiting the northern Rocky Mountains and Nehaunay Hills—*A. Kennicottii*—dwelling in the same localities, with a more northern range, and extending eastward to the Anderson River—and *A. monax* coming as far north, (though rare) as the Liard's River. Out of all of these, the mountain tribes make robes, and the flesh is counted sweet and fat. As I do not think that the marmot, which I have named *A Kennicottii* (after my friend the enterprising naturalist Mr. Robert Kennicott,) has been yet described, I shall here insert a brief notice concerning it.

It is in size as large as a small musk-rat, and in color a silvery grey, interspersed with orange hairs on the back, but changing on the flanks into a decided yellow, palest on the belly; the tail is short. It has cheek-pouches, and is decidedly smaller than *A. monax.* In habits, so far as is known, it assimilates closely to the other marmots. It is a social animal, and digs its den on the mountain's side, or in the banks of rivers. When these animals are outside, a sentinel is placed at a short distance from their habitations, where it sits on its hams, and will, when surprised, lower itself, uttering a peculiar cry or whistle, that when twice repeated, causes all the party to seek for shelter in their holes. They lay up stores of winter provender. Very far north there is a variety which is perfectly black, instead of hoary and yellow. The robes made from the skins of this species, smell very badly.

Beaver.—(*Castor Canadensis*).

The Beaver exists some distance within the arctic circle; and the darkest colored pelts that I have seen are from Fort Good Hope. The Slave and Dog-rib tribes make capotes and robes out of the skin; and the castoreum is extensively used in the manufacture of a medicine or perfume for enticing the lynx to enter into the snaring cabins. The flesh and tail are among the most prized dainties of Indian epicures.

Porcupines.—(*Erithezon*).

These animals are scattered all over the District, principally in the vicinity of the Rocky Mountain ranges, but I do not think that they are often found around the shores of Great Slave Lake The flesh is considered a great treat, and the quills furnish the materials for embroidering the only really tasteful articles to be found among the natives of these regions. The Slave Indians, dwelling along the McKenzie and Liard's Rivers, are reckoned the most skilful fabricators of this manufacture. The things made out of them consist of belts, bands, garters, bracelets; and they are also used for ornamenting bark-work, dresses, and shoes. In manufacturing belts, &c., a frame-work of sinew thread is first laid, through which the quills are interwoven in squares, something in the manner of Berlin-wool work. The articles when finished are very pretty, and some of the women are sufficiently adepts, to follow any angular pattern which may be set them. The dyes used are procured principally from the vegetable king-

dom, though the natives residing in the vicinity of the Forts often apply to the wives of our servants to tint the quills with imported dye-stuffs.

The Rabbit.—(*Lepus Americanus*).

This animal, so essential to the welfare of the Chipewyan nation, is spread all over the District, except upon the barren-grounds. It is subject to periodical failures, which occur with great regularity, and which cause no small amount of privation and suffering to the Indians, when they happen. When the animals are numerous, the Tinné tribes of the McKenzie valley subsist altogether on them, and the skins furnish almost entirely their winter clothing —robes, shirts, capotes, mittens, and socks being made, which afford a sufficient protection against the most severe cold, though they do not form lasting garments, as the hair falls out very quickly.

The Moose.—(*Alces Americanus*).

Is found, in greater or lesser numbers, throughout the wooded portions of the District. Its food consists of the coarse grass of the swamps, and the shoots of various kinds of willows. It produces from one to two at a birth. In size it is rather larger than a horse, and a buck in its grease will weigh as high as 800 lbs. without the offal. When in good condition the flesh is sweet and tender, and is highly esteemed as an article of food, but should the animal be poor, or have been subjected to violent exertion previously to death, the meat is scarcely eatable. The nose or *moufle* is considered by some the greatest delicacy of the North-west, contesting the palm with Bear's paw, Beaver tail, Reindeer tongue, Buffalo boss, and Sheep ribs. The Indians sometimes snare the Moose; and in the spring, when the action of the sun has formed a thick crust upon the snow, they drive them into drifts and spear them in numbers. It is not a gregarious animal, and to hunt it requires more skill than is necessary in the pursuit of either Reindeer or Buffalo. In the winter, for some time before the hunter comes on his chase, he removes his snow-shoes, and despite the thermometer many degrees below zero, sometimes takes off his leggins; he then makes his approach cautiously, cutting such twigs of willows as may be in his way, with his teeth, and avoiding when possible, dry brush, and fallen timber. As the slightest unusual sound is sufficient to frighten this animal, the chosen period for hunting it is during the continuance of a heavy gale of wind. During the rutting season, which happens in the fall,

the males are rather dangerous to follow, and instances have occurred of native hunters having been severely injured and even killed by them. They fight rather with their fore feet than with their horns.

The uses to which the various parts of the Moose are put, are many. The hide supplies parchment, leather, lines, and cords; he sinews yield thread and glue; the horns serve for handles to knives and awls, as well as to make spoons of; the shank bones are employed as tools to dress leather with; and with a particular portion of the hair, when dyed, the Indian women embroider garments.

To make leather and parchment, the hide is first divested of hair by scraping, and all pieces of raw flesh being cut away, if then washed, stretched and dried, it will become parchment. In converting this into leather a further process of steeping, scraping, rubbing and smearing with brains is gone through, after which it is stretched and dried, and then smoked over a fire of rotten wood which imparts a lively yellow color to it. The article is then ready for service. Of parchment, as such, the Chipewyans make little use; but the residents avail themselves of it, in place of glass for windows, for constructing the sides of dog-carrioles, and for making glue. The leather is serviceable in a variety of ways, but is principally made up into tents and articles of clothing, and in the fabrication of dog-harnesses and fine cords, wallets, &c. The capotes, gowns, firebags, mittens, moccasins and trousers made of it are often richly ornamented with quills and beads, and when new, look very neat and becoming. The best dressers of leather, in these parts, are the Slave Lake Chipewyans and Liard's River Slaves.

The lines and cords are of various sizes, the largest being used for sled lines and pack-cords, the smaller answer for lacing snow-shoes and other purposes. In order to make sled lines pliant—a very necessary quality when the temperature is 40° or 50° below the zero of Farht.—the cord is first soaked in fat fish liquor, it is then dried in the frost, and afterwards rubbed by hauling it through the eye of an axe; to complete the operation it is well greased, and any hard lumps masticated until they become soft, by which process a line is produced of great strength and pliancy, and which is not liable to crack in the most severe cold.

To obtain thread, the fibres of the sinews are separated and twisted into the required sizes. The Moose furnishes the best

quality of this article, which is used by the natives to sew both leather and cloth, to make rabbit snares, and to weave into fishing nets. Sinews can be boiled down into an excellent glue or size.

In mounting knives and awls with the horns, lead, copper and iron are used for inlaying, and rather handsome articles are sometimes produced. The making of spoons, tipping of arrows, and carving of fish hooks requires little explanation nor does the stuffing of dog-collars, and embroidering with the hair need any particular comment, so I shall conclude this imperfect notice of a very valuable animal, what yields food, shelter, and clothing to the savage inhabitants of this remote and dreary portion of the globe.

Reindeer.—(*Rangifer*).

Two species inhabit this District, the Strong-wood (*R. caribou*) and the Barren-ground (*R. arcticus*), which though very nearly allied, are certainly distinct one from the other.

The Strong-wood Reindeer inhabit the thickly wooded parts of the District, particularly among and in the vicinity of the mountain ranges, where they are of very large size. Though smaller than the Moose, these deer are of considerable bulk, and weigh up to 300 lbs. In most particulars they resemble the Barren-ground species, differing from it in the following points:—smaller horns, darker color, larger size, not being so gregarious and not migrating. Both species are equally infested with the larvæ of a kind of gad-fly, which perforate the skins and cause the animals much pain. These larvæ, or others very similar to them, are also found under the mucous membrane at the root of the tongue and in the nostrils, and I have even found them in the brain. The only hides serviceable for converting into leather are those of animals killed early in the winter, which when subjected to a process, similar to that detailed under the head of Moose, and bleached in the frost instead of being smoked, furnish a most beautiful, even, and white leather which is used for shoe-tops, embroidered with quills and silk.

The Barren-ground Reindeer during the summer and spring months frequent the barren plains lying between the wooded country and the shores of Hudson's Bay and the Arctic Sea. Their migrations, which are performed with wonderful regularity, are as follows: They leave the shelter of the woods in the end of March and beginning of April, and resort to the plains where they feed

on various kinds of lichens and mosses, gradually moving northward until they reach the coast, where they bring forth their young in the beginning of June; in July they begin to retire from the sea-board, and, in October, rest on the edge of the wood, where they remain during the cold of winter. In the northward movement the females lead, while the southward migration is almost invariably headed by a patriarchal male. The horns of these deer are much varied in shape, scarcely any two animals having them precisely alike. The old males shed theirs towards the end of December, the young males and barren females in April, and the gravid females in May. Their hair falls in July, but begins to loosen in May. The new coat is darkish brown and short; but it gradually lengthens, and becomes lighter in color until it obtains the slate-grey tint of winter. A full grown buck will weigh about a hundred weight; the flesh when in prime condition is very sweet, but bucks, when in season, have their fat strongly impregnated with the flavor of garlic, which indeed is always present more or less. The summer food of the Reindeer is lichens, moss, and coarse grass; in the winter it consists of the dried hay of the swamps, and the hairy moss adhering to the pine trees. I have seen it stated that these animals in the winter, in order to procure food, shovel away the snow from the ground with their horns, but this theory, however plausible, is entirely negatived by the facts of the case, for from my own knowledge, and all that I can learn, both from whites and natives, these deer use *their feet only* for this purpose. Indeed when the horns would be necessary the males would have already lost them, and a supplemental addition would be required to the hypothesis, of the females clearing a space for the males to graze on, as the gentler sex, at that period, reversing human fashions, wear *the horns* instead of their lords.

The Barren-ground Reindeer furnishes the principal support of the Yellow-knife, Dog-rib, and Hare Indians, and has the same value to them the moose to the other branches of their nation. Their clothing for winter is made out of fawn skins, dressed with the hair on, and consists of capotes, gowns shirts, leggins, mittens, socks, and robes, which are warm, and when new, nice looking. Hides which are so much perforated by the larvæ of the *Æstrus* as to be unfit for any other purpose, are converted into *babiche*, to make which the skin is first divested of hair and all fleshy matter; it is then with a knife cut into the desired thickness, the operation beginning in the centre of the skin. There

are two sizes of this article, the larger being used for barring sleds and for the foot-lacing of snow-shoes, the smaller as a species of thread for sewing leather, for the fine netting of snow-shoes, and for lacing fishing and beaver nets.

The Buffalo.—(*Bos Americanus.*)

The Strong-wood variety, which comes so far north and east as about 20 miles from the mouth of Little Buffalo River, near Fort Resolution, Great Slave Lake, is found most numerously, in the vicinity of the salt plains of Salt River. It is unknown throughout the country inhabited by any of the Slave tribes, and the point mentioned above may be considered as its furthest limits. It is of larger size than the plain variety, of darker color, and more thickly furred. The Chipewyans eat its flesh and make robes and parchment from the hides. The horns are made into powder-flasks and are used for mounting knives and awls; the tail mounted on a wooden shank, ornamented with goose or porcupine quills, is used as a fly-flapper. From its scarcity this animal does not contribute materially to the tribes under consideration.

The Musk Ox.—(*Ovibos moschatus.*)

This small but powerful animal is an inhabitant of the Barren-grounds and Arctic coast, from 61° N. It frequents wild, rocky situations, and possesses the agility of the antelope, between which and the buffalo it appears to form a connecting link. During the winter it feeds on lichens and in the summer on grass. From its remote habit it is of little service to the Chipewyan tribes, and though the Yellow-knives, Dog-ribs and Hare Indians sometimes hunt it, yet as it is very fierce and the flesh is strongly impregnated with the flavor of musk, it is not much looked after. The calf-skins make excellent robes and caps, but the adult hides are almost too hairy for any purpose of that sort. The tails are made into fly-flappers similar to those obtained from the same part of the buffalo.

The Mountain Goat.—(*Aplocerus montanus.*)

Is found throughout all the mountain ranges of this District to within a short distance of the Polar Sea, if indeed it does not reach it. It is a larger animal than the domestic goat, which it resembles only in name and in having a beard. It is covered with long and rather brittle white hairs, beneath which a coat of very fine white curly wool lies close to the skin. The flesh, though rank, is fat and tender, and is much relished by the Mountain

Indians, who also make robes, clothing and leather from the hide. Curious dog-sleds are manufactured out of the skin covering the shank bones, by sewing numbers of the pieces together with the hair outside, which slides well over the snow.

Birds.

From the various snow geese, of which there are three species (*Anser hyperbo, A. albatus*, and another as yet unnamed, the "horned wavy goose" of Hearne); from the white and sand-hill cranes (*Grus Americanus* and *G. Canadensis*); from the Canada geese (*Bernicla Canadensis, B. leucomelia, B. Hutchinsonii, B. leucopareia et B. Barnstonii,*); from the trumpeter and wild swans (*Cygnus buccinator et C. Americanus*), and from the white-faced geese (*Anser Gambelii et A. frontalis*), the natives derive the quills so much used for ornamenting round the tops of moccasins, and for similar purposes, as well as for feathering arrows. Fire-bags are made out of the skin of the neck of the great northern diver (*Colymbus torquatus*), and the tail feathers of the golden eagle (*Aquila Canadensis*) are used for head ornaments. The yellow flicker (*Colaptes auratus*), and other gaudily arrayed summer birds yield their plumage for ornamenting dresses. The Dog-rib and Yellow Indians make belts of goose quills by dyeing them and sewing them together in longitudinal stripes.

Here concludes the list of the products derived from the animal kingdom by the Chipewyan tribes; the waters furnishing them with food only. Rude in arts, and debased in manners as are these people, they are among the most kind-hearted and merciful of the Indian races; and would doubtless, if dwelling in a more genial climate, prove the most amenable, of any of the red nations, to the humanizing influences of civilization.

List of Species of Mammals and Birds—collected in McKenzie's River District during 1860-61.

From June 1860 *to April* 1861.

Mammals.	No.	Localities.
1. Sorex.	2	Fort Simpson.
2. Putoreus pusillus.	2	Big Island.
3. " Richardsonii.	2	Fort Simpson and Peel's River.
4. " Noveboracensis.	1	Fort Simpson.
5. " longicauda.	2	Do.
6. Gulo luscus (spare skulls.)	2	Do. and Liard's River.
7. Sicurus Hudsonius.	3	Do. and Big Island.

8. Arctomys monax.	1 Liard's River.
9. " Kennicottii (skeletons.)	5 Ft. Good Hope and Anderson R.
10. Jaculus Hudsonius.	2 Portage la Loche and Yoiccon R.
11. Hesperomys myoides, (Embryos.)	29 Fort Simpson, Good Hope, and Big Island.
12. Arvicola riparia.	5 Fort Simpson, Good Hope, and Big Island.
13. " xanthognathus.	2 Fort Simpson and Slave Lake.
14. Lepus Americanus, (spare skulls.)	1 Fort Simpson.
15. Alce Americanus.	1 Fort Good Hope.
16. Aplocerus montanus.	3 Lapierre's House.
17. Ovibos moschatus, (spare skulls.)	2 Anderson River.

BIRDS.

18. Falco columbarius.	1 Lapierre's House.
19. " sparverius.	1 Do.
20. Astur atricapillus.	2 Big Island and Good Hope.
21. Aquila Canadensis.	1 Fort Simpson.
22. Pandion Carolinensis.	1 Fort Good Hope.
23. Scops asio.*	1 Fort Simpson.
24. Otus Wilsonii.*	1 Do.
25. Surnia ulula?	1 Big Island.
26. Picus villosus.*	4 Fort Simpson.
27. Picoides hirsutus.*	2 Do.
28. " dorsalis.*	1 Do.
29. Sphyrapicus varius?	2 Slave River.
30. Colaptes auratus.	3 Fort Simpson, Peel's River, and Good Hope.
31. Chordiles popitue.	1 Lapierre's House.
32. Ceryle alcyon.	1 Peel's River.
33. Turdus Pallasi.	2 Fort Simpson and Big Island.
34. " Swainsonii, (eggs.)	5 Forts Simpson and Good Hope.
35. Anthus Ludovicianus.	2 Fort Simpson.
36. Sciurus Noveboracensis.	1 Do.
37. Dendroica Townsendii.	2 Big Island.
38. " pinus.	6 Big Island and Fort Simpson.
39. " striata.	2 Fort Good Hope.
40. " æstiva, (eggs.)	2 Big Island.
41. Setophaga ruticilla, (eggs.)	5 Fort Simpson.
42. Cotyle riparia, (eggs.)	2 Do.
43. Collyrio borealis.*	2 Do.
44. Vireo olivaceus.*	1 Do.
45. Parus septentrionalis.*	1 Do.
46. " Hudsonicus.*	1 Do.
47. Eremophila cornuta.	1 Do.

48. Pinicola Canadensis.*	4	Fort Simpson.
49. Ægiothus linaria.*	10	Do.
50. Plectrophanes nivalis.	30	Do.
51. " pictus.	2	Do.
52. Zonotrichia Gambelii, (eggs.)	6	Do. and Fort Good Hope
53. " albicollis, "	3	Do. do. do.
54. " Bairdii, (if new species.)	1	Fort Good Hope.
55. Junco hiemalis.	1	Fort Simpson.
56. Spizella socialis.	4	Do.
57. Melospiza Gouldii.	1	Big Island.
58. Scolecophagus ferrugineus.	2	Fort Simpson.
59. " cyanocephalus.	1	Big Island.
60. Agelaius gubernator.	1	Fort Simpson.
61. Paserella iliaca, (eggs.)	2	Do. and Good Hope.
62. Corvus carnivorus.*	1	Do.
63. Perisoreus Canadensis.*	2	Do.
64. Ectopistes migratorius.	2	Do.
65. Bonasa umbellus.*	1	Do.
66. Lagopus albus.*	2	Do. and Lapierre's House.
67. " rupestris.*	1	Fort Good Hope.
68. " leucurus.*	1	Lapierre's House.
69. Charadrius Virginicus.	2	Do. and Fort Simpson.
70. Ægialitis semipalmatus.	3	Fort Simpson, Big Island, and Slave River.
71. Strepsilas interpres.	1	Big Island.
72. Gallinago Wilsonii.	1	Do. and Fort Simpson.
73. Macrorhamphus scolopaceus.	1	Do.
74. " griseus.	1	Lapierre's House.
75. Tringa Wilsonii.	3	Big Island.
76. " Bonaparti.	2	Do.
77. Calidris arenaria.	1	Do.
78. Gambetta flavipes.	6	Do. and Fort Simpson.
79. Tringoides macularius.	3	Do. do. and Slave River.
80. Netlion Carolinensis.	1	Peel's River.
81. Mareca Americana, (eggs.)	2	Peel's River and Fort Simpson.
82. Bucephala Americana, (eggs.)	1	Fort Simpson.
83. " albeola, (eggs.)	1	Do.
84. Histrionicus torquatus.	1	Lapierre's House.
85. Pelionetta perspicillata.	1	Peel's River.
86. Mergus serrator.	1	Do.
87. Stercorarius pomarinus.	1	Fort Simpson.
88. " parasiticus.	1	Do.
89. " cepphus.	1	Peel's River.
90. Laurus glaucescens, (eggs.)	1	Fort Simpson.
91. " Delawarensis.	1	Do.

92. Rissa septentrionalis.	1	Do.
93. Sterna macrura.	15	McKenzie River, Slave Lake, and Slave River.
94. Columbus torquatus.	5	Fort Simpson and Peel's River.
95. " arcticus.	6	Do. do.
96. " septentrionalis.	2	Fort Good Hope.
97. Podiceps Griseigena.	1	Peel's River.
98. " cornutus.	2	Big Island.

The names are from Prof. Baird's works on North American zoology. The species marked with a star (*) remain during winter. I may have made some mistakes in my identifications, but I do not think many.

B. R. Ross.

ARTICLE XXXIII.—*On the Unity of Geological Phenomena in the Solar System;* by L. SÆMANN.

[From the Bull. de la Soc. Géologique de France for Feb. 4, 1861; translated by T. STERRY HUNT, M.A., F.R.S.]

The observations upon the solar eclipse of July 18, 1860, have given rise among astronomers and physicists to some interesting discussions upon the nature of the sun, which seem to merit the attention of geologists. The opinion hitherto generally adopted is founded upon the view suggested by Arago from his observations concerning the spots upon the sun. This great astronomer conceived that by admitting a dark nucleus surrounded by a luminous atmosphere or photosphere, it would be easy to explain the luminous phenomena presented by the sun.* On the other hand Leverrier, from the observations made in Algiers by the scientific commission from the Paris Observatory, maintains that the sun is luminous from the incandescence of its nucleus, and that the variations in the intensity of the light at its surface may be explained by atmospheric perturbations similar to those of our own atmosphere. Mr. Leverrier is led to admit for the sun, at least two atmospheres different in nature and in density, and it is principally with regard to the external envelope, or rose-colored atmosphere, which gives rise to the flames or luminous protuberances, that there exists a difference of opinion among observers.

[* This view of the constitution of the sun, so ingeniously defended by Arago, (see *Annuaire du Bureau des Longitudes* for 1842, p. 510,) is by him there called the theory of William Herschel, who appears to have first clearly defined it.—*Translator.*]

Other observations of a very different nature give a strong support to the conclusions of Leverrier; the remarkable discoveries of Kirchoff and Bunsen upon the dark lines in the solar spectrum, have enabled us to submit the solar atmosphere to an optical analysis which makes known its chemical composition, and shows it to contain several alkaline metals, including sodium and calcium, which can only exist there in the state of gas or vapor. The discussion of this interesting subject belongs especially to chemists and physicists, but geologists may be permitted to express their sympathy for that view which best accords with the theory that forms the basis of their science, and is, moreover, entitled to a certain authority among mathematicians and astronomers, inasmuch as it bears the name of the illustrious Laplace.

All modern geological theories implicitly admit the unity of our planetary system, in so far as that they suppose the sun, the planets and their satellites, to have been formed from one primitive substance; their very variable densities only show that the constituent elements are grouped in varying proportions.* It is not necessary to suppose that each body of the system presents exactly the same chemical combinations as are known on our globe, for affinities will vary with the temperature and the densities of the elements, but we may admit that a portion of any one of these celestial bodies brought to the surface of our earth and there subjected to terrestrial influences, would in obedience to the chemical affinities which here prevail, be at length converted into *a portion of earth.*

This unity of origin once admitted there is no longer any reason for denying the analogy if not the identity, of the phenomena which have accompanied the formation of the sun and the planets, at least of those whose density approaches the nearest to that of the earth. All of them must have passed by cooling from a state of igneous fluidity to a solid condition, and their present state will depend upon the greater or less facility which their volume and their composition will have offered to the passage of heat. The chemical composition being the same, the duration of the geological epochs upon each planet will have been nearly in a direct ratio to its volume, setting aside certain corrections of which it is not necessary at present to discuss the elements. The low density of the sun, which is little greater than that of water (0·252 that

[* Or in different degrees of condensation.—*Translator.*]

of the earth,) would lead us to suppose the existence there of a peculiar condition of things; science has, however, as yet no means of appreciating the action of a heat so excessive as that which is required to maintain the alkaline metals in a gaseous state, and it appears possible that if the temperature of the sun were reduced to that of the earth its density would also be approximated to that of our planet. However this may be, the analogies of Leverrier's theory with the observations of geologists are too important as showing the connection between the two great branches of natural science, not to encourage geologists to further inquiry in the same direction, and it is with this object in view that we have been led to the following reflections.

We admit a similar geological (or chemical) constitution for the various bodies of the solar system, and from this conclude that the phenomena which have accompanied their formation and their successive transformations must have been similar. Thus the planets and satellites whose density is near to that of our earth may be supposed to have passed through the different stages of liquid and solid incandescence, of the successive liquefaction of portions of their gaseous envelopes, and to have finally been the seat of an organic creation.

Of these planetary bodies the best known to us is the moon, and we shall now inquire to what extent our slight knowledge of it is in accordance with the observations made on our earth, and with the present state of the sun as supposed by Mr. Leverrier. It is well known that astronomers, so soon as they became possessed of good telescopes, discovered mountains and plains (or seas) on the surface of the moon, and the immediate application of these names shews the great resemblance which was supposed to exist between the surfaces of the moon and the earth. It does not appear surprising that the form of the lunar mountains should be met with among only a small number of those on our planet, and physicists easily explain the greater elevation and the steep declivities of the former by the comparatively feeble action of the centripetal force at the moon's surface. But one of the gravest objections to the idea of a common origin of the moon and the earth is the apparent absence of water and air from the surface of our satellite, thus seriously embarrassing those geologists who attribute terrestrial volcanic phenomena to the intervention of these expansible elements.

If however we admit for the earth and the moon an identi-

cal and simultaneous point of departure we can understand that their cooling has taken place at a rate nearly proportioned to their volumes. That of the moon being about two hundredths the volume of the earth, its temperature, if we admit an equal conductibility, will have decreased with a rapidity fifty times greater, so that the geological epochs of the moon will have been in the same proportion shorter than the corresponding epochs on the earth, up to the time when the solar heat began to be an appreciable element. The moon has then advanced much more rapidly than the earth in the series of phenomena through which both must pass, and we may therefore logically suppose that our globe will one day offer the same general characters as are now presented by the moon.

We believe then that the water which covers the surface of the earth, and the air which surrounds it will one day disappear, as a necessary consequence of the complete cooling of the interior of our planet. Rocks, with few exceptions, readily absorb moisture, and the more crystalline varieties are the most porous; we need not, however, consider the quantity of water which rocks may imbibe in this way, for the total amount of this element on the earth's surface is so small when compared with the whole mass of the globe, that the ordinary processes of chemical analysis would not detect its presence. If we take the mean depth of the ocean at 600 meters (= 1968 feet), its weight will be equal to one twenty-four-thousandth of the earth, which being reduced to decimals, would give for 100 parts,

Earth, - - - - - - - - -	99·9958
Water, - - - - - - - - -	·0042

In the Bulletin of the Geol. Society of France, (2d series, vol. x, p. 131,) Durocher has published a series of experiments made to determine the quantity of water in those minerals which enter into the structure of rocks, such as the feldspars, micas, hornblende and pyroxene, and which are regarded as anhydrous in composition. These minerals were reduced to coarse powder and exposed to moist air, the proportion of water being determined both before and after; it will be sufficient for our purpose to give the amount of water found after exposure. The orthoclase of Utoë absorbed in this way 0·41 for 100 parts, while the mean of seven other varieties of the same species was 1·28, and that of thirty specimens of various substances 1·27. We have already seen that if the whole of the ocean were to be equally distrib-

uted throughout the earth this would contain only 0·0042, or 100 times less than the least hygrometric of the feldspars. It is probable that the water of the ocean thus absorbed would enter into chemical combination; at all events it would occupy a space much less than the pores produced by the shrinking of the rocks.

If now we attempt a similar calculation for the atmosphere we find that in supposing a height of eight kilometers, the total volume of the air which surrounds our globe, brought to the density which it has at the surface, would be about four millions of cubic myriameters, the volume of the earth being, equal to 1083 millions, or 270 times that of the air, so that a contraction of the primitive volume producing a vacuum of four thousandths ($\frac{1}{270}$) would be more than sufficient to absorb the whole of the atmosphere. (In calculating the volume of the atmosphere we have multiplied the surface of the globe in square myriameters, by 0·8, which gives a sufficiently accurate result, the more so that the density of the air in the interior of the earth will be everywhere greater than at the surface.)

It now remains to be seen whether the assumption of a shrinking of four thousandths can be justified by analogies. In the want of direct determinations of the porosity of crystalline rocks, upon which subject I am not aware of any published experiments, the observation upon the fusion of rocks, and the determinations of their densities in the crystalline and vitreous states admit of an indirect application to the question before us. The experiments of Charles Ste. Claire Deville in the *Comptes Rendus* for 1845, and of Delesse in the *Bulletin* for 1847, agree so closely in this matter that we give them the preference over those of Bischof, published in 1842. Deville and Delesse found that the fusion of rocks yields glasses whose densities are generally inferior to that of the rock in the crystalline state. This diminution for granite is equal to from nine to eleven hundredths, and it is evident that such a glass passing to a crystalline state and retaining its volume, must present vacant spaces in direct proportion to the augmentation of density, that is to say, equal to about one-tenth of its volume. If we take the mean density of granite at 2·60, it might, with such a degree of porosity, imbibe 3·9 parts in 100·0 of its weight of water. This shrinking of one-tenth is no exaggeration, and such a rock would still be a good building material, although containing twenty-five times more vacant space than our calculation requires.

The vitreous state of a body is nothing more than a fixing of its molecules in the positions which belong to them in the liquid state, and probably represents the liquid in its greatest degree of density. The crystallization of barley sugar, of wrought iron and of Reaumur's porcelain, are striking examples of the tendency of molecules to group themselves in crystals, even in the midst of solid masses, and we can thus readily understand the absence of vitreous substances among the older crystalline rocks. The great difficulty is to determine with exactness the proportion of the vacant spaces resulting from this change, since these will vary for each body, and probably also with the volume of the mass. Sulphur fused in an open vessel crystallizes slowly, the level of the liquid sinks a little, and after complete solidification, the surface is covered with hollows resulting from the shrinking, whereas if cooled in a spherical shape these cavities would naturally be formed at the centre. Water and bismuth, as is well known, behave in a very different and remarkable manner, the first dilating eight or ten hundredths at the moment of congelation, and the second one fifty-third. The only conclusion to be drawn from these facts is, that each body in solidification behaves in a different manner, and that for the solution of the question before us, we can only take into account the well known porosity of rocks. The problem, however, appears to me one of great importance in connection with theoretical geology; if we admit with Deville, that at the moment of crystallization, the density of rocks is in all cases augmented, we are forced to conclude that all the crystalline masses formed at the surface of the liquid globe must have sunk and accumulated at the centre. The effect of a similar action has been shown by physicists, who have demonstrated that the cold of winter would freeze our lakes and rivers from the bottom if the ice sunk at the moment of its formation, as would the solidified parts of a lake of molten sulphur. We should then have in place of a liquid globe surrounded by a solid shell, a mass solidified to the centre, a conclusion which is perhaps more in harmony with the feeble and local action which the interior is known to exert on the surface. Since then the data are wanting to fix the amount of shrinking in the crystallization of rocks, we may find in an analogous phenomenon some terms of comparison. The difference between the density of cast metals, and the same after hammering, can only arise from a contraction similar to that which takes place in igneous rocks. The surface

becoming solid while the interior is yet liquid, the natural contraction of this portion is prevented, and from this necessarily result vacant spaces in the mass, which are afterwards compressed by the action of the hammer. In calculating from the differences in density the volume of the vacant spaces thus produced, we find for iron a contraction of 0·075; for nickel 0·045; for aluminum 0·041; for copper 0·011; for gold 0·005; while the contraction of the earth necessary to absorb the whole atmosphere, would be only 0·004. From this it results that an ingot of gold, the most solid obtained by the fusion of a metal, contains more vacant space in proportion to its volume than would be required in the globe for the absorption of its gaseous envelope; it is scarcely possible that any crystalline rock should be wanting in this slight degree of porosity.

From the preceding considerations, the successive absorption of the air and water by the solid portions of the globe, becomes in the highest degree probable, and we may conclude that our earth will one day present that same total absence of ocean and atmosphere which we now remark in the moon. It is evident that this progress of the waters towards the earth's centre must have long been in operation, and it becomes interesting to consider the effect which this must have had upon the level of the ocean. Let us suppose that the rocks near to the surface of the earth contain one hundredth of water, a proportion which from the above calculation will not be regarded as excessive, and that the water moreover does not exist in this proportion at a depth beyond that at which the terrestrial heat equals 100 degrees centigrade. If we take the augmentation of heat in descending to be one degree for thirty-three meters, this will give a depth of about 3000 meters, while one part of water by weight in one hundred parts of a rock whose density is equal to 2·5, will correspond to a volume of one-fortieth. We shall now calculate the volume of this external layer which we have supposed to be thus impregnated with water, regarding it as a prism having for its base the surface of the earth, with a height of 3000 meters, which would give a mass of 1,530,000 cubic myriameters, containing 38,000 cubic myriameters of water. The total volume of the ocean being one-forty-eighth thousandth that of the globe, or 225,000 cubic myriameters, it follows that this layer of 3000 meters of earth would contain a volume of water equal to one-sixth of the present ocean. Whatever may be the real value of

these figures, which we have adopted to render the demonstration more clear, the interest and importance of this inquiry is evident.

I am convinced that the ultimate complete cooling of the interior of the earth is inevitable. We may affirm on general principles, that between two media of different temperatures, separated by a layer of rock which is a conductor of heat, an equilibrium will at length be established. It is probable that this cooling is however to a great extent effected by the innumerable currents of water and gases which circulate in every direction through the interior of the globe, and of which volcanic eruptions, hot springs and *suffioni* are only the more violent manifestations attaining the earth's surface. The recent ingenious experiment of Daubrée has shown us that water may be drawn by capillary force towards spaces heated much above its boiling point. The water thus conveyed, in passing into the state of vapour does not everywhere produce volcanic phenomena, for these probably require the concurrence of conditions which are not often found. The aqueous vapour will ordinarily ascend to colder portions of the earth's crust, and there yielding its heat to the walls of the fissures, will flow back in the liquid state to the source of heat, to repeat the same process, while on the other hand currents of cold water will absorb the heat thus conveyed to the rocks and bring it to the surface by thermal springs.

The general permeability of rocks is so well admitted by most geologists that I have not thought it necessary to seek for proof of it in the discussions of the present question; the brilliant conception of the metamorphism of rocks by the humid way, which has been so well maintained by the ablest chemists, is only possible on this condition. The permeability of rocks also explains in a satisfactory manner the formation of agates, and of zeolites, arragonite and other minerals in the midst of the most compact basalts, and of geodes of quartz in the Norwegian granites. We may also recall the artificial colours which are given to agates. Mr. Damour has even shown by a series of curious experiments that the water which is ordinarily considered as chemically combined in certain hydrated silicates, such as zeolites, may be in part extracted from them, and again restored, without any apparent alteration in these minerals.

ARTICLE XXXIV.—*On the Land and Fresh Water Mollusca of Lower Canada, with thoughts on the general geographical distribution of Animals and Plants throughout Canada.* By J. F. Whiteaves, F. G. S., Honorary member of the Ashmolean Society of Oxford, &c., &c.

(*Read before the Natural History Society of Montreal.*)

Our knowledge of the land and fresh water mollusca inhabiting Canada generally, is very limited. The papers published by Mr. Bell and Mr. D'Urban in the Canadian Naturalist, together with another in the Canadian Journal by Mr. Williamson, contain all the published information on this subject. During the past summer, (1861) I have given the whole of my time to the investigation of these creatures in Lower Canada, and have obtained some additional information respecting them, which I propose bringing before the public in this paper.

The result of about five months collecting, principally in the neighbourhood of Quebec and Montreal, has been the discovery of nineteen species previously unknown in Lower Canada. They are for the most part well known New England species, which had not previously been detected so far north as Canada. Four of these are land, and fifteen fresh water shells. Of the land shells, the first is, it would seem, an indubitable alien,—the *Helix rufescens* of Muller, a small snail, common enough in Great Britain, but which has not hitherto been found on the American continent. During my stay at Quebec, I found it living in abundance on that part of the plains of Abraham, known as the Cove Fields.

On the island of Orleans, another rare and beautiful little snail occurred to me, also alive,—the Helix capsella of Gould, which has been hitherto only found in the state of Tennessee. Living about decayed logs, under small pieces of timber washed ashore, on trunks of smooth trees and under stones,—observed only by the prying eye of the naturalist,—occur sundry little snails, with cylindrical shells, the apertures of which are generally armed with teeth. Owing to the general resemblance of these shells to a small chrysalis, they have received the generic name of Pupa. Of this group two species (Pupa simplex, Gould, and Vertigo Gouldii, Binney) were previously known to inhabit Lower Canada from the researches of Messrs. Bell and D'Urban. To this number I can add two species, Pupa armifera, Say, which lives in quantities under stones on the plains of Abraham, and Pupa contracta, Say, which I found on the island of Orleans. The extremes

of heat and cold, together with the dryness of the atmosphere in Canada seem unfavourable to the abundance of land snails. Hence we must not expect, perhaps, to find many novelties among the terrestrial mollusca, except among the small and critical species. But in this land of lakes and mighty rivers, which may almost be said to be unexplored, many interesting fresh water shells may yet be obtained.

Of the Unionidæ, four species new to the published lists, have occurred to me in Lower Canada. Three of these are New England species, while the other was described from the Ohio river.

In the rivers, lakes and swamps, throughout the whole province, living in the sand or mud at the bottom, there occur small bivalves of the genera Cyclas and Pisidium. The chief difference between Cyclas and Pisidium is that in Cyclas the two siphons are distinct, while in Pisidium the siphons are united into a single tube. The shell of Cyclas is nearly equilateral, while that of Pisidium is very oblique. These creatures are most abundant everywhere, but, comparatively speaking, very little is known respecting them. I have eight species not previously recorded as Canadian, while in the proceedings of the Boston Natural History Society, ten species new to science are recorded from the neighbourhood of Lake Superior. I would call special attention to these little shells; the fact of no less than eighteen species having been left out in all the catalogues of land and fresh water shells in the Canadian Naturalist, would seem to shew that our rivers and lakes may contain many rare and curious forms which have yet to be detected.

The remaining three species are Limnæa columella, Planorbis armigerus and P. deflectus; three fresh water snails, mostly critical forms, which have been previously overlooked. A most remarkable fact in connection with these fresh water snails, is that no less than nine species, a large proportion of the whole, occur on both the Atlantic and Pacific coasts. It has been held by many naturalists, that a lofty mountain chain will form an obstacle to the migration of species. Yet here we find that on each side of a mountain barrier, some of the peaks of which are as much as 15,000 and 16,000 feet above the level of the sea, and clothed with perpetual snow, such sluggish creatures as fresh water mollusca both can and do exist, the species in each case being identical. It would seem at any rate, that there are exceptions to this rule, and that the Rocky Mountains, for example, do not present an insuperable obstacle to migration.

But if we call in the aid of geology, we shall find that, in all probability, this great mountain barrier is of later date than the fauna and flora existing around it. It should be stated too that the fresh water Pulmonifera are remarkable for their world-wide distribution.

The laws which affect the geographical distribution of plants and animals on the surface of our planet, are creating much interest just now in the minds of scientific men. Analogy it has been said favours the supposition that each species whether animal or vegetable was originally formed in some particular locality, whence it spread itself gradually over a certain area; rather than that the earth was at once, by the fiat of the Almighty, peopled as we at present behold it. The majority of our best naturalists are inclined to accept the theory that every species has originated from a common centre, and that numerous such centres were situated in different parts of the world, each centre being the seat of a particular number of species. In accordance with this view, Mr. Woodward, in his admirable treatise on recent and fossil shells, has mapped out the whole globe into molluscan provinces, each of which he supposes to possess a certain number of shells peculiar to it, and to be characterized by definite groups of this class of animals. Prof. Schouw, of Berlin, has carried out the same idea in the vegetable kingdom; but the views of these two gentlemen do not exactly correspond. Mr. Woodward divides the eastern part of North America into two regions, characterized, according to his views, by a peculiar assemblage of land and fresh water shells. One of these he calls the Canadian region, which includes the whole of Upper and Lower Canada;—and the other the Atlantic region, which comprises all the United States east of the Mississipi valley. In Europe generally, even at the present date, but little is known respecting the natural history of Canada. Hence Mr. Woodward's data were hardly sufficient to enable him to generalize with much confidence. He remarks, "the country drained by the great lakes, and the river St. Lawrence possesses very few peculiar shells, and those mostly of fresh water genera. It is chiefly remarkable for the presence of a few European species, which strengthen the evidence of a landway across the Atlantic having remained till after the epoch of the existing animals and plants."

This landway I propose to say a few words about presently. And here, it may be observed, that of all the land snails which are common to both sides of the Atlantic, very few can be proved

to be really indigenous to America. Now, with one exception, all the shells of both Upper and Lower Canada also inhabit the Atlantic region. The little group of fresh water bivalves, to which I endeavoured previously to draw some attention, forms this exception. Eight species of Cyclas and three of Pisidium are, so far as we know at present, peculiar to Canada, and have never been found elsewhere. But these little shells require to be carefully searched for, and are very similar one to an other; hence they may have been overlooked in the New England states.

When we turn to the sister science of botany, we shall find that somewhat different views of geographical distribution have been entertained. If we compare our knowledge of Canadian plants with Prof. Schouw's theories respecting the general geographical distribution of the vegetable kingdom we shall see that in Canada two botanical provinces meet. The first is the well-known Arctic flora, which is characterized by the abundance of mosses, Saxifrages, Gentians, species of Silene, Arenaria, and Dianthus; and also by the presence of many species of willow and sedges.

As defined by Prof. Schouw, the total absence of tropical families, a notable decrease of the forms peculiar to the temperate zone, and the prevalence of forests of firs and birches, form additional characteristics of this region. Geographically, it includes all the countries within the polar circle, with some parts of Europe, Asia and America to the south of it; as for example, the mountains of Scotland and Wales, Labrador, Greenland, and the northern part of Canada. Next we have what Prof. Schouw calls the region of Asters and Solidagos, characterized by the great variety of oaks and firs, the small number of Umbelliferæ and Cruciferæ, by the almost total absence of true heaths, which are here replaced by Vacciniums, and by the abundance of the said Asters and Solidagos. Geographically it includes Mr. Woodward's Atlantic region, and the southern part of Canada. Thus, judging from the distribution of Mollusca, Mr. Woodward thinks that Canada should rank as a distinct natural-history region, while on the contrary, judging from the evidence afforded by the vegetable kingdom,—according to Prof. Schouw's theory, part of Canada belongs to an Arctic, and part to an Atlantic region. But here again we must not neglect to inquire what light the geology throws upon this question, and turning to the geologic record, we shall find that since the first appearance of these animals and plants on the surface of our globe, great alterations in the relative distribution of land and water and a general subsi-

dence and re-upheaval of the continents of Europe and America, have been effected. We shall do well to remember the brilliant generalizations of the late Edward Forbes, after a close study of the distribution of animals and plants in Great Britain, and of their connection with the tertiary deposits of the same country.

On the tops of the mountains near the lakes of Killarney, in the south of Ireland, occur a few plants, entirely different from those of the Scotch and Welsh mountains, but nearly agreeing with those of the Asturian mountains in the north of Spain. According to Forbes, the southern character of these Irish plants, and their extreme isolation, point to a period when a great mountain barrier extended across the Atlantic, uniting Ireland with Spain. Soon after this, arguing from similar data, he infers that another barrier connected the west of France with the south-west of England and thence to Ireland;—and a little later England and France were connected by dry land, towards the eastern part of the Channel. Upon this supposition it is easy to understand why two small snails (the Helix incarnata and Bithinia marginata,) which abound as Pleistocene fossils in the valley of the Thames, although extinct in Great Britain, are still found living in France.

At the time of the glacial drift, what are now the summits of the Scotch and Welsh mountains were then—Forbes argues—low islands, or members of chains of islands, extending to the area of Norway, through a glacial sea—clothed with an Arctic vegetation, which in the gradual upheaval of those islands, and consequent change of climate, became limited to the summits of the new formed and still existing mountains. After this upheaval it is believed that Ireland was connected with England, and England with Germany, by vast plains, fragments of which still exist, and upon which lived the Irish elk, two-horned rhinoceri, the Arctic elephant (Elephas primigenius), and other quadrupeds now extinct, but which have left behind them in the gravels of our English drift, unmistakeable evidence of their having at one time roamed in great numbers over what is now Great Britain.

The array of facts which tends to corroborate Forbes's theories would occupy too much time to explain in detail;—I have merely stated his general views in so far as they affect the question at issue. Carrying out these well known generalizations, Sir Charles Lyell after visiting this country and studying the peculiar distribution of Pleistocene fossils in Lower Canada, published a theory which he thought would account for these phenomena. This

was that the land in North America, "after it had acquired its present outline of hill and valley, cliff and ravine," was subjected to a gradual submergence—and that at a subsequent period it re-emerged from the ocean. Again, it is a well-known fact, that more than half of the marine shells of the northern New England states, and also of the Gulf of the St. Lawrence are common to the seas of northern Europe. This has been held, with much probability, to prove the existence of a landway across the Atlantic since the epoch of the still living animals and plants.

It should be stated that many American shells, which are not now known to inhabit the European seas, occur fossil in the red crag of Great Britain—this would tend to prove the great antiquity of the existing fauna.

If too the Helix labyrinthica (a little snail common in Canada) be, as many of our best naturalists think, identical with a fossil species from the Eocene beds of the Isle of Wight, it is just possible that some of our land shells may prove to be even of still older date. It has been noticed by scientific men in Britain, that these fossil land shells from the Isle of Wight are of a group quite American in character. Neither should we forget the theory that at a period somewhat later geologically than these Eocene beds, the isthmus of Darien, or some portion of it at least, was submerged, and we should take into consideration the supposed consequent alteration of the currents of the gulf stream. It has been suggested that from this cause alone, the climate of Great Britain was then as cold as that of the island of Newfoundland at the present day.

But here in Canada, our knowledge of facts is much too meagre and unsatisfactory to enable us to generalize either on the distribution of plants and animals in British America, or on the connection between existing animals and the tertiary formations of this country. The deposits of land and fresh water shells in our lacustrine marls, require to be carefully worked out. and catalogues of the species which they contain to be published. In the living land and fresh water mollusca, much is yet to be done; —the neighbourhood of Lake Superior may yet produce many new fresh water forms, while the vicinity of Toronto, and that part of Canada to the south-west of Lake Erie are, conchologically speaking, almost unknown. The opening up of canals has caused a northward emigration of fresh water shells, and by this means several species have been enabled to travel from Ohio into the south-west peninsula of Canada. In my own private collection,

I have six fresh water shells hitherto not known to inhabit Canada, which have been introduced in this way; five are from the Welland Canal, and one is from the Thames river at Chatham, C.W.; they are all well-known Ohio shells. The object of this paper has been a suggestive one, and if by these few remarks I shall have attracted attention to the interesting subject of our land and fresh water shells, my labour will not have been in vain.

List of land and fresh water shells hitherto not known as inhabiting Lower Canada.

Anodonta undulata, Say. St. Charles River, near Quebec.
Anodonta decora, Lea. Old quarries near the Mile-end, Montreal.
Anodonta plana, Lea. Rideau Canal near Ottawa City.
Unio luteolus? Lam. var. Common in the St. Lawrence both at Quebec and Montreal.
Unio compressus, Lea. (U. alasmodontinus? Barnes). Assumption River, M. de Villeneuve: Rideau Canal near Ottawa City, Mr. Billings.
Cyclas rhomboidea, Say; and two species as yet undetermined; St. Lawrence, at Quebec.
Pisidium variabile? Prime; and four species not yet determined.
Planorbis armigerus, Say. Trenches in fields near Quebec. This shell belongs to the genus Planorbalina of Haldeman.
Planorbis deflectus, Say. Streams near Quebec.
Limnæa columella, Say. Common in the St. Lawrence near Quebec, at low water, with its variety macrostoma.
Helix rufescens, Muller. Common in the Cove fields, Quebec, but probably introduced.
Helix capsella, Gould. Island of Orleans, but very rare.
Helix dentifera, Binney. St. Lambert, Montreal.
Pupa armifera, Say. Abundant in the Cove fields, Quebec.
Pupa contracta, Say. Island of Orleans.

Shells new to Upper Canada.

From the Welland Canal and its neighbourhood:

Unio graciiis, Barnes.
" coccineus? Lea.
" plicatus, Lesuer.
Paludina integra, Say.
Physa gyrina, Say.
Helix palliata, Say.
" thyroidus, Say.

From the river Thames at Chatham, C. W:

Unio circulus, Lea.

Canadian fresh water shells which occur also on the west side of the Rocky Mountains.

Valvata sincera, Say.
Limnæa solida, Lea. (L. apicina, Lea).
" catascopium, Say.
" jugularis, Say. (L. stagnalis, Linn).
" palustris, Linn. (L. elodes, Say).
" pallida, Adams.
Physa heterostropha, Say.
" hypnorum, Linn. (P. elongata, Say).
Planorbis corpulentus, Say.
" trivolvis, Say.

Of these shells, two are not allowed to be good species; Limnæa catascopium being considered a variety of L. palustris, and Planorbis corpulentus of P. trivolvis, but in each case they form well marked varieties. My authority for their occurrence west of the Rocky Mountains is Dr. Binney, in his catalogue of the fluviatile gasteropoda of North America, published for the Smithsonian Institution, Washington.

REVIEWS AND NOTICES OF BOOKS.

Voyage d'André Michaux en Canada, depuis le lac Champlain jusqu'à la Baie d'Hudson.—By O. Brunet, Professor of Botany at the Laval University. From the printing establishment of *l'Abeille*, Quebec; 8vo., 27 pages.

This is a notice of the voyages to North America of André Michaux, a native of France, made during the years 1785 to 1786; with a sketch of his life. The object of his travels was to make botanical researches and mark the locality of trees and plants peculiar to the country. He has rendered great service to science and deserves the especial consideration of Canadians, for he may be looked upon as the founder of Botany in Canada. The only work having any pretention to a history of Canadian plants which appeared before that of André Michaux was Cornuti's, published in 1635, under the title, *Plantarum Canadensium Historia*, which is far from being a complete flora, and it is besides defective in classification. Charlevoix gives a translation of this work into French, adding a number of plants which had subsequently been discovered. Kalm, the celebrated disciple of Linnæus and Professor of Natural History at Abo, had also visited America in 1749-51, at the request and charge of the King of Sweden; he extended his visit even to Canada, but the fruits his labours went to enrich the *Species Plantarum* of his great master, where to this day they are to be seen, being identified as his discoveries by the mark of the initial letter K. This would show that Canadian Botany may claim a respectable origin, as by this it is almost contemporaneous with the introduction of the science in modern times,—botany owing its rational momenclature and classification to Linnæus. Michel Sarrazin, an inhabitant of Quebec and Physician to the King under the French dominion, and also a corresponding member of the Academy of Sciences, may be mentioned here as the first Canadian botanist, who became renowned for his discovery of the curious plant which bears his name—*Sarracenia*

purpurea. To the above names may be added those of the Marquis de la Gallissonnière; Dr. Gaultier, after whom Kalm called a small plant, very common in our woods, the *Gaultheria procumbens,* yielding an essential oil used in medicine; P. Boucher, Governor of Three Rivers, and several others.

Michaux was very successful in his searches for the native productions of the vegetable kingdom in Canada, but as the spots where he made his numerous and important discoveries are not always sufficiently described in his works, printed and manuscript, many of the plants have not been met with since, and others are exceedingly rare or still very little known. As most of his time was spent in travelling and herborizing, he did not write much; thinking that the best way he could serve science was by introducing new plants into Europe. Still he has left a history of the oaks of America, published in Paris in 1801, containing a description of twenty species of this tree; besides notes on his travels, which are scattered through the work of his son, who had accompanied him in some of his voyages to America; and a manuscript diary, which the latter presented to the American Philosophical Society of Philadelphia. But his notes and herbaria have furnished materials for a work still more interesting to Canada,—the flora of North America published in Latin by the eminent botanist Claude Louis Richard, in 1803, (the year in which Michaux died,) forming two volumes 8vo, with 52 plates, and in which upwards of 1700 plants are described.

Michaux had already visited England, the Pyrenees and Spain, and had brought with him from Persia a splendid collection of plants and seeds, when the French Government, desiring to introduce into France some of the trees and shrubs growing in North America, charged him with the mission of procuring them.

Instructions had been given him to travel over the United States and collect seeds and roots. He arrived in New-York in November 1785, from whence during two years he made excursions to New-Jersey, Pennsylvania and Maryland. During the first year, he sent to France twelve boxes of seeds, several thousand specimens of trees, and some Canadian partridges, that multiplied at Versailles. He also laid out a garden near Charleston, South Carolina, which was to serve as a starting point for his southern exploration.

In 1787, he made a journey to the Alleghany Mountains. Having ascended the Savannah to its source, and found many beautiful plants and several kinds of oaks, he also proceeded to

the sources of the Tennessee, and thence returned to Charleston, having travelled three hundred leagues through Carolina and Georgia. Many of his notes contain remarks on the most interesting plants which he met with, and even point out the places where they were discovered, in such precise terms that it would still be easy to find them out. In 1788 and the following year, he successively visited Florida, the Bahama Islands, and Virginia. On the 1st of July he arrived at *Washington Court House*, a hamlet in the latter State, which then passed for the first town in that part of the world, though it contained only "twelve wooden houses," and could afford but indifferent cheer to the traveller.

After other excursions to different parts of the Union, attended with more or less success, he came to Canada, in 1792; having spent some seven or eight years in the United States. His first researches in passing from one country into the other, were made on both shores of Lake Champlain, where he noticed many plants, —all mentioned in his flora. Then directing his course towards Montreal, he arrived in this city on the 30th of June, and having remained here only a few days, started for Quebec. On his way down he stopped at Sorel, and there found the *Rhodora Canadensis*. His sojourn in the ancient metropolis of Canada was also of short duration, as it was important he should avoid being overtaken by winter in his progress northward. Having sailed down the St. Lawrence as far as the Saguenay, he landed at Tadousac, the first out-post of the Hudson's Bay Company in that direction, situated at the entrance of the river, and at one time much frequented by the Indians for the purpose of trading; it is now a pretty village. Here he remained a few days, during which he collected some specimens. He next ascended the Saguenay in a bark canoe, and early in August reached Chicoutimi, where the river ceases to be navigable for large vessels. As his way to Lake St. John lay through an almost unexplored wilderness, and as the journey had never been undertaken except by aborigines and a few missionaries, he secured the services of a half-breed and three Indians, with whom he proceeded up the river Chicoutimi and Lake Kinogami, and, after a short portage, through Lake Kinogamichich, down the Aulnet River and Belle Riviére, thus reaching Lake St. John after six days' travelling. At Lake Kinogami he found an aquatic plant, *Lobelia Dortmanna*, which has not since been met with there; its light blue corolla floats upon the surface, while the leaves are entirely submerged. Michaux discovered many specimens on the shores of Lake St. John; and he

saw in the surrounding forest the red pine *Pinus rubra*, the white spruce *Abies alba*, and the cedar, *Thuya occidentalis;* this situation is the farthest north in which these trees had been seen. He remarked that the white pine, *Pinus strobus*, was scattered over a vast extent of country, but not equally so, having seen some on the banks of Lake Mistassin as far north as forty leagues from Lake St. John; it is however very common two degrees south of that. The *Larix Americana*, or American larch, generally called tamarack in Canada, abounds in the environs of the lake; the hemlock spruce *Abies Canadensis*, which thrives on the shores of Hudson's Bay, is also abundant.

Our indefatigable voyager then ascended the Mistassin, sometimes called Rivière des Sables, which falls into lake St. John, and which, with the exception of a few short portages, is navigable for canoes a distance of 120 miles. It was then, and still is the route followed by the Mistassin Indians, who dwell near the great Lake Mistassin, and who come to trade at Pointe Bleue, the most northern post in the Canadian territory. Having journeyed for 120 miles up the river he came to the foot of a waterfall. High banks of rock contract the width of the stream, which is precipitated from an elevation of eighty feet over ledges of stone resembling huge steps. Here the intrepid botanist stopped to scramble over the drenched rocks in quest of new specimens pausing now and then to admire the grandeur of the scene.

Continuing his route over the mountains intervening between Canada and the Hudson's Bay Territory, and from whose summit he had a view of the immense valley lying beyond, he reached Lake Mistassin on the 4th September, having halted a few moments to herborize on the shores of the Lac des Cygnes, one of the many lakes which, with numerous streams, water this region. Mr. Brunet, from whose pamphlet, we scarcely need observe, the information contained in this notice is gleaned, gives some interesting details and traditions connected with the great Lake Mistassin, but into these we have neither time nor space to enter. The northernmost point reached by Michaux was one which our author indicates as being on Rupert River, at a short distance from Hudson's Bay; the Indian guides, dreading the approach of winter, would proceed no farther. He however had an opportunity of determining the exact latitude at which the trees of the north cease to grow, and of recording his observations on the topography of the country. It was while exploring in the neighborhood of Lake Mistassin that he found the pretty species of prim-

rose which he named after the lake, *Primula Mistassinica*. This was his last discovery in that part of North America. Before leaving this continent however, he once more visited the United States, and returned to his native country in 1796. His diary contains interesting information on the climate and vegetable productions of the northern regions visited by him, and the author expresses a hope that the government or some public institution may be induced to cause it to be printed. Mr. Brunet, we understand, intends travelling over the same region, up to Lake Mistassin, with a view to completing the beautiful herbarium which he is making for the Laval University.—*Journal of Education, L. C.*

Iron; its history, properties, and processes of Manufacture By William Fairbairn, C.E., LL. D., &c., &c. Edinburgh: A. & C. Black. Montreal: B. Dawson & Son.

This volume is a reprint, with additions and corrections, of the article on the iron manufacture in the eighth edition of the Encyclopædia Britannica.

It endeavours, in a concise history, to trace the progress of the iron manufacture from its earliest beginnings down to the present time, and the various improvements which have been effected in the reduction of the ores, and the subsequent manipulation of the crude iron. The author also gives us analyses of the ores and fuel, so far as they bear on the results of the different processes of manufacture; and shows the reader how much we owe to chemical science, and to the distinguished men who have laboured so industriously and successfully in this important field of research. From his own experience Mr. Fairbairn has been enabled to trace the kinds of furnaces and machinery, from their almost primitive condition, to their present high state of improvement. Chapter I treats of the history of the iron manufacture; then follows an account of the various ores, and of the strata and localities in which they are found. The following chapters treat of fuels; the reduction of ores; the conversion of crude into malleable iron; the mechanical operations of the wrought-iron manufacture; the production of steel; the strength of iron and steel; the chemical composition of iron; statistics of the iron trade; and a brief notice of armour plated ships.

This is the most complete and reliable treatise on this subject in the English language. The eminence of its author as a worker

in iron, and an investigator into its properties, and the processes of its manufacture, render it one of the most complete books that can be consulted. For the general reader, who wishes to be informed about a branch of manufacture and commerce of the highest value and importance to all countries, and for those who are themselves engaged in any department of the iron trade, this work will prove invaluable, and cannot be too strongly recommended.

First Sketch of the New Geological Map of Scotland; with Explanatory Notes. By Sir Roderick I. Murchison, D.C.L., F.R.S., Director-General, and Archibald Geikie, F.R.S., F.G.S., Geologist, of the Geological Survey of Great Britain. Constructed by A. Keith Johnston, Geographer to the Queen. Edinburgh: W. & A. K. Johnston, and W. Blackwood & Sons. London: E. Stamford, Charing Cross.

The leading object of the projectors of this map, as explained by Sir Roderick Murchison, is to lay the basis of a new classification of the rocks of Scotland, with the view of carrying out to their ultimate application the principles first promulgated by Hutton. For this end the careful explorations of Sir Roderick himself, and of the other skilful geologists by which he has been assisted, and to which the science of geology owes in no small measure its rapid development, have been embodied in the map with an amplitude and a distinctness which renders the geological structure of the country patent to the eye, even of the most unitiated, at a glance. To simplify it all the more, there is placed along its margins transverse sections through different parts of the country, showing the general succession of the rock masses. We have first, a generalized section of the crystalline rocks of the Northern Highlands, from the Hebrides across Sutherland, to Brora; secondly, a general section of the country from the north-west promontory of Skye to the Cheviot Hills; thirdly, one from Ben Lomond to the Cheviot Hills; and, fourthly, a detailed section of the structure of Arthur's Seat, as worked out by Mr. Geikie during the progress of the Geological Survey in Scotland. The map, while it presents a complete geological picture of the country, is distinguished from all the other maps that have preceded it, in embracing all the most recent discoveries, and in correcting various errors into which earlier geologists were led while con-

ducting their researches during the dawning of the science, if not also in setting at rest some of the questions upon which different opinions have arisen. Its execution is the production of Mr. Geikie, at the request of and aided by Sir Roderick Murchison, who felt, he says, "aware that in addition to all that had been done in the north, Mr. Geikie's intimate acquaintance with the rocks of the south would render the work of essential service in advancing Scottish geology." There is prefixed to the map an explanatory sketch by Sir Roderick of its various sections, which throws much interesting light upon the progress of discovery; and the topography has been laid down by Mr. A. Keith Johnston, who, as a geographer, has long enjoyed a world-wide reputation. Sir Roderick himself, with the assistance of his colleagues, has completed the map by adding to it many names of places of geological importance. The combined labours of men so distinguished in their respective walks as those to whom we owe the construction of this map, could not fail to prove eminently successful; and we have in it, accordingly, one of the best manuals for the study of the geology of our native country that has yet come under our notice.

Prof. Hall on Receptaculites.

Prof. Hall sends to us a sheet of his forthcoming report on Wisconsin, containing among other matters, notices of several species of the remarkable genus Receptaculites, found principally in the lead-bearing limestones of that State. Two of these had been previously discovered and described by Dr. D. D. Owen, under the generic names *Coscinopora* and *Gelenoides*. Prof. Hall refers both, and four other species found with them, to the genus Receptaculites, and after noticing the new facts in the structure of these fossils stated by Salter in the 1st decade of organic remains, issued by the Canadian Geological Survey, gives the following amended description of the genus.

Generic Characters.—Body consisting of an infundibuliform spreading disc, more or less concave at the centre, depressed-orbicular, and globose. The spreading discoid forms consist of a range of vertical cells in single series; the orbicular discoid forms have radiated curving cells which are directed from the centre or axis towards the margin, their length and curvature depending on the size and form of the mass; the foramnia or cells

in all the forms become larger as they recede from the centre to the periphery, and again become smaller, on the lower side, in the globose forms. Cells cylindrical, contracted below the aperture, and thickened or expanded above, with rhomboidal openings at each extremity. On one side the openings sometimes shows obsolescent rays; the interior walls of the cells are often striated as if preserving the remains of transverse septa.

In all these bodies the cells are arranged on curving lines which diverge from the centre in a constantly enlarging circle; these are crossed by similar lines in an opposite direction, which thus leave quadrangular or rhomboidal spaces, "like the engine turned ornament of a watch." The form of these apertures depends upon the degree of curvature, or upon the form of the mass to which the curvature of the cell lines will conform. In all cases, however, the cell is cylindrical beneath the exterior.

Since the cells vary in size at different distances from the centre, the size of the cells in separate fragments, affords no means, alone, for specific determination.

Regarding the form and mode of growth, I have recognised the following species in the Galena limestone of the lead region.

The species described are

Receptaculites Oweni.
" *Iowensis.*
" *fungosum.*
" *globulare.*
" *infundibulum.*
" *hemisphericum.*

The first of these species sometimes attains to a diameter of 12 inches; and if as Salter supposes, these fossils really belong to Foramenifera, the present observations of Prof. Hall extend in a remarkable manner our ideas of the development and number of these singular creatures in the silurian seas.

Prof. Hall states in the introduction of the report, that large materials have been collected for extended publication on the geology, palæontology, and useful minerals of Wisconsin. We hope that these will be speedily published, and in a manner creditable to the State, and worthy of the talent and skill employed in the work.

J. W. D.

Scientific Farming made easy, or The Science of Agriculture reduced to practice. By THOMAS C. FLETCHER. 2nd edition. London: Routledge, Warne & Routledge. Montreal: B. Dawson & Son.

This is an excellent manual for farmers and although written for England it yet contains directions for the proper cultivation of plants suitable for all countries. It is divided into two parts, the first of which treats of the soil and its fertilizers, the second of cattle feeding; an appendix is added containing general directions on matters of practical chemistry interesting to farmers. The most recent experiments and observations on the application of science to agriculture are given in this volume, in short compass and in a simple intelligible manner. The observations on the feeding of cattle are specially valuable and cannot fail to be of interest to farmers in Canada.

Manual of Agriculture for the School, the Farm and the Fireside. By GEO. B. EMERSON and CHAS. L. FLINT. Boston: Swan, Brewer & Tilestone. Montreal: B. Dawson & Son.

This manual is designed for the instruction of the young. It has been prepared by the directions of the State Board of Agriculture of Massachusetts and is issued under their imprimatur, in the hope that it may be the means of laying the foundation of a complete agricultural education in the district schools of the State. The authors lay no claim to originality, and have availed themselves of all the information, scientific and practical within their reach. It embraces a wide range of topics. The chemistry of the earth, air and water is concisely and accurately stated. The elements of which plants are composed, and the modes of their growth receive ample attention. All the departments of practical farming are treated of, and illustrated with small but clear woodcuts. The chapter on the diseases and enemies of growing plants contains, in a brief form, almost all that can be said of practical use, on these subjects. For the use of teachers there are copious questions at the end of the volume. This book might, with great advantage, be introduced into our common schools in the country. The information which it contains could be easily communicated by any intelligent teacher, whether male or female, to the pupils who generally attend these schools, and could not fail to be both interesting and profitable.

BOTANICAL SOCIETY OF CANADA. KINGSTON.

The eighth meeting of this Society was held in the Convocation Hall of Queen's College on Friday evening, 15th Nov., the Rev. Professor Williamson, LL.D., Vice-President, in the chair.

The chairman opened the proceedings by a short introductory address, in which he alluded to the recent origin of the Society, notwithstanding which, it had already struck its roots deeply into the soil, passed the period of youth, and grown up into a goodly tree, whose branches were spread far and wide. Already, he said, contributions and applications for membership were almost daily being received not only from various parts of Upper and Lower Canada and the adjoining States, but also from Britain, and France, and Italy, and Germany, and even our Australian colonies. And not only so; the Society, young as it was, had already acquired the maturity requisite to enable it to bring forth abundant fruit. Its contributions to science, recorded in the "Annals" of the Society, and in numerous scientific journals of Canada and Britain, were already well known. A Botanic Garden had also been established in Kingston, the first of the kind in Canada, and one that might be expected ere long not only to add to the range of scientific knowledge, but also to yield valuable economic results from the experiments that would be undertaken as to the plants suited to our climate. A public Herbarium was also in course of formation, to which, as in other countries, the student might repair to resolve his doubts in the determination of obscure species. At this season of the year, the plants which form the objects of the botanist's study go to rest; so also the botanist himself withdraws from his pleasant and healthful researches in the fields and woods; but, as there is no real rest in the case of the plant, as the tissues go on developing, and the juices are being elaborated even beneath the snows of winter, so the botanist also does not now pass into a state of inactivity. Our winter meetings begin, the members come together, and an opportunity is afforded of elaborating and making known the results of the summer's work. The chairman concluded by alluding to the valuable aid that had been derived from Prof. Gray and Sir Wm. Logan in forwarding the objects of the Society, and expressed a hope that our Provincial Government would view the labors of this Society in the same favorable light in which they were viewed by scientific men, and give to the Society that countenance

and aid which the Governments of other countries did not fail to bestow upon similar institutions.

Numerous donations to the Botanic Garden to the Herbarium, and to the library were announced.

Dr. Dickson, Professor of Surgery, moved a vote of thanks to the various donors. He alluded to the valuable character of some of the donations, such as those of Professor Tuckerman, and especially of Sir William Logan and Prof. Asa Gray of Harvard. Sir William had sent to the Society the various collections of plants that had been made at different times by the officers of the Geological Survey of Canada.—Many of these were from localities inaccessible to ordinary collectors, and were of great interest. Independent, however, of the intrinsic value of these very large collections, we must regard the compliment paid to us by Sir Wm. Logan in making us the custodiers, as an indication of his confidence in the ability of our Society to sustain the character of botanical science in the country. Professor Gray's invaluable donation from the Cambridge Garden could scarcely be overestimated, for it, along with the donations of our local horticulturists, had enabled us in a short time to form a Botanic Garden and the force of our example in this respect was already beneficially felt by other cities in Canada. Coming at such a time, when the country is distracted by civil war, we must appreciate Professor Gray's donation as a special mark of favor, and accord our thanks with more than ordinary fervour.

Prof. Lavell seconded the motion, and alluded particularly to the donations of trees, shrubs and plants that had been made by our local horticulturists. Thanks were cordially voted to all the donors.

A letter was read from J. Thayer, junr., Secretary of the Montreal Agricultural and Horticultural Society, stating that the members of that society were desirous of establishing a Botanic Garden in Montreal, and requesting any reports, documents, and suggestions. The secretary was authorised to send the "Annals," and other publications, to the Montreal Society, as published, and to afford any additional information that might be required.

Various papers were read—we select the following.

REMARKS ON A NEW CULINARY VEGETABLE, THE PARSNIP CHERVIL, BY MRS. PROF. WEIR

On 30th August, 1861, Messrs. Vilmorin, Andrieux & Co.. the eminent Seedsmen of Paris, issued a circular, in which they re-

commend the cultivation of this root, on the ground that it has acquired new importance from the fact that the disease has attacked all the early varieties of Potato.

It is in fact one of the best of those recently introduced, being desirable for its feculent qualities, its flavour (which is something betwen that of a chesnut and a potato), and also on account of its productiveness, yielding as it does six tons an acre.

Another merit of this vegetable is that it comes into use early in the season; in the beginning of June the roots are formed, and they keep good until the April following. It requires the same treatment as the potato, and, like it, can be cooked in a variety of ways.

The cultivation of it is very simple. It ought to be sowed in the month of September or October, either in lines or scattered as you would carrot seed, care being taken to press down the soil slightly after it is sown.

We ought to remark at the same time that, unlike the potato, which thrives best in a light, dry or sandy soil, the Chærophyllum bulbosum is most successfully cultivated in rather damp soil which has previously been prepared and manured.

If sown later than the period above mentioned, it will be necessary to use seed which has been kept for some time in a layer of earth or damp sand; without which precaution it is not likely to germinate till the year following. The roots are gathered in the month of July, and preserved in the same way as potatoes, care being taken to turn them occasionally to prevent their deteriorating.

This root has received various names, such as *Myrrhis bulbosa*, Spreng, *Scandix bulbosa*, of some German botanists, *Chærophyllum bulbosum*, L. But the name by which it is likely to be know in common use is Parsnip Chervil.

Professor Lindley says it is regarded by French gourmands as "un vegetable des plus delicieux," and he agrees with them. It is in fact he says, uncommonly good to eat, very like a boiled Spanish chesnut, without its crispness or hardness. In Europe, as has already been remarked, it is sown in September or October, but it will brobably be found better to sow it in spring in Canada. The plant is a native of Europe, and was cultivated in England by Mr. Philip Miller so long ago as 1726, but as a botanical curiosity only. Again, a few years ago, it was proposed for cultivation, but the roots were found to be too small to be of much use. Since

then, however, it has been improved by cultivation; the roots are figured as of the size and nearly the shape of an undersized early horn carrot. It is likely, therefore, to form a substantial addition to our culinary crops.

It has been stated in the Gardeners' Chronicle that the Royal Horticultural Society bought up for their members all the good seed that was procurable, and this was to be distributed in small packets last month. It will, therefore, be satisfactory to the members of the Botanical Society of Canada, to learn that our Society had previously secured a supply of seeds, which will be distributed to members in good time for sowing.

MISCELLANEOUS.

Note on Indian Beads presented to the Natural History Society by James Robb, Esq., Mining Engineer, &c.

In a memorandum accompanying these specimens, they are said to have been taken from an old burying place in a small island in the St. Lawrence near Brockville. They were found with two skeletons, placed in a sitting posture and facing each other, buried under four feet of sand resting on a floor of clay, which was supposed to have been artificial. The beads and a sea shell were in a heap under three flat stones placed on edge, and converging at the top. These stones were of a quality suitable for hones.

The beads are made of native copper, which has been beaten out and then doubled into thick rings, about a quarter of an inch in diameter externally. They are quite rough but rather uniform in size and shape. The shell appears to be the common *Purpura lapillus* of the American coast, smoothed externally, and with the apex ground off. It has no doubt been strung with the beads. It is curious thus to find at a place half-way between the copper regions of Lake Superior and the sea coast, the products of both carried from their distant sources, and used for ornamental purposes by the aborigines.

J. W. D.

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MONTHLY METEOROLOGICAL REGISTER, ST. MARTINS, ISLE JESUS, CANADA EAST, (NINE MILES WEST OF MONTREAL,) FOR THE MONTH OF OCTOBER, 1861.

Latitude, 45 degrees 32 minutes North. Longitude, 73 degrees 36 minutes West. Height above the level of the Sea, 118 feet.

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

Day of Month.	Barometer—corrected and reduced to 32° F. (English inches.)			Temperature of the Air.—F.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.			Direction of Wind.			Horizontal Movement in 24 hours. In miles.	OZONE. Mean amount of, in tenths.	RAIN. Amount of, in inches.	SNOW. Amount of, in inches.	WEATHER, CLOUDS, REMARKS, &c. &c. [A cloudy sky is represented by 10, a cloudless one by 0.]		
	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.					6 a. m.	2 p. m.	10 p. m.
1	30.315	30.250	30.160	40.0	60.9	50.6	.232	.310	.309	.96	.60	.85	S. W.	S. S. E.	S. by W.	4.80	2.0	.....	.....	Fog.	Clear.	Cirr. Str. 8.
2	29.952	29.748	29.474	46.4	74.3	60.4	.286	.469	.456	.92	.57	.88	S. S. E.	S. by E.	S. by E.	41.00	2.0	.....	.....	C, C. Str. 6.	Cu. Str. 6.	" 9.
3	678	721	903	61.0	64.0	50.2	.449	.314	.265	.85	.53	.75	W. by S.	W.	N. N. W.	220.80	2.5	.....	.....	Clear.	C. C. Str. 6.	Clear.
4	964	934	988	43.9	60.0	46.1	.224	.456	.286	.79	.88	.92	S. S. E.	S. S. E.	S. S. E.	22.90	3.5	Inapp.	.....	Cum. 9.	Cu. Str. 10.	"
5	796	719	758	40.0	41.6	43.0	.225	.251	.261	.91	.96	.95	N. E. by E.	N. E. by E.	N. W.	242.90	5.0	0.836	.....	Rain.	Rain.	Rain.
6	629	647	709	51.0	57.9	55.5	.354	.429	.405	.96	.91	.94	S. S. E.	S. S. E.	N. E. by E.	94.30	4.0	.....	.....	Cu. Str. 10.	Cu. Str. 8.	"
7	924	932	30.020	50.0	53.1	48.2	.297	.295	.310	.85	.73	.91	N. E. by E.	N. E. W. E.	S.	147.10	4.5	0.523	.....	Cu. Str. 4.	" 6.	Cu. Str. 10.
8	30.021	30.010	074	46.4	53.0	45.1	.269	.248	.275	.88	.86	.91	W. S. W.	S. E.	S. S. W.	12.80	3.5	0.420	.....	Rain.	" 6.	Clear.
9	150	127	200	41.0	68.2	48.7	.235	.176	.329	.91	.69	.94	S. S. W.	S.	S. E.	0.30	3.0	.....	.....	Fog.	Clear.	Clear.
10	120	100	020	36.7	68.4	49.6	.236	.336	.315	.95	.77	.89	S. S. E.	S. S. E.	E.	1.20	3.0	.....	.....	Fog.	"	Clear. Aurora B. Streamers.
11	29.851	29.814	29.701	43.0	49.2	47.3	.254	.322	.316	.92	.92	.97	E.	N. E. by E.	N. E. by E.	73.49	4.0	1.236	.....	Cu. Str. 8.	Rain.	Cu. Str. 10.
12	604	406	412	50.0	68.4	50.4	.341	.606	.353	.96	.86	.93	W.	W. S. W.	S. S. E.	88.80	5.0	1.694	.....	Rain.	C. C. Str. 6.	" 10.
13	401	394	521	43.6	52.0	46.3	.254	.208	.280	.92	.53	.89	W. S. W.	W. N. W.	W.	229.80	5.5	0.044	.....	Cu. Str. 8.	Clear.	Clear.
14	682	624	701	41.9	59.0	49.0	.228	.380	.290	.86	.76	.82	W. S. W.	W. S. W.	S. W.	276.50	4.5	.....	.....	Cu. Str. 8.	Cu. Str. 4.	Cum. 2.
15	790	814	972	40.1	58.4	45.0	.225	.394	.245	.91	.82	.80	S. W.	S. W.	S. W.	155.90	1.0	.....	.....	Clear.	Clear.	Clear.
16	30.070	954	884	35.1	50.9	46.1	.183	.277	.286	.90	.75	.92	E. S. E.	E. N. E.	N. E. by E.	54.40	3.5	.....	.....	Cu. Str. 10.	Cu. Str. 9.	Cu. Str. 10.
17	29.801	854	850	45.1	68.6	56.1	.275	.606	.391	.92	.88	.87	E. S. E.	S. S. E.	S. by E.	20.40	2.5	.....	.....	" 10.	C. C. Str. 4.	Cir. Cum. 6.
18	710	670	762	54.1	49.9	45.6	.390	.315	.293	.93	.89	.96	S. S. E.	N. E. by E.	N. E. by E.	159.90	3.5	0.396	.....	" 6.	" 8.	Cu. Str. 10.
19	697	511	497	44.1	48.1	45.2	.265	.310	.275	.92	.92	.92	N. E. by E.	N. E. by E.	W.	158.60	5.5	0.014	.....	Rain.	Cu. Str. 4.	" 4.
20	567	814	997	44.2	48.2	35.0	.265	.285	.175	.92	.85	.89	W.	W. N. W.	W. by N.	130.98	5.5	Inapp.	.....	Cu. Str. 8.	" 6.	Clear.
21	30.151	30.160	30.172	26.0	47.0	55.6	.111	.200	.177	.81	.90	.85	W. S. W.	S. S. W.	E. S. E.	32.80	2.5	.....	.....	Clear. Hard Frost.	Clear.	"
22	040	29.840	29.830	28.4	56.9	51.0	.129	.275	.309	.82	.60	.85	N. E. by E.	E. S. E.	S. S. E.	88.80	2.5	Inapp.	.....	" "	Cu. Str. 8.	Cirr. Str. 8.
23	29.461	317	449	50.1	54.2	41.0	.341	.341	.235	.96	.83	.91	S. S. E.	W. S. W.	S. by E.	230.20	5.0	Inapp.	Inapp.	Cu. Str. 10.	Rain.	" 10.
24	750	891	30.200	31.3	39.0	29.0	.149	.158	.129	.85	.68	.82	W. by S.	W. by S.	S. W.	364.90	5.0	Inapp.	.....	" 4.	C. C. Str. 4.	Clear. Aurora Borealis.
25	30.300	30.257	170	21.4	45.0	37.0	.090	.275	.177	.79	.92	.85	S. S. E.	S. E.	S. S. E.	48.70	3.0	.....	.....	Clear.	" 6.	Cirr. Str. Faint Aurora Borealis.
26	080	001	29.912	36.0	51.6	45.7	.162	.348	.305	.84	.93	.96	S. S. E.	S. S. E.	S. W.	65.70	3.5	0.166	.....	Cu. Str. 10.	Cirr. Str. 10.	Rain.
27	100	094	30.101	35.0	47.1	32.1	.183	.273	.142	.90	.85	.84	W.	N. by E.	N. W.	128.10	3.5	.....	.....	" 4.	Cirr. 4.	Clear. Aurora Borealis at 4 a.m.
28	066	009	29.950	30.0	41.0	33.0	.142	.111	.156	.88	.44	.85	N. N. W.	S. W.	S. W.	49.60	3.0	.....	.....	Clear.	Clear.	"
29	29.750	29.453	541	25.0	36.2	40.5	.155	.315	.197	.88	.71	.78	S. W.	S. W. by S.	S. S. E.	75.00	2.5	.....	.....	"	"	"
30	391	357	400	30.1	44.0	41.0	.156	.218	.241	.85	.88	.95	N. E. by E.	N. N. E.	N. E. by E.	11.70	5.5	Inapp.	.....	"	C. C. Str. 6.	Cu. Str. 10.
31	534	660	576	39.0	46.1	39.4	.216	.262	.210	.91	.86	.86	N. E. by E.	S. W.	W. S. W.	159.90	3.0	0.041	.....	Cu. Str. 10.	Cu. Str. 10.	" 4. Aurora Borealis.

REPORT FOR THE MONTH OF NOVEMBER, 1861.

Day of Month.	Barometer—corrected and reduced to 32° F. (English inches.)			Temperature of the Air.—F.			Tension of Aqueous Vapour.			Humidity of the Atmosphere.			Direction of Wind.			Horizontal Movement in 24 hours. In miles.	OZONE. Mean amount of	RAIN. Amount of, in inches.	SNOW. Amount of, in inches.	WEATHER, CLOUDS, REMARKS, &c., &c. [A cloudy sky is represented by 10, a cloudless one by 0.]		
	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.	6 a. m.	2 p. m.	10 p. m.					6 a. m.	2. p. m.	10 p. m.
1	30.100	30.142	30.167	30.1	47.0	36.6	.148	.208	.149	.89	.66	.71	W. S. W.	S. W. by S.	N. E. by E.	61.50	2.0	.....	.....	Clear.	C. C. Str. 8.	Cu. Str. 4.
2	201	29.940	29.854	30.1	34.2	36.1	.148	.155	.191	.89	.79	.90	N. E. by E.	N. E. by E.	N. E. by E.	258.70	2.5	Inapp.	.....	Cu. Str. 10.	Cu. Str. 8.	Rain.
3	29.497	421	387	35.1	42.1	41.0	.183	.244	.241	.90	.91	.95	N. E. by E.	N. E. by E.	N. E. by E.	487.00	4.0	0.214	.....	C. C. Str. 10.	Rain.	"
4	371	412	558	40.0	48.3	39.0	.248	.242	.216	1.00	.74	.91	S. S. E.	S. by E.	S. S. E.	98.40	4.5	0.112	.....	Light Rain.	C. C. Str. 8.	Cu. Str. 4.
5	567	521	567	34.2	47.0	43.0	.155	.258	.281	.79	.81	.88	S. S. E.	E. S. E.	N. E.	46.40	2.0	.....	.....	Cu. Str. 10.	Cu. Str. 10.	" 10.
6	500	465	442	37.0	44.0	44.0	.206	.265	.266	.93	.92	.93	N. E. by E.	N. E. by E.	N. W.	87.20	1.5	.....	.....	Fog.	" 10.	Rain.
7	574	567	644	39.2	45.7	36.0	.216	.198	.156	.91	.65	.75	W. S. W.	W.	W. S. W.	209.50	1.5	.....	.....	C. C. Str. 8.	" 4.	Clear.
8	660	567	755	31.9	41.5	33.2	.144	.126	.156	.80	.49	.84	W. by S.	S. W. by S.	S. E. by E.	217.30	1.0	.....	.....	Clear. Au. Bo. 3 a.m.	Clear.	Cu. Str. 10.
9	561	642	701	32.1	41.4	35.6	.180	.190	.149	.74	.73	.74	S. E.	S. S. E.	W.	41.50	1.0	Inapp.	.....	"	Cu. Str. 10.	" 10.
10	894	30.001	981	23.0	43.0	33.0	.106	.127	.154	.86	.47	.86	S. by W.	E.	S. E.	21.70	1.0	.....	.....	Clear. Au. Bo. 3 a.m.	C. C. Str. 4.	C. C. Str. 10. Incp L. Halo 7 p.m.
11	477	29.459	632	38.9	42.0	40.0	.216	.293	.210	.91	.96	.86	S. S. E.	E. S. E.	W. S. W.	220.30	3.0	0.673	.....	Cu. Str. 10.	Rain.	Cu. Str. 8.
12	30.042	30.047	30.120	32.5	57.5	32.0	.162	.110	.119	.89	.49	.89	W. S. W.	W. by N.	N. W.	397.40	2.5	0.014	.....	" 10.	C. C. Str. 8.	" 9.
13	29.931	29.930	29.801	27.5	34.2	33.0	.111	.138	.150	.75	.71	.89	E.	E. S. E.	S. by W.	15.80	2.0	.....	.....	C. C. Str. 8.	Cu. Str. 10.	" 9.
14	754	746	780	31.0	38.1	30.0	.136	.144	.136	.78	.63	.83	S. W.	S. W.	S. W.	333.40	1.5	.....	.....	Str. 4.	Cirr. 2.	Cirr. Str. 2.
15	580	450	484	28.5	33.0	30.0	.111	.131	.148	.71	.70	.89	W. N. W.	W. N. W.	W. by N.	241.90	2.0	.....	.....	Cu. Str. 10.	Cu. Str. 2.	Snow.
16	357	519	617	27.3	38.4	37.3	.129	.186	.157	.88	.81	.71	S. S. W.	S. W.	S.	229.20	4.5	.....	.....	" 10.	Snow.	Cu. Str. 8.
17	650	657	670	31.1	39.4	30.0	.142	.178	.117	.84	.78	.72	S. by W.	S. by E.	W. by N.	236.60	2.0	.....	.....	" 10.	Clear. Solar Halo.	" 4.
18	824	797	900	25.9	40.1	31.0	.111	.160	.150	.81	.64	.80	S. W. by W.	W. S. W.	W. S. W.	48.10	2.0	.....	.....	C. C. Str. 6.	Cirr. 4.	Clear.
19	30.026	30.147	30.190	22.3	35.2	26.2	.084	.127	.088	.71	.62	.62	W.	E. S. E.	S. S. E.	37.50	1.5	.....	.....	Clear.	Clear.	"
20	166	009	020	22.0	36.6	27.6	.084	.129	.165	.71	.61	.70	N. E. by E.	N. by E.	N. E. by E.	134.50	1.0	.....	.....	"	"	"
21	29.987	29.996	101	25.0	34.0	27.2	.100	.155	.117	.75	.79	.83	N. E. by E.	N. E. by E.	S. W. by S.	172.50	2.0	.....	.....	Cu. Str. 6.	C. C. Str. 6.	Cirr. 4.
22	30.097	937	29.800	24.3	40.4	27.4	.101	.160	.111	.79	.64	.75	N. E. by E.	N. E. by E.	N. W.	61.60	2.5	.....	.....	Clear.	Clear.	Clear.
23	29.650	631	540	27.6	33.4	32.0	.123	.102	.168	.82	.84	.89	N. E. by E.	N. E. by E.	N. E. by E.	161.10	4.0	.....	1.92	C. C. Str. 8.	Snow.	Snow.
24	261	344	449	32.0	33.4	34.2	.108	.162	.177	.89	.84	.88	N. E. by E.	S. E.	S. S. E.	247.90	5.0	.....	4.42	Cu Str. 10.	"	Cu. Str. 10.
25	504	512	610	27.6	36.2	26.1	.123	.170	.105	.82	.80	.75	E.	E.	S. W.	18.90	2.5	.....	.....	" 10.	C. C. Str. 10.	Clear.
26	700	779	900	25.1	35.2	24.3	.105	.162	.111	.80	.79	.86	S. E.	S. W.	S. S. W.	48.80	2.0	.....	.....	" 10.	Cu. Str. 10.	Cu. Str. 10.
27	918	900	803	22.4	28.9	27.1	.095	.093	.111	.79	.59	.75	E. by N.	N. E. by E.	N. E. by E.	104.20	2.5	.....	.....	"	"	"
28	774	834	876	30.4	35.0	28.2	.142	.142	.117	.84	.70	.76	S. E. by E.	S. by E.	S. W.	135.80	3.5	.....	1.30	Snow.	" 10.	" 4.
29	594	480	560	27.0	32.0	31.1	.117	.162	.135	.82	.89	.89	E.	E. S. E.	S. S. W.	129.00	4.8	Inapp.	1.64	"	Snow.	" 10.
30	299	548	662	29.6	37.3	29.7	.136	.164	.186	.83	.76	.83	W.	S. W.	S. S. W.	38.40	4.8	.....	0.67	Cirr. Str. 10.	"	" 10.
...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

REMARKS FOR OCTOBER, 1861.

Barometer..... Highest, the 1st day, 30·315 inches.
Lowest, the 30th day, 29.301 "
Monthly Mean, 29.876 "
" Range, 1.014 "

Thermometer... Highest, the 17th day, 68°6.
Lowest, the 22nd day, 26°2.
Monthly Mean, 46°64.
Monthly Range, 42°4.

Greatest intensity of the Sun's rays, 98°0.
Lowest point of Terrestrial radiation,—24°0.
Amount of evaporation. 1·17 inches.
Mean of Humidity, .843.

Rain fell on 16 days, amounting to 5.370 inches; it was raining 69 hours and 39 minutes.
Snow fell on 1 day inappreciable.
Most prevalent wind, the S. S. E.
Least prevalent wind, the S.
Most windy day the 20th day, mean miles per hour, 17.54.
Least windy day the 9th day, mean miles per hour, 0.01.
Aurora Borealis visible on 5 nights.
The Electrical state of the Atmosphere has indicated moderate intensity.
1st Snow of the Season fell on the 24th day.

REMARKS FOR NOVEMBER, 1861.

Barometer..... Highest, the 2nd day, 30.201 inches.
Lowest, the 30th day, 29.299 "
Monthly Mean, 29.714 "
Monthly Range, 0.302 "

Thermometer. Highest, the 4th day, 48°3.
Lowest, the 22nd day,—19°7.
Monthly Mean, 33°60.
Monthly Range, 28°6.

Greatest intensity of the Sun's rays, 77°7.
Lowest point of terrestrial radiation,—17°4.
Mean of humidity, ·787.
Rain fell on 6 days, amounting to 1·023 inches, it was raining 32 hours, 52 minutes.

Snow fell on 8 days amounting to 11·51 inches. It was snowing 54 hours and 29 minutes.
Most prevalent wind, N. E. by E.
Least prevalent wind, S.
Most windy day, the 3rd day; mean miles per hour, 2.25.
Least windy day, the 12th day; mean miles per hour, 0.65.
Aurora Borealis visible on 3 nights.
The Electrical state of the Atmosphere has indicated feeble intensity.
Snow Birds (*Plectrophanes Nivalis*) 1st seen 17th day.
Imperfect Solar Halo on the 18th day.
Imperfect Lunar Halo on the 10th day.
Crows left here about the 7th day.

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The next number of this Magazine will be published in February 1862.