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GEOLOGICAL SURVEY OF CANADA.

ALFRED R. C. SELWYN, LL.D., F.R.S., F.G.S., DIRECTOR.

REPORT

ON

HUDSON'S BAY

AND SOME OF THE LAKES AND RIVERS LYING TO THE WEST OF IT.

BY

ROBERT BELL, M.D., F.G.S., C.E.

1879-80.

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MONTREAL, May 4th, 1881.

A. R. C. SELWYN, ESQ., LL. D., F, R. S.,

Director, Geological Survey:

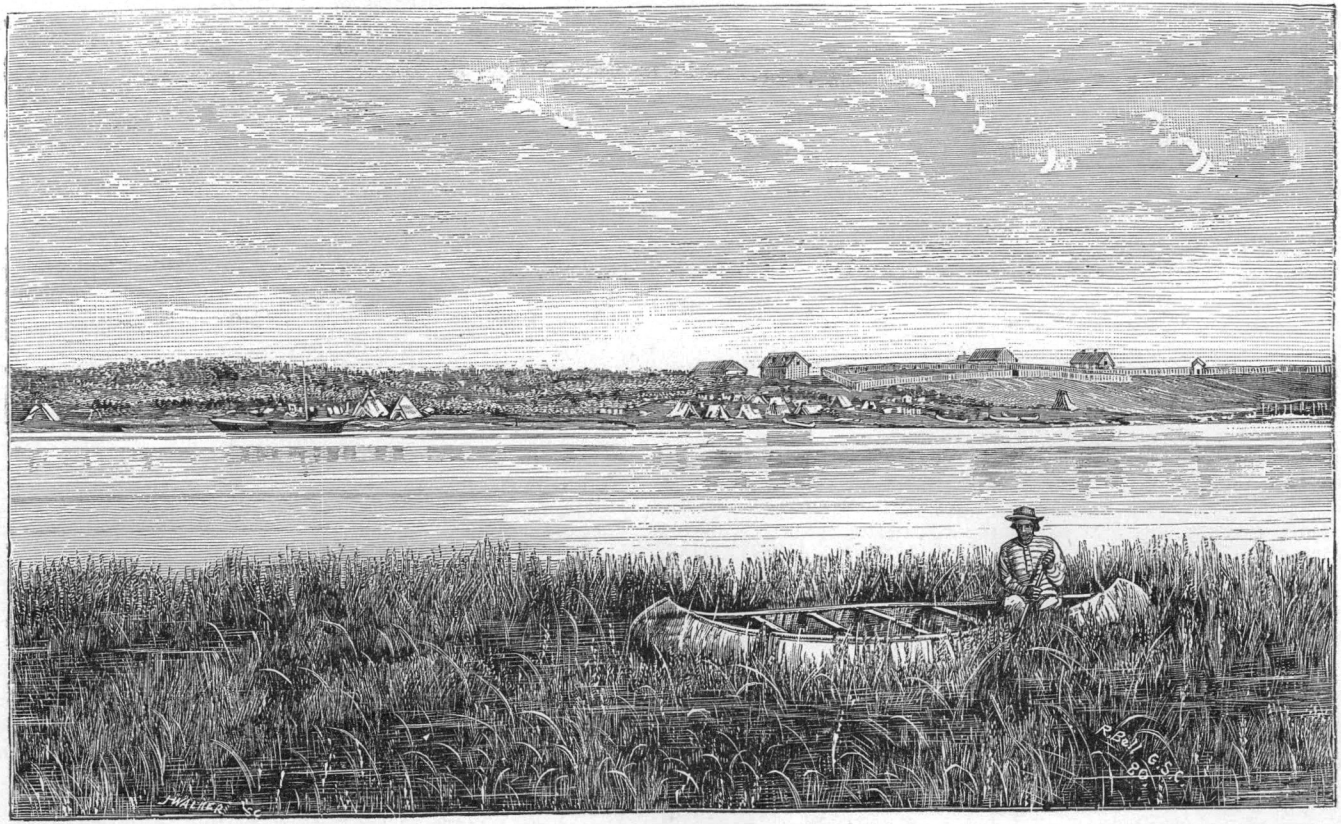
SIR,—I beg to submit, herewith, my report for the year 1879–80.

I have the honor to be,

Sir,

Your obedient servant,

ROBERT BELL.



GEOLOGICAL SURVEY, 1880.

From a Photograph by DR. BELL.

OXFORD HOUSE—LOOKING SOUTH-EAST.

REPORT

ON

HUDSON'S BAY

AND SOME OF THE LAKES AND RIVERS LYING TO THE WEST OF IT.

BY

ROBERT BELL, M.D., F.G.S., C.E.

The explorations of myself and assistants during the summer of 1880 had for their object the continuation of those of the two previous years in the region lying to the west of Hudson's Bay. I was instructed to return home through Hudson's Strait; and the Hudson's Bay Company kindly allowed me a passage by their ship from York Factory to London. It was hoped that an opportunity might thus be afforded of ascertaining something of the geology of the shores of the strait, and it fortunately happened that a great part of its northern and southern shores were seen during the passage, and also the principal islands which lie within it. To the officers of the Company residing in the country we are again indebted for many favors and much valuable assistance. Among others from whom such courtesies were received I may mention the Chief Commissioner, Mr. Graham, Messrs. J. H. McTavish, W. Flett, R. Ross, C. Sinclair, J. Fortescue, W. Clark, H. Belanger and P. Deschambault.

Object of explorations.

Acknowledgment of aid.

Mr. A. S. Cochrane was again my assistant, and we were also aided by Mr. Charles A. Molson, B.A., and Mr. Charles A. Lawford, of Montreal, both of whom accompanied the party as volunteers. All these gentlemen performed their duties in an efficient and satisfactory manner.

Assistants.

Reaching Winnipeg on the 16th of June, we hoped to be able to proceed at once to Norway House, the proposed starting point of the three divisions of our party, after obtaining the necessary Indians,

canoes, &c. The steamer "Colville" was, however, the only means of doing so, and it was nearly a month later before she started on her first trip to Norway House. The interval was profitably employed in making a variety of preparations, procuring supplies, constructing maps, taking photographs of the characteristic scenery of the province, making geological examinations and collecting natural history specimens, including a collection of fossils from the limestone of the Red River in the parish of St. Andrews, and at the newly opened quarry at East Selkirk. This collection will be examined and reported upon by Mr. Whiteaves. We landed at Norway House on the 17th of July, and with the kind assistance of Mr. Roderick Ross, the gentleman in charge, immediately made arrangements which enabled Messrs. Molson and Lawford to proceed in one direction, and Mr. Cochrane in another, while I took a third, having given full written instructions as to all matters which the branch expeditions were expected to attend to. Nearly all the supplies and outfit required, with the exception of canoes, had been brought with us, and these were furnished by Mr. Ross, who also aided us in securing good canoemen, and allowed us the use of a building in which to store our provisions and baggage.

Preparations.

Fossils.

Division of party.

Messrs. Molson and Lawford were instructed to make track surveys and geological examinations of the part of Cross Lake on the Nelson River which had not already been examined by myself, and of the whole of Walker's Lake, lying a short distance to the east of it. Mr. Lawford was obliged to return to Montreal on the completion of this work, and Mr. Molson, with two canoemen, was directed to make a similar survey and examination of a lake situated a short distance east of the Nelson River, between Cross Lake and Lake Winnipeg. This sheet of water is known to the Indians of the neighborhood as Winnipegosis, but in order to avoid confounding it with the larger and better known lake of the same name (to the west of Lake Winnipeg), it is proposed to call it Molson's Lake, after the gentleman to whom we are indebted for the first exact knowledge concerning it. After completing the survey of this lake, Mr. Molson, having to wait about two weeks for an opportunity to return home, spent the time in going over a part of the line which was being run by the Chief Engineer of the Nelson Valley Railway & Transportation Company, on the north-west side of the Nelson River.

Cross Lake.

Molson's Lake.

Line of Nelson Valley railway.

One of the objects of the present season's explorations being to trace out the boundary between the Cambro-silurian limestone and the more ancient rocks to the north-westward, from the foot of Lake Winnipeg, Mr. Cochrane was instructed to proceed to the western extremity of Cross Lake, and thence to traverse the country to the south-westward, by way of Pine River and Moose Lake and River to the Saskatchewan,

Boundary of Cambro-silurian limestone.

Cross Lake to the Saskatchewan.

GEOLOGICAL SURVEY. 1880.

TEN-SHILLING CREEK, NEAR YORK FACTORY.

From a Photograph by DR. BELL.

which he was then to ascend to Cumberland House. Thence to make his way northward to the Churchill River at Frog Portage, and to descend this river to its junction with Deer River from the northward, ward, which discharges the waters of the Reindeer Lake. He was next to ascend the river to the lake, and then to make a survey and and examination of as much of its shores as the season would permit.

Churchill River

Reindeer Lake.

In the event of Mr. Cochrane finding it impossible to complete his exploration of Reindeer Lake before winter, he was to remain either at the lake itself or as near as possible to it, and to be guided in his operations next season by the instructions he might receive before the opening of navigation, and in the meantime endeavor to map his work and report the results as far as possible. A sufficient stock of provisions, &c., for his use was sent to Cumberland House, even if he should require to spend the winter in the country.

Wintering in the country.

Mr. Cochrane has completed all the work prescribed except a portion of Reindeer Lake. The winter set in while he was exploring its shores, and he resolved to remain at the Hudson's Bay Company's post at the northern part of the lake. Mr. Deschambault, the gentleman in charge, had a shanty built for him, and before the end of January he had prepared his report and maps showing his explorations. These documents reached Montreal in March: The maps will require to be corrected for latitude, variation of the compass, &c., and carefully compiled on a smaller scale for publication, which can best be done after the completion of the explorations of the coming season. An abstract of Mr. Cochrane's report on last season's work will be given further on.

Work accomplished.

Having completed the foregoing arrangements, I left Norway House on the evening of the 20th of July, and followed the same boat route to York Factory of which a track survey was made in 1878. The latter post was reached on August 1st, but having spent three days at Oxford House, only nine days were consumed in travelling, and even this allowed time for stopping frequently on the way. Some additional notes were made on the geology of the region traversed, the latitudes of a few points determined, a number of interesting photographs obtained, and some zoological and a large number of botanical specimens were collected. While awaiting the sailing of the Hudson's Bay Company's ship "Ocean Nymph" on her annual return voyage to London, I was kindly entertained by Mr. Fortescue, the Chief Factor in charge of York Factery.

Norway House to York Factory.

The ship formerly often reached this port early in August, but for the last few years she has had orders to call first at Churchill Harbor, and is now somewhat later in reaching York Factory; this year she was considerably later than usual, but being daily expected, I could not venture far from the factory. The time, however, was usefully

Date of arrival of ship.

employed in making more detailed examinations of the estuaries of the Hayes and Nelson Rivers, taking photographs of the characteristic scenery of the neighborhood, observations for latitude, and in collecting botanical and geological specimens, &c.

Bishop of Moosonee.

The Bishop of Moosonee, who had been spending two years in this part of his extensive diocese, was also at York Factory, waiting to take passage by the same ship to England. Having been aware in 1879 of His Lordship's intention to visit Trout Lake and the Severn River during the spring of 1880, I had requested him by letter to observe the rocks he might pass on his way, with a view to discovering any bands of the Huronian system which might exist in that direction. Judging from the specimens and information which he kindly gave me on his return, it is inferred that a belt of these rocks crosses the Trout Lake branch of the Severn River just below the outlet of that lake. The specimens collected by the Bishop at this locality consist of a very dark, coarsely crystalline diorite or hornblende rock, containing crystals of dirty, greenish-grey felspar; dark, compact felsite, and dark, fine-grained hornblende schist. Further down, in the banks of the Trout Lake River, he noticed beds of gravel cemented together by calcareous matter. These extend for a considerable distance along the stream, and large blocks of the rock which have rolled down to the beach form a conspicuous feature of this part of the river. His Lordship kindly brought a specimen of this rock, and also of a light-colored fossiliferous limestone which he reports as occurring abundantly in the bed of the river about twenty-five miles above Fort Severn, and which no doubt belongs to the Cambro-silurian system.

Trout Lake.

Huronian rocks.

Cemented gravel.

Fossiliferous limestone.

Arrival of ship.

The "Ocean Nymph" arrived on the 4th of September, and was ready to sail again on the 10th, but calm weather prevented her doing so, and she was subsequently detained by a gale from sea until the 13th, on the evening of which we cleared the land. An abstract of the notes taken on the voyage, until well out in the Atlantic Ocean, is given further on. The "Ocean Nymph" is a barque of about 320 tons. On arriving from sea she anchors in York Roads or the channel of the North or Nelson River, opposite the Point of Marsh or the extremity of Beacon Point, until a Pilot is sent out. Then, having secured a favorable wind, she sails at high tide into Hayes River, where, while discharging and loading cargo, she lies at anchor in the middle of the main channel, half a mile wide, directly in front of the Factory. Here, at low tide, the water is ten or twelve feet deep, and upwards of twenty feet at high tide. On the present occasion, the "Ocean Nymph's" draft of water on entering was about twelve feet, and on leaving only between nine and ten feet. A ship drawing more than this could not apparently come up the stream to York Factory.

Ship's anchorage.

The larger vessels which formerly brought the goods for this establishment were therefore obliged to remain at Five-fathom Hole, in the mouth of Hayes River, about seven miles from the Factory.

Cross Lake and Walker's Lake.

The western part of Cross Lake was mapped in 1878, and during the present season Messrs. Molson and Lawford completed the survey of the remainder of its shores, and we now have a complete map of the whole lake. Its main body proves to be nearly straight, with a general course of about N. 60° E. (mag.), and a length of about fifty-four miles. Its width varies from four to seven or eight miles, except in the ten miles at the eastern end, where it is only about one mile wide. From a point in the middle of the lake, opposite the most easterly of the outlets, the arm on the east side of the Indian Reserve Island extends southward a distance of sixteen miles. The western channel of the Nelson River from Great Playgreen Lake, and also a stream called Pine River, enter the western extremity of the lake. The Indians, by ascending a creek at the north-east extremity of the wide part about a mile, and thence by a portage about three miles long, leading northward, come to a pond, from which the water flows to White Rabbit Lake. This again discharges into Sipi-wesk Lake. The Mistasini or Big-stone River falls into the north-eastern extremity of Cross Lake. A canoe-route which begins here soon leads to one of the head branches of the Fox River, which may, it is said, be easily descended by canoes to that stream, and this again to its junction with Hill River. The Indians are reported to follow this route occasionally in travelling between York Factory and Norway House. Another canoe route is said to exist between Cross Lake and the lower part of the Nelson River. Some of the Indians stated that Cross Lake has an outlet near its north-east extremity, but this was found to be an error.

Survey of Cross Lake.

Pine River.

White Rabbit Lake.

Fox River.

Towards the north-east end of the lake there is a considerable bay on the south-east side, the eastern extremity of which receives the river or narrow strait, two and a half miles long, which leads, in an easterly direction, into Walker's Lake, so called after an Indian in whose hunting grounds it is situated. This sheet of water has the same level as Cross Lake, and the set of the current between the two is frequently determined by the direction of the wind. Walker's Lake runs S.S.W. (mag.), and has a length of nine miles, with a breadth of four miles. Both lakes contain many islands, scattered over all parts of their surface.

Walker's Lake.

Cross Lake is so named from the fact that it lies transversely to the general course of the Nelson River. This river may itself be regarded as flowing across the lake, since its milky-looking water extends only

Water of Cross Lake.

between the inlets and outlets,—the water of the southern arm and of the main body of the lake to the north-east of the outlets being transparent, with a slightly brownish tint.

Surrounding country.

The country around Cross and Walker Lakes has a generally level appearance. Much of it appears to be rocky, but a good deal of clayey soil was observed at various parts of the shores of the lake. The forest is mostly green or unburnt, and consists of spruce, Banksian pine, tamarac, Canada balsam, white birch, aspen and balsam-poplar, together with willows of two or three species, pigeon cherry (*Prunus Pennsylvanica*), common and green alder (*Alnus incana* and *A. viridis.*), and rarely the rowan or mountain ash (*Pyrus Americana*).

Timber.

Rocks.

The Huronian rocks of the western part of Cross Lake were described in the report for 1878. On the north-western side of the lake, to the eastward of the outlets, Mr. Molson found only Laurentian gneiss, except at Poplar Point, about half-way up the shore, where a band of micaceous hornblende schist occurs in a vertical attitude; strike, S. 55° W. (mag). The same band was seen on the opposite shore in the continuation of this. Gneiss was the only rock found upon Walker's Lake. The character and strike of the gneiss were recorded in a considerable number of places around both lakes, and these observations are useful in mapping the geology of this region, but they do do not require to be described in detail. It may be mentioned, however, that taking the average of all the courses noted, the general run was found to be S. 45° W. and S. 80° W. (mag). The rock in different parts presents considerable variety as to texture, mode of lamination, &c., and various shades of red and grey were observed on both sides. The directions of the glacial striæ, which were noted in a number of places around Cross Lake, were found to vary from S. 45° W. to S. 50° W.

Hornblende schist.

Gneiss.

Strike.

Glacial striæ.

Molson's Lake.

The White-water River, by which this lake is reached, joins the Echimamish from the south at about seven miles east of the short portage over the height of land dividing its channel, or two miles above Robinson's Lake. From this point the outlet of Molson's Lake lies at a distance of only three and a-half miles in a straight line, bearing S. 35° W. (mag.),but the river makes a curve to the westward, which increases the distance to five miles. Four rapids occur in the White-water, but they can all be surmounted by canoes, except the last, which requires a portage of 120 yards to be made in order to pass it. The greatest length of the lake, which is about eighteen miles, lies in an E. N. E. and W. S. W. direction. The outlet is situated at about one-third of the entire length from the north-eastern end, and the broadest

Molson's Lake.

White-water River.

part of the lake, about eight miles across, is just opposite to it. From this part the width diminishes regularly to either extremity.

A small stream, known as Pine River, falls into the north-east end, and another called Pai-musk-taban Sipi, or Marshy Canoe-route River, enters the south-western extremity. A canoe-route from the Echimamish passes up the White-water River, through Molson's Lake, and then follows up the latter stream, which is sluggish and marshy, in a south-westerly direction, to its source in a muskeg, or open swamp, at a distance of eight or ten miles from the lake. A trail from this muskeg passes over some rocky ground, and emerges on the Nelson River above Sea River Falls. Canoe-route.

On the north side of the Pai-musk-taban Sipi, near its mouth, a perperdicular cliff of gneiss rises to a height of about 100 feet. The face of the cliff runs S. 38° W. (mag.), and is marked by horizontal glacial striæ. On this cliff are some small figures in red ochre, said to have been painted by the father of the present chief of the colony of Indians which removed a few years ago from Little Playgreen Lake to Fisher River, on the west side of Lake Winnipeg. The largest pictures are not more than one foot high, and most of them do not exceed eight inches. They represent a boat, canoe, tortoise, bird, deer, otter, Indian, pipes, &c., and are spoken of by the Indians as being much more wonderful than they really are. Painted figures.

The eastern part of Molson's Lake is surrounded by a rocky country. Some of the hills or bluffs rise to a height of upwards of 100 feet above the water. Boulders are unusually prevalent about the margins of this lake and White-water River, but a clayey soil, bearing good-sized spruce and other timber, occurs in some places. Surrounding country.

Gneiss, principally of a grey color, is the only rock found around this lake. Its general strike is between S. W. and W. S. W. It nowhere presents any peculiarities worthy of special description, as far as Mr. Molson could observe. The general course of the glacial striæ around the lake was found to be from S. 30° W. to S. 40° W. Rocks. Glacial striæ.

The water of Molson's Lake is transparent, with a greenish tinge, and it is well stocked with fish. Among them is the grey or lake trout, which is found only in the clearer lakes of this region. Whitefish, suckers, pike, pickerel, dogfish, &c., also occur in abundance. Fish.

Exploratory Surveys by Mr. A. S. Cochrane.

In referring to the instructions given to Mr. Cochrane, the various routes which he was to follow were indicated. The result of his labors will now be given from the information contained in his preliminary report and maps, as well as in his letters. For this purpose each of the sections explored will be described under a separate heading. Five Result of Mr. Cochrane's labors.

well-executed maps, showing these explorations on a scale of four miles to the inch, have been received from Mr. Cochrane. The length of the track survey represented on each is as follows:—

	Miles.
1. Between Cross Lake (on the North River) and Cumberland House...	242
2. Between Cumberland House and Pelican Narrows.....	196
3. Between Frog Portage (into the Churchill River) and outlet of Rein-deer Lake.....	102
4. Boat-route through Reindeer Lake from the outlet to Du Brochet Post, at the north end.....	175
5. Shore line of northern part of Rein-deer Lake.....	250
Besides these, Mr. Cochrane made surveys in the vicinity of Cumberland House and Du Brochet Post amounting to sixty-six lineal miles.....	66
	1,031

Exploration from Cross Lake on the Nelson River to Cumberland House.

Cross Lake to Cumberland House.

In making this exploration Mr. Cochrane ascended the Pine River, which discharges into the south-western extremity of Cross Lake, and from its source, by means of a portage 2,600 yards in length, across a height of land, he gained Moose Lake, which empties by a short marshy stream into one of the winding channels of the Saskatchewan, in the low country between the Pas Station and Cedar Lake. In ascending the Saskatchewan to Cumberland he cut off the Big (northward) Bend by passing through the lake round which it flows, and ascending for a short distance the Birch River, which discharges into this lake. Passing over the Birch Portage, 4,400 yards in length, across the neck of land between this river and the Saskatchewan, he again came out upon the latter near the junction with the Tearing River, flowing from Pine Island Lake, on the south side of which Cumberland House is situated.

Course and distance.

The general upward direction of Pine River, from Cross Lake to Moose Lake, is south-west, and the distance about eighty miles. The height of land separating the two waters is just east of Moose Lake, so that the portage from the head of Pine River falls directly into Moose Lake. Hill's Lake is a widening of the river about half way up. Drunken Lake occurs about half way up the lower stretch, and Lily Lake about the middle of the upper one. From Cross Lake to Drunken Lake the river is wide, and the banks are covered with small timber, consisting of poplar, birch, Banksian pine and balsam fir. Tolerably good soil, composed of clay with a little sand, was seen in a few places. Drunken Lake lies to the south of the general course of Pine River, which passes through its northern part, and another river, whose name could not be ascertained, falls into its southern extremity. Very coarse

Hill's Lake.

Timber.

grey-ribboned gneiss, containing small garnets, and running S. 72° W., was met with about half way from Cross Lake to Drunken Lake, and on the south and west sides of the latter gneiss, consisting of light and dark grey bands, occurs; but the strike is here S. 37° E. From Drunken to Hill's Lake, a distance of twenty-three miles, the river passes through a flat and swampy country. For the first twelve miles the banks are three or four feet above the water, but in the last eleven the river passes through continuous swamps and reedy marshes, the stream on either side being closely lined with willow bushes. Hummocks of grey gneiss, with a varying strike, stand up in several places in the low gronnds between the two lakes.

Grey gneiss.

Flat country.

Grey gneiss.

Hill's Lake is about twelve miles long, and from one-half to three-quarters of a mile wide. It is surrounded by precipitous banks of fine stratified clay, from twenty to twenty-five feet in height. The fossiliferous limestone was first met with at the upper or south-western end of this lake. The exposure is in the form of a cliff, thirty feet high. The rock is of a light brownish color, and holds fossils similar to those found in the parish of St. Andrew's, on Red River. The river just before falling into this end of the lake passes over a shallow rapid one mile and a-third in length, with a limestone bottom. Several smaller rapids are passed before reaching Lily Lake. They are mostly over broken limestone, but at one of them this rock, which is all of the same light brownish color, occurs in *situ*, and dips S. 45° W. at a small angle. Lily Lake is quite small. Its banks are about twenty feet high, and are well wooded with birch. Above this lake the stream becomes little more than a brook, which is generally so narrow or shallow as barely to allow a canoe to pass. The country through which it flows, as far as the Height-of-Land portage, is all swampy, except at the various rapids. The navigation of this part of the stream is rendered more difficult from its being much obstructed by beaver dams, which are sometimes from five to eight feet high. The Height-of-Land portage, which is about a mile and a-half in length, passes over wet, marshy ground, with the exception of a space of about 200 yards of flat limestone, which occurs about the centre.

Clay banks.

First limestone.

Beaver dams.

Height of land.

Mr. Cochrane had not time to make a complete exploration of Moose Lake. The portion which he passed through from the above portage to the outlet is about forty miles long, and lies in a south-westerly direction. A number of large islands lay near his course, and several bays stretched away to the eastward beyond the horizon, but no reliable information as to their form or extent could be obtained. Another deep bay, on which an Indian reserve is situated, stretches to the westward of the southern part of the lake. Limestone similar to that of Lake Winnipeg was seen at a few places on the north-western shore.

Moose Lake.

Limestone.

The dip in all cases was to the southward. No fossils could be found. The southern bay of Moose Lake comes within about three miles of a "lost" channel of the Saskatchewan River, and is connected with it by means of a very narrow creek, winding, with no perceptible current, through a large marsh, in which the reeds and grass had grown so high as to completely obstruct the view from a boat. It is a remarkable fact that the water at the northern end of Moose Lake was very clear, while that at the southern extremity was quite muddy, owing apparently to the Saskatchewan, which was at a very high stage, backing its waters into the lake. There is a post of the Hudson's Bay Company at the south end of Moose Lake, and here Mr. Cochrane was informed that the Saskatchewan had not been so high since 1872, and that last year (1879) it had been extremely low.

Water of Moose Lake.

High water.

Nothing new was noted in ascending the Saskatchewan to the Pas. The Birch River flows into the south-western extremity of the lake, which is included within the Big (northern) Bend, just above the Pas. It is a deep, sluggish stream, with low marshy borders, fringed with willows near the mouth; but in ascending it the banks rise gradually, till they have attained a height of fifteen feet above the high-water level at Birch portage, seven miles up. On the Indian reserve at this locality the land had been partly cleared along the bank of the river, and planted with potatoes, which looked particularly well. The land was all that could be desired, very fertile, with a clay bottom, covered with rich, dark yellow and black sandy loam. Birch portage itself, which is two and a-half miles long, passes over excellent land, which for the first half of the distance is clear of timber and covered with a very luxuriant growth of bushes and wild grass, and bears a close resemblance to the country near the banks of the lower part of the Red River. The northern half of the portage lies through a thick growth of timber, consisting principally of balsam-poplar (*Populus balsamifera*), some of the trees being fully two and a-half feet in diameter. White elm (*Ulmus Americana*) comes next, both as to abundance and the size o the trees. The green ash (*Fraxinus viridis*) is also abundant, and a few maples (*Negundo aceroides*) and aspens (*Populus tremuloides*) are likewise to be seen. The white spruce (*Abies alba*) here attains a large size. A short distance above the northern end of the Birch portage, a narrow neck of land between the Saskatchewan and the Tearing River was crossed by means of a portage trail. The latter stream, in which the water was very high, was ascended to Pine Island Lake, and Cumberland House was reached on the 10th of August. Here Mr. Cochrane received the greatest kindness and every assistance from Mr. H. Belanger, the Hudson's Bay Company's officer in charge.

Birch River.

Good soil.

Timber.

Tearing River.

Cumberland House to Frog Portage.

After surveying some of the channels in the neighborhood of Cumberland House, and making the necessary preparations for the work of the rest of the season, Mr. Cochrane left this post for Reindeer Lake on the 16th of the same month, in company with Mr. Deschambault, the gentleman in charge of the Hudson's Bay post on that lake, who had come down to Cumberland House to obtain his season's outfit of goods. Mr. Cochrane was afterwards indebted to Mr. Deschambault for much kindness and valuable assistance. Cumberland House to Frog portage.

In going northward from Cumberland House to Pelican Lake, instead of taking the usual route, leaving the east end of Pine Island Lake, which has been described by various travellers, Mr. Cochrane, in company with Mr. Deschambault, followed another route lying considerably to the westward, which starts from the western extremity of Pine Island Lake. The first part of the journey was due north (mag.) up the Grassberry River, a distance of thirty-five miles, to Windy Lake. This is a narrow stream with many bad rapids, which at first are among large Laurentian boulders and loose masses of limestone, but in the last ten miles they are over smooth beds of limestone, all of which is similar in character to that of Moose Lake and Lake Winnipeg. The country through which this river passes is flat and swampy, with the exception of a strip 300 or 400 yards wide along either side of the stream. The timber, however, is often good, and consists of balsam-poplar, white spruce and Banksian pine. Shrubby balsam fir, and a thorn like that of Manitoba, were also seen. New route followed. Grassberry River. Limestone. Timber.

Windy Lake is small, and receives the Balsam River from the north-east. Two cliffs of limestone, like the last, each about twenty feet high, occur on the south side. Leaving this lake the route passed through Narrow River, three miles long, connecting it with Little Pelican Lake, which is about twenty miles long. The next part of the route was up Blackfeet River from the north side of the last-mentioned lake. This river, which is narrow and crooked, has a course of about twenty miles, in which the rise amounts to eighty feet. The rapids and chutes were over ledges of limestone, all of the same character as the last, which cross the bed of the stream, and often have hard boulders resting upon them. Little Pelican Lake. Limestone.

Blackfeet Lake, at the head of the river of the same name, is surrounded by a more hilly country than the lakes and rivers already described. Its immediate shores are generally about ten feet high, but at the south end the banks are fifty or sixty feet in height, and appear to be of clay, on which there is a thick growth of spruce timber. The same limestone occurs on a number of the points, but no fossils could be Blackfeet Lake.

discovered in any of it. Lobster (Cray-fish) Lake, the next one on the route, is connected with the north-western extremity of the last by a rapid, over beds of limestone, with a rise of about five feet. It is only two miles long, and is surrounded by clay banks about ten feet high.

Big-stone River.

Big-stone River, three miles long, with a rapid over flat limestone at its head, leads up to the lake of the same name. The surrounding country is now still more hilly than that around Blackfeet Lake. The timber, which is small, consists of the same kinds as we noticed on the Grass-berry River, with the addition of tamarac (*Larix Americana*).

Hilly country.

Limestone Lake.

From Big-stone Lake a winding and rapid river, only five miles in length, with a rise of twenty-six feet, is followed up to Limestone Lake. At both the mouth and head of this stream, which is called Limestone River, fine-grained reddish and gray gneiss, was met with in *situ*, the strike being south, while on the lake itself the flat limestone was the only rock seen in place.

Gneiss.

Height of land.

The height of land, separating the waters just described to the south from those flowing northward into Pelican Lake, runs past the west side of Limestone Lake. Only a short portage of 300 yards is necessary in order to cross the dividing ridge to a pond, on the east side of which almost perpendicular hills of the stratified limestone rise to the height of about one hundred feet. From this pond the Limestone portage, nearly two miles long, leads to the south end of a lake about twenty miles in length, which Mr. Cochrane (in the absence of any other name) called Deschambault Lake, in honor of his *companion-de-voyage*. The portage for the most part passes over bare flat-bedded limestone, the surface of which is much broken up; but about a quarter of a mile before reaching Deschambault Lake it is suddenly replaced by dark reddish gneiss, which strikes S. 40° E., and dips to the S. W. This lake has a northward course, and near the middle is divided by narrows. In two places near the south end Mr. Cochrane found close-grained, finely-stratified mica schist, with veins of white and pinkish quartz. The strike in one case was S. 40° E., and in the other S. 10° E. Gneiss occurs about the middle of the lake. It is both coarse and fine-grained in texture, grey in color, all very micaceous, and holds many viens of white, purplish and claret-colored quartz. The northern or lower half of the lake is nearly round in outline. Bear River flows in at its western and out at its eastern side, where it falls over two chutes, the first of twenty-six and the second of fifteen feet. Here the river passes between high and nearly bare hills. On the east side they are composed of granite, and on the west of schist, the line separating the two kinds of rock having a N. N. W. course. Coarse grey gneiss, containing large garnets, appears a few miles further down Bear River.

Deschambault Lake.

Mica schist.

Bear River.

Granite and schist.

Bear River discharges into Pelican Lake, which is upwards of twenty miles long, in a northerly direction. It is surrounded by steep and nearly bare hills of gneiss and granite. Those on the west side rise almost perpendicularly to a height of between 200 and 300 feet, but on the east side, and around the north end, their height does not exceed 100 feet. Both reddish and grayish varieties of granite were met with. The gneiss is mostly grey. In the southern part of the lake the strike is a little east of south, and at the northern a little west of south. A post of the Hudson's Bay Company, called Pelican Narrows, and two mission stations, are situated on this lake. Mr. Cochrane arrived at the former on the 25th of August, the distance from Cumberland House, by the route followed, being about 190 miles. He was unable to continue his track-survey from this point to Frog Portage, at the Churchill River, a distance estimated at between forty and fifty miles, owing to the heavy rains, which prevailed. Perhaps the most important geological fact noted in this interval is the occurrence at Burntwood Lake of Huronian schists with serpentine. Frog Portage, on the south side of the Churchill River, was reached on the 27th of August.

Pelican Lake. Granite. H. B. Co.'s post. Mission stations. Serpentine.

The Churchill River from Frog Portage to the Junction of Deer River.

Frog Portage, which is 315 yards in length, is not past a rapid on the Churchill River, but leads from the south bank of that stream to the commencement of the route southward to Cumberland House. Deer River, discharging the Reindeer Lake, joins the Churchill twenty-seven miles below Frog Portage. Its average width in this distance is about one mile. Its course is northward, and the upward direction of the lower thirty miles of Deer River is about the same, and its character similar. Many rocky islands occur in both. The immediate banks of this section of the Churchill are low, but the country on either side rises gradually, for a distance of one-half to three-quarters of a mile from the water's edge, to heights varying from 100 to 400 feet. The slopes on the right, or eastern side, are sparingly covered with poplars and what appeared to be a second growth of birch; while on the hills on the left side the timber is nearly all spruce, forming, apparently, the original forest, although the trees are all small. The rocks consist of grey gneiss, with a general south-westward strike. The country near this part of the Churchill is very barren, only one patch of soil—clay—having been observed between Frog Portage and the junction of Deer River. Kettle Fall, four miles above the junction, is passed by a portage on the left side 150 yards in length. The descent here is about twenty feet. The water of the Churchill is very clear.

Churchill River. Deer River. Character of country. Timber. Kettle Fall.

Deer River.

Deer River.

The distance from Churchill to the outlet of Reindeer Lake, following the general course of the river, is seventy-five miles. Deer River is a splendid stream: large, deep, and comparatively easy to navigate with boats. The current is strong in some places, but only four portages are met with throughout its course. They are all short, the longest measuring only 260 yards. It receives four large rivers, two from the east and two from the west, besides a considerable number of brooks. It ranges from less than half a mile to one mile in width. Its waters, as well as those of the four tributaries, is very clear, indeed.

Branches.

Mountainous country.

The country on either side is rough and mountainous. Near its mouth the hills average about 200 feet in height; about half-way up they become lower, not often exceeding 100 feet, but towards the head of the river they increase in height until they attain an elevation of 500 feet above the rapids at Rock Portage, which may be considered the outlet of Reindeer Lake. Patches of soil of a few acres in extent were seen at some points along the eastern stream, but otherwise the whole country seemed barren. The timber, which is small and poor, consists principally of spruce, but aspen, balsam-poplar, birch and Banksian pine were often seen. At one place, not far below the outlet, a good deal of tamarac was observed, but, although the trees were tall, they were of small size. The rocks consist entirely of grey and reddish gneiss. The general strike along the lower part of the river is S. S. E., and along the upper part about S. S. W. The outlet of Reindeer Lake was reached on the 1st of September.

Timber.

Gneiss.

Reindeer Lake.

Reindeer Lake.

This great sheet of water, according to Mr. Cochrane's map, is about 175 miles in length, and between twenty and thirty in width, except in the fifty miles at the southern end, where it is much narrower and full of large islands. Great bays run off from both sides in this part. Messrs. Cochrane and Deschambault left the outlet on the 2nd of September, and reached the Hudson's Bay Company's post (called Du Brochet), near the upper end of the lake, on the 6th, so that there was very little opportunity on this journey for sketching in the shores. Before the close of navigation, or between the 10th and 27th of the same month, Mr. Cochrane managed to make a track survey of 250 miles of the coast line around the northern part of the lake.

Du Brochet Post.

Track survey.

The course of the boat-route, which was followed through the lake from the outlet to Du Brochet Post, was almost due north (mag). It was near the east shore, and passed from island to island, coming near the mainland at two-thirds of the distance up. Mr. Cochrane

thinks his estimate of the length of the lake is not more than ten or, at the most, fifteen miles in error.

In the southern part of the lake the banks on either side are high and precipitous, varying from 200 to 400 feet above the water. They are composed entirely of gneiss, which is thickly covered with small timber. At the north end of the lake, on the other hand, no hills are to be seen, and the surrounding country, as far as could be seen, where not muskeg or rock, is barren and sandy. The timber is here all very small. Small patches of clay occur at the Hudson's Bay Company's post, and about the middle of Perch Bay, a long narrow arm which forms the northern extremity of the lake. Reddish granite occurs at Du Brochet Post, and on an island near the east side of the lake, about fifty miles to the south of it. At all other parts of the lake the rocks, wherever examined, consisted of greyish gneiss, the usual strike of which is south-westward. **Character of the surrounding country.** **Rocks.**

Mr. Cochrane, having spent the winter at Du Brochet Post, will be able to make a much earlier start in the spring, and, besides, having accomplished more field-work last autumn, will have saved considerably in travelling expenses. **Advantages of wintering in the country.**

The last letter received from him was dated 31st of January. He was keeping a meteorological register, including readings of the thermometer and barometer, and observations of the winds, clouds, &c., noted three times a day. The winter had so far proved milder than he had expected to find it, fine weather having prevailed up to the above date. Ice began to form around the lake on the 12th of October, and by the 20th it had frozen to a considerable distance from shore. Up to the end of January snow had fallen to a depth of one foot and a-half on an average in the woods. Towards the end of this month the reindeer, or barren ground caribou, began to pass Du Brochet Post in great numbers, moving southward. About the end of March it was said they would begin to return northward, on the ice of Reindeer Lake, towards the barren grounds, where they breed. At the time of the return migration the snow has mostly disappeared from the land, and the surface of the ice on the lake affords excellent travelling. The lake is not free of ice till the middle of June. **Meteorological register.** **Climate.** **Reindeer.**

On the opening of navigation Mr. Cochrane proposes to devote one month to the completion of the track survey of Reindeer Lake, after which he is instructed to proceed westward through Wollaston Lake to Lake Athabasca, making as complete topographical and geological explorations as possible, to Fort Chippewyan, from which he is to return to Manitoba by way of Methy Portage, Isle à la Crosse Lake and Cumberland House. In this way it is expected that much valuable information will be obtained. Wollaston Lake discharges into Reindeer Lake by the **Continuation of work in 1881.** **Wollaston Lake**

Swan, Canoe, or Hatchet-lake Rivers. It is said to discharge also into Athabasca Lake by more than one outlet. The rivers which thus lead from Reindeer Lake to Lake Athabasca are reported to be large and good for canoe navigation. The distance from Du Brochet Post to Fort Chippewyan by this route is estimated at about 450 miles. Serpentine is believed to occur on Wollaston Lake, Mr. Cochrane having been shown a pipe and a cup carved out of this mineral, which he was informed was found there. Sir John Richardson remarks that sandstone, like that of the great boulders at the Methy Portage, is reported to exist in *situ* towards the east end of Athabasca Lake. Mr. Roderick Ross, of Norway House, who formerly lived at Fond du Lac, on this lake, informs me that graphite and other minerals occur in the neighborhood of that post.

Lake Athabasca.

Serpentine.

Sandstone.

Graphite.

NOTES OF A VOYAGE, IN 1880, FROM YORK FACTORY, HUDSON'S BAY, TO LONDON, BY THE BARK "OCEAN NYMPH," 320 TONS, BELONGING TO THE HUDSON'S BAY COMPANY.

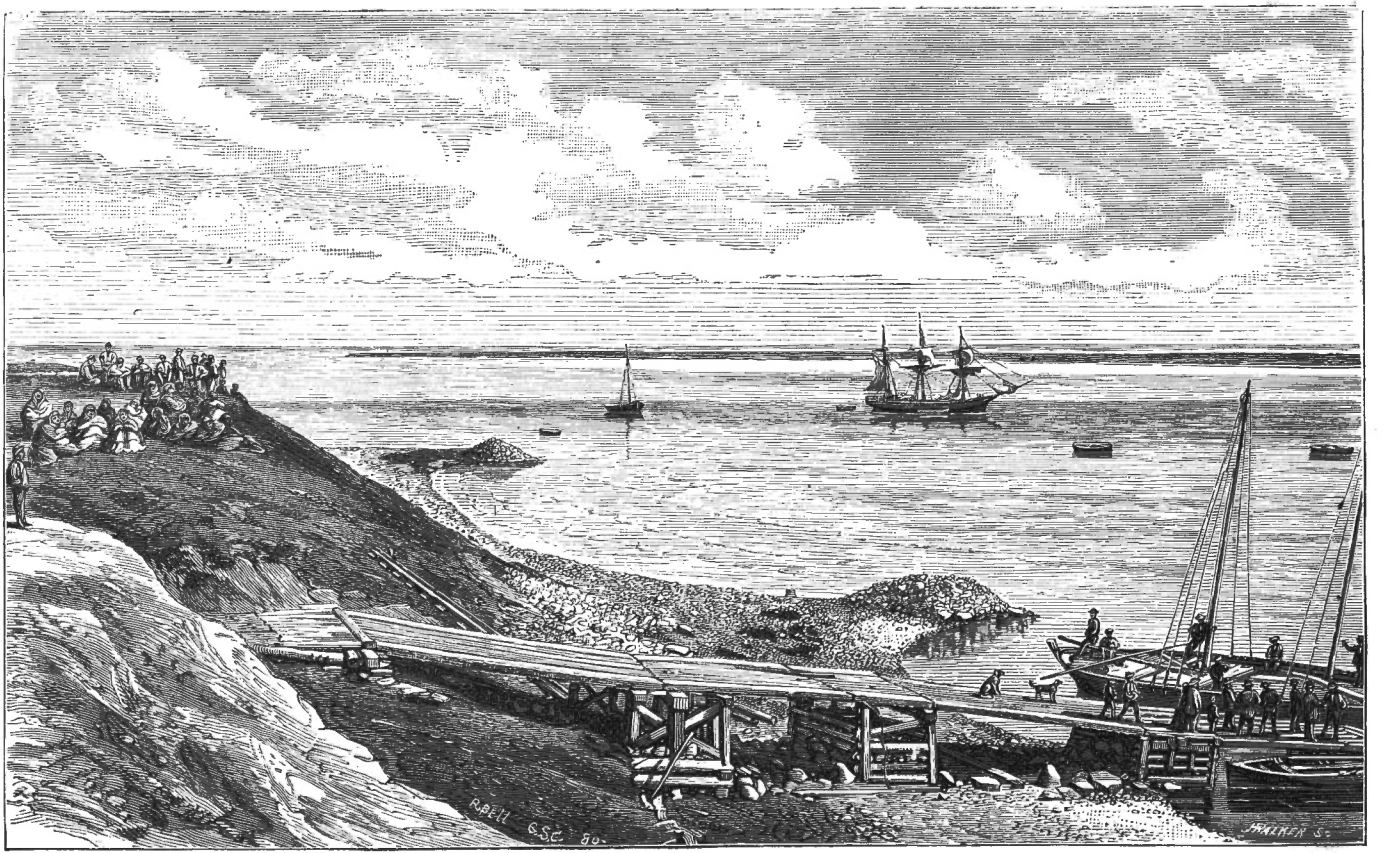
Monday, September 13*th*, 1880.—The ship lying in the middle of the Hayes' River, opposite York Factory, all ready for sea, her company consisting of Captain John McPherson, commander; John Hawes, first officer; E. G. Miller, second officer; steward, cook, carpenter, eight seaman; and, as steerage passengers, ten retiring servant-men of the Hudson's Bay Company; as cabin passengers, the Right Revd. John Horden, D.D., Bishop of Moosonee, and Dr. R. Bell (the writer). A bright, clear day at York Factory, with light wind from the S.W. Get both anchors up, and make sail just before high water. The ship begins to move at 3.15 p.m. Follow the buoyed channel, in charge of a pilot, to beyond the Five Fathom Hole, when the pilot leaves us to return to the Factory. After passing the outer or checked buoy, our course is more northward than the line of buoys leading out from the mouth of the river. The light breeze, which had hitherto been from the S., now shifts to W., N.W., and finally N., so that we are obliged to take an easterly course towards the Tatman Land. The water becoming too shallow in this direction, put the ship about, and make towards Nelson Shoal as night comes on.

Ship's company

tart on voyage

Tuesday, September 14*th*.—Dark and hazy last night, especially towards morning. Brightening up between 6 and 7 a.m., and is quite clear, but overcast, at 9, with fresh breeze from the E. The wind, from the same quarter, increases all day, and is quite strong at 7 p.m., with a rough sea. Have been obliged to carry as much canvas as possible all day, so as to keep off the land, but at dusk are obliged to shorten sail. Although the ship is very light the water has been coming over the deck on the lee side. The sun not having been visible all day, no

Head wind.



GEOLOGICAL SURVEY, 1880.

VIEW AT YORK FACTORY, LOOKING OUT TO SEA.

From a Photograph by DR. BELL.

latitude has been obtainable, and owing to the great lee-way the ship is making (over two points) our position at dusk is not very certain, but is supposed to be about thirty-five miles off the mouth of Broad River. Temperature of the sea at 8 p.m., 40° Fah.

Wednesday, September 15th.—Wind strong and steady from E. all day. Sailing five or six knots an hour, but making much lee-way. Sea rough. Barometer lower than yesterday, and still falling. At 6 p.m. our position, calculated by dead reckoning, is ninety miles to N.N.E. of Cape Churchill. Temperature of the sea at 8 p.m., 41° F. **Off Cape Churchill.**

Thursday, September 16th.—Light wind from S. all day, the speed of the ship varying from three to five knots an hour. Weather clear in the morning, but dull in the afternoon. Latitude at noon, 60° 04′. Temperature of the sea at 8 p.m., 41° F. After dark this evening the ship left a tolerably luminous wake, in which numerous phosphorescent balls appeared.

Friday, September 17th.—Light wind all day, shifting from S. to W. and N.W., and in the evening being nearly N. Rate about three to five knots an hour all day. Sea water very clear. Pleasant moonlight evening. Smooth sea. In conversing about the fishes of Hudson's Bay, it was said that the common salmon is reported to run in the smaller rivers of Hudson's Strait, as well as in the rivers flowing into Ungava Bay, where it is well known to be extremely abundant. In coming out this voyage the captain saw a dead haddock floating in the strait. The Bishop has heard of a few "real" cod having been caught near Whale River, and I have seen plenty of rock cod taken at various places on the east coast of James' Bay. There appears to be no reason why the common cod should not be found in Hudson's Bay. The conditions as to temperature, depth of water, &c., are favorable, and its food, especially the capelin, is abundant. The latitudes of the prolific fishing-grounds of the Atlantic coast of Labrador are the same as those of Hudson's Bay. The question whether or not cod fishing-grounds are to be found in this great bay is so important that it deserves a thorough trial. **Fishes of Hudson's Bay.** **Cod.**

Saturday, September 18th.—Light wind all day. Rate varies from two to five knots an hour. Sea smooth. Temperature of water at noon, 41° F.; of air in the shade, 41° also. Clear and bright all day.

Sunday, September 19th.—Another fine day, with smooth sea. Sky cloudless in the morning, but more or less overcast in the afternoon, with a little fine rain towards evening. Latitude at noon, 62° 18′. Between 10 a.m. and noon a considerable number of white porpoises passed westward, the first ever seen in this part of the bay by the captain. In the afternoon pass much large flat sea-weed (*Laminaria*) floating on the surface. Haul in an average specimen, and find the **Fine day.** **White porpoises.**

round to measure ten feet in length. A small five-rayed star-fish was sticking to the base of the thick round stalk. The sea is streaked by currents running parallel to the ship's course. Temperature of sea at noon, 39½° F.; air about the same. In the afternoon we get a distant view of the northern part of Mansfield Island; at 6 p.m. are about twenty miles to the N.W. of it. It has a low, even outline. The first officer has walked over several miles of the country on the northern part of this island, having spent several days there some years ago. From his description of the rocks I suppose them to consist of trappean strata and bedded grey quartzites similar to those of the Hopewell and Nastapoka Sound groups, which I examined in 1877. The strike on Mansfield Island, according to Mr. Hawes, would be parallel to its greatest length, and the dip mostly westward. The captain says that in sounding off this island, he once brought up a small piece of coal from the bottom of the sea. This is an interesting fact in connection with the occurrence of anthracite on Long Island, on the Eastmain coast. (See Report for 1877.) From descriptions of the strata of some parts of the Southampton group of Islands, I should judge that rocks similar to those of the Nastapoka group occur there also.

Mansfield Island.

Volcanic rocks.

Coal.

At ten this morning the bell rang for Divine Service, and the Bishop read prayers and preached a sermon to the passengers and crew assembled in the open air on the main deck. Altogether a beautiful forenoon; the decks dry and clean, and the air so mild and sunny that our ordinary coats were sufficient for comfort while attending service, during which everyone remained with head uncovered. Service again, on the open deck, at 4 p.m. Being the "dog-watch," nearly the whole of the passengers and crew attended, forming a congregation of upwards of twenty.

Beautiful weather.

Divine service on deck.

Monday, September 20th.—Early this morning came up to some drifting "bay" ice, and shortened sail, and hove-to till daylight, after which it fell calm, and remained so all forenoon. Latitude at noon, 62° 55′. Many small, reddish, gelatinous creatures in the water. Small fishes, resembling sardines in size and appearance, swimming past the ship's side. Grey, speckled water-fowl basking in the sun on the surface of the smooth water. During the afternoon, a light wind blowing from the direction of the drifting ice prevented us, owing to the slight hold the ship has on the water, from entering amongst it for some hours, as we wished to do, in order to pass through it on our course. The most the ship could be induced to do was to keep her bows "looking" towards it, while she was allowed to drift gradually southward. However, we were sailing among the "pans" of ice before dark.

Drifting ice.

Calm.

Fish and water-fowl.

Tuesday, September 21st.—Light head wind all the time till towards

evening, when it fieshens. Keep topsails, jib and spanker set all day, tacking slowly about among the bay ice. Occasionally the vessel would lie for a few seconds quite still against an unusually large "pan." Owing to her bad sailing and the light wind, she has been merely dropping, almost broadside, from piece to piece, sometimes on the one tack, and sometimes on the other, according as she happened to turn when balancing against each pan of ice she encountered, or according as it yielded to her pressure at one end or the other. Almost the whole of the ice which we sailed amongst to-day is discolored with fine brownish earth on the surface, as if it had drifted over it, as dust in the winter, when it was forming along shore, showing that it must have come from some coast, where banks or beaches of fine material, such as clay, sand or mud, exists. All the pans have their angles rounded off, and look soft and spongy. The larger ones have generally a depression, containing water, in the centre. They are evidently much worn and melted, being all undermined at the edges, and sometimes projecting more broadly below than above water. Many of them are composed of layers agglomerated at different angles. The tops of the highest pans would be four or five feet above the water, but most of them are small and flat. When they are bowled over by the ship they generally leave a whitish-looking cloud of mud in the water around. In addition to the light brown coloring of the ice, there are sometimes darker patches and black-looking spots, which, on close inspection, prove to be the dung of seals and other animals.

Earth on the ice.

A ship, supposed to be the "Prince of Wales," in charge of Captain Bishop, from Moose Factory, was sighted early this morning, and remained in view all day, a long way to the northward. Latitude at noon, 62° 56′.

"Prince of Wales."

Wednesday, September 22nd.—During the night the captain sailed the ship back to near the position occupied yesterday afternoon, so that we are still to the northward of Mansfield Island. Sail slowly all day in a south-easterly course by compass, or about true E. Day mostly overcast, with a flurry of snow towards evening. A snow-bird remained some time in the rigging to-day. A peep of sunshine now and then in the forenoon, during which observations are obtained. In the evening we are moving a little faster, about two miles an hour. Owing to the lightness of the wind and the great lee-way made by the ship, we could not get through a little isthmus of drift ice, which could have been crossed in ten minutes by a steamer. The delay caused by our inability to do this may affect the whole of the rest of the voyage more than we can foresee.

Disadvantages of sailing vessels.

Thursday, September 23rd.—Early this morning many white and some brown (young) porpoises were seen around the ship. Moving very

Porpoises.

slowly all day among scattered pans of ice before a light air, never sufficiently strong to fill the sails or to be perceptible on the water. At dusk we reckon we have made about twelve miles in the twenty-four hours since last evening. Set up my camera on the poop, and after adjusting it so as to take in a good view of the surface of the sea, dotted with flat patches of ice, which were about equally distributed all over, put in a "quick," dry plate, and waited for hours in the hope that the ship might be brought to a momentary stand-still, when a rapid view of the pans might be taken. Although the pressure on the sails was so very light, the ship never for a moment ceased moving on, until, when I was about to take away the instrument in despair, one of the officers kindly brought her up purposely for a few seconds, and an almost instantaneous picture was obtained, which serves to show the proportion of ice to water surface. All the ice-pans passed to-day have also been dusted over with brown and light grey mud. On one pan saw a small quantity of light-colored, angular gravel, apparently limestone. From early morning till the middle of the afternoon the sea remained as smooth as a mirror, after which a gentle swell from the eastward began to be felt. Between 5 and 6 p.m. get into water almost free of pans, but the drift ice still visible on our port or northern side. Had a glimpse of the sun about 11 a.m., and obtained the latitude, which was nearly the same as yesterday. After a dull, overcast day, a yellow sun-set bursts through the haze. Let down the deep-sea lead at noon and 8 p.m., but find no bottom in either case at 150 fathoms. Our position is supposed to be in mid-channel, between Nottingham and Digges. At 4 o'clock this morning the temperature of the air was 31° F.; of the sea, 30°; at noon—air, 34°; sea, 31°; at 8 p.m.—sea, 36°.

Photography.

Gravel.

Calm.

Deep water.

In the course of the day saw a few seals and some small fishes near the ship. Some grey and some black water-fowl were also seen swimming about a short distance off. A ptarmigan flew past the ship. Calm, foggy evening; but at 11 o'clock to-night a light air moves the ship a knot and a-half an hour. "Sea phosphorus" is now rising to the surface in the clear water around the ship. It resembles "fire-flies" in the air on a warm summer's night. The captain says the drift ice we have just passed through is much worse than any he saw in the straits on the outward voyage. This rather surprised me, as it did not appear at all formidable compared with the continuous ice I have passed through in a steamer going from St. John's, Newfoundland, to Halifax, where it covered the sea completely for the greater part of the distance. He says it is very unusual to meet ice at all in this part of his track, neither he nor the first officer having seen it before. They say the straits are always clear towards Digges, and that a steamer, by going close to the south side in that quarter, could always be sure of a

Seals, fishes and water-fowl.

Calm water.

Phosphorescence.

Steamer amongst drift ice.

FIG. 1.

CAPE WOLSTENHOLME, SOUTH SIDE, WESTERN ENTRANCE, OVER 1000 FEET HIGH.

FIG. 2.

OUTLINE OF COAST EAST OF CAPE WOLSTENHOLME, SOUTH SIDE, SEPTEMBER 25TH.

ABOUT FIFTEEN MILES DISTANT.

free passage at any time; but this might sometimes be dangerous with a sailing vessel, where so many contingencies require to be considered, especially if she could not be depended upon to work to windward. When drifting ice has been seen off this end of the straits earlier in the season, it has appeared to be pressed against Southampton, Nottingham and Salisbury Islands, with points projecting occasionally to the southward and eastward. The freedom from ice enjoyed by the opposite side is supposed to be due to the west-flowing tide up the straits, and the northward current up the Eastmain Coast. Position of drifting ice

Friday, September 24th.—Early this morning many white porpoises were seen about the ship. Foggy all day. Sailing slowly along in smooth water, with a light north-easterly breeze. At 4.45 p.m., while sailing S. E. (mag.), the fog lightening a little, we come suddenly in sight of land, three or four miles off. The fog continuing to lift as we get closer in, we obtain a good view. It proves to be one of the Digges (islands), with Cape Wolstenholme behind. The mainland sinks out of sight about thirty miles off to the right or S. W. (mag). The island presents a front of two or three miles in width before us, but seems to run further back to the south-east. It is almost bare rock, with a sand beach in the centre, and rises to a height of about 500 feet. It shows some high cliffs, evidently of greyish gneiss, some of which is strongly banded, the bedding being on an average perpendicular, and the strike directly away from us, or S. E. (mag). Behind this island Cape Wolstenholme rises fully 1,000 feet, or probably more, and shows some very bold cliffs or bluffs, in some cases overlooking inlets or deep coves. The general outline of the top of the land maintains about the same elevation above the sea. A few small patches of old snow remain in shady ravines. The appearance of the land at this place is given in the accompanying outline sketch. (Fig. 1.) White porpoises. Digges. Cape Wolstenholme

Saturday, September 25th.—Rather dark and foggy during last night. Ship made some progress to the eastward. The accompanying sketch (Fig. 2) represents the appearance of the land to the south of us, at 6 a.m. The locality is some 20 miles east of Cape Wolstenholme, and the sketch is taken at about fifteen miles off. Some deep, narrow bays or inlets run in between the high cliffs of this part of the coast line. One of them evidently makes an angle at a short distance back, and looks as if it might afford good shelter for vessels. The general outline of the top of the land is about 1,000 feet above the sea, and is horizontal for some distance abreast of us, but diminishes in height to the eastward. There is a slight "dusting" of fresh snow on the tops of the hills, and small patches of old snow are visible in a few shady nooks. These hills are evidently composed of Laurentian gneiss, as they bear a close resemblance to those of the Eastmain Coast, between Nastapoka and Inlets. Laurentian gneiss.

Hopewell Sounds, which were examined closely in 1877. One white porpoise was seen to-day. Some black divers, with white breasts, were swimming near the ship in the forenoon. The weather has been beautiful to-day, with light winds. At noon we had gained only thirty-five miles eastward in the previous twenty-four hours, but owing to the light winds our progress is no doubt much influenced by the tides. In the evening, the air being mild and pleasant, walk on the poop, in company with the first officer, enjoying the bright moonlight; the sea very smooth, and having considerable phosphorescence. The wake of the ship is full of "stars and balls of fire."

Beautiful day.

Mild evening.

Sunday, September 26th.—A mild, sunny morning, with light wind from the northward, which continues all forenoon. At 10 a.m. the Bishop again held service on the main deck, and preached a sermon. No overcoats and only ordinary clothing worn by the congregation. Some of the sailors and servants attended in their jerseys, and others in their shirt-sleeves. All present remained with bare heads during the whole of the service. Salisbury Island was in sight during forenoon. The hills on it are either flat-topped or angular, and somewhat separated from each other, having the appearance of a Huronian rather than a Laurentian country. In the afternoon the sky becomes overcast, and the wind very changeable, but unfavorable, and as the men are kept constantly busy working the sails, no afternoon service is held. Only thirty-two miles forward had been made in the twenty-four hours up to noon to-day. The weather begins to be rough and disagreeable in the evening, and a steady head-wind has set in at bed-time.

Service on deck

Salisbury Island.

Monday, September 27th.—Very disagreeable weather. A rather strong head-wind, with sleety snow at intervals all day. Cold and disagreeable. All sails have been carried during daylight, but at dusk the royals are taken in as a precaution, although the wind is not strong. Sea very phosphorescent. A bleak look-out for the night. The captain remarks, "If we had a ship with a screw in her stern we should be in London to-night."

Disagreeable weather.

Tuesday, September 28th.—The wind died away early last night, and it remained nearly calm till morning. Made only fourteen miles from six o'clock last evening till eight this morning, when a very light breeze sets in from S. S. E. Mild, pleasant morning; air clear, but sky overcast. At 9 a.m. a small iceberg from Fox's Channel is floating abreast of us, two or three miles to the north. Before noon the wind comes from the south-westward, with a clear, blue sky, and good observations are obtained. Latitude at noon, 63° 11′; long., 73° 33′. Breeze very light at noon. At this hour the north-east point of Charles Island lies S. S. W., nearly thirty miles off. It shows a series of undulations or hills with long slopes. High land is also visible to the N. N. E., which

Charles Island.

the Captain says is the north shore, some fifty miles to the westward of the Upper Savages. At 1 p.m. the wind veers around to the E., or nearly dead ahead. Sail northward till 4 p.m., when we go about. At this point the land along the north side of the Strait is near enough to distinguish its character plainly. The rocks are evidently Laurentian. The highest part is between longitude 72° of the chart and the inlet to the S. E. of it. The wind, which is still ahead, freshens at sunset, and the weather turns colder.

Wednesday, September 29th.—Strong head-wind, with haze and rain all day. Raining hard at dusk. The night setting in very dark, shorten sail. The sea very phosphorescent; its temperature at 8 p.m., 32½° F. Ship pitching considerably, and the wind making a great howling in the rigging. **Heavy rain.**

Thursday, September 30th.—The weather began to clear up towards morning, but the wind continued ahead, and the sea rough, so that with the shortened sail we are only able to hold our ground. The air turning milder this morning. After daylight the weather continued to clear. The sun shone out at nine, and we obtained an observation. The land about Cape Weggs is visible during the morning. It is high and undulating. One berg visible astern of us, and several pieces of ice in a row floating down the north side of the strait. Wind comes from various quarters during the day, and we sail about in different directions. At one time we were within seven or eight miles of the north coast to the N. W. of Drake's Inlet, where the accompanying sketch (Fig. 3,) was taken looking north-eastward. The central part represents an island. The range of hills on the mainland is about 2,000 feet high. A few small patches of snow visible on the highest parts, principally in one locality.

Friday, October 1st.—Clear, bright morning. Sea calm, with slight swell, but glassy surface. Warm sunshine all forenoon, and during most of the afternoon. As the Bishop remarked, "The day is simply beautiful." Between 11 a.m. and noon the thermometer registered 47° in the shade. Land visible at the same time on both sides of the strait. That on the south side is not so high as on the north, but it presents abrupt faces to the sea, with an even general outline, while on the north side the hills rise gradually for a long distance back, and the outline varies much in height. These characters appear to apply to the respective sides of the strait throughout the greater part of its length. Several seals and divers swimming about the ship and basking in the sun. Air so calm that for a considerable time the ship would not answer the helm, and turned about in any direction. A little motion in the air at one time moved her slowly back stern first. A number of small bergs seen in a row down the strait, north of the **Warm sunshine** **Comparison of the two sides of the strait.** **Small bergs.**

central line. They are more or less undermined, and show water-marks running up them at various angles, from their having turned at different times, owing to melting away and parts breaking up disturbing their previous balance. They are all very white and spongy, looking as if old or far-travelled. Some of them had spots of dirt, and on one a dark patch of considerable size was seen. After sunset a high but increasing breeze from the west springs up, and we run two, three and four miles an hour. At 10 p.m. it is quite dark, but still the little bergs can be seen with the aid of a good binocular.

Variable wind.

Saturday, October 2nd.—Wind sufficiently fair early this morning to sail on our course at the rate of three knots an hour; but it heads us after 8 a.m., coming from the N. E., and remains from that quarter all day. At 6 a.m. a ship, supposed to be the "Prince of Wales," made her appearance, following us till she came within five or six miles, when she put about and soon disappeared towards the south side of the strait. During the forenoon she re-appeared, at first as a speck, but soon came near enough for us to make her out to be the vessel we had supposed. Tack about during the day, abreast of North Bluff. The appearance of the land in this neighbourhood, from a distance of ten to fifteen miles, is represented in the accompanying outline sketch. (Fig. 4.) North Bluff itself is near the middle of the view, Point Lookout at the left, or N. W., and the Upper Savages at the right, or S. E. extremity. Some small spots and streaks of old snow on the top of the highest hills above North Bluff, a few miles inland. A good many small bergs seen to-day, most of them in a row, going down the strait between us and the North Bluff. Passed close to one which shows a wake on the sea behind it, as if it were being borne along by an under-current. Both sides of the strait have been plainly visible. The appearance of the land on the sonth side, at what is said to be the western point or horn of King George's Sound, is shown in the accompanying outline sketch, (Fig. 5,) taken about fifteen miles to the N. E. of it. A slight sprinkling of new snow has fallen on the hills on this side.

"Prince of Wales."

North Bluff.

Row of small bergs.

King George's Sound.

Sunday, October 3rd.—Very light north-easterly winds, or nearly calm all day. Overcast in the forenoon, with a streak of bright sky near the horizon, and sunshine on the water to the northward of us. At 1 p.m., sun shining also around the ship, and to the southward. The "Prince of Wales" in sight behind us all day. Only twenty-seven miles gained from noon yesterday till noon to-day. The air being still and mild, the Bishop again held service and preached a sermon, on the open deck, at 10 a.m. A long sermon and service again on deck at 4 p.m. On both occasions the men wore only their jerseys or jackets. This is the third consecutive Sunday in the strait on which service has been held in the open air, on the deck of the ship, without discomfort.

Mild air.

Service held on deck.

FIG. 3.

NORTH COAST, N. W. OF DRAKE'S INLET, ABOUT LONG. 72°, HILLS NEARLY 2000 FEET HIGH.

SEVEN MILES DISTANT.

FIG. 4.

NORTH COAST BETWEEN POINT LOOKOUT AND THE UPPER SAVAGES, INCLUDING N. BLUFF.

TEN TO FIFTEEN MILES DISTANT.

FIG. 5.

WEST POINT OF KING GEORGE'S SOUND, SOUTH COAST, LOOKING SOUTH-WEST.

FIFTEEN MILES DISTANT.

FIG. 6.

SOUTH POINT OF RESOLUTION ISLAND, NORTH SIDE OF EASTERN ENTRANCE, OCTOBER 8TH.

The surface of the sea has been glassy most of the day. Passed considerable numbers of black-backed divers in flocks resting on the smooth water. In the morning passed twelve or fifteen miles to the N. E. of Prince of Wales Island, which has a flattened dome-like outline. The land behind it presents rather steep faces to the sea, and is somewhat broken up into bays or inlets. In mid-channel the land was visible to the naked eye on both sides at the same time. When nearest to North Bluff an open space could be seen between the point of the mainland and the nearest of the upper savages. The captain and first officer describe North Bay as having a high, steep or perpendicular cliff running round its western and north-western sides. The currents are so strong in this bay that if a sailing ship got too far in she might find it difficult to get out again. Large brown sea-weeds (*Laminaria*) floating near the surface in considerable quantities to-day.

Divers.

Land visible on both sides.

Large sea-weeds.

Monday, October 4th.—The wind was free enough to sail on our course during the early part of last night, but headed us again before midnight, and this morning the ship is plunging considerably with a rather strong head-wind. Towards noon the wind lulls, and the weather, which had been overcast all night and this morning, with more or less drizzle, cleared up, and the sun shone out for half-an-hour between 12 o'clock and 1 p.m. In afternoon overcast again, with occasional drops of rain, and almost calm. Total run for twenty-four hours to noon, forty-seven miles. Last night we passed two icebergs, but only two (possibly the same) were seen during the day. A snow-bird flew on board the ship, and was easily captured and placed in an empty cage, which happened to be in the cabin. (This bird began to eat "canary seed" as if it had been accustomed to it, and was taken in good condition all the way to London). This morning the "Prince of Wales" passed across our stern, about four miles off, on the opposite tack.

Clearing weather.

Tuesday, October 5th.—Bright, pleasant morning. Sun shine and blue sky, with fleecy white clouds; settled looking weather. During the forenoon, however, it becomes overcast, and in the afternoon it turns out raw and foggy; but in the evening it clears up again and becomes mild. Temperature of the water in the morning, 34°; in the afternoon, 31½°. Between 5 and 6 p.m. sight Green Island, lying about fifteen miles due south of us. Its outline is rather high and undulating. This island is seldom seen by vessels passing through the strait. The "Prince of Wales" in company behind us this afternoon. At 6 p.m. she was only three miles off, and sailing in the same course as ourselves. At 8 p.m. both ships burn blue lights, and afterwards show lanterns. Light southerly winds have prevailed all day. Between last evening and this morning our rate has varied from one to three and a-half knots an hour. Some snow has rested on the ship

Bright morning.

Green Island.

Pleasant evening.

to-day. Found it pleasant walking on the poop in the evening, without gloves or overcoat.

Wednesday, October 6th.—Mild and pleasant in the forenoon, with a light, fair wind. Sun shining for a short time, during which observations were obtained. A very large seal came to the surface, and followed close under the stern of the ship for some minutes. The "Prince of Wales" was seen a good way behind us at 9 a.m. A fog came rapidly over the water about the middle of the day, and the afternoon was raw and chilly. Soon after the fog came on a flock of rock ptarmigan (*Lagopus rupestris*) made their appearance around the ship. From the confused manner in which they flew about, they had evidently lost their way in the fog. At first there were not less than thirty or forty, but they were so frightened by the men trying to catch them that they gradually disappeared, some falling into the sea. Only two were captured, one in molt (mottled) and the other white.

Rock ptarmigan.

Thursday, October 7th.—Sailed slowly all last night, as the weather was rather thick, and we are nearing the narrowed outlet of the Strait, where the currents are apt to carry a vessel out of reckoning. Clears off for a while in the morning, and we get observations of the sun at 9. At 10 the "Prince of Wales" is about four miles to the N. E. of us. In the forenoon a flock of "Eskimo" (eider) ducks passed us, going south, and flying close to the surface of the water. About 11 a.m., wind light from N.W., but fog coming on we take in sail, so as to run only a mile and a-half an hour. Foggy all the rest of the day. During the afternoon we were visited by several flocks of rock ptarmigan. There were between forty and fifty birds in the largest. The captain says they are on their way from North Bluffs to the south side of the straits. This time the men allowed them to settle on the spars and ropes of the ship, and by means of nooses attached to short sticks they captured a considerable number. They were much relished at supper, not only by the crew and passengers, but also by the golden eagle and silver fox which we are taking to the London Zoological Garden. They were mostly mottled, and in different stages of molt. Two seals were noticed this evening along side the ship. The fog clears off in the evening. The night, however, proves too dark to run out of the strait, although the wind is fair, but light.

Nearing outlet of straits.

Eider ducks.

Flocks of ptarmigan.

Friday, October 8th.—At one o'clock this morning the vessel began to move and at daylight there was a considerable swell. On going on deck find the ship hove-to (although wind is fair from the N.W., and the weather very bright), waiting to ascertain our position, no land being visible. A little before noon get the latitude, and finding ourselves in the middle of the channel, immediately square away, and run eight to nine knots an hour before the wind. This forenoon a flock of eider

Bright weather

ducks and one ptarmigan passed us, going south. It is said that from the ships either in going or coming few or no geese are seen crossing the strait. At 3 p.m. we cross a strong stream of tide running in. Our position at 5 p.m. is about ten miles south of Hatton's Headland, or the south point of Resolution Island. Its appearance at this distance is represented in the accompanying outline sketch. (Fig. 6.) The Button Islands, to the south, are also visible in the distance,. The weather has been bright all day, and so mild as to be very pleasant walking on the poop. Geese.

Saturday, October 9th.—Wind continued fresh from the N.W. all day. Ship going regularly about eight knots an hour, but rolling very much, although the sea is running fair after, and all the sails which will draw are set. We have made 184 knots from noon yesterday to noon to-day —the best run of the whole voyage. The captain is now shaping his course directly away from the land, or for the middle of Davis Strait, so as to cross the course of the icebergs, which keep its western side, as soon as possible. None, however, were seen. Good run.

The remainder of the voyage to England having been on the open sea does not require to be here described. We reached London all well on the 17th of November, or in our tenth week from York Factory, having made one of the most tedious voyages on record. The delay was owing to persistent heavy gales from the south-eastward. The Hudson's Bay Company's ships seldom encounter such weather in their homeward voyages, the length of which average four weeks from York and five from Moose Factory to London, and about one week less to the Land's End. As to the present voyage, I have much pleasure in bearing testimony to the great kindness and constant care displayed both by the captain and his officers, from the time we weighed anchor at York Factory till the ship was safely moored in the West India Docks. Reach London. Average length of voyages.

General Account of Hudson's Bay.

In the popular mind Hudson's Bay is apt to be associated with the Polar regions; yet no part of it comes within the Arctic Circle, and the latitude of the southern extremity is south of London. Few people have any adequate conception of the extent of this great Canadian sea. Including its southern prolongation, James' Bay, it measures about one thousand miles in length, and is more than six hundred miles in width in its northern part. Its total area is in the neighborhood of 500,000 square miles, or upwards of half that of the Mediterranean. It is enclosed by the land on all sides, except the north-east, where it communicates by different channels with the outer ocean. The principal or best known of these is Hudson's Strait, which is Great size of Hudson's Bay. Hudson's Strait.

about 500 miles in length, and has an average width of about 100 miles.

Hudson's Bay, which might have been more appropriately called Hudson's Sea, is the central basin of the drainage of North America. The limits of this basin extend to the centre of the Labrador peninsula, or some 500 miles inland on the east side, and to the Rocky Mountains, or a distance of 1,300 miles, on the west. The Winnipeg basin constitutes a sort of outlier of the region more immediately under notice, since the waters drain into it from the north, south, east and west, and discharge themselves by one great trunk, the Nelson River, into Hudson's Bay. The southernmost part of this basin, namely, the source of the Red River, extends down nearly to latitude 45°. The head waters of the southern rivers of James' Bay are not far to the north of Lake Huron, while one of the branches of the Albany rises within twenty-five miles of the north shore of Lake Superior. Including the Winnipeg system, the basin of Hudson's Bay has a width of about 2,100 miles from east to west, and a length of about 1,500 miles from north to south, and its dimensions approach the enormous area of 3,000,000 of square miles. Over a great part of this region there is a temperate climate, and although the soil of much of it is comparatively barren, yet large tracts are very fertile. The numerous rivers and lakes of the first class, embraced within these limits, will prove of great value in the settlement of the country. Both the bay and strait are remarkably free from rocks and shoals, which might interfere with their free navigation. The groups of islands near the east side of the bay are surrounded by deep water, and a wide channel leads up the centre of James' Bay. Fortunately the main body of the great bay, which is the portion which may hereafter be frequented by shipping, is entirely without shoals, reefs or islands. The depth is very uniform over most of the bay, and nowhere does it present any great irregularities. It averages about seventy fathoms throughout, deepening to one hundred and upwards in approaching the outlet of Hudson's Strait; while in the strait itself the soundings along the centre vary from about 100 to upwards of 300 fathoms. The bottom appears to consist almost everywhere of boulder clay and mud. Near the shores a stiff clay, affording good holding ground for anchors, is almost invariably met with on both sides.

Basin of Hudson's Bay.

Dimensions of basin.

Fertile land.

Freedom from obstructions.

Uniform depth.

James' Bay.

James' Bay begins at Cape Jones, on the east side, and Cape Henrietta Maria on the west, and runs south about 350 miles, with an average breadth of about 150 miles. The east side of Hudson's Bay, including its southern prolongation is known as the Eastmain Coast. Between Cape Jones and Cape Dufferin, on the Portland promontory, and again in approaching Cape Wolstenholme, at the termination of

this coast, the land is high and bold, some points attaining an elevation of nearly 2,000 feet above the sea. The country on the south-west side of the main bay, as well as that lying to the west of James' Bay, is low and generally level, with shallow water extending a long distance out from shore. Both sides of Hudson's Strait are high and rocky, but the northern is less precipitous than the southern. High land.

Of the numerous rivers which run into Hudson's Bay from all sides, about thirty are of considerable magnitude. All those which enter on the Eastmain coast appear to flow in a uniform course directly west, or parallel to one another, and as the height of land in the centre of the Labrador peninsula is furthest inland towards the south, the rivers which fall into the southern part of this coast are the largest, and the remainder become progressively smaller as we go north. Numerous streams converge to the head of James' Bay from all points southward of an east and west line passing through its southern extremity. The Moose, about a mile wide, is the principal of these. On the western side, the Albany and the Churchill Rivers are the longest, but the Nelson, with a course of only about 400 miles, discharges the greatest body of water into the sea. Indeed this huge artery of the Winnipeg system of waters may be considered as one of the greatest rivers of the world. Few of the rivers of Hudson's Bay afford uninterrupted navigation for large vessels to any great distance from the coast. During the season of high water shallow-draft steamers might ascend the Moose and two of its branches for upwards of 100 miles. Hayes River and two of its branches might also apparently be navigated by such craft in the spring to points about 140 miles inland, and the Albany for nearly 250 miles; while larger steamers might ascend the Nelson for seventy or eighty miles from the open sea. The Nelson is the only muddy-water river entering Hudson's Bay. Most of the others have a slightly brownish tinge, but their waters are perfectly wholesome, and contain only very small quantities of foreign matter. The Churchill, which is the second largest river of Hudson's Bay, is a beautiful clear-water stream, somewhat larger than the Rhine. It is remarkable for having at its mouth a splendid harbour, with deep water and every natural advantage for the purpose of modern commerce. Thirty rivers. Large rivers. Navigation of rivers. Good water. Splendid harbor.

The only harbors on the west side of Hudson's Bay are those formed by the mouths of rivers, but none of them, with the exception of Churchill Harbor, can be entered by vessels drawing more than ten or eleven feet, and only at high water even by these. The Nelson may form an exception to this. Most of its estuary becomes dry at low tide, but a channel runs through it near the centre, as far as the head of tide-water. I sounded this channel in a number of places. in 1878, '79 and '80, and although an average depth of about two fathoms at low Estuary of the Nelson River.

water was found, continuous soundings throughout might have shown interruptions or shallower water in some places. As stated in previous reports, there is a section at the head of tide, or between the tidal portion and the regular inland channel of the river, in which not more than ten feet of water was found. This may extend for about two miles, above which an apparent continuous channel, with a depth of about twenty feet, according to our soundings, extends to the lowest limestone rapid, which is the first break in the navigable part, and is between forty and fifty miles from the head of tide, or from seventy to eighty from the open sea. If the section referred to were deepened, steamers coming in from sea might enter this part of the river and find perfect shelter, or even proceed up the stream to any point below the rapid referred to. In continuation of the channel running down the estuary, a "lead" of deeper water extends out into the bay, and forms the "North River," or "York Roads," with excellent anchorage.

Navigable stretch of river.

Mouth of the Churchill River.

The Churchill, unlike all the other rivers, has a deep, rocky and comparatively narrow mouth, which can be entered with ease and safety by the largest ships at all stages of the tide. On the point at the west side of the entrance of the harbor stands the old "Fort Prince of Wales," which is probably the largest ruin in North America. Although occupying a commanding position, and mounting about forty large guns, it was surrendered, without firing a shot, to the French Admiral, La Perouse, who destroyed it in 1772. The ruins of this large fort are shown in the accompanying wood-cuts, taken from photographs.

Fort Prince of Wales.

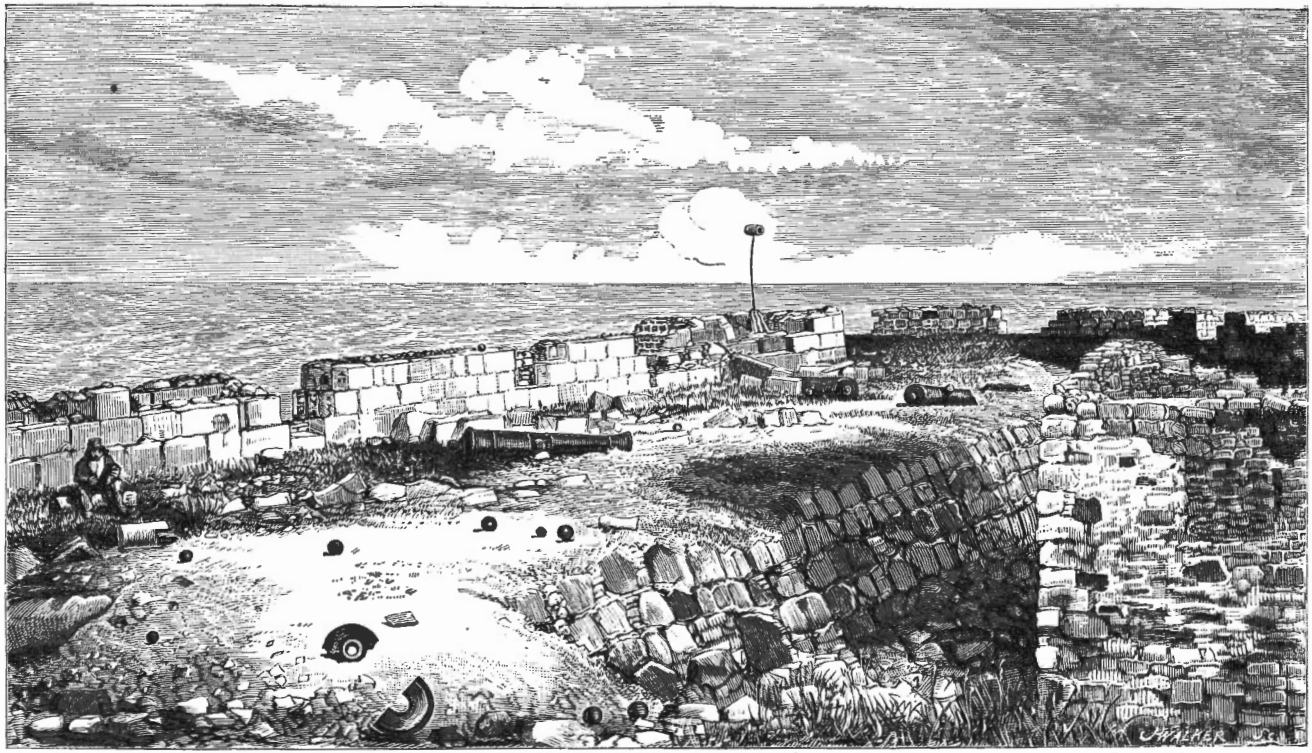
Tides.

Along the west coast the rise and fall at spring tides amounts to about eleven or twelve feet, on an average, and is pretty uniform, diminishing somewhat towards the south. It is greatest at the mouth of the Nelson River, where it amounts to about fifteen feet. The tides are lower all along the east side of the bay. In Hudson's Strait there is a very good tide, according to the report we have received of Acting Staff-Commander J. G. Boulton's *reconnaissance* during the past summer.

Geology.

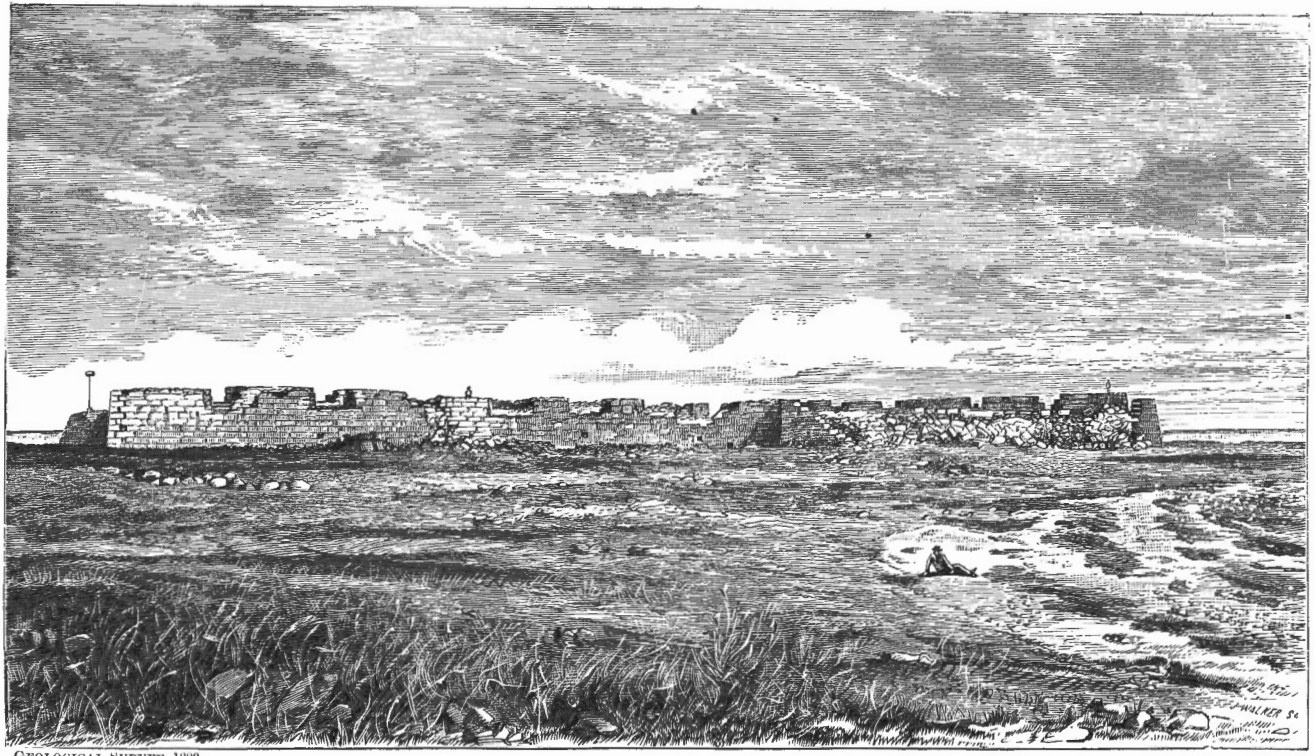
Geologically, the basin of Hudson's Bay, excluding the western or Winnipeg division, lies within the great Laurentian area of the Dominion. Cambro-silurian rocks, resting almost horizontally upon these, form an irregular border along the south-western side of the bay; and in the valleys of some of the rivers they extend inland from one to two hundred miles. To the south and west of James' Bay the cambro-silurian are overlaid by Devonian rocks, which here occupy a considerable area. The long chains of islands which fringe the east coast for nearly 300 miles to the northward of Cape Jones, and also the mainland in the vicinity of Richmond Gulf, are composed of bedded-volcanic and almost unaltered sedimentary rocks, resembling the Nipigon series of the Lake

Nipigon series.



From a Photograph by DR. BELL.

RUINS OF FORT PRINCE OF WALES, LOOKING N. E.—CHURCHILL RIVER.



GEOLOGICAL SURVEY, 1880.

From a Photograph by DR. BELL.

RUINS OF FORT PRINCE OF WALES, FROM THE WEST.—CHURCHILL RIVER.

Superior region, which may be of Lower Cambrian age. On the western side of the bay, from Churchill northward, quartzites and other rocks, which may also belong to the Cambrian system, appear to be largely developed. Valuable minerals may be looked for on this coast. The extensive level region around the south-western side of the bay, is overspread with a great sheet of boulder clay, which is generally covered by the modified drift. The rocks of the outlying or Winnipeg division of the basin comprise an extensive series, ranging from the Laurentian to the Tertiary. **Level region.**

The resources of Hudson's Bay and the country immediately around it are varied and numerous, although, as yet, few of them are at all developed. The fur trade is the principal and best known business which has hitherto been carried on in these regions; but a considerable amount of oil, derived from the larger whales, the porpoises, walruses, white bears, and various species of seals which frequent the northern parts of the bay, has been carried to New England, and small quantities, principally of porpoise and seal oil, have from time to time been taken to London by the Hudson's Bay Company. The trade in oil might be greatly extended in these quarters. Other articles have been exported from the bay, but hitherto only in trifling quantities. They embrace whalebone, feathers, quills, castoreum, lead ore, sawn lumber, ivory, tallow, isinglass, and skins of seals and porpoises. The fisheries, properly speaking, of Hudson's Bay, have not been investigated. Both the Indians and Eskimo find a variety of fish for their own use, and fine salmon abound in the rivers of Hudson's Strait. From one or two of them a considerable number of barrels, in a salted condition, are exported every year by the Hudson's Bay Company. Water-fowl are very numerous on both sides of the bay, and larger game on the barren grounds in the northern parts; so that the natives, with prudence, may always have a plentiful supply of food. **Various resources.** **Exports.** **Fisheries.** **Game.**

But perhaps the most important of the undeveloped resources of the country around the bay are its soil, timber and minerals. To the south and south-west of James' Bay, in the latitude of Devonshire and Cornwall, there is a large tract in which much of the land is good, and the climate sufficiently favorable for the successful prosecution of stock and dairy farming. A strip of country along the east side of James' Bay may also prove available for these purposes. To the south-west of the wide part of the bay the country is well wooded, and, although little or no rock comes to the surface over an immense area, still neither the soil nor the climate are suitable for carrying on agriculture as a principal occupation until we have passed over more than half the distance to Lake Winnipeg. This region, however, appears to offer no engineering difficulties to the construction of a railway from the sea-coast **Soil, timber and minerals.**

to the better country beyond, and this, at present, is the most important point in regard to it. Some of the timber found in the country which sends its waters into James' Bay may prove to be of value for export. Among the kinds which it produces may be mentioned white, red and pitch pine, black and white spruce, balsam, larch, white cedar and white birch. The numerous rivers which converge towards the head of James' Bay offer facilities for "driving" timber to points at which it may be shipped by sea-going vessels.

Minerals.

Minerals may, however, become in future the greatest of the resources of the shores of Hudson's Bay. Little direct search has as yet been made for the valuable minerals of these regions. In 1875 I found a large deposit of rich ironstone on the Mattagami River. (See Geol. Survey Reports for that year.) In 1877 inexhaustible supplies of good manganiferous iron ore were discovered on the islands near the Eastmain coast, and promising quantities of galena around Richmond Gulf and also near Little Whale River, where a small amount had previously been known to exist. Traces of gold, silver, molybdenum and copper were likewise noted on the Eastmain coast. Lignite was met with on the Missinaibi, gypsum on the Moose, and petroleum-bearing limestone on the Abittibi River. Small quantities of anthracite and various ornamental stones, and some rare minerals, were collected in the course of our explorations around the bay. Soapstone is abundant not far from Mosquito Bay on the east side, and iron pyrites between Churchill and Marble Island on the west. Good building stones, clays and limestones exist on both sides of the bay. A cargo of mica is said to have been taken from Chesterfield Inlet to New York, and valuable deposits of plumbago are reported to occur on the north side of Hudson's Strait. Some capitalists have applied to the Government for mining rights in the latter region.

Saving in distance.

Situated in the heart of North America, and possessing a sea-port in the very centre of the continent, 1,500 miles nearer than Quebec to the fertile lands of the North-west territories, Hudson's Bay now begins to possess a new interest, not only to Canadians, but also to the people of Great Britain, from the fact that the future highway between the great North-west of the Dominion and Europe may pass through it. The possibility of this route being adopted for trade is not a new idea. It has been frequently suggested by far-seeing men in past years, and occasionally referred to in the newspapers. In 1848, the then Lieut. M. H. Synge, in his work on Canada, wrote: "A ship annually arrives at Fort York for the service of the Hudson's Bay Company; who can tell how many may eventually do so?" The journal of the Statistical Society of London for March, 1864, contains a paper by H. Y. Hind on "The Commercial Progress and Ressources of Central British America,"

Route for trade

in which the writer says: "It is more than probable that whenever the necessity arises, the communication between Winnipeg and Hudson's Bay, and thence to the Atlantic, by the aid of steamers, will be made easy and speedy for at least three months in the year." In 1876 Mr. Selwyn brought the subject officially before members of the Canadian Government, and recommended that surveys be made of Hudson's Bay and Strait. In 1878 Col. Dennis published a pamphlet, accompanied by a valuable map, in relation to it. The report of the Minister of the Interior for 1878 contains an appendix by the writer on the practicability of building a railway from Lake Winnipeg to Hudson's Bay. During the session of 1878–79, and again the following year, the Hon. Thomas Ryan, a gentleman of great enterprise, brought the matter under the notice of the Dominion Senate.

Chartered companies.

In 1880 the Parliament of Canada granted charters to two companies for constructing railways and otherwise opening a route for commerce from the North-west territories to Europe, *via* Hudson's Bay, and during the past year one of them, the Nelson Valley Company, caused a survey to be made of a part of the distance betweeen Lake Winnipeg and the harbor of Churchill. Their chief engineer has reported the route, as far as he located the line, to be an easy and inexpensive one for a railway. The directors of the company have again sent an engineering party to the field to carry on the survey during the present year (1881). This company has also the power of connecting with the Canadian Pacific railway in the Saskatchewan region, but the main line is intended to form a connecting link between the great system of inland navigation, which centres in Lake Winnipeg, and the sea. If constructed, the Nelson Valley railway may carry to the sea-board not only the surplus of the grain and cattle of our own North-west, but also that of Minnesota and Dakota. Lieut.-General Sir J. H. Lefroy, President of the Geographical Section of the British Association, in his address at the Swansea meeting (1880), said: "Hudson's Bay itself cannot fail, at no distant day, to challenge more attention. Dr. Bell reports that the land is rising at the rate of five to ten feet in a century, that is, possibly, an inch a year. Not, however, on this account will the hydrographer notice it; but because the natural sea-ports of that vast interior, now thrown open to settlement, Keewatin, Manitoba, and other provinces unborn, must be sought there. York Factory, which is nearer Liverpool than New York, has been happily called by Professor H. Y. Hind, the Archangel of the West. The mouth of the Churchill, however, although somewhat further north, offers far superior natural advantages, and may more fitly challenge the title. It will undoubtedly be the future shipping port for the agricutural products of the vast North-west territory, and the route by which immigrants will

Engineer's report.

Link of railway

Genl. Lefroy's remarks.

enter the country." Sir Henry Lefroy, being personally well acquainted with Hudson's Bay and the North-west territories, may be accepted as a good authority on the subject.

Great wheat-growing region.

It has been shown that the Canadian North-west territories, embracing hundreds of millions of acres of fine land, are destined to become the greatest wheat-field in the world. The centre of this immense agricultural region probably lies to the north of the Saskatchewan. If we look at the map of the northern hemisphere, we shall see at a glance that the shortest route between these territories and England is through Hudson's Bay. Mr. Lindsay Russell, the Surveyor-General, has recently made a close calculation of relative distances, and foundthat even the city of Winnipeg, which is situated in the extreme south-eastern part of these territories, is at least 800 miles nearer to Liverpool by the Hudson's Bay route than by the St. Lawrence; while the difference in favor of the former will be increased continually as we advance north-westward into the interior. If we take a central point of the whole of the agricultural lands of our North-west territories, say in the neighborhood of Lac la Biche, Long. 112° W., Lat. 55° N., we shall find that the distance from it to the city of Winnipeg is about the same as to Churchill, on Hudson's Bay. The distance from the latter point to Liverpool is about the same as from Montreal to this port; so that between the above-named centre and Liverpool, by the Hudson's Bay route, the whole distance from Winnipeg to Montreal is saved. This amounts to 1,291 miles by way of Lake Superior, and 1,698 miles by the Chicago route. The distance by way of New York is still greater than by Montreal. The advantages of this route over all others are numerous, and a few of them may be here referred to. The great saving in distance represents an important economy in time and money, or in freight and passenger rates. If the grain, cattle and other products of the North-west territories could reach a European market only through Ontario and Quebec, or by way of New York, a large proportion of their value would necessarily be consumed by the long land carriage; whereas, if they can find an outlet at Churchill or York Factory, there will be a saving of at least 1,291 miles as compared with Montreal, and of upwards of 1,700 miles as compared with New York, and this without increasing the length of the voyage. In effect, this will place a great proportion of the farms of our North-west territories in as good a position with regard to a seaport as are those of Ontario west of Toronto, and consequently will greatly increase the value of every description of farm produce, and therefore of the farms themselves. Some kinds of produce which could not be sent out of the country at all by the longer land routes may be profitably exported by the shorter one. Owing to the short land journey, grain from the Saskatchewan and Peace River regions could be

Shortest route.

Centre of agricultural region.

Advantages of northern route.

Comparison with Ontario.

exported by way of Hudson's Bay the same year in which it is harvested, which could scarcely be hoped for if sent by way of one of the longer routes. For the transportation of both grain and fresh meat, as Col. Dennis has pointed out, the northern route, besides the shortening of the distance, would have great advantages over all those to the south, owing to its cooler and more uniform temperature. Heavy or bulky goods of all kinds would of course be imported into the North-west territory by the shortest land route. In regard to the export or import of live stock, this independent route will possess a great importance to these territories. Hitherto, cattle, horses, hogs and sheep have there enjoyed an immunity from almost all forms of contagious diseases, and owing to the very healthy nature of the climate for these animals, it is hoped this state of things will continue. The domestic amimals in the United States and the older Canadian Provinces being occasionally afflicted with contagious disorders, it becomes necessary for European countries to impose restrictions on their importation. In the event of an epidemic of this nature existing in some part of these regions, but not in the North-west territory, there would be no objection to exporting live stock from the latter by way of Hudson's Bay.

Col. Dennis' observations.

Export of live stock.

As a route for emigrants from Europe, that by Hudson's Bay possesses not only the advantages of the short land journey, but the still more important one, to us, of entirely avoiding the United States and the populous parts of Canada, in both of which, it is well known, a very serious percentage of the immigrants destined for our North-west lands are every year enticed away to settle in the great republic. An inlet by Hudson's Bay is the only thoroughly independent channel which can ever be established between Great Britain and the great and valuable British territories in the interior of North America; and it is very desirable, on national grounds, that this route should be opened up. Troops have hitherto been sent to the Red River settlement, on more than one occasion, by way of Hudson's Bay, while the intervening country was, as it is yet, in a state of nature. Were a short railway built through this tract, it would at once become for military purposes an easy connecting link with the Mother Country.

Route for emigrants.

Independent channel.

An impression has long prevailed that Hudson's Bay and Strait could not be navigated for the ordinary purposes of commerce, on account of ice, but this idea is perhaps destined to prove chimerical. The occasion for testing the point had not hitherto arisen, and the fact that these waters have been successfully navigated by ordinary sailing vessels for nearly 200 years, in order to secure what little trade the country has hitherto afforded, indicates what may be expected from properly equipped steamships, as soon as the larger business of the future may require their services in this direction. The conditions of

Successful navigation of Hudson's Bay.

Comparison with Gulf of St. Lawrence.

the sea-borne commerce of the North-west in relation to Hudson's Bay may, after all, turn out to be somewhat similar to those of the rest of Canada with reference to the Gulf of St. Lawrence. In both cases, everything must be done during the summer. Yet, Hudson's Bay is, of course, open all the year round. A sea of such vast extent in the latitude of the British Islands would not be expected to freeze across, and as a matter of fact it does not. The Lower St. Lawrence (notwithstanding its comparative narrowness) is also partly open, even in the middle of winter. But the difficulty in both cases is the apparent impossibility of getting into harbors. A harbor such as that of Churchill on Hudson's Bay would have the advantage over Quebec or Montreal of connecting directly with the open sea, and hence in the autumn vessels would not be liable to be frozen in, as occasionally happens in the St. Lawrence, as for example in the autumn just passed, also in the autumn of 1870, when the outward bound shipping got frozen in below Quebec, occasioning a loss, it was said, of over a million of dollars. Again, in the spring there might be no more uncertainty about entering from sea than in the Gulf of St. Lawrence, where vexatious delays are not uncommon after the open season is supposed to have arrived.

Open water.

Some discussion has taken place in the newspapers as to the length of time during which Hudson's Strait and Bay might be navigated each year, but there does not seem to be much evidence that the strait is entirely closed at any season, and the bay is always open. The great width and depth of the strait, and the strength of its tides, probably keep it open all winter. My own experience and that of many others leads me to believe that the climate generally of Hudson's Bay is much better than is popularly supposed. From all that I could learn or observe, there appears reason to believe that the strait and bay may be navigated and the land approached *by steamships* during an average of over four months each year, or from the middle of June till near the end of October. The strait and bay might perhaps be navigated by steam vessels earlier than the middle of June, but nothing would be gained, except perhaps by whalers, in going out before an open harbor could be reached. Much has been recorded in favor of the above opinion, from the days of the Danish Captain, John Monck, who wintered at Churchill 261 years ago (1619-20), to the present time, and a good deal of unrecorded evidence which I have collected leads me to the same conclusion. Churchill Harbor does not freeze up until November, and the sea is open close to it during the whole winter.

Season of navigation.

Climate of Martin's Falls.

A record of the principal phenomena of the seasons at Martin's Falls, on the Albany, extending through a period of fifty years, shows that the river there is open on an average for fully six months of the year. In the Appendix will be found a record of the opening and closing of

Hayes River at York Factory for fifty-two years, which proves it to have an annual average of six months of open water. The Nelson is open for a longer period, which may amount to an average of seven months, but no exact record has been kept in regard to this stream. The tidal portion is said never to set fast, but in winter more or less ice drifts up and down with nearly every tide, the channel out to sea being clear only after the prevalence of strong winds off the land. During the winter of 1880-81 the river did not freeze across at all for some forty miles above tide water.

Hayes River open six months.

In view of such facts as the foregoing, the navigation of Hudson's Bay and the approach to land by steamships need not be despaired of, as far as the length of season is concerned. Even were the time of open navigation shorter than it is known to be, the very great benefits which Canada generally, and the North-west territories in particular, would derive from possessing an outlet in that direction are sufficient to make it well worth an effort to open it up. The freedom of Hudson's Strait and Bay from rocks, shoals and other impediments to navigation will exempt vessels in that quarter of the globe from the heavy expenses for pilots, lighthouses, &c., which burden shipping to many other American ports. The delays from drifting ice in the strait which have heretofore occasionally occurred to sailing ships, especially of the old-fashioned type, cannot be fairly cited at all as to what may be expected to be accomplished by well appointed steam vessels.

Importance of short route.

Experience of sailing ships not applicable to steamers.

Both shores of Hudson's Strait are high and bold, and if observatory stations were placed upon some of the more elevated points on either side they would command a complete view of its entire surface. By means of signals or telegraphic communication between these stations, in case of the existence of drifting ice, vessels could be directed what course to follow in order to pass through it at the easiest part or to avoid it altogether.

Bold shores of Hudson's Strait.

Signals.

It is evident that in proportion as the cost of transporting farm produce to a foreign market is diminished its home value is correspondingly increased, and with it the value of the land itself, in about the same ratio. Now, considering the vast extent of the farming lands to be favorably affected by the opening of the route above referred to, if the value of each acre of it were enhanced in this way by only seventy or eighty cents, the aggregate increase would amount to more than a hundred million of dollars. Such a gain as this, together with the great advantages which, as we have seen, may be derived from the opening of this new ocean route, should it prove feasible, will, I think, sufficiently show the importance of at least giving it due consideration.

Increased value of land.

I am indebted to William Armit, Esq., the obliging Secretary of the Hudson's Bay Company in London, for the list in the Appendix show-

Arrivals and sailings of ships at York and Moose Factories.

ing the dates of the arrivals of the Company's ships at Moose Factory, and of their departure from that point, and to Mr. Chief Factor Fortescue for the similar list in reference to York Factory. They show that very few interruptions have occurred in making the regular annual voyages to these ports during periods of 147 and 93 years respectively.

The Northern Limits of the Principal Forest Trees of Canada, East of the Rocky Mountains.

Authorities for tree-lines.

On the accompanying map the general northern limits of the principal forest trees of Canada, east of the Rocky Mountains, are represented. The lines have been laid down chiefly from observations made by the writer during the last twenty-five years, extending from Newfoundland nearly to the Rocky Mountains, and from the northern United States to the eastern and western shores of Hudson's Bay. The limiting lines of the species which extend into the far North-west are drawn from information received from various officers of the Hudson's Bay Company, and from the data furnished by the accounts and maps of the different scientific travellers who have penetrated these regions. In the more southern regions, many details have been obtained from lumbermen and botanists which have helped to determine the lines with great accuracy in certain localities. Among the botanists may be mentioned Mr. A. T. Drummond, the late Dr. John Bell, Professors Lawson, Bailey, Macoun and N. H. Winchell, also the older botanists who have written on our flora. Thanks are due to my colleagues on the Geological Survey, Messrs. Richardson and Webster, for some facts on the distribution of trees in the Province of Quebec, and to Messrs. Fletcher, Ells and Broad, for others as to the Maritime Provinces, while Mr. A. S. Cochrane has made careful notes on this subject during our explorations in the North-west territories. To Captain William Kennedy, the Arctic explorer, now residing in Manitoba, thanks are due for valuable information as to the trees of the peninsula of Labrador, in different parts of which he spent a number of years in the service of the Hudson's Bay Company. The Hon. D. A. Smith, Mr. Robert Crawford, and others who have resided in the Labrador country, have also given notes on the timber, which have greatly facilitated the approximate determination of the limits of the species found in that large peninsula. Nearly all the reports of the Geological Survey, from 1857 to 1879, contain more or less information on the distribution of timber trees, but previous to the former year the writer had studied the forests of southern Ontario and the Ottawa valley. In a paper on the "Trees and Shrubs of Lake Superior," published in the Transactions of the Botanical Society of Canada in 1861, he pointed out a number of facts in regard to the geographical distribution of trees in

Far North-west

Botanists.

Geologists.

Capt. Kennedy.

Labrador.

Lake Superior.

that region, which had not been previously observed. In 1873, the northern limits of our principal timber trees in the provinces of Ontario, Quebec, New Brunswick and Nova Scotia were laid down in colored lines on a large sheet, to illustrate a lecture before the Natural History Society of Montreal, by Mr. A. T. Drummond, on the distribution of plants in Canada. This sheet was loaned to the Department of the Interior, Ottawa, and some of the lines were transferred from it to the large map exhibited by the Department at the Paris International Exhibition of 1878. A reduction of the same sheet was published in 1879, to accompany a paper by Mr. Drummond in the report of the Montreal Horticultural Society and Fruit-Growers' Association. In the portion of the present map which includes the four provinces referred to, the tree-lines are all carefully revised and corrected. The northern limits of thirty of the principal species of our forest trees are outlined on this map, being as large a number as can be conveniently represented on so small a scale. About forty other species, however, besides shrubs, occur within the limits of the Dominion east of the Rocky Mountains. A list of these, with notes on their geographical distribution, is added to that of the species mentioned on the map.

Original map.

Thirty species shewn on map.

Forty other species east of the Rocky Mts.

One of the principal uses of this map is to indicate the area within the Dominion throughout which each kind of timber exists. The abundance and quality of each kind varies much, of course, within these boundaries. Occasional or chance trees and depauperated representatives of some of the species shown on the map are known to occur beyond the limits laid down, but as these lines are intended to represent the general boundaries, they could not fairly be extended so as to include such cases. More or less extensive outliers or colonies of some trees occur in situations entirely separated from the main areas occupied by the species to which they belong. The southern boundaries of some of the more northern species, such as the white spruce, Banksian pine and balsam poplar, might be nearly included within the map, but to avoid confusion it is considered best to show only the northern limits. Most of our forest trees extend far to the south of the confines of Canada, so that at any point which we choose to select within the Dominion we are apt to find in the forest nearly all the species whose northern limits lie to the north of it. Professor Charles S. Sargent, of Harvard College, a special commissioner in connection with the tenth census of the United States, is preparing maps illustrative of the distribution of the woods, prairies and barren grounds of North America, and at his request the writer has had much pleasure in assisting him in this work as far as Canada is concerned.

Occasional occurrence beyond limits.

Southern boundaries.

Prof. Sargent.

A knowledge of the limits of our different forest trees is also valuable as indicative of climate. Some of these will be found to correspond

Other practical value of this information.

with the northern limits of the successful cultivation of particular crops. Certain trees cease to exist when they come to regions subject to severe spring or summer frosts, or where early autumn frosts prevent them from maturing their fruits. Locally, the presence of a particular group of trees is serviceable as a guide to the quality of the soil, but owing to differences in the character of the climate and other circumstances, it is obvious that such a test, although quite reliable within a limited area, may not be at all applicable to another region.

Situation and latitude.

Some species appear to find their appropriate conditions in different latitudes by a change in their habitat: for example, the larch, balsam fir and white birch, which in the north grow freely on dry or hilly ground, towards the southern limits seek the cold ground in swamps. The white cedar and white pine in some places manifest the same tendency.

Effect of mountains.

The appropriate temperature for the growth of a number of species is carried far to the south of their normal latitudes, along the elevated parts of the continent, especially the Alleghanies and the Rocky Mountains.

Causes governing range of species.

The range of any species is evidently not governed entirely by the mean annual temperature. The extremes of heat and cold in the west, as compared with the milder winters and cooler summers in the east, with about the same mean temperature for the year, appears to be the chief cause of the marked difference in the character of the woods in the two regions, since there is not a sufficient disparity in the amount of the annual precipitation to account for it. A great difference in the moisture of the air in two regions, otherwise resembling each other in climatic conditions, has also a powerful effect upon the growth of forests; and the dryness of the air in the western prairie and arid regions is, no doubt, the chief cause of the absence of timber. The proximity of the sea, especially where fogs or cold winds are of frequent occurrence, has a great influence upon the kinds and the size of the timber, and, in the north, upon the very existence of trees near the coast. Differences in the composition of the soil appear to have only a local effect upon the distribution of forest trees.

Geological interest.

The study of the geographical distribution of the various forest trees of North America possesses a certain interest to the geologist as bearing upon questions in regard to the condition of the continent in later geological times. The outlines of the areas occupied by the different species, and other circumstances connected with their character and distribution, may throw some light on their dispersion from certain centres or lines, or possibly, in some cases, their contraction from wider limits; or we may find that some of them have still a tendency to advance or retire.

The continent of North America possesses a great variety of forest trees. About 340 different species occur within the United States. All the kinds which we have in Canada, amounting to about ninety, including those of the Pacific slope, are also met with in that country. Some species are not only very widely diffused, but are also persistent over great areas, being found almost everywhere within the limits of their distribution, while others, although having an extensive range, are nowhere very common, and are sometimes absent for considerable intervals. Others, again, are confined to comparatively small tracts. As a general rule, the more northern species occupy the greatest extent of country, while the southern ones are progressively more and more restricted, even in a more rapid ratio than would be implied by the narrowing of the continent from north to south. This is owing to the great differences experienced in climatic conditions in going from east to west in the more southern latitudes. Along the northern borders of the forests of the continent the elevation of the land above the sea is comparatively slight and regular, and the other physical conditions are tolerably uniform. As a consequence, we find the most northern group of trees extending from Newfoundland into Alaska, a distance of about 4,000 miles.

Great variety of trees in North America.

Great areas occupied by northern species.

Causes.

An inspection of the accompanying map will show some interesting features as to the general distribution of our forest trees, as well as regarding almost every individual species of timber. For example, it will be observed that there is no material change in the woods throughout the great triangular area embracing about 600,000 square miles, of which the national boundary line between the Rocky Mountains and Lake Superior forms the base, and the Rocky Mountains and Laurentian hills respectively the west and east sides, the apex being at the mouth of the Mackenzie River. In the southern part of this area, a number of species are added to the kinds which everywhere throughout it make up the bulk of the forests, and again, few trees of any kind are found to the south of the North Saskatchewan; still, making allowance for local peculiarities of condition, there is a remarkable uniformity in the timber of this enormous area. It includes, however, only a few species, of which the aspen, balsam poplar and willows are more abundant towards the western, and the spruces, larch, balsam fir and Banksian pine towards the eastern side of the area.

Peculiarities.

It will be observed that the lines marking the northern limits of about a dozen species turn southward and become their western limits on reaching the eastern side of the valley of Lake Winnipeg and the Red River; while the boundaries of the species occurring next to the south of these also manifest a tendency to turn southward in approaching the prairies of the west. The species above referred to are the

Limiting lines turn southward towards Red River.

white cedar, black ash, white pine, red pine, sugar maple, yellow birch, red oak, white ash, hemlock, beech, ironwood, red cedar (arborescent variety) and white oak. They are to a great extent replaced by other species before the region of open plains is reached. Had the great forests originally extended further west, and been destroyed by fire or other causes, in comparatively recent times, we should have found the northern limits of these species continuing their general course to the prairie region, and ending abruptly there, instead of which they all curve gradually round, in a more or less concentric fashion, and other trees occupy the intervening ground. These well-marked features of forest distribution show that the present divisions of prairie and woodland are of very ancient date. The evidence of the smaller plants, and also of certain superficial geological conditions, all point to the same conclusion.

Replaced by western species.

The state of Minnesota is situated in a very interesting region in regard to forest distribution. Here we find the northern limit of the group to which the most southern trees of Ontario belong, such as the black walnut, shell-bark hickory, hackberry and Kentucky coffee tree; the north-western limit of the commoner trees of the northern states and of Quebec and Ontario, such as the white oak, red cedar (aborescent variety), ironwood, beech, hemlock, white ash, rock elm, red oak, yellow and black birch, sugar maple, red maple, wild plum, &c.; the western boundaries of some of the trees whose northern limits pass through northern Ontario, such as the white cedar, black ash, white pine and red pine; the southern limits of the most northern group, including the white spruce, the larch, Banksian pine, balsam fir, balsam poplar and canoe birch; and the general eastern limits of some of the western species, such as the ash-leaved maple, green ash, bur oak and cottonwood.

Forest distribution in Minnesota.

It will be observed that in the Labrador peninsula the tree-lines trend northward mid-way between the eastern and western shores. This is due partly to the unfavorable influence of the sea on either side, and partly to the beneficial effect of the central depressions in which the rivers run northward into Ungava Bay. From Mingan to Lake Superior, the height of land, north of the St. Lawrence, is rudely parallel to the general course of the lines marking the northern boundaries of the trees, and it may have had some effect in limiting the northward range of a number of species. A southward curve in the watershed about the longitude of Ottawa is marked by a corresponding curve in the tree-lines, Again, where a great depression occurs in this dividing plateau, some of the trees, which in such places may be approaching their northern boundaries, are found to extend, in the lower levels, beyond their general outline on either side. As examples

Trend of tree-lines in Labrador.

Height of land parallel to tree-lines.

Effect of depressions.

of this, the Lake Temiscaming and Abittibi district, and the valley of the Kenogami, or principal south branch of the Albany, may be mentioned. On the Missinaibi, or west branch of the Moose River, the white elm reappears 130 miles north of its general boundary on descending to a sufficiently low elevation above the sea. The Saguenay, for about 100 miles from the St. Lawrence, is really a narrow arm of the sea, and the country in the vicinity of Lake St. John, at the head of the river, is only slightly elevated above its level, and has a fertile soil, although surrounded by a mountainous region. Here we find an isolated colony of bass-wood, sugar maple, and other trees, considerably removed from the rest of their species. On the north side of Lake Huron and to the north of the city of Quebec, the land rises somewhat rapidly, and in both instances the tree-lines near these latitudes are more closely crowded together than elsewhere.

Moose River.

Lake St. John.

Some kinds of trees, in approaching their northern limits, show a tendency to diminish gradually in size, and to become more and more scattered, rendering it difficult to draw any definite boundary of the species, while others vanish abruptly. The latter habit is more characteristic of southern than northern species, as far as the Dominion is concerned. The various species appear to die out more gradually as they range northward in the western than in the eastern regions.

Approaching northern limits.

Forest trees east of the Rocky Mountains may be divided into four groups, as regards their geological distribution within the Dominion: (1) A northern group, including the white and black spruces, larch, Banksian pine, balsam fir, aspen, balsam poplar, canoe birch, willows and alder. These cover the vast territory down to about the line of the white pine. (2) A central group of about forty species, occupying the belt of country from the white pine line to that of the button-wood; (3) a southern group, embracing the button-wood, black walnut, the hickories, chestnut, tulip-tree, prickly ash, sour-gum, sassafras and flowering dog-wood, which are found only in a small area in the southern part of Ontario; (4) A western group, consisting of the ash-leaved maple, bur oak, cotton-wood and green ash, which are scattered sparingly over the prairie and wooded regions west of Red River and Lake Winnipeg.

Four groups.

In the western peninsula of Ontario the forests present a remarkable richness in the number of species to be found growing together. In some localities as many as fifty different kinds may be counted on a single farm lot. A more varied mixture is probably not to be met with in any other part of the continent, or perhaps in the world.

Richness in species.

In tracing the tree-lines across the continent in the comprehensive manner shown on the map, it will be found that most of them afford interesting peculiarities for study. A few facts will now be given in

Thirty species enumerated in their order from north to south.

regard to the geographical distribution of the thirty species whose northern limits, within the Dominion, are shown upon the map. They will be noticed in the order of their occurrence from north to south, and the lines traced from east to west. The common names used are those by which they are known in Canada.

White spruce.

1. WHITE SPRUCE, SINGLE SPRUCE, SEA SPRUCE—Pine of the Hudson's Bay Company's people,—(*Albies alba*, Michx.)—This and the next are the most northern trees of North America. Abundant and of good size in Newfoundland and the Maritime Provinces, where it is sawn into deals. The Indians of these provinces call it "sea spruce" to distinguish it from the next. Captain Kennedy informs me that south of the limit shown on the map it is common in valleys and sheltered places throughout the Labrador peninsula. It nowhere reaches the Atlantic coast, receding fur ther and further in going north. On the south side of Ungava Bay it is found at the mouths of Whale, George's and Ungava Rivers, large enough for building boats, but the trunks are short and apt to be knotty. In going up the east coast of Hudson's Bay it vanishes about latitude 57°, or a few miles above Richmond Gulf, but it is said to extend further north at a distance inland. On the west coast of the bay it extends to Seal River, in latitude 59°, from which the northward limit runs apparently almost directly north-west to near the mouth of the Mackenzie River, or about latitude 68°. According to both Hearne and Sir John Richardson, it is found on the Coppermine River to within twenty or thirty miles of the sea. Around James' Bay, and between this bay and Lakes Huron, Superior and Winnipeg, it attains a good size for lumber, and even on the Hayes and Nelson Rivers I have seen good, sound logs cut upwards of two feet in diameter, and showing from 100 to 140 lines of growth. Common throughout Quebec and Northern Ontario, but rare in the southern parts of the latter province. In the prairie country I have not seen it further south-west than Pine Creek, about 100 miles west of Winnipeg.

Maritime Provinces.

Labrador.

Hudson's Bay.

Mackenzie River.

Black spruce.

1*a*. BLACK SPRUCE, DOUBLE SPRUCE (*Abies nigra*, Poir.)—Professor Gray regards the white and black spruce as probably only varieties of one species, and there certainly appears to be every gradation between the two. The white spruce grows on rich intervale grounds, or near the shores of lakes and rivers; it becomes a moderately large tree, while the black spruce is found on hills and in cold swamps, and is a smaller tree than the other. The bark of the white spruce, when young, is smooth and grey, while that of the black spruce is brownish, and is always covered with small, loose scales, even when the trees are young. The two kinds have the same geographical range northward.

Differences.

American larch.

2. AMERICAN LARCH, TAMARAC, RED SPRUCE, JUNIPER (*Larix Americana*, Michx.)—All the way from Newfoundland to near the mouth of

the Mackenzie River, the northern limit of this tree is only a little to the southward of that of the spruce. It is found along with this tree on the shores of Ungava Bay. In Newfoundland, New Brunswick and the Gaspé peninsula it attains a good size, and is a valuable timber-tree on all the northern branches of the St. Lawrence and throughout the Ottawa valley, from which large quantities have been exported for ship-building, &c. It has an equally thrifty growth in the country to the south of James' Bay, and westward towards Lake Winnipeg. In this great region it attains its greatest perfection on the dry uplands and in good soil near the rivers, but smaller trees, with small black spruces, grow everywhere on the level or swampy grounds. South of the Ottawa it grows principally on low and level land.

Larch exported.

3. Balsam Poplar, Balm of Gilead, Rough-Barked Poplar, Cotton Tree, White-Wood, &c., (*Populus balsamifera*, L.)—Abundant everywhere around the Gulf of St. Lawrence and throughout a great part of the Labrador peninsula. Luxuriant, but not of large size, along all the rivers of James' Bay and of the south-west side of Hudson's Bay, disappearing about Fort Churchill, from which its northern limit runs to about latitude 65° on the Mackenzie. On the east side of the bay small trees were seen as far north as Richmond Gulf. It is a very common tree, and of large size in the valley of the Mackenzie, especially on the Rivière aux Liards. It attains a considerable size around Lakes Huron and Superior, where the thick bark of old trees is used by the fishermen as a subsitute for cork in making net-floats.

Balsam poplar. Hudson's Bay. Mackenzie River.

4. Aspen, Common Poplar, Trembling-Leaved Poplar (*Populus tremuloides*, Michx.) A rather more southern tree than the last; very common throughout the whole region from the Gulf of St. Lawrence to near the mouth of the Mackenzie River. It extends over the southern half of the Labrador peninsula, and around James' Bay. On the south-west side of Hudson's Bay it keeps some distance back from the coast. It is the commonest tree in the prairie and half-wooded parts of the North-West territories. Throughout the Hudson's Bay Territory it is the principal fuel used by Indians and for open fires at the Company's posts, as it does not throw out sparks like the spruce and larch. In the Eastern Townships and elsewhere it is used for the manufacture of paper. Although the most widely diffused tree of North America, it is relatively most abundant in the west, where it ranges from the Arctic regions to California. Professor Sargent remarks that it has "not yet been seen on the high peaks of the southern Alleghany Mountains, to which it might naturally extend."

Aspen. Labrador. North-West territories. Most widely diffused tree of North America

5. Canoe Birch, White Birch (*Betula Papyracea*, Ait.)—A very common tree along the northern tributaries of the St. Lawrence, and

Canoe birch.

Labrador. ranging as far north in the Labrador peninsula as Lake Naskopie, and to within 250 miles, or perhaps less, of Ungava Bay, on the river of the same name. It attains its greatest perfection around the Gulf of St. Lawrence and in the Ottawa valley, and is also found of large size near Lakes Huron and Superior. In Labrador, on both sides of James' Bay and north-westward to the Mackenzie River, it affords sufficiently large sheets of bark for canoe-building. From James' Bay to the Mackenzie, which it strikes beyond the Arctic Circle, its northward boundary keeps near that of the aspen, being sometimes on one side of it and sometimes on the other. In the most southern parts of Ontario it is rare, of small size, and found only in swamps. In the Red River region it ranges as far south as the United States' boundary, and is found along the Assiniboine valley as far west as the Qu'Appelle lakes.

Greatest perfection.

Canoe building.

Banksian pine. 6. BANKSIAN PINE, SCRUB PINE, JACK PINE, CYPRESS (*Pinus Banksiana*, Lamk.)—This tree has not been noticed in Newfoundland, on the north shore of the Gulf of St. Lawrence, nor in the interior of Labrador beyond Lake Mistassini, although it may possibly have a somewhat more northern range in this peninsula than represented on the map. It occurs throughout Nova Scotia and New Brunswick. Starting from the head of the Bay of Chaleur, its northward limit appears to cross the other tree lines to the lake just named, from which it runs west to the Moose River, keeping about 100 miles south of James' Bay. From Moose River it runs north-west to the Mackenzie, which it crosses about the Arctic Circle. It does not touch either James' or Hudson's Bay. Southward it is common on the north shore of Lake Huron and around both shores of Lake Superior, whence it is met with all through the country to Lake Winnipeg. The area over which it is distributed appears to be in the form of a belt, with a breadth equal to five or six degrees of latitude, running across the continent. Although a small and scrubby tree in the southern and eastern parts of its range, in the central part (both as regards latitude and longitude) it attains much greater perfection. On the southern branches of the Albany I have seen large groves of these trees about seventy feet in height, and two feet in diameter at the butt, with straight trunks nearly free from branches for the first twenty or thirty feet.

Northern limit.

Area of distribution.

Balsam fir. 7. BALSAM FIR, FIR, VAR, SILVER PINE, BLISTER PINE—"Palm" in Cape Breton—(*Abies balsamea*, Marshall.)—The Maritime Provinces, Newfoundland and the southern half of the Labrador peninsula, its northern limits in this region being on Naskopie Lake and the Ungava River. It flourishes best in the Gaspé peninsula, where I have seen many trees from twenty inches to two feet in diameter, with trunks tall enough to afford one good sawlog—about fifteen feet. It occurs around James' Bay, but its northern limit keeps to the south-west of

Gaspé.

Hudson's Bay, where it passes between Fort Severn and Trout Lake, and reaches the neighbourhood of the junction of the Shammattawa and Steel Rivers, which form the Hayes' River. From this point it turns south-west, and crosses the Nelson River at the outlet of Sipiwesk Lake, from which it runs north-west to the Mackenzie River, crossing it about latitude 65°. South-west of Hudson's Bay it grows only in the warmest and best soils, and is entirely wanting in the cold, swampy tracts. In Ontario, where it is cultivated as an ornamental tree, I have not observed it growing naturally south of the latitude of Toronto. In the North-West territories it appears to be absent to the south and west of Lake Winnipegosis.

Nelson River.

Ontario.

8. WHITE CEDAR, CEDAR, ARBOR VITÆ (*Thuya occidentalis*, L.)—The geographical distribution of this species presents some very interesting features. In the Gulf of St. Lawrence region its boundary runs south-east from Anticosti to the Bay of Fundy, directly acros sall the intervening tree-lines. It is absent from Newfoundland, Cape Breton, Nova Scotia, and the eastern half of Prince Edward Island, but is unusually large and fine in New Brunswick and the Gaspé peninsula, in which the climate, soil, &c., are the same as in the adjacent regions, where not a trace of the species is to be found. From Anticosti the limit runs south-westward to a point about 200 miles north of Montreal. Thence it turns north-west and reaches Rupert's House, on James' Bay. From the neighbourhood of Moose Factory the line crosses the Albany River at some distance from the sea, and continues westward to a point about seventy-five miles south-west of Trout Lake, where it turns south-west and reaches the southern extremity of Lake Winnipeg; thence it turns southward to the United States boundary, keeping to the east of the Red River all the way. There is a remarkable outlier of white cedar brushwood around Cedar Lake, on the lower part of the Saskatchewan River, at a distance of 190 miles to the north-west of the nearest point of the main area covered by the species, and a few cedar trees are said to occur on Lake Winnipeg, not far from the mouth of the Saskatchewan. Captain Kennedy informs me that he believes the white cedar occurs in Labrador west of the head of Hamilton Inlet. If so, this outlier would occupy a position with regard to the north-east promontory of the cedar-line which would correspond to that of the Cedar Lake one to its north-western promontory. We might account for the singular fact that the white cedar has not yet extended itself eastward into Newfoundland and Nova Scotia by supposing that, in comparatively late geological times, when the land was lower or the sea higher, the Arctic current, which now flows through the Straits of Belleisle into the Gulf, passed on over the isthmus separating Nova Scotia from New Brunswick, and flowed through the Bay of Fundy. This

White cedar.

Cedar absent.

James' Bay.

Lake Winnipeg.

Outlier.

Labrador.

Supposed cause.

steady current of Arctic water, which would itself carry no seeds of trees, might prevent those of the cedar from crossing to the islands beyond it. But on this hypothesis it would be difficult to understand why the white pine, yellow birch and other trees, which are even more southern in their general habit than the species in question, should be found in these provinces.

Difficulty.

Black ash.

9. Black Ash, Swamp Ash (*Fraxinus sambucifolia*, Lam.)—In Anticosti and southern Newfoundland. From the neighbourhood of Seven Islands the northern limit runs west (curving slightly to the southward) to Lake Winnipeg. It is common, but of small size, along the different branches of the Moose River, especially towards the height of land. St. Peter's portage, on the Missinaibi branch is the most northern point at which I have seen it in this region. I have found small trees around the southern part of Lake Winnipeg, but have never noticed it further west.

Moose River.

White elm.

10. White Elm, Swamp Elm, Grey Elm, American Elm (*Ulnus Americana*, Willd.)—With the exception of the northern group, this species has the widest range of any tree in Canada. It extends from the southern part of Newfoundland to the base of the Rocky Mountains. It occurs at the head waters of all the principal branches of the Moose River, and on one of them, the Missinaibi, I found an outlier within 120 miles of James' Bay. On the Kenogami it extends to a point about half-way from Long Lake to the Albany. The northern limit intersects the east shore of Lake Winnipeg, and gains its highest latitude (about 54½°) on the main Saskatchewan, where Mr. A. S. Cochrane last summer observed some good-sized trees not far from Cumberland House. Professor Macoun says he has "found it on Tail Creek, which discharges Buffalo Lake into Red Deer River, a branch of Bow River." In the plain country, near the United States boundary line, the writer met with fair-sized trees in valleys in the Wood Mountains, and in different valleys to the northward of them. The trees in such situations are not visible from the table-lands until the brink of the valley is reached, and are locally known as "sly-woods." It grows to a large size along the Red and Assiniboine Rivers.

Outlier.

Most northerly range.

Bow River.

In the plain country.

Ash-leaved maple.

11. Ash-Leaved Maple, Box Elder, Red River Maple (*Negundo aceroides*, Mœnch.)—Does not appear to have been found native in Quebec or Ontario, although occurring in the eastern states. Young trees raised at Montreal from seeds brought from Manitoba are growing very rapidly, and bearing seeds in the eighth year from sowing. In the North-West, Professor Winchell gives it as reaching the western extremity of Lake Superior. It is abundant in the Red River valley, and extends north to the Dog's Head on Lake Winnipeg, beyond which the writer has not found it in that direction. It occurs along the main

Montreal.

Lake Superior.

Saskatchewan and the south branch. The most westerly locality known is Tail Creek, which discharges Buffalo Lake, where it was found by Professor Macoun, along with the white elm. It is difficult to draw the geographical boundary of any tree in the prairie country, where timber of all kinds is so scarce, and therefore the lines on the map in this region are subject to correction. Buffalo Lake.

12. GREEN ASH, WESTERN ASH (*Fraxinus viridis*, Michx.)—Common along the Red River in Manitoba, and extends north-westward as far as the Saskatchewan, in the neighborhood of Cumberland House. Mr. A. S. Cochrane writes that he found it abundant, but of small size, at the Birch portage, in this vicinity. I have met with it at the elbow of the South Saskatchewan, and Professor Macoun says he has not seen it west of the Cypress Hills, but that it extends east as far as Owen Sound, on the Georgian Bay. It occurs on the Lake of the Woods and along the Rainy River. Green ash. Saskatchewan. Owen Sound.

13. BUR OAK (*Quercus macrocarpa*, Michx.)—The limit of this species in Canada extends from the international boundary on Lake Superior north-westward to the north end of Lake Winnipegosis, from which it drops south to the Dakota line, in the vicinity of the Souris River. Professor Winchell writes that it is scattered all over the state of Minnesota. It attains a good size on the Rainy River and in the district between Lake of the Woods and Winnipeg River and the Red River; also along the Red and Assiniboine Rivers. On the English River it was first observed about half-way from Lonely Lake to the Winnipeg River. It extends northward on Lake Winnipeg as a tree to the Loon Straits, and as a bush to Beren's River. Small trees occur along the Swan River and north branch of the Assiniboine. Professor Macoun has not noticed it west of Spy Hill, near the Qu'Appelle River. Bur oak. Dakota. Winnipeg River. N. and W. limits.

14. WHITE PINE—"Yellow Pine" of the British markets—(*Pinus strobus*, L.)—This and the next species have so nearly the same limit throughout the greater part of their northward range, that they are represented on the map both by one line. The red pine, however, does not extend so far east as the white, so that in this direction the line represents only the boundary of the latter. Contrary to popular belief, the white pine is confined to a comparatively small part of the Dominion, as will be observed by an inspection of the map. Its northern limit in Canada extends east as far as Mingan, while to the west it does not reach Lake Winnipeg, or Red River. It reaches its lowest latitude opposite to Ottawa City, about 48¾°, and its highest, about 52°, in the Lonely Lake region. It occurs in favorable situations throughout the greater part of Newfoundland, but it is of best quality and most abundant along the Gander and Exploit Rivers on the north, and the Humber on the west side of the island. On the last named stream, White pine. Area of pine. Lowest and highest latitudes. Newfoundland.

I have cut into the centres of several good-sized trees, and found the wood of excellent quality. In the country immediately north of Lake St. John, the Messrs. Price have cut large quantities of fine white pine timber for export. When coming from Lake Mistassini to Ottawa, by way of the Gatineau River, Mr. Richardson, of the Geological Survey, first met this species at 230 miles north of that city. It occurs of fair size on the head waters of all the principal branches of the Moose River, and in former times is said to have extended considerably further north along these streams; but having been entirely destroyed by extensive forest fires, it has been replaced by other trees. Owing to these fires it is now very scarce in most of the region north of Lake Superior, but small groves of it have been observed as far north as represented. It is scattered over the country between Lake Superior and the Winnipeg River and around Lonely Lake, but it is of rather small size. In approaching Lake Winnipeg the limiting line of this tree curves south-westward, and crosses the Winnipeg River about fifteen miles above Fort Alexander, and then runs south to the United States boundary at some distance east of Red River.

Lake St. John. Gatineau River. Moose River. Lake Superior. Winnipeg River.

Red pine.

15. Red Pine, Norway Pine (*Pinus resinosa*, Ait.)—As above stated, the northward range of this species and the white pine correspond so nearly, except towards the east, that for the present their limit is represented by a single line. It is not so common a tree in Canada as the white pine, and is usually found in rather small groves, although in the Ottawa valley they are sometimes pretty extensive. The white pine, on the other hand, may be found mixed with all other kinds of trees. It begins to disappear from the northern parts of the region of the white pine east of the longitude of Quebec, and is absent from Anticosti and Newfoundland. I have observed it in the Province of Quebec on the upper part of the Patapedia River, in the Gaspe peninsula, and Mr. Ells informs me that it is found on the Tobique River and on the New Brunswick and Canada railway fifty miles from St. Andrew's.

North-eastward range.

Yellow birch.

16. Yellow Birch (*Betula excelsa*, Ait.)—The 49th parallel forms the average northern limit of this species from Newfoundland to the Red River valley, in which it curves round and runs southward. It grows to a good size in Newfoundland and the Maritime Provinces, where it is used in ship-building. Some of the trees whose northern boundaries are near that of the yellow birch in the east, gain much higher latitudes in the west. It ranges north of the height of land at Lake Abittibi, but is not found on the north shore of Lake Superior from Michipicoten to the United States boundary, and only small trees are found on the Canadian side of the line from this point to the Rainy River.

Newfoundland. Lake Superior.

17. SUGAR MAPLE, HARD MAPLE, ROCK MAPLE (*Acer saccharinum*, Wang.)—This tree, which was adopted as emblematic of Canada, is confined to the south-eastern borders of the Dominion. It is rather more southern in its tendency than the yellow birch. Some small trees have been noted at the head of Bay St. George, Newfoundland. It is found in sheltered places on the north side of the Gaspé peninsula, and is common in its southern parts, thrives well on the fertile limestone land of Lake St. John, and reaches Lake Temiscamang on the Ottawa; is abundant, but of a dwarfed description, on Michipicoten Island and the hills on the east side of Lake Superior. Going north in this region, the last trees were seen south of the Long portage, on the Michipicoten River. It is absent from the northern parts of the shores of Lake Superior and northward. On the west side of the lake it re-appears on the south side of the lower part of the valley of the Kaministiquia River, and thence the limit keeps westward, a little to the north of the boundary line, as far as Lake of the Woods, where it turns south. Sir John Richardson mentions this tree as occurring in the Saskatchewan region, but this is probably an error.

Sugar maple. Gaspé. Lake Superior. Lake of the Woods.

18. RED OAK (*Quercus rubra*, L.)—Nova Scotia, New Brunswick south of the Bay of Chaleur, Province of Quebec south of the city of the same name, and in Ontario to latitude 46°. On the north side of Lake Huron it is found for only a short distance inland. South shore of Lake Superior and at the eastern and western extremities. It has been said by one writer to occur on Michipicoten Island, but others familiar with the island have not observed it.

Red oak.

19. HEMLOCK, HEMLOCK-SPRUCE (*Abies Canadensis*, Michx.)—Eastward the northern limit of this species is at the Bay of Chaleur, but it is scarce near the eastern sea coast of New Brunswick. Very abundant in the northern part of Nova Scotia. It crosses the St. Lawrence a short distance below Quebec, extending further down on the north than on the south side. Thence it reaches the north end of Lake Temiscaming and the eastern extremity of Lake Superior at Agawa, south of the Michipicoten River. On the south shore of Lake Superior it does not reach the western extremity, turning southward in the neighborhood of Ashland. I am informed, however, that there is an outlying grove of hemlock at Thompson, about twenty-five miles west of Duluth. This tree maintains a good size to the verge of its range, and always appears to terminate abruptly. Sir John Richardson states that it grows on the Kaministiquia River. This, however, appears to be an error. I have never seen it or heard of its occurrence near this locality.

Hemlock. Maritime Provinces. Lake Superior.

20. BASSWOOD, LINDEN, WHITE WOOD (*Tilia Americana*, L.)—Common in Nova Scotia and New Brunswick, except the northern part, not

Basswood.

Gulf of St. Lawrence.

having been noticed beyond the southern branches of the Restigouche. The northern limit seems to reach the Gulf south of Miscou, from which it runs west to near Quebec, and thence in a pretty direct course to the eastern shore of Lake Superior. It is wanting around the northern parts of this lake, but re-appears just south of Thunder Bay, from which it nearly follows the international boundary to Lake of the Woods. Here it bends north-west, and almost gains the southern extremity of Lake Winnipeg, the last trees seen in that direction being at East Selkirk, on the Red River, where they are very small. Westward it is found along the Assiniboine to a short distance above Fort Ellice.

Red River.

Beech.

21. BEECH (*Fagus ferruginea*, Ait.)—Throughout Nova Scotia and in New Brunswick to the Bay of Chaleur, except on the coast of the Bay of Fundy. The northern boundary crosses the St. Lawrence a short distance below Quebec, and thence runs west to Lake Nipissing and the outlet of Lake Superior. On the south shore of this lake it occurs as far west as Grand Island, but it seems to disappear from the immediate neighborhood of the lake before reaching L'Anse. Sir John Richardson says this tree occurs on Red River of Lake Winnipeg. If so, it must be south of the Canadian line.

Bay of Fundy.

Lake Superior.

White ash.

22. WHITE ASH (*Fraxinus Americana*, L.)—Found throughout Nova Scotia and in New Brunswick, except the northern part; also in the southern parts of Quebec and Ontario, its northward range corresponding nearly with that of the beech. It occurs along the southern, but not on the northern side of Lake Superior.

Ironwood.

23. IRON-WOOD, HOP HORNBEAM—Lever-wood of the Eastern Townships (*Ostrya Virginica*, Willd.)—Nova Scotia and the greater part of New Brunswick, the northern limit being on the Bay of Chaleur, from which it runs to near the city of Quebec, and reaches Lake Huron at the mouth of the French River. It has been seen on the Manitoulin Islands, but not to the north of Lake Huron. Sir John Richardson mentions it as occurring on the Winnipeg and Red Rivers, and I have noticed it on Lake of the Woods and the lower part of the Assiniboine River.

Blue beech.

24. BLUE BEECH, AMERICAN HORNBEAM (*Carpinus Americana*, Michx.)—This small tree does not range quite so far north as the last. It has not been noticed on the north side of Lake Huron, nor anywhere around Lake Superior.

White oak.

25. WHITE OAK (*Quercus alba*, L.)—In the southern parts of Nova Scotia and New Brunswick, in both of which it is rare. More common in the southern districts of Quebec and Ontario. A very valuable timber tree in the Ottawa valley, below the Mattawa, and throughout south-western Ontario, from both of which regions large quantities have hitherto been exported to foreign markets.

26. RED CEDAR (*Juniperus Virginiana*, L.)—The arborescent form of this species is found in none of the provinces except Ontario. Its northern limit begins on the Atlantic coast about the eastern part of the state of Maine, and runs west near the parallel of latitude 45°, crossing the St. Lawrence about mid-way between Montreal and Lake Ontario, and reaching Lake Huron at Parry Sound. In the early days of the settlement of Upper Canada large quantities of this wood were cut in the neighborhood of Kingston and the Bay of Quinté, and shipped out of the country. The prostrate variety (*J. humilis*, Hook.), is found in all the provinces, and is common in sandy and gravelly soil in the North-west prairie country. It also occurs in dry and rocky places along rivers and lakes in the wooded regions of the Hudson's Bay territories, as far north as the mouth of the Nelson River. Red cedar. Former abundance near Kingston. Prostrate variety.

27. BUTTERNUT (*Juglans cinerea*, L.)—Said to be found in Nova Scotia on the east side of the Bay of Fundy. Occurs in the southern counties of New Brunswick, especially King's, and along the St. John River above Woodstock; absent from the coast and northern part of this province; in the St. Lawrence valley, nearly as far down as the city of Quebec, and along the Ottawa up to the Madawaska, from which the northern boundary runs to the Georgian Bay. Large trees are found in a few places in the county of Grey, not far from this Bay. Butternut.

28. BITTER HICKORY (*Carya amara*, Nutt.)—Ranges over a much larger area in Canada than the shell-bark hickory, being found around Montreal, in the Eastern Townships and along the lower part of the Ottawa valley, and thence westward throughout the southern part of Ontario to Lake Huron. Bitter hickory.

29. BLACK WALNUT (*Juglans nigra*, L.)—This tree is confined to the tract lying south of a line drawn from the head of Lake Ontario to near the outlet of Lake Huron. Black walnut.

30. CHESTNUT (*Castanea vulgaris*, Lam., var. *Americana*, A. DC.)—In the district along the north side of Lake Erie, and north-eastward to the north shore of the head of Lake Ontario. Chestnut.

THE GEOGRAPHICAL DISTRIBUTION OF TREES OCCURRING IN CANADA BUT NOT REPRESENTED UPON THE ACCOMPANYING MAP.

1. TULIP TREE (*Liriodendron tulipifera*, L.—At Niagara Falls and in some localities westward near Lake Erie.

2. SILVER MAPLE, WHITE MAPLE (*Acer dasycarpum*, Ehrh.)—Eastern Townships and province of Ontario south of latitude 45°. Generally confounded with the red or soft maple.

3. STRIPED MAPLE (*Acer Pennsylvanicum*, L.)—This small tree, although everywhere scarce, has much the same range in Canada as the

sugar maple, being found from Gaspé to the outlet of Lake Superior; also with the sugar maple at Lake St. John.

4. Mountain Maple (*Acer spicatum*, Lam.)—The most northern species of maple. Ranges from Newfoundland to James' Bay, and north-westward to Island Lake on the waters which reach the sea at York Factory. The last locality at which it was seen in this direction is George's Island, in Lake Winnipeg.

5. Black Maple (var. *Acer nigrum*, Michx.)—Identified by the late Dr. John Bell as occurring at Grenville, on the Ottawa.

6. Soft Maple, Red Maple (*Acer rubrum*, L.—A common tree throughout the Maritime Provinces, and in Quebec and Ontario south of latitude 49°; has a slightly more northern range than the sugar maple.

7. Kentucky Coffee Tree (*Gymnocladus Canadensis*, Lam.)—Said to occur in southern Ontario. Professor Winchell informs me that it is found in the southern part of Minnesota.

8. Wild Plum (*Prunus Americana*, Marshall.)—The northern limit runs from near the city of Quebec to the eastern extremity of Lake Superior. It occurs on the Rainy and the Red River and the lower part of the Assiniboine, and at the south end of Lake Manitoba.

9. Pigeon Cherry, Small Red Cherry (*Prunus Pennsylvanica*, L.) —Very widely diffused; has a high northern range, small examples extending in most regions nearly to the verge of the timber.

10. Black Cherry (*Prunus serotina*, Ehrh.)—Formerly a valuable timber tree in the lower Ottawa region and south-western Ontario; very fine in the county of Bruce; now nearly exhausted.

11. Mountain Ash, Rowan (*Pyrus Americana*, De C.)—Abundant and of good size in all the Maritime Provinces, Anticosti and Gaspé; thence it extends westward, the northern limit touching James' Bay. Further west it is found of small size as far west as Island Lake, on the Shamattawa, and to White Mud Falls, on the Nelson River, seventy or eighty miles below Lake Winnipeg. This tree, which is of a northern habit, probably attains its greatest perfection around the Gulf of St. Lawrence and Lakes Huron and Superior.

12. Scarlet-Fruited Thorn (*Cratægus coccinea*, L.)—Common in the southern and central latitudes of Quebec and Ontario, but its northern limits have not been accurately ascertained. Between Lake Superior and Manitoba thorn bushes grow as far north as the international boundary, but not much beyond it. Thorn bushes, apparently belonging to this species, were found by Mr. Cochrane on the Grassberry River, twenty or thirty miles north-west of Pine Island Lake.

13. Cockspur Thorn (*Cratægus crus-galli*, L.)—Ontario, except the more northern parts. In Manitoba a thorn which appears to be identical with this species is abundant.

14. Black Thorn (*Cratægus tomentosa*, L.)—In the southern parts of Quebec and Ontario.

15. Flowering Dog-wood (*Cornus florida*, L.)—In southern Ontario only. Most common apparently at Niagara Falls, and westward to the valley between Dundas and Ancaster, but rarer on the higher grounds.

16. Sour-gum (*Nyssa multiflora*, Wang.)—Dr. Hurlbert informs me that this tree grows in some parts of southern Ontario, but I have not observed it myself.

17. Sassafras (*Sassafras officinale*, Nees.)—From the Niagara River to Ancaster, near the head of Lake Ontario, and probably other parts of southern Ontario.

18. Slippery Elm (*Ulmus fulva*, Michx.)—Southern parts of Quebec. Along the Ottawa River for 200 miles, above Montreal; small and rather scarce. In Ontario as far north as Georgian Bay.

19. Rock Elm (*Ulmus racemosa*, Thomas.)—Eastern Townships, Lower Ottawa valley and province of Ontario south of latitude 46°. Formerly common, but most of the finest trees in all these regions have been cut for export.

20. Buttonwood, American Plane-tree (*Platanus occidentalis*, L.)—Around the head of Lake Ontario and in the western peninsula, especially along rivers such as the Grand, Thames and Saugeen.

21. Shell-bark Hickory (*Carya alba*, Nutt.)—In the southern part of Ontario; rather common in some localities. The brown hickory (*C. porcina*) and the white-heart hickory (*C. tomentosa*) are also believed to occur in the same region.

22. Swamp White Oak (*Quercus bicolor*, Willd.)—The white oak of the low lands in the Ottawa valley and southern Ontario appears to belong to this species. Near Dundas I have also seen what I took to be the black oak (*Q. tinctoria*, Bartram.)

23. White Birch (*Betula alba*, L.)—This species, which is often mistaken for the canoe birch, occurs in the Maritime Provinces, and in Quebec as far west as Montreal, and probably further.

24. Black Birch (*Betula lenta*, L.)—Often confounded with the yellow birch. Occurs in both Nova Scotia and New Brunswick. Identified in Gaspé and other places in the Province of Quebec, and in Ontario as far west as the Manitoulin Islands.

25. Black Alder (*Alnus incana*, Willd.)—Abundant along streams everywhere from Newfoundland to the Saskatchewan, and as far north as the forests extend, but not in the southern parts of Ontario. In the Hudson's Bay territories it is often called "black willow." The green alder (*A. viridis*) has also been noticed, although not so common as the black, from Newfoundland to Lake Winnipeg, and northward to the verge of the forests around Hudson's Bay.

26. WILLOWS.—The willows have not been identified with sufficient specific accuracy in the various regions in which the aborescent forms occur to map the geographical range of the different species.

27. LARGE-TOOTHED POPLAR (*Populus grandidentata*, Michx.)—Of a southern habit compared with the aspen. Its northward range is somewhere between that of the sugar maple and the white pine. Abundant in New Brunswick and Gaspé. It does not extend west as far as Manitoba.

28. COTTON-WOOD (*Populus monilifera*, Ait.)—Large trees occur along the Assiniboine River.

29. *Pinus contorta* (Dougl.)—Western part of the North-west Territories.

30. PITCH PINE (*P. rigida*, Mill.)—In some places in the Ottawa valley, and at the Thousand Islands on the St. Lawrence.

31. ENGELMANN'S SPRUCE (*Abies Engelmanni*, Parry.)—This tree, which is known to extend as far east as the Black Hills of Dakota, is said to occur also on the upper waters of the South Saskatchewan.

APPENDIX I.

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LIST OF FOSSILS COLLECTED BY DR. R. BELL IN MANITOBA DURING THE SEASON OF 1880.

BY J. F. WHITEAVES.

1. From the "Galena Limestone" (D. 2b. Utica) of East Selkirk.

Protozoa.

Receptaculites Oweni, Hall.

Cœlenterata.

Columnopora cribriformis, Nicholson.
Columnaria alveolata, Goldfuss (=*Favistella stellata*, Hall).
Streptelasma corniculum? Hall.—Large and robust variety.

Cephalopoda.

Endoceras—like *proteiforme*, Hall, but with more closely arranged septa; also embryo tube of the same.
Orthoceras Simpsoni, Billings.
Orthoceras, Sp. Undt.

2. From the "Galena Limestone" of the Banks of the Red River, in the Parish of St. Andrew's.

Protozoa.

Receptaculites Oweni, Hall.

Cœlenterata.

Columnopora cribriformis, Nicholson.
Halysites catenularia, Linné.
Columnaria alveolata, Goldfuss, *non* Hall.
Monticulipora, N. Sp.—Fragments of a small branching form.
Monticulipora, N. Sp.—Portion of a massive hemispherical species.
Monticulipora, N. Sp.—Apparently allied to *M. undulata*, Nicholson.
Streptelasma corniculum? Hall, var.

POLYZOA.

Retepora Trentonensis, Nicholson.
Ptilodictya, Sp. Undt.—Fragments only.

BRACHIOPODA.

Rhynchonella capax, Conrad, var. *increbescens*, Hall.
Platystrophia biforata, Schlotheim, var. *lynx*.
Orthis testudinaria, Dalman.
Strophomena alternata, Conrad.
Strophomena camerata? Conrad.
Strophomena (?) Nov. Sp.
Streptorhynchus filitexta, Hall.
Leptæna sericea, Sowerby.

GASTEROPODA.

Murchisonia bellicincta, Hall.
Fusipira, Sp. Undt.—A frament of a cast.
Bucania, Sp. Undt., allied to *B. bidorsata*. Hall.
Bucania expansa? Hall. A badly preserved cast.
Cyrtolites ornatus? Conrad. A badly preserved cast.
Cyrtolites compressus, Conrad.

CEPHALOPODA.

Actinoceras Lyoni, Stokes.
Actinoceras Richardsoni, Stokes.

CRUSTACEA.

Leperditia, Sp. Undt.
Calymene senaria, Conrad.
Lichas Trentonensis, Conrad.
Illænus crassicauda, Hall, and D. D. Owen, as of Wahlenberg.
Cheirurus pleurexanthemus, Green.

3. FROM THE BANKS OF RED RIVER, PARISH OF ST. ANDREW'S, BUT APPARENTLY FROM A DIFFERENT AND HIGHER GEOLOGICAL HORIZON—PROBABLY THAT OF THE NIAGARA LIMESTONE.

CŒLENTERATA.

Thecia, Nov. Sp.
Eridophyllum, Sp. Undt.

BRACHIOPODA.

Stricklandinia, Nov. Sp.

CRUSTACEA.

Illænus (*Bumastes*) *Barriensis*, Murchison.

APPENDIX II.

—

List of Plants Collected in 1880.

The plants collected during the season are enumerated in the following list, which has been kindly prepared by Professor Macoun, F.L.S., of Albert University, Belleville, Ontario. The localities of the species are indicated by asterisks placed in the columns, which are designated as follows:—

I.—York Factory.
II.—Echimamish River to Oxford House.
III.—Oxford House to Knee Lake.
IV.—Around Cross Lake on Nelson River.
V.—Hayes' River.
VI.—Hill River.
A.C.—Plants Crossing the Arctic Circle.

Nos.		I.	II.	III.	IV.	V.	VI.	A.C.
	RANUNCULACEÆ.							
1	Anemone parviflora, Michx....						*	*
2	" multifida, D.C.....					*	*	*
3	" Pennsylvanica, L.....	*	*					*
4	" Richardsoni, Hook.....	*						*
5	Thalictrum dioicum, L.....	*						*
6	" Cornuti, L	*						
7	Ranunculus aquatilis, L. var. trichophyllus, Gr.			*	*			*
8	" cymbalaria, Pursh.....	*						*
9	" sceleratus, L.....	*						*
10	" Flammula, L. var. reptans, Gr...		*					*
11	Caltha palustris, L.....	*		*				*
12	Aquilegia Canadensis, L.....			*				*
13	Actæa spicata, L. var. rubra, Gr.....			*	*			
	SARRACENIACEÆ.							
14	Sarracenia purpurea, L.....				*			*

Nos.		I.	II.	III.	IV.	V.	VI.	A.C.
	FUMARIACEÆ.							
15	Corydalis glauca, Pursh							*
16	" aurea, Willd	*			*			
						*		
	CRUCIFERÆ.							
17	Nasturtium palustre, D.C	*	*					*
18	Cardamine hirsuta, L	*						*
19	Arabis petræa, Lam	*						*
20	Erysimum cheiranthoides, L	*						*
21	Sisymbrium sophioides, Fischer	*						*
22	Draba incana, L	*						
23	Lepidium intermedium, Gray			*				
	VIOLACEÆ.							
24	Viola palustris, L			*				*
	CARYOPHYLLACEÆ.							
25	Lychnis apetala, L	*						*
26	Arenaria lateriflora, L	*						*
27	" verna, L	*						*
28	" formosa, Fischer	*						*
29	" nardifolia, Ledib ?					*		
30	" peploides, L	*						*
31	Stellaria media, L	*						
32	" longifolia, Muhl	*						*
33	" borealis, Bigel	*		*				*
34	" uliginosa, Murr	*						*
35	" longipes, Goldie		*					*
36	Sagina nodosa, Fenzl	*						*
	GERANIACEÆ.							
37	Geranium Carolinianum, Linn			*				
	RHAMNACEÆ.							
38	Rhamnus alnifolius, L'Her			*			*	
	LEGUMINOSÆ.							
39	Astragalus hypoglottis, Ker					*		*
40	Hedysarum Mackenzii, Rich					*		*
41	Vicia Americana, Muhl	*	*					*
42	Lathyrus ochroleucus, Hook			*				*
43	" palustris, L				*			
	ROSACEÆ.							
44	Prunus Pennsylvanica, L							
45	Geum strictum, Ait	*	*					
46	Fragaria Virginiana, Ehrh		*					
47	Potentilla Norvegica, L		*					
48	" Anserina, L	*	*					*

Nos.		I.	II.	III.	IV.	V.	VI.	A.C.
	ROSACEÆ.—(*Continued.*)							
49	Potentilla fruticosa, L.							•
50	" tridentata, Ait.		•		•			•
51	palustris, Scop.	•	•		•			•
52	diversifolia, Lehm.	•	•					
53	Rubus Chamæmorus, L.			•				•
54	arcticus, L.			•				•
55	strigosus, Mich.		•					
56	Rosa blanda, Ait.	•	•					•
57	Amelanchier Canadensis, var. oblongifolia		•		•			•
	" " var. Botryapium		•					
	SAXIFRAGACEÆ.							
58	Ribes lacustre, Poir.			•				•
59	" prostratum, L'Her.		•					
60	" Hudsonianum, Rich.			•	•			•
61	" rubrum, L.	•		•				•
62	" oxycanthoides, L.			•				
63	Parnassia palustris, L.	•		•	•			•
64	Saxifraga Hirculus, L.	•						•
65	" tricuspidata, Retz.	•						•
66	Heuchera hispida, Pursh		•					•
67	Mitella nuda, L.	•		•				•
	HALORAGEÆ.							
68	Hippuris vulgaris, L.	•						•
	ONAGRACEÆ.							
69	Epilobium augustifolium, L.	•	•					•
70	" palustre, var. lineare, Gr.			•				•
71	" tetragonum, L.	•	•					
	UMBELLIFERÆ.							
72	Cicuta virosa, L.	•						
73	Sium lineare, Michx.		•		•			•
74	Carum Carui, L.			•				
	ARALIACEÆ.							
75	Aralia hispida, Michx.				•			
	CORNACEÆ.							
76	Cornus Canadensis, L.			•				•
77	" stolonifera, Michx.	•	•					•
	CAPRIFOLIACEÆ.							
78	Linnæa borealis, Gronov.	•		•				
79	Symphoricarpus racemosus, Michx.	•						
80	Lonicera involucrata, Banks			•				
81	" parviflora, Lam.		•					
82	" cærulea, L.			•			•	
83	Viburnum pauciflorum, Pylaie	•	•		•			
	RUBIACEÆ.							
84	Galium trifidum, L.	•						•
85	" boreale, L.	•				•		•

Nos.		I.	II.	III.	IV.	V.	VI.	A.C.
	COMPOSITÆ.							
86	Nardosmia palmata, Hook			*				*
87	" sagittata, Benth	*						
88	Aster graminifolius, T. & G		*				*	
89	" puniceus, L	*						
90	Erigeron acre, L	*				*		
91	Solidago lanceolata, Ait				*			
92	" Canadensis, L	*						
93	Achillæa millefolium, L		*					*
94	Leucanthemum arcticum, D.C	*						*
95	Matricaria inodora, L	*						*
96	Tanacetum Huronense, Nutt					*		
97	Artemisia Canadensis, Michx					*		
98	Antennaria dioica, Gærtn, var. rosea, Wat	*						*
99	" plantaginifolia, Hook		*					
100	" Carpathica, R. Br	*						
101	Senecio palustris, Hook	*						*
102	" aureus, L	*	*			*		*
103	" ——— ?	*						
104	Arnica augustifolia, Vahl		*					
105	" foliosa	*						
106	Hieracium Canadense, Mich., var. umbellatum, Rich					*		
107	Nabalus racemosus, Hook					*		
108	Taraxacum palustre, D.C			*				*
109	Mulgedium pulchellum, Nutt						*	*
	CAMPANULACEÆ.							
110	Campanula rotundifolia, L		*		*			*
	ERICACEÆ.							
111	Vaccinium oxycoccus, L	*						*
112	" Canadense, Kalm		*					*
113	" Vitis-Idæa, L			*				*
114	" uliginosum, L		*					*
115	" macrocarpon, Ait	*						
116	Arctostaphylos uva-ursi, Spreng		*					
117	" alpina, Spreng	*						
118	Cassandra calyculata, Don						*	
119	Ledum palustre, L					*		*
120	" latifolium, Ait	*		*		*		
121	Pyrola minor, L			*				*
122	" secunda, L			*				*
123	" rotundifolia, L		*		*			*
124	" elliptica, Nutt				*			
125	Moneses uniflora, Gray	*		*				
	PLANTAGINACEÆ.							
126	Plantago major, L					*		*

Nos.		I.	II.	III.	IV.	V.	VI.	A.C.
	PRIMULACEÆ.							
127	Primula farinosa, L.	*						
128	" Mistassinica, Michx					*		
129	Lysimachia thyrsiflora, L.			*				
	LENTIBULACEÆ.							
130	Utricularia vulgaris, L.	*	*		*			*
131	Pinguicula vulgaris, L.	*						*
	SCROPHULARIACEÆ.							
132	Castilleia pallida, var. septentrionalis	*		*		*		*
133	Euphrasia officinalis, L.	*	*					*
134	Rhinanthus crista-galli, L.	*				*		*
135	Pedicularis Grœnlandica, Retz	*						
136	" palustris, var. Wlassoviana, Bunge	*						
	LABIATÆ.							
137	Mentha Canadensis, L.				*			
138	" " var. glabrata		*					
139	Lycopus Virginicus, L.			*				
140	Scutellaria lateriflora, L.		*	*	*		*	
141	Stachys palustris, L.		*	*				*
	BORAGINACEÆ.							
142	Mertensia paniculata, Don.	*	*					
	POLEMONIACEÆ.							
143	Collomia linearis, Nutt.	*						
	GENTIANACEÆ.							
144	Gentiana amarella, L., var. acuta, Gr.	*		*				*
145	" detonsa, Fries	*						*
146	" propinqua, Rich	*						*
147	Halenia deflexa, Griesb.					*		
148	Pleurogyne rotata, L.	*						*
149	Menyanthes trifoliata, L.	*			*			*
	APOCYNACEÆ.							
150	Apocynum androsæmifolium, L.	*						
	CHENOPODIACEÆ.							
151	Chenopodium album, L.	*						*
152	Blitum capitatum, L.					*		
	POLYGONACEÆ.							
153	Polygonum amphibium, var. aquaticum				*			
154	" viviparum, L.			*				*
155	" maritimum, L.	*						
156	Rumex salicifolius, Wein.	*						*
157	" orbiculatus, Gray	*						
		*						

Nos.		I.	II.	III.	IV.	V.	VI.	A.C
	ELÆAGNACEÆ.							
158	Elæagnus argentea, Pursh						*	*
159	Shepherdia Canadensis, Nutt	*					*	*
	SANTALACEÆ.							
160	Comandra umbellata, Nutt	*			*			
161	" livida, Rich		*					*
	EMPETRACEÆ.							
162	Empetrum nigrum, L	*						*
	URTICACEÆ.							
163	Urtica gracilis, Ait	*						
	MYRICACEÆ.							
164	Myrica Gale, L						*	
	BETULACEÆ.							
165	Betula glandulosa, Michx		*		*			
166	Alnus incana, Willd		*		*			*
	SALICACEÆ.							
167	Salix candida, Willd	*						
168	" cordata, Muhl			*				
169	" discolor, Muhl							
170	" myrtilloides, L	*						*
171	" Novæ-Anglicæ, And	*						
172	" reticulata, L	*						*
173	" vestita, Pursh						*	
174	" ——— ?	*						
175	" ——— ?	*						
176	" ——— ?	*						
177	" ——— ?						*	
178	" ——— ?			*			*	
	CONIFERÆ.							
179	Juniperus communis, L						*	*
180	" Sabina, var. procumbeus, P	*			*			
	ALISMACEÆ.							
181	Triglochin palustre, L					*		*
182	" maritimum, L	*						*
183	Sagittaria variabilis, Engelm		*	*	*			

Nos.		I.	II.	III.	IV.	V.	VI.	A.C.
	ORCHIDACEÆ.							
184	Habenaria hyperborea, Lindl	*	*	*		*		*
185	" obtusata, Rich	*	*					*
186	Spiranthes Romanzoviana, Cham			*				
187	Listera convallarioides, Rich					*		
188	Corallorhiza innata, R. Br		*					
189	Cypripedium pubescens, Willd		*					*
	IRIDACEÆ.							
190	Sisyrinchium Bermudianum, L					*		*
	LILIACEÆ.							
191	Tofieldia palustris, Huds						*	*
192	Smilacina stellata, Desf		*					
193	" trifolia, Desf	*						
194	" bifolia, Ker		*					*
195	Lilium Philadelphicum, L		*					
	JUNCACEÆ.							
196	Luzula parviflora, Desv., var. melanocarpa					*		*
197	Juncus Balticus, Deth			*				
198	" castaneus, Smith	*						*
199	" tenuis, Willd		*					
200	" ——— ?					*		
	CYPERACEÆ.							
201	Eleocharis palustris, R. Br	*						*
202	Scirpus cœspitosus, L	*						*
203	" Eriophorum, Michx		*					
204	" atrovirens, Muhl			*	*			
205	Eriophorum gracile, Koch	*						
206	Carex atrata, L					*		*
207	" aurea, Nutt			*				
208	" gynocrates, Wormsk	*						*
209	" scoparia, Schk		*					
210	" stricta, Lam	*						
211	teretiuscula, Good	*						
212	utriculata, Schk	*						
	GRAMINEÆ.							
213	Agrostis scabra, Willd					*		
214	Calamagrostis stricta, Trin	*				*		
215	Glyceria nervata, Trin			*				
216	" aquatica, Smith	*						
217	" ——— ?	*						
218	Poa alpina, L	*						*
219	" ——— ?	*						
220	Bromus ciliatus, L			*				*
221	Triticum repens, L			*				*
222	" dasystachyum, Gray	*	*					
223	Aira cœspitosa, L			*				
224	Hierochloa borealis, Roem. & Schultes			*				
225	Beckmannia erucæformis, Hook					*		

Nos.		I.	II.	III.	IV.	V.	VI.	A.C.
	EQUISETACEÆ.							
226	Equisetum sylvaticum, L.			*				*
227	" pratense, Ehrh.	*		*				
228	" arvense, L.	*						*
229	" palustre, L.	*						*
230	" limosum, L.							
231	" scirpoides, Michx.			*				*
	FILICES.							
232	Polypodium vulgare, L.				*		*	*
233	Allosorus acrostichoides, Spreng.		*		*			*
234	Phegopteris Dryopteris, Fee.		*					*
235	Cystopteris fragilis, Benth.		*					*
236	Woodsia Ilvensis, R. Br.		*		*			*
237	Botrychium lunaria, Swartz.		*	*				*
238	" Virginicum, Swartz.			*				
	LYCOPODIACEÆ.							
239	Lycopodium clavatum, L.		*					*
240	" complanatum, L.			*				
	MUSCI.							
241	Sphagnum acutifolium, Ehrh.	*						
242	Polytrichum juniperinum, Hedw.	*						
243	" commune, L.							
244	Bryum nutans, Schreb.	*						
245	" bimum, Schreb.	*						
246	Aulacomnium palustre, L.	*						
247	Mnium affine, Bland.			*				
248	" cuspidatum, Hedw.	*						
249	Hypnum cordifolium, L.	*		*				
250	" nitens, Schreb.	*						
251	" Schreberi, Willd.		*					
	HEPATICÆ.							
252	Marchantia polymorpha, L.	*		*				
253	Jungermannia exsecta, Schmid.	*						
	LICHENES.							
254	Usnea barbata, Fries.	*						
255	Alectoria jubata, Ach.	*						
256	Peltigera aphthosa, Hoffm.	*						
257	Cladonia cornuta, Fr.	*						
258	" cornucopioides, Fr.	*						
259	" rangiferina, Hoffm.	*						
260	" " var. alpestris, Trit.	*						
261	" gracilis, var. hybrida, Ach.	*						

Professor Macoun also gives the following interesting notes and grouping of the species:—"The greater number of the species belong to the Ontario flora, but there are a large number of these which are only found in the cold woods bordering the shores of Lake Superior. These are boreal or Alpine in their habit, and are given in the accompanying list. Those which have been detected also in the Rocky Mountains are followed by the letter R., while the species which cross these mountains are followed by the letter W.

Lake Superior Species.

Anemone parviflora. R.
" multifida. W.
Ranunculus Cymbalaria. W.
Arabis petræa. W.
Draba incana. W.
Viola palustris. W.
Sagina nodosa. W.
Vicia Americana. W.
Potentilla tridentata. R.
Parnassia palustris. W.
Lonicera involucrata. W.
" cœrulea. R.
Viburnum pauciflorum. W.
Aster graminifolius. Slave Lake.
Erigeron acre. California.
Tanacetum Huronense. W.
Nabalus racemosus. Prairies.
Vaccinium Vitis-Idæa. W.
" uliginosum. W.
Pyrola minor. R.
Pinguicula vulgaris.
Castilleia pallida. Var.
Mertensia paniculata. R.
Halenia deflexa. R.
Polygonum viviparum. W.
Comandra livida. W.
Empetrum nigrum. W.
Luzula parviflora. Var. W.
Carex atrata. R.
Poa alpina. W.
Allosorus acrostichoides. W.
Botrychium lunaria.

All the above species grow either on islands in Lake Superior or close to its shores, and indicate a low summer temperature, which doubtless exists where they were obtained.

The following have been detected either on the Gulf of St. Lawrence or close to its shores.

Arenaria peploides. W.
Stellaria uliginosa. R.
Astragalus hypoglottis. W.
Rubus Chamæmorus. W.
" articus. W.
Antennaria Carpathica. W.
Arctostaphylos alpina. R.
Ledum palustre. Alaska.
Euphrasia officinalis. R.
Rhinanthus Crista-galli. W.
Pedicularis Grœnlandica. W.
Collomia linearis. W.
Gentiana acuta. W.
Pleurogyne rotata. R.
Polygonum maritimum.
Salix vestita. R.
Juncus castaneus.

There are likewise a few which extend southward and become mixed with the prairie flora (P.), but have not been detected in the Maritime Provinces. Others, again, are found in the Rocky Mountains, and often pass southwards into the United States. These are indicated by the letter R.

Anemone Richardsoni. R.
Arenaria verna. R.
" formosa. R.
" nardifolia. R.
Potentilla diversifolia. R.
Ribes Hudsonianum. R.
Saxifraga Hirculus. Saskatchewan.
" tricuspidata. Lake Winnipeg.
Heuchera hispida. P.
Epilobium tetragonum. P.
Cicuta virosa. P.
Nardosmia sagittata. P.
Leucanthemum articum. W.
Senecio palustris. P.

Arnica foliosa. P.
Mulgedium pulchellum. P.
Hedysarum Mackenzii. P.
Pedicularis palustris. Var. W.
Gentiana propinqua. R.
Elæagnus argentea. P.
Salix reticulata. R.
Tofieldia palustris. R.
Triticum dasystachyum. P.
Beckmannia erucæformis. P.

Only two species remain to be accounted for: one, Sisymbrium sophioides, seems to be very local, unless it be united to S. Sophia, which is reported from Quebec. Matricaria inodora is more northern than any of the others, and is reported from far north of Hudson's Bay.

On the whole, the collection indicates a much better climate than is generally supposed to be found near Hudson's Bay, and no plants that seem to have been collected a few miles from it show a more boreal climate than is to be found in Quebec, where wheat and other cereals have been cultivated for many years. I consider the collection a representative one, as it evidently contains all the more prominent species. It is true, many of them are shore plants, or those found along river margins, but this fact does not make any material difference as regards the climate, since the river banks seem to indicate the extremes of temperature in any given locality.

There are a few species not enumerated, of which I am in doubt. These I shall send away and get named very shortly."

APPENDIX III.

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LIST OF COLEOPTERA COLLECTED IN 1880 IN MANITOBA AND BETWEEN LAKE WINNIPEG AND HUDSON'S BAY.

I am again indebted to Dr. J. L. LeConte, of Philadelphia, the well-known entomologist, for kindly determining the Coleoptera which we collected last season. The specimens were obtained in four different localities, and the names of the species from each of them are given separately. In regard to this collection, Dr. LeConte remarks:—"There are, as you will observe, no undescribed species except one *Graphoderes*, which we had from other localities, and which will appear in a monograph of Dytiscidæ, soon to be published by the Royal Society of Dublin. There are some few species, notably in the *Lirus* (or *Curtonotus*) group of Amara, which, on account of the number of indefinite forms in the books, cannot be named with precision. I have kept all the specimens of that group, so that at a future time Dr. Horn or myself may endeavor to establish the species in more limited number, but with more distinct characters."

York Factory, Hudson's Bay. August and September.

1. Carabus tædatus.
2. " Chamissonis.
3. Platynus stygicus. Newfoundland to Alaska.
4. Pterostichus punctatissimus.
5. " orinonum.

6, 7. Cernara (Lirus.) Two species; one undetermined, the other seems to be C. reflexa, Putz. The species of this set are indefinite and opinionative, and require re-arrangement.

8. Bembidium lucidum.
9. Hydroporus impressopunctatus.
10. " ovoideus.
11. " Undetermined; near Schönherri of Europe.
12. " modestus.
13. " tartaricus.
14. " subtonsus.

15. Gaurodytes longulus. Lec.
16. Graphoderes. To be described by Dr. Sharp. Mass. to H. B. T.
17. Helophorus lineatus.
18. Philhydrus perplexus.
19. Hydrobius fuscipes.
20. Aphodius leopardus.
21. Ellychnia corrusca, race lacustris.
22. Clerus undatulus.
23. Criocephalus agrestis.
24. Merium Proteus.
25. Monohammus scutellatus.
26. Gonioctena pallida.
27. Acalyptus carpini.

Norway House to Oxford House. July.

1. Notiophilus Hardyi.
2. Carabus palustris.
3. Metabletus borealis.
4. Cymindis cribricollis. Dej.
5. Pterostichus punctatissimus.
6. " orinonum.
7. Amara (Lirus) reflexa. Putz.
8. " " cylindrica. Lec.
9. " protensa. Putz.
10. Harpalus herbivagus.
11. Bembidium bimaculatum.
12. Creophilus villosus.
13. Silpha lapponica.
14. Anisotoma (undetermined fragments.)
15. Pediacus fuscus.
16. Anatis 15-punctata.
17. Dermestes talpinus.
18. Saprinus oregonensis.
19. Aphodius leopardus.
20. Trichius affinis.
21. Buprestis Nuttalli.
22. Chrysobothris trinervia.
23. Corymbites triundulatus.
24. Scirtes tibialis.
25. Podabrus puberulus.
26. Telephorus fraxini.
27. " nigritulus. Lec; n. sp.

28. Clerus undatulus.
29. Merium Proteus.
30. Xylotrechus undulatus.
31. Neoclytus leucogonus.
32. Acmæops Proteus.
33. " pratensis.
34. Leptura subargentata. Var. similis.
35. Monohammus scutellatus.
36. Donacia proxima.
37. Gonioctena pallida.
38. Galeruca sagittariæ.
39. Graptodera bimarginata.
40. " Not determined.
41. Tenebrio molitor.

Lower Fort Garry, Manitoba. June and July.

1. Carabus tædatus, race Agassii.
2. Platynus cupripennis.
3. " cupreus.
4. " placidus.
5. " retractus.
6. " obsoletus.
7. " quadripunctatus.
8. Pterostichus orinonum.
9. " caudicalis.
10. " (Poecilus) lucublandus.
11. Amara (Lirus) cylindrica. Lec.
12. " (Bradytus) avida.
13. " fallax.
14. " obesa.
15. " musculus.
16. Agonoderus pallipes.
17. Harpalus amputatus.
18. " pennsylvanicus.
19. " pleuriticus.
20. " herbivagus.
21. Bradycellus rupestris.
22. Bembidium salebratum.
23. Berosus striatus.
24. Listrotrophus cingulatus.
25. Onthophagus Hecate.
26. Aphodius validus.

27. Aphodius ruricola.
28. Trichius affinis.
29. Dicerca prolongata.
30. Buprestis fasciata, race Langi.
31. Melanophila appendiculata.
32. Elater apicatus.
33. Agriotes fucosus.
34. Podabrus modestus.
35. Gastrophysa polygoni.
36. " cyanea.
37. Chelymorpha argus.
38. Tenebrio molitor.

Cross Lake, Nelson River. July.

1. Notiophilus Hardyi.
2. Carabus palustris.
3. " serratus.
4. Calathus ingratus.
5. Platynus sinuatus.
6. " melanarius.
7. Pterostichus orinonum.
8. " mandibularis.
9. Amara (Lirus) cylindrica.
10. " fallax.
11. " Sp. Indt.
12. " interstitialis.
13. Harpalus pleuriticus.
14. Bembidium bimaculatum.
15. " nitens.
16. Laccophilus proximus.
17. Silpha lapponica.
18. " trituberculata.
19. Creophilus villosus.
20. Dicerca prolongata.
21. Buprestis maculiventris, race rusticorum.
22. Corymbites æripennis.
23. Clerus undatulus.
24. Criocephalus agrestis.
25. Merium Proteus.
26. Xylotrechus undulatus.
27. Pachyta liturata.

28. Donacia proxima.
29. " magnifica.
30. " hirticollis.
31. " subtilis.
32. Plagiodera interrupta.
33. Galeruca sagittariæ.
34. Hypolampsis pilosa.
35. Œdisnychis scripta.
36. Upis ceramboides.

APPENDIX IV.

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MOLLUSCA.

The following list contains the names of some species not enumerated in my report for 1879, and additional localities for others which were there mentioned. With two or three exceptions, the species were determined by Mr. J. F. Whiteaves.

A.—Land and Fresh Water.

1. *Vitrina limpida*, Gould. In damp woods at Norway House.
2. *Patula striatella*, Anthony. In the woods around the lakes of the Winnepeg basin.
3. *Succinea ovalis*, Gould, non Say. From Norway House to York Factory. Very numerous at the latter place among grass on damp ground which is occasionally covered with fresh water at high tide.
4. *Limnæa stagnalis*, Linn. In nearly all the lakes, streams, and marshes from Manitoba to York Factory.
5. *Limnæa* (*Bulimnea*) *megasoma*, Say. This fine species was found living in considerable numbers in the Echimamish River, between the Nelson and the height of land. Its discovery at this place is interesting on account of its great distance to the northward of previously known localities for the species.
6. *Limnæa* (*Limnophysa*) *palustris*, Mull. (=*L. elodes*, Say.) Numerous and fine in ponds at York Factory; also abundant in ponds along the Red River in Manitoba.
7. *Limnæa* (*Limnophysa*) *catascopium*, Say. Common in different parts of Oxford Lake.
8. *Physa* ——? Small specimens of a *Physa* resembling the *P. elliptica* of Lea, but possibly distinct therefrom, were found in ponds at York Factory.
9. *Bulinus hypnorum*, Linn. (=*Physa elongata*, Say.) This species occurs in ponds all the way from Manitoba to York Factory.
10. *Planorbis* (*Planorbella*) *campanulatus*, Say. Abundant in Lake Winnipeg and in the Red and Nelson Rivers.

11. *Planorbis* (*Helisoma*) *trivolvis*, Say. Some very large specimens of this species were collected in the Echimamish River, on the west side of the height of land. Although common in ponds, marshes and rivers to the south and west, it was not observed to the northward of this locality.
12. *Planorbis* (*Helisoma*) *bicarinatus*, Say. A peculiar variety of this species occurs in Lake Manitoba.
13. *Segmentina armigera*, Say. In ponds between Forts Ellice and Pelly. Collected there in 1874.
14. *Sphærium striatinum*, Lam. (=*Cyclas edentula*, Say.) Ponds at York Factory.

B.—Marine.

15. *Buccinum tenue ?* Gray. Shores of Hudson's Bay near York Factory.
16. *Natica* (*Acrybia*) *flava ?* Gould. On the east coast of Hudson's Bay.
17. *Littorina palliata*, Say. On rocky parts of both shores.
18. *Mya arenaria*, Linn. Richmond Gulf.
19. *Mya truncata*, Linn. "
20. *Macoma calcarea*, Chemn. East coast of Hudson's Bay.
21. *Macoma fragilis*, O. Fabr. " " "
22. *Cardium Islandicum*, Chemn. " " "
23. *Astarte lactea*, Brod. & Sby. " " "
24. *Mytilus edulis*, Linn. " " "
25. *Pecten Islandicus*, Chemn. " " "

APPENDIX V.

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ANALYSIS OF THE WATERS OF HAYES' AND NELSON RIVERS.

The three samples analysed were collected:—

No. 1.—On the 15th August, 1880, five wine bottles from Hayes' River, opposite York Factory.

No. 2.—On the 11th August, 1880, five wine bottles from the mouth of Nelson River.

No. 3.—One wine bottle from Nelson River, below Sea River Falls, or forty miles in a straight line below the outlet of Lake Winnipeg.

They were put directly into clean glass bottles, and immediately sealed. After arrival in England the weather became so cold that had the samples been sent to Montreal for analysis, the frost would probably have burst the bottles. It was, therefore, deemed advisable to have them examined in Britain, and for this purpose they were handed to Professor William Dittmar, of Anderson's College, Glasgow, one of the best known water-analysts in the Kingdom. The following is his report:—

These three waters contained deposits which, in each case, were removed by filtration of the whole sample through asbestos. Hence the analyses of the saline components to be given refer to the clarified waters. All the waters contained traces of *organic* matter, which, however, was left undetermined, because after the execution of duplicate analyses of Nos. I. and II., and an analysis of No. III., there was not enough of water left for the execution of any of the modern methods (*e.g.*, determination of organic carbon and nitrogen). The mere determination of the loss of the total solids on ignition is of no value whatever.

No. I.—(Hayes' River.)

One Imperial gallon contains in grains:—

Suspended matter, dried at 105° C.	·875
Leaving on ignition	·567

Salts in Filtrate.

Silica	0·920
Sesquioxides ($Al_2 O_3$ and $Fe_2 O_3$)	0·190
Lime	2·480
Magnesia	0·700
Potash	0.133
Soda	0·456
Sulphuric acid	*nil.*
Chlorine*	0·247
Carbonic acid of the carbonates, reckoned as $R'' Co_3$	2·360
Total	8·086
* Oxygen, equivalent of Cl	·056
Total salts	8·030

Hardness Determined directly by Clark's Process.

NOTE.—1° of hardness means soap-destroying power equal to one grain of carbonate of lime per gallon.

Total	5° 9
Permanent	2° 4

No. II.—(NELSON RIVER.)

One Imperial gallon contains in grains:—

Suspended mattér, dried at 150° C	0·552
Leaving on ignition	0·198

Salts in Filtrate.

Silica	0·915
Sesquioxides	0·080
Lime	2·790
Magnesia	1·180
Potash	0.147
Soda	1·050
Sulphuric acid (So_3)	4·370
Chlorine*	0·586
Carbonic acid of the carbonates, taken as $R'' Co_2$	1·542
Total	12·660
* Ox., equivalent of Cl., = ·132 ; ∴ Total salts	12·528

Hardness by Clark's Method.

Total	8° 55
Permanent	1° 78

No. III.—(Nelson River, Below Sea River Falls.)

A complete analysis of this water was started, but, unfortunately, lost when half completed, and owing to the smallness of the sample it could not be repeated.

Found—Grains, per Imperial gallon:—

Suspended matter, dried at 105° C.	2·565
Leaving on ignition	·734

In Filtrate.

Silica	0·576
Lime	2·576
Magnesia and alkalies	Lost.
Sulphuric acid proved absent.	
Chlorine	0.1421
Carbonic acid in the carbonates, considered as $R'' Co_3$ (in this case determined acidimetrically by titration, with aurine as indicator)	2·64

Total solids (dried at 105° C.,) determined directly (in only 70 grains	17·1	(Gr. per gal.)
Leaving on ignition	7·5	

Sesquioxides absent.
Hardness not determined.

(Signed), W. DITTMAR

Anderson's College, Glasgow,
4th June, 1881.

APPENDIX VI.

YORK FACTORY.

Seasonal or Periodic Events.

1875—April 25.....	First rain of year.
May 3.....	Geese first seen.
May 6.....	Plover first seen.
May 14-15....	Game birds passing north in great numbers.
May 19.....	River broke up with great violence; water 29 feet above low water mark.
June 13.....	Swallows first seen.
June 18.....	First thunderstorm, and first mosquitoes.
August 1.....	Fireflies seen.
September 8..	First snow.
September 9..	First frost.
1876—January 31...	Thickness of ice in current, 3′ 8″.
February 29..	Do. do. do. 4′ 7″.
April 30.....	Do. do. do. 5′ 1″.
April 27.....	First rain of year.
May 10.....	River broke up; cleared out on 15th.
May 14.....	Frogs first heard.
May 24.....	First thunder.
June 5.....	Last snow of season.
June 26-27...	From 4 p.m to 9 a.m. 3 in. of rain fell.
July 26.....	In forty minutes 2.7 in. of rain fell.
August.....	From 3 p.m. of 23rd to noon of 25th 8.3 in. of rain fell.
September 28.	First snow of season.

YORK FACTORY.

Seasonal or Periodic Events—Continued.

November 30.	Thickness of ice in current, 1′ 5″.
December 31.	Do. do. do. 3′ 8″.
1877—January 31...	Thickness of ice in current, 4′ 8″.
February 28..	Do. do. do. 5′ 2″.
April 28.....	First goose seen.
May 13.....	First rain of season.
May 21.....	River clear of ice.
May 27.....	First thunder.
June 24.....	Hoar frost.
July 28.....	From 0 a.m. to 3 p.m. 7.6 in. of rain fell.
1878—March 17....	Snow-birds seen; first of season. Thickness of ice on river, 5′ 8″.
April 4.....	First rain of year.
April 22.....	Goose seen.
April 23.....	Ducks seen.
April 25.....	Snipe seen.
April 26.....	Frogs heard.
April 27.....	Robins seen.
May 15-16...	Ice on river breaking up.
May 29.....	Last snow.
June 1.....	Mosquitoes seen.
June 9.....	First thunderstorm.
June 20.....	Fireflies seen.
June 27.....	4.3 in. of rain fell during thunderstorm.
September 9..	6.5 in. of rain fell during day.
September 10.	First snow of season.
September 20.	4.1 in. of rain fell during day.
November 1..	River frozen over at Fort.
December 31.	Thickness of ice on river, 2′ 9″.

APPENDIX VII.

YORK FACTORY.

TABLE SHOWING DATES OF THE OPENING AND CLOSING OF HAYES' RIVER, AT YORK FACTORY, COMPILED FROM AUTHENTIC RECORDS BY MR. WILLIAM WOOD, METEOROLOGIST, YORK FACTORY.

YEAR.	RIVER OPENED.	RIVER CLOSED.	REMARKS.
1828....	June 1	November 15	Opposite Fort.
1829....	May 10	" 11	Ditto.
1830....	" 17	December 2	Ditto. A remarkably fine season.
1831....	" 22	November 28	Ditto. " "
1832....	" 25	" 26	Ditto.
1833....	" 13	" 22	Ditto.
1834....	" 27	" 20	Ditto.
1835....	" 24	" 18	At Mile Sand.
1836....	" 16	" 29	Opposite Fort.
1837....	" 11	" 25	Ditto.
1838....	" 23	" 22	Ditto.
1839....	" 22	" 19	Fast on the 19th, and opened again till 27th.
1840....	" 12	" 16	At Mile Sand.
1841....	" 10	" 13	Ditto.
1842....	" 17	" 11	Ditto.
1843....	" 29	" 11	Ditto.
1844....	" 13–20	" 16	Ditto.
1845....	" 22	" 24	Opposite Fort. (This date rather doubtful.)
1846....	" 7	" 25	Ditto.
1847....	" 9	" 15	Ditto.
1848....	" 21	" 28	Ditto.
1849....	" 18–24	" 27	Ditto.
1850....	" 31	" 28	Ditto.
1851....	" 31	December 9	Ditto.
1852....	" 16	November 8	Ditto.

YORK FACTORY.

DATES OF OPENING AND CLOSING OF HAYES' RIVER AT YORK FACTORY—Continued.

YEAR.	RIVER OPENED.	RIVER CLOSED.	REMARKS.
1853....	May 26–30	November 9	Opposite Fort.
1854....	" 23	" 16	Ditto.
1855....	" 21–24	" 24	Ditto.
1856....	" 20–22	" 19	Ditto.
1857....	" 14–19	" 17	Ditto.
1858....	" 24	" 24	Ditto.
1859....	" 13	" 16	Ditto.
1860....	" 18	" 19	Ditto.
1861....	" 22–28	" 16	Ditto.
1862....	" 24–29	" 24	Ditto.
1863....	" 22	" 30	Ditto.
1864....	" 19	" 26	Ditto.
1865....	" 16	" 20	Ditto.
1866....	" 14	" 28	Ditto.
1867....	" 23–28	" 24	Ditto.
1868....	" 24–31	" 29	Ditto.
1869....	" 25	" 6	At Mile Sand.
1870....	" 11	" 27	Opposite Fort.
1871....	" 12	" 23	Ditto.
1872....	" 16	" 20	Ditto.
1873....	" 14	" 18	Ditto.
1874....	" 16	" 20	Ditto.
1875....	" 19	" 15	Ditto.
1876....	" 10	" 24	Ditto.
1877....	" 20	" 15–20	Ditto.
1878....	" 15	" 3	Ditto.
1879....	" 11	" 23	Ditto.
1880....	" 26	.....	

APPENDIX VIII.

YORK FACTORY.

DATES OF THE ARRIVALS OF THE HUDSON'S BAY COMPANY'S VESSELS AT YORK FACTORY, AND OF THEIR SAILINGS, FOR 93 YEARS, FROM 1789 TO 1880, BOTH INCLUSIVE.

YEAR.	ARRIVED.	SAILED.	REMARKS.
1789.....	August 25	September 10	The King George.
1790.....	" 20	" 11	Sea Horse.
1791.....	September 8	October 4	Sea Horse.
	" 8	September 17	Queen Charlotte.
1792.....	August 20	" 17	Sea Horse.
1793.....	" 16	" 3	Nimble.
	" 12	" 7	Prince of Wales.
	" 27	" 7	Queen Charlotte.
1794	September 5	" 16	Prince of Wales.
1795.....	August 27	" 21	King George.
	" 11	" 21	Queen Charlotte.
1796.....	" 20	" 13	King George.
	" 15	" 13	Queen Charlotte.
1797.....	" 24	" 16	King George.
	" 6	" 16	Queen Charlotte.
1798.....	September 1	" 26	King George.
	" 17	" 26	Queen Charlotte.
1799.....	August 30	" 21	King George.
	September 13	" 21	Queen Charlotte.
1800.....	" 8	" 24	Prince of Wales.
	" 4	" 24	Queen Charlotte.
1801.....	" 10	" 21	King George.
1802.....	August 26	" 13	King George.

YORK FACTORY.

ARRIVALS AND SAILINGS OF VESSELS—Continued.

YEAR.	ARRIVED.	SAILED.	REMARKS.
1802.....	September 9	September 18	Ceres.
1803.....	August 15	" 3	King George.
	" 29	" 3	Ceres.
1804.....	" 6	August 27	King George.
1805.....	" 28	September 7	" "
1806.....	" 18	August 30	" "
1807.....	September 19	October 4	Prince of Wales.
1808.....	August 14	September 4	King George.
	" 14	" 4	Eddystone.
1809.....	September 8	" 22	King George.
1810.....	August 19	" 4	" "
1811.....	September 27	October 7	Eddystone.
	" 24	" 6	Edward and Anne.
1812.....	August 31	September 14	King George.
1813.....	September 26	October 6	Prince of Wales.
1814.....	" 2	September 28	" "
1815.....	August 28	" 23	" "
	September 1	October 5	H. M. Sloop-of-war Convoy.
1816.....	" 22	" 3	The P. of Wales. Wintered at Churchill
1817.....	.....	.....	Britannia.
1818.....	August 14	September 8	Prince of Wales.
1819.....	" 30	" 27	" "
1820.....	" 16	" 9	Eddystone.
1821.....	" 22	" 14	Prince of Wales.
1822.....	" 10	" 17	" "
1823.....	" 15	" 11	" "
1824.....	" 20	" 12	" "
1825.....	" 16	" 1	" "

YORK FACTORY.

ARRIVALS AND SAILINGS OF VESSELS—Continued.

YEAR.	ARRIVED.	SAILED.	REMARKS.
1826.....	September 7	September 22	Prince of Wales.
	" 16	" 17	Camden. From Moose.
1827.....	August 25	" 16	Prince of Wales.
1828.....	" 16	" 20	Prince Rupert.
1829.....	" 12	" 15	" "
	" 9	August 25	Montcalm.
1830.....	" 14	September 17	Prince Rupert.
	" 14	" 28	Camden.
1831.....	" 28	" 18	"
1832.....	" 26	No date.	Prince Rupert.
1833.....	September 4	September 27	Ditto. Wintered at Churchill.
1834.....	August 23	August 30	Ditto. From Churchill.
	" 25	September 12	Prince George.
1835.....	" 23	" 24	Prince Rupert.
	September 14	" 24	Nonpariel.
1836.....	" 24	.....	Prince Rupert.
	October 7	August 28	Eagle. Wintered at York Factory.
1837.....	August 27	September 16	Prince Rupert.
	September 4	" 21	Prince George.
1838.	August 27	" 17	Prince Rupert.
1839.....	" 15	" 11	" "
1840.....	" 9	" 6	" "
1841.....	" 16	" 13	" "
	" 16	" 13	Prince Albert.
1842.....	" 16	" 15	Prince Rupert.
1843.....	" 9	" 21	" "
1844.....	" 11	" 14	" "
1845.....	" 10	" 4	"

YORK FACTORY.

ARRIVALS AND SAILINGS OF VESSELS—Continued.

YEAR.	ARRIVED.		SAILED.		REMARKS.
1846.....	August	6	September	19	Prince Rupert.
	"	9	"	6	H. M. S. Blenheim.
	"	13	"	6	H. M. S. Crocodile.
1847.....	"	25	"	24	The Prince Rupert.
	"	30	"	28	Westminster.
1848.....	"	14	"	11	Prince Rupert.
	"	13	August	30	Chartered ship.
	"	25	September	12	" "
1849.....	"	13	"	11	The Prince of Wales.
1850.....	"	2	August	30	Prince Rupert.
	"	12	September	12	Prince of Wales.
	"	15	August	30	Flora.
	"	24	"	28	George.
1851.....	"	12	September	9	Prince Rupert.
1852.....	"	15	"	16	" "
	"	25	"	1	Chartered vessel.
1853.....	"	15	"	11	The Prince of Wales.
1854.....	"	28	"	20	" "
1855.....	September	3	"	25	" "
1856.....	August	20	"	22	" "
	"	19	"	22	Prince Albert.
1857.....	"	9	"	18	Prince of Wales.
	"	26	"	18	Baroness.
	"	12	"	18	Great Britain.
1858.....	"	12	"	13	Prince of Wales.
	"	23	"	17	Effort.
1859.....	"	26	"	18	Prince of Wales.
1860.....	"	16	"	8	" "

YORK FACTORY.

ARRIVALS AND SAILINGS OF VESSELS—Continued.

DATE.	ARRIVED.	SAILED.	REMARKS.
1861.....	August 22	September 9	Prince of Wales.
	" 23	August 31	Sir Colin Campbell.
1862.....	" 13	S ptember 9	Prince of Wales.
1863.....	" 28	" 17	" "
1864.....	" 23	" 20	Ocean Nymph.
1864....	" 28		The Prince of Wales. Wintered at York Factory, and left with The Prince Rupert.
1865....	" 22	October 2	
1866.....	September 2	" 4	The Prince Rupert.
1867.....	August 12	September 17	" "
1868.....	" 25	" 20	" "
1869.....	" 20	" 26	" "
1870.....	" 22	" 18	" "
	September 2	" 9	Ocean Nymph.
1871.....	August 8	" 20	Prince Rupert.
	" 11	" 2	Ocean Nymph.
1872.....	" 17	" 22	Prince Rupert.
	September 23	" 21	Schooner Walrus { New vessel for York Factory.
1873.....	August 10	" 20	Prince Rupert.
1874.....	September 9	" 20	Schooner Mink, for Moose.
			Walrus, for London.
1875.....	" 15	" 22	Ocean Nymph { Called at Churchill before making York.
1876.....	" 12	" 21	" " " "
1877.....	" 12	" 25	" " " "
1878.....	August 22	August 29	" " " "
1879.....	" 24	September 1	" " " "
1880.....	September 4	" 13	" " " "

APPENDIX IX.

MOOSE FACTORY.

SEASONAL OR PERIODIC EVENTS.

1878—January 19	Slight rain.
February 16	Snow in woods ten inches deep.
March 15	Snow-birds seen.
April 5	First goose. First robins seen.
April 14	Blackbirds seen.
April 30	Frogs heard. First thunderstorm. River open.
May 1	Mosquitoes and swallows seen.
May 19	Garden dug. Some seed sown.
May 21	Potatoes planted.
May 23	Swallows appeared in force.
June 4	Last snow of season.
June 28	First lightning.
October 15	First snow of season.
November 2	River frozen over.
November 4	Snow in woods five inches deep.
December 25	Thirty inches of snow in woods.
1879—March 24	Snow-birds seen.
April 23	First thunderstorm.
May 4	Sufficient snow in woods for sleighing.
June 15	Last snow of season.
July 24	Potatoes nipped with frost.
September 13	First snow of season.
1880—January 9	Rain, 2 to 6 p.m.
April 14	Thunderstorm. St. Elmo's fires seen on several projecting points, 10 to 12 p.m.
June 2	Last snow of season.

APPENDIX X.

MOOSE FACTORY.

DATES OF THE ARRIVALS OF THE HUDSON'S BAY COMPANY'S VESSELS AT MOOSE FACTORY, AND OF THEIR SAILINGS, FOR 147 YEARS—1735 TO 1880, BOTH INCLUSIVE.

YEAR.	ARRIVED.	SAILED.	YEAR.	ARRIVED.	SAILED.
1735....	August 3	August 30	1757....	August 24	September 1
1736....	" 15	" 28	1758....	September 16	October 2
1737....	" 7	" 24	1759....	" 4	September 11
1739....	" 5	" 19	1760....	August 26	" 16
1740....	" 4	" 20	1761....	" 9	" 5
1741....	" 26	September 1	1762....	September 2	" 12
1742....	July 27	August 4	1763....	August 29	" 5
1743....	August 3	" 14	1764....	" 21	August 28
1744....	" 12	" 21	1765....	September 4	September 20
1745....	July 21	" 29	1766....	August 2	" 6
1746....	August 17	" 27	1767....	September 1	" 16
1747....	" 12	" 22	1768....	" 2	" 6
1748....	" 20	" 29	1769....	" 1	" 8
1749....	July 27	" 6	1770....	August 2	" 11
1750....	August 27	September 4	1771....	" 25	" 14
1751....	" 3	August 10	1772....	September 5	" 11
1752....	" 13	" 21	1773....	August 26	" 2
1753....	September 4	September 11	1774....	September 5	" 21
1754....	" 2	" 15	1775....	August 23	" 6
1755....	August 28	" 7	1776....	" 29	" 17
1756....	September 16	" 23	1777....	September 13	" 26

ARRIVALS AND SAILINGS OF VESSELS—Continued.

YEAR.	ARRIVED.	SAILED.	YEAR.	ARRIVED.	SAILED.
1778....	August 22	September 17	1805....	August 17	September 13
1779..	Did not reach Moose on account of ice. Went to Churchill instead		1806....	" 10	" 13
1780....	September 5	September 29	1807....	September 4	" 24
1781....	August 28	" 22	1808....	August 14	" 21
1782....	" 24	" 25	1809....	August 31	September 30
1783....	September 17	October 5	1810....	" 10	" 24
1784....	" 4	September 20	1811....	September 25	October 10
1785....	" 8	" 23	1812....	August 26	September 28
1786....	August 16	" 9	1813....	September 4	" 27
1787....	" 27	" 10	1814....	" 2	" 21
1788....	" 16	" 10	1815....	August 23	" 24
1789....	" 15	" 14	1816....	September 20	October 4
1790....	" 29	" 28	1817....	August 26	September 14
1791....	September 7	" 28	1818....	" 17	" 11
1792....	August 17	" 16	1819....	" 29	" 19
1793....	" 22	" 21	1820....	" 6	" 11
1794....	" 18	" 13	1821....	" 19	" 16
1795....	" 29	" 26	1822....	" 15	" 12
1796....	" 20	" 21	1823....	" 18	" 16
1797....	" 28	" 23	1824....	" 29	" 22
1798....	September 6	" 30	1825....	" 16	" 18
1799....	August 31	October 1	1826....	" 30	" 10
1800....	September 8	" 8	1827....	" 11	" 9
1801....	August 23	September 14	1828....	" 29	" 17
1802....	" 19	" 10	1829....	" 31	" 16
1803....	" 26	" 11	1830....	" 30	" 22
1804....	" 5	" 21	1831....	" 27	" 27

ARRIVALS AND SAILINGS OF VESSELS—Continued.

YEAR.	ARRIVED.	SAILED.	YEAR.	ARRIVED.	SAILED.
1832....	August 25	September 20	1859....	September 2	" 16
1833..	September 7 Wintered at Ch	" 24 arlton Island.	1860....	August 22	" 9
1834....	August 25	September 8	1861....	" 31	" 19
1835....	" 18	" 7	1862....	" 29	" 29
1836....	September 2	" 18	1863....	" 28	" 26
1837....	August 27	" 13	1864....	.....	.....
1838....	September 5	" 19	1865....	September 13	September 28
1839....	August 14	" 11	1866....	August 24	" 23
1840....	" 12	August 30	1867....	" 18	" 18
1841....	" 30	September 12	1868....	" 26	" 14
1842....	" 29	" 10	1869....	September 8	" 26
1843....	September 14	October 3	1870....	August 24	" 11
1844....	August 28	September 10	1871....	" 27	" 18
1845....	September 8	" 24	1872....	" 20	" 10
1846....	August 9	August 31	1873..	August 21 Wintered at Ch	" 19 arlton Island.
1847....	" 24	September 9	1874....	August 24	September 13
1848....	" 10	August 31	1875....	September 10	" 26
1849....	" 16	September 9	1876....	" 4	" 20
1850....	" 17	" 7	1877....	August 20	" 8
1851....	" 25	" 10	1878....	" 11	" 4
1852....	" 15	" 8	1879....	" 23	" 12
1853....	" 22	" 17	1880....	" 23	" 10
1854....	September 3	" 21			
1855....	August 23	" 22			
1856....	" 17	" 7			
1857....	" 16	" 8			
1858....	" 18	" 8			

APPENDIX XI.

—

Statistics of the Weather for Two Years at York and Moose Factories, Hudson's Bay.

Observatory stations have been established for a few years at York and Moose Factories, in connection with the Government Meteorological Office in Toronto. As these afford complete and accurate statistics of the weather at two points on Hudson's Bay, about seven hundred miles apart, a summary of the results of the observations for two years, from each station, is herewith given, as being among the best means of illustrating the climate of the region to which this report refers. We are indebted to Professor Charles Carpmael, Director of the Meteorological Service, for copies of these returns.

YORK FACTORY.

Abstract of Observations during the year 1876 *at York Factory, H. B. Latitude,* 57° 0′ *N.; Longitude,* 92° 26′ *W. Mr. Wm. Wood, Observer.*

	TEMPERATURE.									Average amount of cloud.	NO. OF WINDS FROM (AT HOURS OF OBSERVATION.)										RAIN.		SNOW.		No. of fogs.	No. of thunder-storms.	No. of auroras.
	7 a.m.	2 p.m.	9 p.m.	Mean.	Mean of highest.	Mean of lowest.	Absolutely highest.	Absolutely lowest.	Greatest range in 24 hours.		N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.	Av'rage velocity of wind in miles.	Amount of	Days of	Amount of	Days of			
	°	°	°	°	°	°	°	°	°												in.		in.				
January	-19.58	-14.03	-15.93	-16.37	-5.15	-24.30	22.0	-48 0	30.0	4.6	12	0	8	5	4	17	7	23	17	7.41	0.00	0	11.3	20	0	..	15
February	-25.57	-15.55	-19.83	-20.31	-10.46	-29.27	17.0	-53.0	37.0	4.5	5	6	9	3	8	12	14	21	9	8.46	0.00	0	6 5	14	0	...	13
March	-19.55	-3.52	-11.79	-11.66	-1.13	-26.10	24.0	-46.0	52.0	3.3	17	15	0	0	8	6	9	23	15	5.86	0.00	0	6.7	11	0	..	13
April	15.75	27.33	19.80	20.67	30.53	9.36	54.0	-16.5	39.0	6.1	20	13	13	10	10	3	11	5	5	9.55	0.04	1	6.1	15	1		7
May	35.79	42.92	36.08	38.26	48.11	29.55	78.0	15 5	48.5	4.9	32	21	7	2	10	9	5	3	1	7.96	0.25	1	1 0	4	1	1	7
June	45.65	53.37	48.55	49.05	59.78	37.47	79.0	27.0	40 0	4.5	12	15	19	14	18	2	10	9	1	9.13	7.70	7	...	...	1	1	0
July	53.63	61.65	55.48	56.56	67.24	47.08	99.0	39.5	41.0	5.2	17	10	16	5	23	1	12	8	1	12.30	17.10	19	...	...	5	2	3
August	52.85	61.32	54.19	55.63	66.21	46.05	86 0	29.0	41.0	4.6	27	8	6	1	19	9	19	4	0	15.19	22.70	16	....	....	1	1	4
September	42.56	51.10	44.85	45.84	53.66	38.61	74.0	28.0	32 0	6.9	17	7	18	8	14	5	3	18	0	14.59	9 40	17	.....	....	1	3	6
October	25.51	28.75	26.01	26.57	30.65	22.21	42.0	8.0	21.5	7.4	19	12	10	6	13	0	4	29	0	16.80	1.97	5	5.8	18	7	...	5
November	0.76	4.88	0.03	1.42	9.93	-6.20	35.0	-25.5	37.5	5.2	28	0	1	0	13	12	12	24	0	12.71	0.00	0	20.1	17	1	....	8
December	-12.69	-9.55	-13.21	-12.16	-4.72	-20.19	24.0	-38.0	31.0	5.2	23	0	0	0	20	20	17	13	0	17.07	0.00	0	8.4	17	0	....	15
	16.36	24.06	18.69	19.45	.....	.....	99	-53.0	48.5	5.2	229	110	107	44	160	96	123	180	49	11.42	59.16	66	65.9	116	18	8	96

YORK FACTORY.

Abstract of Observations during the year 1878 *at York Factory, H.B. Latitude,* 57° 0′ *N. Longitude,* 92° 26′ *W. Mr. Wm. Wood, Observer.*

	TEMPERATURE.										NO. OF WINDS FROM										RAIN.		SNOW.				
	7 a.m.	2 p.m.	9 p.m.	Mean.	Mean of highest.	Mean of lowest.	Absolutely highest.	Absolutely lowest.	Greatest range in 24 hours.	Average amount of cloud.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.	Av'rage velocity of wind in miles.	Amount of	Days of	Amount of	Days of	No. of fogs.	No. of thunder-storms.	No. of Auroras.
	°	°	°	°	°	°	°	°	°												in.		in.				
January	.....	.....	.....	-6.92	.....	.....	26.5	-33.0	.....	...	...	...	...	...	...	...	...	...	...	11.6	0.00	0	4.9	6	....	0	16
February	.....	.....	.....	2.78	.....	.....	40.0	-27.0	.....	...	...	...	...	...	...	...	...	...	...	8.81	0.00	0	5.7	10	....	0	11
March	.....	.....	.....	10.24	.....	.....	36.0	-18.5	33.0	6.5	7	25	14	10	6	3	6	16	0	10.9	0.00	0	17.9	22	....	0	12
April	21.42	32.83	26.20	26.66	36.68	17.68	53.5	3.5	30.0	4.4	14	24	8	5	11	10	7	11	0	9.5	0.25	3	1.6	9	1	0	7
May	29.90	38.08	32.03	33.11	42.34	25.94	75.0	10.5	44.0	5.6	27	26	7	2	7	5	7	12	0	12.1	1.91	11	3.8	6	....	0	3
June	54.43	78.38	63.38	64.89	87.48	48.98	109.5	25.0	49.5	4.2	16	16	20	15	7	5	10	1	0	14.3	10.50	11	.....	....	....	6	5
July	62.48	83.63	74.55	73.80	91.73	56.73	106.0	46.0	46.0	3.9	11	27	21	10	9	5	7	3	0	13.2	14.80	15	.....	....	1	7	3
August	53.03	68.20	57.00	58.81	75.05	47.84	91.5	38.0	41.5	3.2	4	22	18	13	13	7	10	6	0	11.9	4.90	9	.....	....	....	4	6
September	34.55	40.92	37.28	37.50	42.69	31.94	60.2	26.0	22.8	5.4	28	9	3	0	3	8	17	22	0	12.2	14.10	12	2.7	10	1	0	7
October	19.44	24.97	21.61	21.91	27.64	15.77	38.2	-2.0	26.0	5.6	24	15	9	1	5	1	10	28	0	12.0	0.00	0	24.1	19	....	0	10
November	14.58	21.32	17.62	17.78	23.75	10.53	35.0	-15.0	28.5	6.4	13	2	4	2	24	12	13	20	0	10.5	0.20	1	6.2	16	1	0	6
December	-9.65	-3.14	-6.61	-6.50	-0.08	-14.45	29.0	-28.0	29.0	6.0	13	0	2	4	5	10	19	40	0	11.2	0.00	0	4.3	20	....	0	4
	.....	.....	.....	27.84	.....		106.0	-33.0	.....	...	...	...	...	...	...	...	...	...	...	.....	46.65	62	71.2	118	4	17	90

YORK FACTORY.

Mean Daily Temperature from Observations at 7 a.m., 2 and 9 p.m., 1876.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
1.....	-14.1	-31.7	-7.5	22.5	34.0	36.7	52.5	67.9	49.5	36.9	27.0	-17.9
2.....	-3.1	-26.1	-6.0	13.6	29.5	37.0	64.8	72.4	45.4	33.4	4.6	9.6
3.....	-30.5	-47.6	-25.4	34.6	27.2	53.1	44.9	71.1	48.9	25.1	-3.3	16.8
4.....	-30.0	-37.0	-30.3	20.8	28.0	39.8	54.5	56.0	52.7	21 2	1.0	13.5
5.....	-17.0	-20.7	-27.5	8.1	40.3	33.4	62.3	50.5	42.1	26 2	0.0	13.3
6	-5.4	-35.6	-20.5	-2.9	44.7	46.5	58.8	58.2	46.0	23.0	13.7	-3.6
7.....	-15.8	-33.5	-13.1	-7.2	45.8	42.4	56.5	65.7	41.0	20.8	36.2	-17.9
8.....	-19.5	-22.7	3.6	4.9	38.0	46.8	50.1	71.3	42.9	24.2	20.4	-27.0
9.....	-13.4	-24.7	-21.2	12.1	33.7	62.8	47.5	52.0	53.0	26.5	8.5	-31.6
10.....	-22.3	-13.0	-21.6	25.4	31.5	67.9	55.8	44.0	56.4	23.0	19.9	-8.0
11.....	-14.3	-7.5	-24.3	25.1	34.2	48.1	54.5	42.8	59.6	19.4	-7.4	-6.5
12.....	-17.1	-14.7	-17.7	31.6	26.7	46.3	57.3	45.0	50.0	18.6	-3.1	-22.4
13.....	-9.1	-20.6	-13.3	36.0	27.0	40.5	54.5	56.6	42.4	18.1	-11.5	-24.4
14.....	-5.1	-12.9	-26.3	23.9	33.7	48.1	55.1	60.5	36.4	15.4	-16.3	-17.7
15.....	-3.0	-7.2	-26.6	18.7	46.0	39.0	57.6	54.4	37.9	22.9	-12.9	-30.1
16.....	6.1	-11.5	-23.1	13.7	56.2	38.3	52.4	53.1	45.5	24.4	-3.5	-28.4
17.....	14.5	-5.1	-14.8	12.1	45.3	49.7	52.0	57.8	45.6	31.4	-14.6	-27.4
18.....	-0.1	-4.0	-10.0	10.3	42.7	56.6	55.9	48.5	43.0	28.0	-2.9	-24.5
19.....	-14.1	-22.5	-15.0	20.8	53.3	56.3	47.4	48.8	48.0	33.1	13.9	-30.4
20.....	-14.3	-20.9	5.5	31.2	39.8	39.5	45.5	56.5	52.4	32.9	18.6	-32.3
21.....	-11.0	-19.0	9.5	33.6	31.0	42.0	49.5	66.1	59.7	34.4	19.8	-19.6
22.....	-13.6	-26.5	-8.8	33.3	48.2	63.8	53.6	70.5	54.7	33.4	8.4	-0.4
23.....	-25.5	-27.8	-2.4	51.2	32.2	73.0	55.4	55.9	50.3	34.0	8.7	-8.7
24.....	-22.0	-28.1	-6.9	19.0	38.5	63.0	65.9	44.2	46.5	31.3	7.1	-0.8
25.....	-20.5	-33.9	-15.0	34.2	57.3	44.4	66.4	43.5	42.4	25.4	1.1	5.5
26.....	-9.1	-27.0	-14.2	40.8	40.0	46.3	67.8	47.3	42.9	14.4	-4.1	3.5
27.....	-35.3	-7.9	-4.7	30.1	34.8	45.4	58.8	46.1	41.5	21.4	-20.4	-1.0
28.....	-32.4	-0.9	-5.6	10.0	34 5	52.0	53.1	53.6	34.3	29.8	-19.0	-10.5
29.....	-42.4	-11.6	0.0	13.3	50.3	60.5	56.3	58.9	32.7	34.0	-20.2	-17.4
30.....	-30.1	.....	2.8	18.7	32.5	53.8	69.3	54.5	31.6	32.4	-17.9	-6.5
31.....	-37.5	.....	16.4	.....	29.3	.....	77.0	48.9	.....	29.4	.....	13.8

YORK FACTORY.

Highest and Lowest Temperature for each day during the year 1876.

	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1.....	.....	.....	-28.0	-45.0	-1.0	-26.0	30.0	-9.0	13.0	15.5	51.0	27.0	62.0	41.0	78.0	62 0	59.0	43.0	42.0	28.0	28.0	24.0	-12.0	-29.0
2.....	.....	.....	-21.5	-35.0	9.0	-5.0	40.0	2.0	35.0	26.0	43.0	28.5	72.0	52.0	80.0	61.0	55.0	41.0	38.0	32.0	28.0	1.0	13.0	-16.0
3.....	.....	.....	-20.0	-48.5	12.0	-32.0	24.0	20.0	31.0	24.5	62.5	34.0	65.0	40.0	80.0	61.0	58.0	38.5	32.0	23.0	6.0	-8.0	18.0	3.0
4.....	.....	.....	-38.0	-53.0	-22.0	-32.0	44.0	15.0	33.0	24.0	72.0	33.0	64.0	40.0	67.0	49.0	64.5	40.5	25.0	20.0	10.0	-10.0	23.0	9.0
5.....	.....	.....	-13.0	-38.0	-24.0	-46.0	27.5	3.0	50.0	33.0	42.0	29.5	72.0	42.0	56.0	42.0	46.0	39.0	30.0	18.5	8.5	-7.0	24.0	6.0
6.....	.....	.....	-11.5	-40.0	-15.0	-46.0	12.0	3.0	55.0	33.0	54.0	32.0	65.0	54.0	67.0	52.5	52.0	38.0	26.0	17.0	18.0	0.0	6.5	-10.0
7.....	.....	.....	-23.5	-45.5	-8.0	-29.0	4.0	-13.0	57.0	35.0	67.5	34.5	65.5	48.5	78.0	52.0	46.5	40.5	23.0	16.0	32.0	17.0	-6.5	-25.0
8.....	.....	.....	-14.0	-35.0	2.5	-28.0	0.0	-16.5	58.0	33.5	55.0	31.0	55.5	40.0	84.0	65.0	50.0	39.0	26.0	17.0	35.0	16.5	-20.0	-31.0
9.....	.....	.....	-14.0	-37.0	10.0	-22.0	13.5	-12.5	38.0	30.0	74.0	44.0	50.0	40.0	67.0	44.0	62.0	38.0	31.0	22.0	16.5	4.0	-27.0	-35.0
10.....	.....	.....	-10.0	-26.0	-19.0	-32.0	28.0	9.0	36.0	27.0	77.0	52.0	62.0	51.5	46.0	42.0	63.0	46.0	28.0	18.5	36.0	8.5	-2.0	-33.0
11.....	.....	.....	-3.0	-12.0	-12.0	-31.0	37.0	16.5	38.0	29.5	69.0	40.0	65.0	50.0	48.0	39.0	74.0	45.0	27.0	15.0	9.0	-11.0	6.5	-12 0
12.....	-1.0	-22.5	-5.0	-14.0	-19.0	-36.0	28.0	24.0	31.0	24.5	51.0	34.5	68.5	49.5	50.0	39.0	72.0	40.0	20.0	9.5	5.0	-12.5	-4.0	-29.0
13.....	-1.0	-22.0	-6.0	-28.0	-5.0	-34.0	40.5	28.0	32.0	22.5	51.0	34.5	61.0	52.0	76.0	40.0	51.0	35.0	20.0	16.0	-5.0	-16.5	-20.0	-36.0
14.....	-6.0	-27.0	-9.5	-25.0	4.0	-32.0	42.0	20.0	43.0	25.0	56.0	29.0	60.0	48.0	70.0	40.0	42.0	32.0	19.0	14.5	-9 0	-22.0	-13.0	-23.0

YORK FACTORY.

Highest and Lowest Temperature for each day during the year 1876.—*Continued.*

	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
15.....	5.0	-7.5	-4.0	-21.5	-13.0	-32.0	35.0	13.0	56.0	28.5	52.0	34.0	60.0	48.5	71.0	44.0	41.0	33.0	36.0	14.5	-7.5	-24.0	-13.0	-35.0
16.....	9.0	-14.0	-3.0	-25.0	-19.0	-37.0	23.0	12.0	63.0	40.5	42.5	31.0	75.0	44.5	61.0	46.0	53.0	38.0	30.0	14.0	6.0	-14.0	-20.0	-32.5
17.....	19.0	6.0	10.0	-27.0	-8.0	-35.0	20.0	9.0	57.0	38.5	59.0	34.5	72.0	44.0	76.0	45.5	53.0	28.0	36.5	25.0	-6.0	-21.0	-24.0	-35.0
18.....	22.0	-2.0	17.0	-7 0	0.0	-30.0	20.0	9.5	53.0	31.0	68.5	40.5	63.0	49.0	57.0	40.5	52.0	41.0	35.0	27.0	0.0	-14 5	-19.0	-28.0
19.....	2.0	-23.0	15.0	-20.0	10.0	-25.0	21.0	-1.0	67.0	44.0	69.0	40.5	56.0	43.0	54.0	37.5	52.0	37.5	35.0	27.0	16.0	-3.0	-23.0	-38.0
20.....	-2.0	-23.0	16.0	-38.0	-6.0	-24.0	32.0	3.0	52.0	32.0	51.0	36.0	50.0	40.5	70.0	39.0	60.0	49.5	34.0	32.0	21.0	12.0	-26.0	-36.0
21.....	-4.0	-18.0	-9.0	-18.0	14.0	-18.5	36.5	25.5	40.0	28.0	49.0	35.0	51.0	41.5	80.0	39.0	68.0	46.0	37.0	33.0	23.0	17.5	-13.0	-36.0
22.....	-7.0	-17.5	-10.0	-33.0	18.0	-3.0	43.0	20.0	72.0	28.5	69.0	46.0	73.0	42.5	86.0	58.5	69.0	49.5	37.5	32.5	17.5	5.0	3.0	-13.0
23.....	-3.0	-22.0	-23.0	-29.0	9.0	-30.0	47.0	23.0	43.0	26.5	79.0	52.0	60.0	39.5	71.0	50.0	62.5	41.5	35.0	32.0	11.0	2.0	-2.0	-14.0
24	-15.0	-38.0	-21.0	-34.0	24.0	-28.0	48.0	12.0	53.0	25.0	74.0	58.0	91.0	50.0	55.0	42.0	55.0	38.0	34.0	31.0	21.0	1.0	3.0	-14.0
25.....	-13.0	-25.0	-24.0	-35.0	10.0	-20.0	28.0	10.0	78.0	45.0	50.0	38.0	82.0	57.5	55.0	41.5	48.0	40.5	31.0	21.5	8.0	-15.0	8.0	0.0
26.....	-6.0	-26.0	-21.0	-46.0	-9.0	-25.0	51.0	18.0	48.0	33.0	50.0	42.0	87.0	56.0	57.0	38.0	47.5	34.0	21.5	8.0	20.0	-17-5	10 0	1.0
27...	-4.0	-34.0	-1.0	-22.0	-6.0	-21.0	53.0	35.0	44.0	31.0	50.5	37.0	65.0	54.5	60.0	29.0	43.5	36.0	26.5	9.5	-14.0	-25.0	5.0	-6.0
28.....	-25.0	-43.0	1.0	-5.0	2.0	-14.5	54.0	8.5	41.0	27.0	59.0	38.0	65.0	47.5	68.5	42.0	41.5	31.0	32.5	22.0	-9.0	-25.0	-1.0	-16.0
29.....	-23.5	-42.0	2.5	-20.5	7.0	-14.5	18.0	4.0	61.0	27.0	74.0	34.0	63.0	43.0	67.0	51.0	36.0	31.0	37.0	32.5	-14.0	-25.5	-14.0	-22.0
30.....	-29.5	-48.0	.....	.....	9.5	-9.5	16.0	7.0	50.5	26.5	72.0	44.0	85.0	45.0	63.0	48.0	33.0	28.5	33.0	32.0	-13.0	25.0	-2.0	-16.0
31.....	-20.0	-37.5	.....	.....	15.0	-11.0	.....	.....	33.0	26.0	.....	.....	99.0	64.5	54.0	47.5	.....	.....	32.0	28.0	.....	.....	-5.0	-19.5

YORK FACTORY.

Mean Daily Temperature from Observations at 7 a.m., 2 and 9 p.m., 1878.

	January.	Febrtary.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
1	.....	.....	.....	23.8	32.3	29.9	74.1	60.5	47.0	30.1	6.6	21.1
2	.....	.....	.....	36.0	32.6	39.5	76.4	60.3	45.4	29.4	7.0	11.8
3	.....	.....	2.3	43.2	33.7	31.9	79.5	60.0	45.9	28.5	-6.1	3.1
4	.....	.....	0.4	40.0	39.3	45.8	78.0	56.7	46.5	29.8	6.3	4.2
5	.....	.....	1.1	13.8	31.7	66.9	82.9	58.6	43.3	26.7	15.1	-5.9
6	.....	.....	-5.2	15.6	34.0	70.5	84.5	59.9	39.5	26.9	25.7	-18.6
7	.....	.....	-5.5	17.5	35.4	70.5	83.9	60.4	37.4	26.4	22.0	-19.3
8	.....	.....	1.6	21.0	22.8	62.1	78.6	57.5	42.4	25.0	22.1	-13.6
9	.....	.....	18.5	20.7	31.5	73.1	78.6	56.8	38.1	22.9	30.0	-0.6
10	.....	.....	17.1	24.6	22.4	68.2	76.1	57.5	36.9	24.1	26.1	1.2
11	.....	.....	18.0	25.8	23.2	67.4	82.9	60.1	35.9	23.5	23.1	-14.6
12	.....	.....	15.9	20.6	19.8	70.6	74.4	57.6	35.6	23-9	17.3	3.6
13	.....	.....	16.8	20.2	23.2	69.1	67.9	56.9	34.9	27.0	17.7	-2.9
14	.....	.....	23.6	21.0	26.3	70.1	78.5	56.9	34.9	30.6	15.6	-5.1
15	.....	.....	18.1	22.1	32.5	72.8	79.0	56.5	36.6	31.8	15.6	-8.4
16	.....	.....	16.0	22.0	34.0	68.7	83.2	56.5	36.1	29.4	28.8	-9.3
17	.....	.....	1.1	22.8	34.2	68.3	82.6	60.1	37.6	30.7	32.9	-1.9
18	.....	.....	11.7	25.0	32.5	71.1	84.0	56.2	38.9	30.6	22.4	-13.1
19	.....	.....	8.9	25.1	23.4	68.9	80.1	58.5	37.5	32.3	13.5	-13.9
20	.....	.....	5.4	24.6	39.1	75.9	85.3	59.5	40.0	18.5	13.2	-13.2
21	.....	.....	4.4	24.7	45.3	73.9	72.0	60.0	39.1	14.6	25.9	-7.5
22	.....	.....	-0.3	35.5	42.5	72.7	71.2	71.3	34.4	15.0	22.3	-13.6
23	.....	.....	-2.6	33.5	46.2	61.0	65.8	65.5	32.6	16.0	19.5	-11.6
24	.....	.....	13.1	35.1	36.8	58.3	51.9	59.7	33.6	8.7	21.2	-7.6
25	.....	.....	14.4	31.9	35.1	59.1	61.6	58.3	33.1	12.1	21.8	-8.1
26	.....	.....	6.9	31.4	42.0	64.4	64.5	54.9	32.1	13.1	21.1	-1.3
27	.....	.....	13.4	29.1	42.5	74.1	66.7	54.5	31.1	10.6	11.0	-5.7
28	.....	.....	24.5	33.0	38.9	76.4	64.8	55.0	31.2	7.1	12.5	-13.0
29	.....	.....	15.7	32.1	32.5	72.4	59.4	60.1	30.4	13.5	5.9	-4.1
30	.....	.....	20.0	33.9	30.6	72.4	58.9	58.2	37.1	9.6	18.2	-15.6
31	.....	.....	21.9	.....	30.6	.....	60.6	58.5	.....	10.6	.....	-18.1

YORK FACTORY.

Highest and Lowest Temperatures for each day during the year 1878.

	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1	.....	.....	.....	.....	.....	.....	39.0	15.5	43.5	27.0	34.0	25.0	99.0	60.5	70.5	50.0	60.2	37.9	38.2	27.0	15.0	0.5	29.0	14.0
2	.....	.....	.....	.....	.....	.....	41.0	20.0	40.0	28.0	61.5	28.0	98.0	62.0	76.0	51.5	57.7	35.9	32.0	26.0	13.0	2.0	17.0	8.0
3	.....	.....	.....	.....	8.0	-5.0	49.5	28.0	46.0	27.0	35.0	29.0	102.0	58.5	78.0	50.0	53.8	33.9	31.5	24.0	2.0	-10.5	9.0	-5.0
4	.....	.....	.....	.....	8.5	-5.0	51.0	34.0	38.0	25.0	67.0	28.5	96.5	59.0	68.0	50.0	52.8	30.9	34.0	24.0	13.5	-15.0	8.0	-3.0
5	.....	.....	.....	.....	7.0	-17.5	37.0	8.0	34.0	23.0	90.0	41.5	106.0	60.0	67.0	49.0	54.8	39.4	30.0	23.5	21.0	5.0	7.0	-15.0
6	.....	.....	.....	.....	4.5	-10.0	26.0	3.5	38.0	26.0	96.0	47.5	101.0	63.0	69.0	49.5	49.8	28 9	29.0	25.0	27.0	14.0	-7.0	-24.5
7	.....	.....	.....	.....	-0.5	-18.5	26.0	3.5	37.5	28.0	92.0	57.0	98.0	61.0	71.0	50.5	45.8	30.9	28.5	21.0	26.0	20.0	-17.0	-25.0
8	.....	.....	.....	.....	8.0	-4.0	29.5	6.0	37.0	27.5	73.0	54.5	96.5	57.0	70.0	51.5	50.8	35.9	27.5	20.5	28.0	8.5	-7.5	-25.5
9	.....	.....	.....	.....	30.5	0.0	30.0	12.0	36.0	26.0	94.0	50.5	98.5	56.0	78.0	52.0	46.8	33.9	26.0	20.0	33.0	24.0	3.0	-12.0
10	.....	.....	.....	.....	29.5	2.0	36.0	10.0	31.0	18.0	90.5	48.0	99.0	59.5	72.5	51.0	39.8	32.9	27.0	19.0	31.5	15.0	8.5	-6.0
11	.....	.....	.....	.....	28.0	-2.0	34.0	13.0	30.0	10.5	91.0	50.5	102.0	60.0	74.0	52.0	39.3	31.9	26.0	18.0	30.0	18.0	1.0	-18.5
12	.....	.....	.....	.....	27.0	6.0	31.0	12.0	25.0	17.0	92.5	54.0	97.0	56.0	73.5	50.5	38.8	30.9	26.5	18.5	26.0	13.0	10.0	-13.0
13	.....	.....	.....	.....	25.5	7.5	28.0	11.5	27.0	15.0	97.5	54.0	80.0	63.0	76.0	48.5	37.8	31.9	31.5	21.0	20.0	13.5	3.0	-8.0
14	.....	.....	.....	.....	36.0	16.0	32.0	12.0	32.0	20.0	99.5	55.5	98.0	60.0	71.5	49.0	38.3	32.4	35.0	24.0	19.5	13.0	2.0	-9.0

15	.....	.....	.....	.....	28.0	15.0	31.0	16.0	41.0	24.0	100.5	57.0	99.0	61.5	72.0	49.5	39.8	32.4	36.5	26.5	20.0	12.0	-4.5	-18.0
16	.....	.....	.....	.....	23.0	1.5	30.0	15.5	44.0	25.5	86.5	50.0	101.0	58.5	70.5	50.0	40.3	32.9	31.0	26.0	33.0	17.0	-1.0	-19.5
17	.....	.....	.....	.....	18.0	-8.0	37.5	15.0	46.0	26.0	90.5	53.0	101.5	61.0	76.0	50.5	43.8	34.9	34.5	25.5	35.0	28.0	4.0	-12.0
18	.....	.....	.....	.....	29.0	-0.5	36.0	16.0	42.0	28.0	94.0	56.5	104.0	64.5	76.0	45.0	44.8	34.9	36.0	24.0	33.0	20.0	0.5	-17.0
19	.....	.....	.....	.....	22.0	0.0	29.0	17.5	32.0	18.0	97.5	50.5	99.5	62.0	83.0	44.5	42.8	33.9	37.0	28.0	23.0	11.0	-7.5	-27.0
20	.....	.....	.....	.....	10.0	-1.0	31.0	20.0	65.5	20.0	100.5	54.5	103.0	63.0	82.5	43.5	45.8	34.4	31.0	10.0	20.0	7.0	-9.0	-23.0
21	.....	.....	.....	.....	10.5	-1.5	33.5	18.5	75.0	31.0	98.5	52.5	91.0	56.0	84.5	52.0	45.3	37.9	29.5	8.0	28.0	12.0	-2.0	-10.0
22	.....	.....	.....	.....	9.0	-2.0	48.0	18.0	58.0	32.0	96.5	57.0	86.0	55.5	91.5	50.0	37.8	31.9	26.0	6.0	27.0	16.0	-9.0	-20.5
23	.....	.....	.....	.....	4.0	-6.5	53.5	26.0	62.0	33.0	95.5	50.0	81.0	54.0	86.0	58.5	36.0	29.9	31.0	9.0	26.5	14.0	-7.5	-19.0
24	.....	.....	....	.....	23.0	-7.0	47.0	28.0	46.0	32.0	90.0	40.5	68.0	47.0	78.0	48.5	35.5	30.4	24.0	-2.0	28.5	14.0	-4.0	-16.0
25	.....	.....	.....	.....	31.0	-2.0	47.0	26.5	40.5	31.0	89.0	42.5	76.5	48.0	74.0	40.5	35.0	29.4	19.0	2.0	27.0	15.0	-6.0	-12.5
26	.....	.....	.....	.....	18.0	-0.5	38.0	24.5	54.0	32.0	80.0	46.5	74.0	50.0	73.0	38.0	34.0	28.9	20.5	7.0	29.0	10.0	0.0	-9.0
27	.....	.....	.....	.....	26.0	-5.0	37.0	22.0	60.5	34.0	97.0	58.5	90.5	49.5	71.0	39.0	33.0	27.9	18.0	3.5	21.0	8.0	0.0	-7.0
28	.....	.....	.....	....	34.0	15.0	46.0	22.5	48.0	35.0	99.5	59.0	76.5	48.0	67.0	40.5	34.0	27.0	12.0	-2.0	20.0	7.0	-6.5	-19.0
29	.....	.....	.....	.....	23.0	13.0	44.0	24.0	37.0	31.0	98.0	58.0	78.0	49.5	76.0	41.0	33.0	26.0	18.0	4.0	11.0	1.0	2.0	-16.0
30	.....	.....	.....	.....	28.0	10.5	43.0	26.0	32.0	26.5	97.5	60.0	71.5	46.0	78.5	44.0	39.3	28.0	14.0	6.0	28.0	2.0	-8.0	-26.0
31	.....	.....	.....	.....	30.0	14.5	....	.....	33.0	27.0	.....	.....	71.0	49.0	72.0	43.0	.....	.....	16.0	2.0	.....	.....	-10.0	-28.0

MOOSE FACTORY.

Abstract of Observations during the year 1878 *at Moose Factory, James' Bay. Latitude,* 51° 16′ *N.; Longitude,* 80° 56′ *W. By J. R. Nason, Esq.*

	TEMPERATURE.									Average amount of cloud.	NO. OF WINDS FROM (AT HOURS OF OBSERVATION.)									Average force of wind.	RAIN.		SNOW.		No. of fogs.	No. of thunder-storms.	No. of Auroras.
	9 a.m.*	2 p.m.	7 p.m.*	Mean.	Mean of highest.	Mean of lowest.	Absolutely highest.	Absolutely lowest.	Greatest range in 24 hours.		N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.		Amount of	Days of	Amount of	Days of			
	°	°	°	°	°	°	°	°	°												in.		in.				
January	-5.66	3.23	-0.78	-1.07	10.35	-9.45	32.7	-35.9	46.6	5.3	5	3	5	1	7	26	14	24	8	2.1	R.	1	0.3	9	....	....	7
February	9.62	17.41	12.92	13.31	21.71	0.82	42.5	-21.7	37.5	4.7	11	13	1	0	3	17	15	17	7	2.3	0	0	0.2	5	....	....	5
March	17.76	24.29	19.12	20.39	28.75	7.79	48.1	-22.4	37.2	6.1	15	19	4	8	3	14	7	16	7	2.5	0.04	1	0.8	15	....	....	7
April	34.12	38.76	33.88	35.59	41.04	24.40	66.1	8.9	42.7	6.5	20	30	0	1	3	4	4	18	10	2.6	1.22	6	0.1	2	2	....	3
May	46.90	50.10	44.97	47.32	52.38	36.01	76.5	19.1	29.3	7.6	8	21	5	1	6	16	10	21	5	2.8	1.95	11	0.8	4	....	....	4
June	56.55	59.69	54.88	57.04	63.54	43.20	92.1	26.9	34.3	6.3	27	28	1	2	3	13	0	13	3	3.0	1.64	9	S.	1	....	2	2
July	67.44	68.84	64.44	66.91	74.02	52.80	91.6	41.8	33.5	5.9	16	21	6	2	2	20	14	9	3	2.6	2.79	12	....	....	1	1	1
August	62.59	65.84	60.54	62.99	68 52	51.74	81.3	34.9	30.6	7.0	19	14	0	2	1	23	16	12	6	2.1	6.11	17	....	....	2	1	6
September	49.39	54.37	51.21	51.66	59.76	42.18	73.9	31.1	29.7	7.5	17	11	5	6	6	25	7	5	8	2.7	5.46	19	....	....	1	1	6
October	39.00	43.99	39.83	40.94	48.64	33.08	66.8	7.6	27.1	7.1	7	2	5	5	16	27	10	7	14	2.5	1.74	14	3.0	5	....	....	7
November	18.38	28.75	25.65	26.48	30.40	19.45	40.8	4.3	23.0	7.9	9	5	1	0	8	14	12	29	12	2.5	R.	3	25.5	19	....	....	3
December	5.80	10.47	7.01	7.57	13.55	0.33	32.9	-18.4	29.9	7.8	2	3	0	2	1	20	22	33	10	2.7	R.	1	27.4	23	....	....	3
	33.49	38.81	34.47	35.76	.....	.....	92.1	-35.9	46.6	6.6	156	170	33	30	59	219	131	204	93	2.5	20.95	94	58.1	83	6	5	54

* During a part of the last two months of the year observations were made at 7 a.m., 2 and 9 p.m.

MOOSE FACTOKY.

Abstract of Observations during the year 1879 *at Moose Factory, James' Bay. Latitude,* 51° 16′ *N.; Longitude,* 80° 56′ *W. By J. R. Nason, Esq.*

	TEMPERATURE.									Average amount of cloud.	NO. OF WINDS FROM									Average force of wind.	RAIN.		SNOW.		No. of fogs.	No. of thunder-storms.	No. of Auroras.
	7 a.m.	2 p.m.	9 p.m.	Mean.	Mean of highest.	Mean of lowest.	Absolutely highest.	Absolutely lowest.	Greatest range in 24 hours.		N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.		Amount of	Days of	Amount of	Days of			
	°	°	°	°	°	°	°	°	°												in.		in.				
January	-7.63	0.23	-4.15	-3.92	5.04	-14.32	24.0	-40.3	38.1	6.1	20	1	1	3	7	24	18	14	5	2.2	0	0	9.6	16	...	....	6
February	-12.70	0.16	-7.17	-6.72	3.69	-17.43	19.1	-41.3	40.6	5.5	8	5	0	3	4	13	18	19	14	2.2	0	0	8.1	10	....	....	6
March	8.22	19.35	10-37	12.08	23-31	-2.72	46.3	-33.4	57.5	6.3	10	2	3	6	12	18	13	12	17	2.5	0.60	3	9.8	13	....	....	9
April	22.40	29.32	22.53	24.19	30.35	15.77	52.2	-7.0	38.3	6.9	17	16	0	1	4	5	2	39	6	2.7	1.00	5	15.8	12	1	1	4
May	39.06	45.01	37.87	39.95	49.61	29.70	73.3	22.5	40.5	6.7	24	22	3	1	4	13	7	15	4	2.7	2.08	7	2.0	5	2	0	3
June	48.28	56.86	47.91	50.24	57.81	38.80	81.7	27.3	44.3	6.8	18	22	5	7	1	13	3	14	7	2.3	3.47	16	5.0	3	5	2	2
July	59.84	65.81	57.69	60.26	70.56	48.92	84.8	35.7	35.0	5.6	13	15	4	5	12	20	9	7	8	2.2	5.42	18	.....	....	2	0	1
August	56.28	63.39	55.72	57.78	66.51	49.58	82.8	38.1	29.0	6.4	16	25	4	3	8	7	10	12	8	2 3	2.60	13	.....	....	4	3	7
September	45.98	53.82	48.00	48.95	56.43	41.94	70.1	27.6	24.2	7.3	8	7	2	7	13	19	19	11	4	2.6	1.20	17	.....	....	2	0	8
October	42.23	49.40	44.47	45.14	54.29	37.72	81.8	17.3	38.3	7.4	11	6	5	6	9	25	8	20	3	2.9	2.25	12	2.0	6	....	1	4
November	18.73	23.03	20.71	20.80	26.35	14.89	53.2	-8.0	22.1	8.8	6	3	2	13	13	19	21	19	4	2.9	0.86	4	17.5	14	1	....	0
December	-15.53	-6.89	-11.19	-11.20	-1.52	-21.55	35.8	-45.3	48.3	5.2	9	7	3	4	4	20	26	11	9	2.5	0.65	2	15.8	12	....	....	3
	25.43	33.29	26.90	28.13	.....	.....	84.8	-45.3	57.5	6.6	160	131	32	49	91	196	154	193	89	2.5	23.13	97	85.6	91	17	7	53

MOOSE FACTORY.

Abstract of Observations during the year 1880 *at Moose Factory, James' Bay. Latitude,* 51° 16′ *N.; Longitude,* 80° 56′ *W. By J. R. Nason, Esq.*

	TEMPERATURE.									Average amount of cloud.	NO. OF WINDS FROM									Average force of wind 0–10.	RAIN.		SNOW.		No. of fogs.	No. of thunder-storms.	No. of Auroras.
	7 a.m.	2 p.m.	9 p.m.	Mean.	Mean of highest.	Mean of lowest.	Absolutely highest.	Absolutely lowest.	Greatest range in 24 hours.		N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.		Amount of	Days of	Amount of	Days of			
	°	°	°	°	°	°	°	°	°												in.		in.				
January	0.50	8.06	2.24	3.26	16.60	-11.34	40.8	-30.4	45.8	5.8	3	0	5	5	22	21	16	16	5	2.9	0.35	2	45.0	13	....	....	6
February	-9.89	3.58	-3.26	-3.22	8.16	-16.40	34.0	-34.6	57.4	5.9	18	5	1	1	4	19	21	16	2	3.0	0.03	1	12.5	12	....	....	4
March	-5.70	10.36	1.15	1.74	15.31	-12.45	49.5	-39.5	44.9	4.4	13	9	4	3	12	14	9	12	17	2.1	0.00	0	12.5	8	1	....	14
April	20.43	28.18	20.98	22.67	30.70	11.45	51.0	-10.1	34.8	5.5	19	17	2	3	6	14	8	14	7	3.0	0.07	3	3.0	6	...	....	11
May	38.55	44.47	38.78	40.15	49.54	31.56	73.9	12.8	33.0	7.4	17	28	3	6	5	8	8	10	8	2.8	2.67	15	4.0	6	....	....	5
June	54.30	60.02	52.55	54.86	63.93	44.40	82.8	33.3	35.4	6.6	30	16	2	5	2	15	6	6	8	2.4	3.86	15	S.	1	....	....	2
July	57.23	63.94	57.24	58.91	67.52	49.52	87.5	40.3	25.3	6.2	16	26	1	3	0	12	14	14	7	2.5	2.33	15	....	....	1	2	4
August	52.96	60.58	53.31	55.04	63.76	46.61	77.6	36.7	27.9	6.2	21	14	2	6	5	18	6	11	10	2.3	3.84	20	....	....	...	1	5
September	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
October	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
November	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
December	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....

MOOSE FACTORY.

Mean Daily Temperature from Observations at 9 a.m., 2 and 9 p.m., 1878.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
1.....	4.30	0.07	3.37	35.13	57.60	73.30	79.47	71.60	48.30	63.40	29.17	26.12
2.....	-11.10	15.85	25.17	27.10	60.20	49.50	60.47	67.90	52.60	55.03	22.97	28.35
3.....	-4.20	27.67	12.10	24.10	53.33	41.20	76.83	64.47	55.07	47.40	19.30	19.50
4.....	-22.97	26.70	9.10	35.07	52.90	35.30	50.17	61.73	67.97	45.43	18.67	14.17
5.....	-26.73	32.83	22.80	36.30	52.47	32.40	67.63	66.53	48.37	44.67	17.40	8.97
6.....	-24.27	20.57	37.63	28.23	50.00	35.30	84.17	60.70	51.13	44.23	29.53	12.23
7	-22.60	36.77	37.33	29.37	50.40	53.70	83.50	63.17	65.50	46.30	32.30	-5.75
8.....	3.00	3.87	23.07	32.87	43.23	50.20	54.30	72.23	52.57	43.67	30.73	10.32
9.....	15.35	4.27	27.83	45.60	33.90	50.30	52.37	61.07	64.60	44.93	30.93	5.90
10.....	9.15	-5.37	10.60	47.37	33.17	54.63	63.73	59.03	58.23	44.23	22.73	13.30
11.....	15.42	-1.40	17.35	49.87	31.43	59.07	72.93	54.87	45.67	46.00	30.70	21.10
12.....	29.23	6.70	31.37	43.57	23.10	59.73	66.23	68.90	48.20	49.23	27.37	13.40
13.....	13.88	6.53	32.07	23.70	30.57	58.30	64.93	60.50	50.17	48.17	21.97	9.55
14.....	20.83	8.20	19.47	28.97	32.63	75.27	60.37	54.93	49.90	54.73	17.33	5.25
15.....	-9.60	13.58	35.93	32.10	36.50	58.50	68.43	54.80	48.20	40.43	21.33	14.27
16.....	-15.87	1.37	20.93	31.30	47.40	48.10	70.17	63.63	55.03	39.10	29.80	15.03
17.....	-2.60	-2.60	6.27	30.53	38.20	57.73	70.70	58.83	56.93	45.87	32.97	10.15
18.....	26.87	13.85	28.23	.....	46.63	59.10	75.67	70.80	47.17	36.73	38.07	-7.95
19.....	29.87	19.40	16.05	29.27	57.67	60.90	65.23	62.47	47.00	38.20	37.40	-1.87
20.....	9.33	7.72	3.42	29.60	39.07	39.27	71.13	63.30	42.23	43.37	30.03	4.20
21.....	18.93	-16.28	0.73	26.67	39.87	50.53	62.30	63.97	42.07	54.53	32.23	0.73
22.....	-14.47	23.63	14.55	28.40	62.17	59.53	63.03	74.00	48.67	49.87	30.57	-6.92
23.....	-21.97	15.12	-1.03	50.57	70.00	63.77	77.30	71.40	63.57	34.93	32.77	2.57
24.....	-8.13	8.65	2.22	51.77	55.00	59.73	63.87	63.20	45.73	33.07	29.40	14.35
25.....	-14.43	15.55	20.33	37.80	56.40	41.93	54.27	53.27	43.40	34.77	23.80	12.80
26.....	-5.63	35.90	26.43	32.57	48.07	61.27	63.97	50.77	40.23	27.83	21.87	6.95
27.....	-12.23	28.57	22.47	35.73	42.57	77.90	55.87	55.10	44.47	23.43	30.17	-4.25
28.....	-11.53	-7.70	25.63	29.67	44.60	84.67	57.87	58.77	52.27	24.57	18.07	-11.50
29.....	0.33	.....	35.13	40.00	43.87	82.27	58.20	61.20	56.87	21.23	11.77	-3.32
30.....	-3.53	.....	34.13	61.77	60.67	88.10	71.63	74.90	57.63	22.53	12.07	1.30
31.....	0.10	.....	31.37	.....	73.47	.....	78.27	64.70	.....	21.30	.....	5.85

MOOSE FACTORY.

Mean Daily Temperature from Observations at 7 a.m., 2 and 9 p.m., 1879.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
1.....	-1.95	-1.53	-4.35	9.65	29.63	41.23	76.20	57.78	59.45	55.23	19.55	7.80
2.....	0.73	6.50	7.10	1.03	28.52	44.07	70.62	64.25	57.08	61.47	14.40	-11.98
3.....	12.25	16.47	30.05	13.02	32.38	61.23	42.60	59.72	61.55	42.23	16.08	-11.37
4.....	5.15	11.43	-9.50	12.68	32.97	47.65	45.30	62.55	50.60	31.70	15.92	-7.58
5.....	-2.87	9.27	-10.67	17.40	36.03	37.37	61.40	56.20	48.02	40.80	21.78	18.32
6.....	-7.08	3.65	14.70	26.97	33.40	38.05	69.12	49.00	50.88	63.42	32.77	33.23
7.....	20.57	-1.35	10.13	14.63	42.77	35.98	72.62	53.63	45.70	73.83	36.85	6.92
8.....	8.45	4.93	27.45	25.25	50.83	47.72	61.10	47.65	44.20	47.10	38.95	-10.58
9.....	-5.42	-15.52	30.45	12.37	49.30	58.28	59.63	53.50	49.17	48.32	38.47	-1.55
10.....	-8.35	12.00	35.52	10.48	37.10	61.23	67 08	55.07	55.92	64.00	31.17	21.95
11.....	-1.55	-8.98	12.08	10.92	57.90	53.40	58.65	57.73	60.28	52.90	31.65	-13.67
12.....	-4.10	-10.75	8.90	11.75	34.80	42.17	58.12	52.22	58.30	49.80	30.87	-23.40
13.....	-16.13	-21.95	9.30	22.05	30.20	47.43	50.45	50.20	39.80	46.20	34.25	-13.55
14.....	-22.15	-21.42	4.00	29.43	34.60	34.20	61.60	44.63	39.77	61.08	33.93	-6.50
15.....	-14.15	-11.90	-6.23	29.85	53.07	35.85	67.85	51.62	51.53	55.35	31.00	-15.10
16.....	5.85	-22.33	-5.95	31.22	45.65	42.77	55.85	55.53	51.70	60.85	24.55	-15.48
17.....	17.50	-16.60	-0.75	27.48	30.35	50.75	53.28	52.50	44.80	65.77	21.65	-23.00
18.....	-5.45	-12.77	4.17	25.30	33.35	53.60	57.97	60.50	43.25	34.60	17.87	-24.50
19.....	-19.10	-8.48	6.03	30.70	45.73	70.75	67.55	64.87	40.65	33.33	20.03	-18.47
20.....	-18.65	-30.55	9.82	28.80	36.70	68.17	59.10	63.13	40.82	47.12	-0.75	-38.30
21.....	-26.17	-10.30	7.55	31.60	29.05	64.67	62.20	67.50	47.88	37.73	4.75	-26.90
22.....	-27.10	9.75	18.15	39.95	31.92	45.67	55.88	62.65	43.20	37.45	19.62	-10.65
23.....	5.00	-3.50	22.98	29.95	59.95	53.08	48.75	54.97	35.40	26.35	5.40	-13.00
24.....	-14.05	-8.60	4.90	40.70	43.33	44.40	57.32	55.13	35.92	21.52	17.05	-22.08
25.....	-22.50	7.37	10.47	37.20	34.02	50.15	64.55	57.47	42.20	35.20	11.55	-28.22
26.....	-9.03	-24.97	24.38	33.57	48.13	55.57	60.18	60.70	46.43	40.38	7.53	-23.10
27.....	12.42	-15.98	37.20	44.20	42.80	59.17	59.10	65.85	47.75	39.30	17.35	-11.50
28.....	-4.60	-9.82	39.52	26.55	41.05	55.82	54.52	61.58	59.45	34.47	11.75	-22.68
29.....	8.10	.....	14.03	25.80	51.80	46.13	50.98	56.55	60.30	35.28	7.00	-24.65
30.....	7.95	.....	8.22	27.75	47.52	59.17	66.87	65.67	53.50	28.65	10.30	-27.05
31.....	7.45	.....	14.80	.....	36.18	.....	66.00	70.83	.....	23.00	.....	4.57

MOOSE FACTORY.

Mean Daily Temperature from Observations at 7 a.m., 2 and 9 p.m., 1880.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
1.....	17.30	-20.93	-8.90	36.73	32.00	39.08	60.45	56.25	.....	.....	.....	.....
2.....	-8.00	-8.80	-1.13	33.62	30.47	39.25	68.25	53.63	.....	.....	.....	.....
3.....	5.87	.....	14.33	29.40	24.03	52.27	73.90	58.57	.....	.....	.....	.....
4.....	9.60	-16.13	-6.62	24.00	22.37	61.07	57.70	50.20	.....	.....	.....	.....
5.....	5.52	-11.27	-11.25	11.57	29.57	61.13	64.67	52.40	.....	.....	.....	.....
6	12.77	-18.85	-1.55	9.40	26.55	42.47	53.12	47.90	.....	.....	.....	.....
7.....	0.70	-12.97	-13.80	16.35	34.90	40.00	53.37	56.75	.....	.....	.....	.....
8.....	16.95	-19.57	-21 30	15.63	46.38	48.02	63.25	60.70	.....	.....	.....	.....
9.....	21.20	-16.67	-12.27	28.85	44.35	57.20	50.23	54.88	.....	.....	.....	.....
10.....	-6.05	6.90	-19.83	12.63	45.07	51.83	48.67	55.25	.....	.....	.....	.....
11.....	9.50	7.15	-13.75	8.62	39.22	42.17	54.50	61.82	.....	.....	.....	.....
12.....	-16.27	13.05	-12 05	9.13	33.37	38.00	55.25	64.08	.....	.....	.....	.....
13.....	-15.88	-8.65	0.70	3.73	33.07	46.85	49.53	51.95	.....	.....	.....	.....
14.....	11.55	-2.73	5.57	8.32	47.43	53.95	58.37	46.90	.....	.....	.....	.....
15.....	2.63	8.85	9.92	18.42	47.13	58.20	60.90	52.70	.....	.....	.....	.....
16	8.80	-6.23	2.03	21.57	39.95	60.83	58.57	55.03	.....	.....	.....	.....
17.....	10.50	26.80	2.70	28.63	32.48	73.03	52.20	66.60	.....	.....	.....	.....
18	14.45	-0.68	8.18	43.97	41.75	59.63	52.92	65.60	.....	.....	.....	.....
19.....	-10.45	-4.67	21.30	42.40	50.30	66.37	53.27	48.92	.....	.....	.....	.....
20.....	-17.40	10.77	-5.80	23.45	26.83	49.18	52.57	49.72	.....	.....	.....	.....
21.....	7.25	6.80	13.87	23.37	39.02	51.10	59.93	53.45	.....	.....	.....	.....
22.....	6.17	8.80	2.35	23.22	47.05	56.78	56.52	57.75	.....	.....	.....	.....
23.....	-4.50	-22.80	-6.67	29.45	46.08	67.33	62.42	57.25	.....	.....	.....	.....
24.....	2.10	19.62	-8.80	23.25	57.00	68.60	67.40	47.60	.....	.....	.....	.....
25.....	15.50	0.50	2.42	33.60	55.53	58.22	58.67	45.78	.....	.....	.....	.....
26.....	29.40	-4.77	25.47	19.75	38.70	55.07	53.48	55.20	.....	.....	.....	.....
27.....	8.57	-9.73	12.97	23.67	38.70	69.30	51.27	58.80	.....	.....	.....	.....
28.....	-13.97	-6.83	13.70	30.17	37.25	58.43	53.28	52.57	.....	.....	.....	.....
29.....	-13.98	-6.93	8.82	25.20	55.75	55.17	66.90	48.93	.....	.....	.....	.....
30.....	7.50	.....	14.85	21.13	53.83	65.13	76.75	54.40	.....	.....	.....	.....
31.....	-16.17	.....	38.43	.....	48.37	.....	77.95	64.65	.....	.....	.....	.....

MOOSE FACTORY.

Highest and Lowest Temperature for each Day during the Year 1878.

	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°		°	°
1	21.2	-4.3	7.9	-13.1	14.8	-22.4	37.3	5.2	62.9	46.1	78.1	59.0	91.0	73.9	78.3	63.9	51.1	45.8	66.6	57.3	35.2	15.1	32.9	12.7
2	-5.4	-16.7	23.0	-14.5	30.6	13.9	35.3	15.6	65.0	40.9	72.7	47.0	74.0	57.0	71.2	58.8	58.6	45.5	66.8	47.0	27.8	17.0	30.3	24.5
3	5.5	-18.8	31.4	17.3	24.0	10.3	31.3	17.9	58.0	42.1	49.0	38.7	80.5	47.0	73.2	56.8	60.8	41.3	50.7	41.1	25.9	11.3	28.9	16.3
4	21.0	-25.6	34.4	13 5	14.8	-9.2	38.8	16.8	61.1	43.0	59.5	33.6	80.2	47.0	68.0	55.9	73.9	46.1	50.3	38.2	23.0	11.7	19.6	10.8
5	-17.7	-35.9	37.1	27.1	28.0	12.0	42.0	8.9	54.9	37.6	35.3	28.9	72.7	42.4	71.4	55.2	68.4	45.8	61.2	34.1	25.0	11.3	12.1	4.2
6	-16.5	-30 5	32.6	16.3	43.0	20.6	34.3	18.7	28.0	37.5	38.5	26.9	89.5	60.7	70.1	54.2	55.2	43.2	48.9	30.5	-32.0	12.9	15.2	8.9
7	-15.1	-31.9	39.1	20.2	48.1	29.9	33.7	26.0	56.0	44.8	57.3	31.1	91.6	60.6	68.8	52.8	70.7	51.9	60.3	36.4	36.3	29.3	11.1	-11.2
8	12.6	-20.2	36.4	-7.4	32.7	19.7	36.4	23.0	49.5	33.8	57.4	37.9	83.1	51.9	76.2	52.7	66.4	50.7	48.1	39.3	35.0	23.1	15.9	-14.0
9	18.2	6 9	3.0	-21.7	34.9	19.7	49.7	10.9	58.3	31.2	54.1	37.3	60.1	41.0	.....	.....	71.3	46.2	47.3	39.3	35.0	25.5	12.4	0.4
10	21 5	7.6	2.6	-18.2	23.4	7.1	52.6	28.4	35.9	30.0	59.3	40.1	67.2	44.8	62.0	53.7	71.1	56.2	60.5	40.6	33.8	27.7	17.6	-1.9
11	19 1	4.6	8.3	-15.5	22.6	-1.3	54.9	38.0	34.8	28.0	62.1	39.3	78.0	48.0	58.8	50.4	57.9	40.1	46.6	36.1	32.9	29.0	22.6	16.8
12	31.5	16.0	10.9	-1.9	35.7	15.9	53.6	38.0	28.5	20.6	63.7	41.0	81.9	55.0	74.2	44.6	55.1	36.9	55.7	34.7	31.8	23.3	21.2	10.8
13	31.4	10.5	10.1	4.0	34.8	29.7	38.9	34.0	32.7	19.1	63.5	39.6	69.8	48.0	69.8	56.0	53.1	37.4	51.9	37.3	23.8	19.0	12.3	5.4
14	22.9	8.4	14.3	-11.3	29.8	13.3	32.3	22.0	37.2	19.9	78.6	46 8	65.1	53.1	59.4	51.3	54.1	45.1	59.9	42.5	21.1	14.3	8.3	-1.0
15	29.4	-13.0	23.3	2.0	44.4	9.9	36.0	20.1	39.2	28.7	78.2	44.0	71.0	52.7	59.2	50.5	51.8	40.1	57.6	37.3	27.0	4.3	20.6	5.7
16	-5.6	-26.8	12.5	-2.0	38.4	11.4	34.6	24.7	54.5	30.4	49.9	42.9	72.8	59.8	69.1	47.9	57.8	50.8	40.7	31.5	32.0	16.7	16.3	12.7

17	8.9	-21.5	5.5	-19.9	12.2	0.9	34.2	26.0	43.3	34.7	63.3	42.1	74.3	63.7	64.8	54.7	62.5	47.4	58.7	37.8	38.4	24.6	15.1	6.7
18	31.5	-6.2	18.2	-18.8	34.0	0.2	37.4	25.8	46.1	30.9	65.1	42.2	85.1	65.0	73.7	53.0	53.4	37.4	45.9	33.8	40.8	27.8	10.0	-12.1
19	32.7	25.0	27.5	7.5	31.4	11.8	33.1	27.6	63.9	34.9	72.2	51.0	69.1	56.0	67.0	55.8	61.4	36.7	58.4	26.9	40.5	33.8	1.5	-13.8
20	25.4	7.7	17.2	3.8	13.0	-0.2	32.2	24.0	51.0	34.0	55.0	36.1	79.7	62.0	66.3	51.2	49.2	37.3	50.3	30.3	34.0	24.1	9.0	-4.5
21	21.8	7.6	22.4	0.3	16.2	-18.6	31.6	18.8	46.2	26.0	54.4	34.9	68.0	53.4	66.7	48.1	60.6	33.5	63.6	38.2	33.8	28.5	10.9	-4.8
22	20.4	-21.7	28.0	19.8	24.2	0.9	32.3	24.9	68.2	32.9	63.5	37.7	67.2	49.7	79.6	49.0	58.7	33.1	57.6	41.9	33.0	28.1	-3.2	-9.4
23	-12.8	-31.4	23.3	14.0	9.0	-6.0	57.5	16.8	73.7	44.4	68.3	48.9	79.0	45.3	75.2	63.1	69.3	45.4	42.3	32.8	33.9	30.3	4.8	-8.6
24	-0.9	-25.3	14.7	4.9	11.1	-18.7	57.6	23.1	66.0	50.7	59.7	43.9	70.7	59.4	70.8	56.2	65.8	36.1	55.9	29.8	33.0	28.3	18·3	4.2
25	-5.1	-25.9	26.0	-10.0	23.0	2.6	50.5	43.5	59.6	52.1	45.5	33.8	59.2	41.8	59.2	43.5	45.9	41.1	37.5	28.5	28.4	17.7	16.9	10.8
26	3.1	-17.7	42.5	18.5	33.7	17.8	34.7	34.0	55.5	46.0	69.1	34.8	69.5	42.7	55.2	38.2	46.0	39.1	30.1	26.5	25.9	7.4	19.6	0.5
27	9.1	-14.3	37.1	18.0	27.0	18.9	45.0	28.1	46·1	34.7	81.8	55.8	60.1	44.2	61.5	39.5	52.1	31.1	27.0	19.3	33.0	24.5	2.4	-8.9
28	-3.9	-21.8	18.6	-10.0	31.5	3.1	32.1	28.7	47.4	35.4	88.9	63.1	66.6	44.8	62.6	34.9	63.3	44.3	27.2	12.2	30.0	7.4	-2.5	-18.4
29	5.7	-7.3	.....	.....	42.0	10.2	45.2	27.9	47.7	35.7	90.0	69.7	61.3	47.3	67.3	50.7	64.7	42.5	27.9	18.3	15.9	7.4	2.0	-17.6
30	7.8	-19.3	.....	.....	41.6	21.9	66.1	23.4	66.1	40.9	92.1	67.9	74.7	56.1	81.3	58.7	62.7	47.4	27.2	7.6	13.7	8.2	7.3	-2.8
31	12.3	-15.5	.....	.....	37.2	15.2	.....	.....	76.5	49.4	.....	.....	81.6	61.7	74.8	51.0	.....	.....	25.2	18.3	.....	.....	11.1	-12.2

MOOSE FACTORY.

Highest and Lowest Temperature for each Day during the Year 1879.

	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1	10.9	-7.0	4.2	-18.0	8.9	-13.7	15.1	6.9	33.7	26.7	45.9	27.3	83.3	60.2	61.5	51.5	64.8	57.1	66.5	51.3	22.2	13.1	25.2	3.7
2	3.2	-8.9	8.1	0.1	21.6	-19.2	7.2	-7.0	30.6	24.3	64.2	34.5	81.8	65.2	77.8	55.0	62.6	53.1	71.8	51.0	18.5	12.5	4.0	-15.9
3	17.5	2.9	18.9	7.2	41.8	-8.2	14.8	5.2	37.1	24.6	75.9	31.6	65.3	38.4	71.6	53.0	68.2	52.1	58.8	40.8	22.1	11.8	-2.7	-27.7
4	18.6	1.1	17.9	6.2	37.5	-20.1	16.4	8.3	37.4	30.1	74.8	34.1	53.7	35.7	72.3	53.1	61.6	47.7	42.2	33.5	18.1	14.5	-1.2	-15.1
5	3.2	-6.0	18.4	4.3	-3.4	-33.4	23.8	9.2	44.9	25.4	43.4	31.8	68.9	37.1	67.3	49.3	55.6	45.4	48.9	34.4	26.6	15.0	25.4	-8.0
6	2.5	-23 0	11.1	-8.7	22.0	-4.1	40.4	13.5	42.2	29.1	41.7	30.9	82.7	52.9	58.9	44.5	54.8	42.0	77.0	38.7	31.0	21.4	35.8	24.8
7	24.0	2.0	12.0	-7.5	17.0	7.6	23.0	12.1	55.0	22.5	39.4	34.3	79.0	64.5	56.8	44.5	52.9	42.5	81.8	64.5	40.5	30.2	32.0	0.6
8	20.1	3.1	10.9	1.1	34.1	9.6	44.0	5.7	62.2	31.3	53.1	29.4	70.8	55.8	55.2	45.0	48.5	41.3	73.3	41.8	43.2	32.9	2.3	-18.0
9	2.9	-9 0	1.6	-20.3	35.4	17.3	19.2	8.6	59.6	38.2	66.6	45.3	68.9	50.2	53.7	46.0	59.5	33.8	49.1	42.5	53.2	32.3	4.5	-18.1
10	3.5	-16.8	19.1	-20.7	40.4	32.1	17.5	-0.6	45.7	32.8	68.2	54.3	80.3	55.8	66.0	44.1	67.0	43.3	73.3	49.0	33.0	30.8	30.0	3.4
11	2.7	-18.5	16.1	-16.6	32.0	10.6	19.4	-0.9	69.8	39.7	63.8	48.1	84.8	49.8	66.7	44.1	70.1	45.9	63.8	43.8	33.0	30.4	26.2	-22.1
12	2.3	-11.5	-7.1	-17.4	17.6	4.5	20.4	-1.8	54.7	31.4	50.2	38.0	68.8	40.0	58.8	47.5	65.9	52.6	56.8	45.0	32.2	29.3	-17.7	-34.3
13	-3.0	-25.5	-11.3	-30.0	14.4	-12.1	29.0	2.3	35.0	27.2	64.4	31.6	62.9	45.7	56.8	46.9	57.2	36.3	50.9	32.1	37.0	27.5	-6.3	-29.2
14	-20.1	-37.3	-10.5	-38.3	22.8	-6.0	34.0	22.3	41.1	25.9	39.8	31.1	67.7	44.0	52.2	41.3	48.2	35.1	72.2	45.3	37.4	32.3	0.9	-13.0
15	-8.8	-24.3	1.3	-25.4	2.0	-19.9	37.4	26.3	63.0	26.4	40.2	28.6	78.8	58.0	61.2	38.1	58.7	34.8	70.6	45.3	33.8	28.1	-5.2	-20.1
16	10.4	13.0	-6.3	-26.3	3.3	-23.9	36.8	28.3	73.3	33.3	50.9	32.9	63.6	52.7	74.7	45.7	58.1	49.2	65.8	44.2	31.0	22.0	-8.6	-29.7

17	25.1	12.0	-0.8	-33.3	10.5	-15.9	35.5	25.3	33.8	27.3	57.6	38.4	61.1	46.4	56.8	46.2	51.9	40.5	71.9	61.3	26.1	18.8	-13.0	-26.4
18	13.1	-11.3	-4.6	-30.5	15.1	-12.7	29.9	22.4	37.3	25.4	63.6	44.6	70.8	44.1	69.0	47.2	46.6	37.5	64.8	30.8	20.3	16.8	-15.2	-29.2
19	-10.5	-30.8	12.3	-18.2	15.6	0.1	40.0	14.8	54.2	29.3	81.7	50.2	76.0	50.9	77.9	51.6	45.9	37.8	43.7	30.3	22.9	14.8	-7.3	-32.2
20	-8.1	-24.4	-17.9	-35.3	15.0	-17.8	44.1	12.7	47.0	29.1	78.8	61.2	70.2	53.0	71.0	54.1	46.2	33.7	56.7	30.2	16.6	-3.7	-18.1	-37.3
21	-20.2	-40.3	-0.7	-41.3	14.5	-6.0	37.0	24.6	36.1	24.1	75.4	59.0	69.6	50.2	76.3	60 3	55.6	33.5	52.9	35.7	9.1	-7.9	-20.0	-42.3
22	-15.1	-40.3	15.1	-1.6	29.0	-14.5	52.2	29.8	36.0	27.1	58.8	42.1	70.6	49.3	72.7	54.2	50.1	37.3	48.1	32.8	24.6	8.4	-7.1	-20.9
23	13.1	-25.0	9.9	-7.8	30.9	13.0	37.0	27.1	70.0	29.5	64.1	39.3	54.9	43.5	58.9	52.1	45.2	29.5	33.2	23.3	17.0	-1.1	-6.3	-19.2
24	12.0	-25.0	0.3	-13.2	23.8	-3.0	44.1	28.2	60.8	33.3	56.0	39.1	70.0	35.7	63.1	50.0	45.1	27.8	27.2	18.3	24.1	-2.5	-11.6	-30.2
25	-11.5	-30.5	2.6	-16.9	18.8	-17.3	43.0	33.3	46.0	28.4	53.9	39.2	71.9	48.1	65.8	48.8	45.8	27.6	40.0	17.3	27.0	-4.9	-22.0	-41.3
26	-1.7	-32.8	-10.3	-27.2	36.0	0.1	35.9	30.0	56.1	26.3	62.8	48.3	66.2	53.5	69.3	44.1	52.7	40.1	41.9	39.0	13.1	-8.0	-19.5	-26.2
27	15.8	-1.8	-9.3	-31.2	41.7	24.4	49.0	31.3	60.6	34.0	70.7	52.0	74.2	50.1	73.9	55.3	55.9	44.3	42.0	37.6	22.5	8.2	-2.3	-26.2
28	13.9	-10.0	2.3	-21.2	46.3	34.3	33.3	23.5	48.0	27.3	66.6	49.8	57.3	49.0	68.1	57.8	64.6	43.5	38.3	31.1	17.6	4.7	-14.8	-28.8
29	19.4	-13.3	.....	.....	37.0	10.2	31.3	23.2	55.4	37.3	55.8	41.6	65.6	50.2	60.7	53.3	66.8	57.8	38.2	32.3	13.1	4.1	-16.8	-31.2
30	11.9	5.0	.....	.....	15.8	1.9	30.0	24.3	70.9	39.3	63.8	34.3	72.9	43.4	74.0	52.3	56.8	55.0	35.2	15.8	17.1	0.1	-21.0	-45.3
31	9.1	-9.7	.....	.....	25.1	-2.8	.....	.....	40.3	34.0	.....	.....	74.7	58.2	82.8	60.1	.....	.....	26.1	21.3	.....	.....	8.4	-16.9

MOOSE FACTORY.

Highest and Lowest Temperature for each day during the year 1880.

	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1	29.5	-7.2	-12.7	-30.7	2.3	-23.3	44.0	28.8	45.8	12.8	44.2	34.3	68.8	52.2	77.6	50.3	.....	.....	.....	.....	.....	.....	.....	.....
2	32.0	-16.9	2.0	-24.1	14.2	-10.5	44.0	29.3	37.7	23.4	46.2	33.3	80.3	50.6	60.2	47.0	.....	.....	.....	.....	.....	.....	.....	.....
3	16.9	-26.0	-3.6	-24.1	26.0	6.0	32.2	24.3	32.2	18.3	62.3	33.7	80.8	58.1	68.0	44.0	.....	.....	.....	.....	.....	.....	.....	.....
4	30.5	-1.4	-4.6	-29.0	8.0	-13.0	32.0	18.8	25.1	18.1	67.0	46.3	70.9	51.5	54.9	47.0	.....	.....	.....	.....	.....	.....	.....	.....
5	15.1	-16.1	4.2	-20.6	3.0	-20.1	21.4	6.7	31.8	24.3	70.1	54.3	76.7	53.0	66.9	45.4	.....	.....	.....	.....	.....	.....	.....	.....
6	35.1	-2.9	-7.4	-31.1	9.3	-20.1	18.1	-0.1	32.0	15.5	60.3	38.3	61.0	42.2	54.0	42.3	.....	.....	.....	.....	.....	.....	.....	.....
7	6.2	-9.0	-1.7	-25.9	5.9	-24.1	24.4	-3.7	42.5	18.5	43.9	37.5	55.0	47.4	63.8	42.8	.....	.....	.....	.....	.....	.....	.....	.....
8	29.5	-4.1	-5.5	-27.7	-4.0	-38.4	23.9	-1.7	57.2	33.6	55.4	37.3	69.9	46.2	72.7	53.5	.....	.....	.....	.....	.....	.....	.....	.....
9	40.8	2.6	-10.6	-34.6	-4.6	-22.5	42.0	21.2	50.8	37.5	61.6	41.5	59.6	45.8	64.3	51.2	.....	.....	.....	.....	.....	.....	.....	.....
10	-2.3	-14.7	14.4	11.0	-6.5	-31.8	25.1	8.2	52.9	39.6	62.3	47.3	58.5	43.2	64.2	42.5	.....	.....	.....	.....	.....	.....	.....	.....
11	25.1	-2.9	13.1	-5.6	0.8	-39.5	15.1	3.3	48.9	34.5	47.0	39.5	61.8	40.3	71.9	48.2	.....	.....	.....	.....	.....	.....	.....	.....
12	-3.4	-20.3	22.1	5.6	1.5	-26.2	14.6	-4.6	37.3	30.8	43.2	34.8	61.7	50.0	76.7	54.4	.....	.....	.....	.....	.....	.....	.....	.....
13	-7.7	-29.2	5.4	-16.1	12.2	-24.5	11.1	-2.0	38.9	27.8	53.8	33.9	59.3	43.0	58.7	48.8	.....	.....	.....	.....	.....	.....	.....	.....
14	30.2	-15.6	6.0	-27.2	10.8	2.1	15.0	-10.1	54.9	24.5	61.6	37.0	65.3	42.3	51.1	44.8	.....	.....	.....	.....	.....	.....	.....	.....
15	10.1	-12.0	18.1	1.6	19.1	-7.3	25.9	11.2	65.8	38.8	66.8	42.5	70.7	56.4	59.8	42.5	.....	.....	.....	.....	.....	.....	.....	.....
16	16.1	-2.1	6.2	-12.8	17.4	-7.8	32.3	-2.5	49.0	35.8	67.2	44.3	67.8	51.8	72.0	50.1	.....	.....	.....	.....	.....	.....	.....	.....

17	26.3	-0.9	34.0	-11.0	17.1	-20.8	37.2	15.4	44.0	28.5	82.8	47.4	57.8	48.5	73.7	49.5	.....	.....	.....	.....	.....	.....	.....	.....
18	27.5	-10.2	34.0	-5.5	33.7	0.0	51.0	29.3	46.2	26.6	72.0	56.2	58.6	49.0	74.9	49.4	.....	.....	.....	.....	.....	.....	.....	.....
19	19.1	-17.1	-1.6	-10.0	33.8	-9.2	50.0	36.7	65.9	42.8	82.3	52.3	61.8	49.4	61.9	46.4	.....	.....	.....	.....	.....	.....	.....	.....
20	-6.6	-28.7	18.9	-14.0	26.8	-12.0	42.5	15.3	42.0	25.3	60.3	42.5	56.7	42.3	52.5	43.0	.....	.....	.....	.....	.....	.....	.....	.....
21	5.8	-25.2	20.1	2.1	22.1	-22.8	32.7	15.6	45.0	24.8	58.8	37.4	69.0	50.5	57.7	51.2	.....	.....	.....	.....	.....	.....	.....	.....
22	11.4	-3.4	21.5	-4.2	20.0	-4.1	29.0	8.2	51.8	38.3	65.2	42.7	60.8	52.2	63.4	49.0	.....	.....	.....	.....	.....	.....	.....	.....
23	6.5	-9.2	7.9	-27.6	2.3	-11.0	37.0	12.6	53.4	40.4	78.7	54.1	71.4	50.1	64.6	52.4	.....	.....	.....	.....	.....	.....	.....	.....
24	12.1	-20.8	32.0	-25.4	0.8	-22.7	33.8	14.8	64.0	41.3	76.6	60.3	78.9	54.6	56.1	44.8	.....	.....	.....	.....	.....	.....	.....	.....
25	20.3	11.8	28.0	-5.2	28.9	-13.6	46.0	14.3	62.7	52.6	78.8	46.3	74.9	49.6	52.9	36.9	.....	.....	.....	.....	.....	.....	.....	.....
26	36.0	7.6	1.9	-11.9	39.0	4.2	33.2	12.3	53.9	34.8	61.8	41.4	61.5	49.0	63.8	39.0	.....	.....	.....	.....	.....	.....	.....	.....
27	36.8	2.6	-2.4	-13.5	27.0	7.9	35.0	12.5	53.5	33.6	78.1	58.0	60.6	46.3	61.8	51.1	.....	.....	.....	.....	.....	.....	.....	.....
28	2.3	-18.1	-1.6	-16.1	21.1	2.1	38.4	13.8	45.7	29.8	72.9	53.9	63.4	42.3	64.0	49.2	.....	.....	.....	.....	.....	.....	.....	.....
29	-7.3	-30.4	-1.6	-10.5	19.0	0.0	35.8	14.3	64.6	34.0	62.8	47.5	76.9	45.3	53.6	43.4	.....	.....	.....	.....	.....	.....	.....	.....
30	13.3	-9.7	.....	.....	34.0	7.6	29.0	12.5	73.9	50.0	73.8	46.1	87.5	64.0	62.8	36.7	.....	.....	.....	.....	.....	.....	.....	.....
31	7.4	-22.1	.....	.....	49.5	9.3	.....	.....	66.3	41.7	.....	.....	85.1	68.1	76.1	48.2	.....	.....	.....	.....	.....	.....	.....	.....