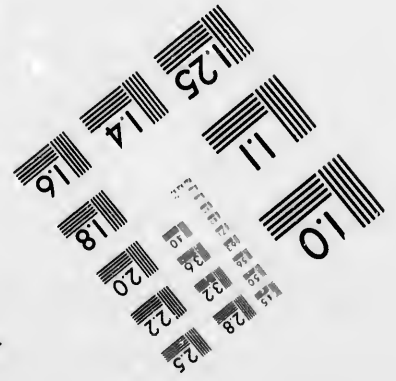
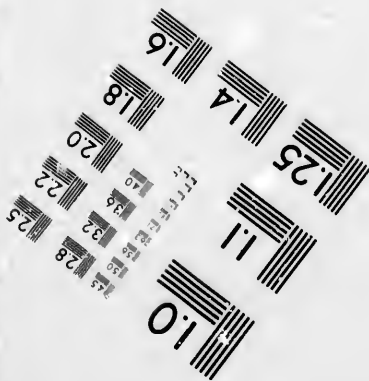
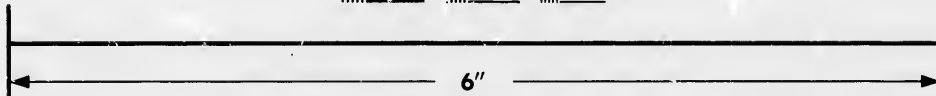
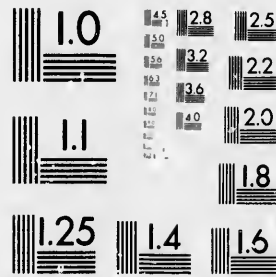


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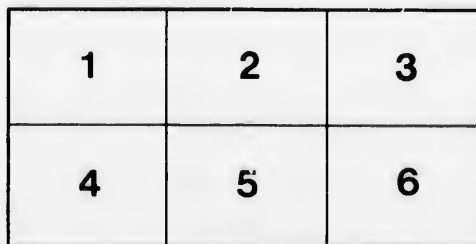
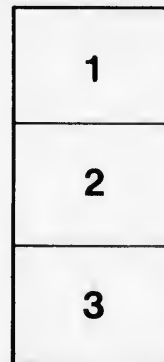
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GEOLOGICAL AND NATURAL HISTORY SURVEY OF CANADA.
ALFRED R. C. SEI WYN, C.M.G., LL.D., F.R.S., DIRECTOR.

REPORT

ON

AN EXPLORATION OF PORTIONS OF THE

AT-TA-WA-PISH-KAT & ALBANY RIVERS,

LONELY LAKE TO JAMES' BAY.

BY

R. BELL, B.A.Sc., M.D., LL.D.

1886.



PUBLISHED BY AUTHORITY OF PARLIAMENT.

MONTREAL :
DAWSON BROTHERS.
1887.

To A. R. C.

SIR,—
during the s
December 1
Interior.

To A. R. C. SELWYN, Esq., C.M.G., LL.D., F.R.S.,

Director of the Geological and Natural History Survey of Canada.

SIR,—Herewith I beg to submit a report of my geological work during the season of 1886, a summary of which was handed you in December last, and published in the Report of the Minister of the Interior.

I have the honor to be,

Sir,

Your obedient servant,

ROBERT BELL.

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ROBERT BELL, B.A.Sc., M.D., LL.D.

The work which I was instructed to carry on during the season of ^{Instructions.} 1886 consisted, first, of an examination of the Grand Manitoulin Island, in order to verify the boundaries of the various formations which I had previously traced in 1865 and 1866, and which will now be laid down upon a map about to be published on a scale of four miles to one inch; and secondly, to make an exploration and survey of parts of the At-ta-wa-pish-kat River on the western side of James' Bay, and, if possible, to complete the survey of the Albany River. These objects were successfully fulfilled, and I shall now proceed to describe the results, and at the same time refer to the methods by which they were accomplished.

In pursuance of the above instructions I left Ottawa on the 12th of June, and after spending two days in obtaining some necessary articles in Toronto, I proceeded to Manitowaning on Grand Manitoulin Island, ^{Manitoulin Island.} and arrived there on the 16th. Eight days were devoted to the object above referred to, and as the roads and the weather were favorable, good progress was made, and the details of boundaries of the formations were accurately located over a large area in the townships of Sheguendah, Howland, and Bidwell. But as it was evidently impossible to complete the work before it became advisable to start for my more northern field, I left Manitowaning on the 24th of June, and

Men and
Assistant.

arrived at Sault Ste. Marie on the 25th. Here I hired six reliable men as voyageurs, and purchased a bark canoe. Leaving the Sault on the 27th, I arrived at Port Arthur on the 28th. Mr. John MacMillan and Mr. Alfred P. Murray accompanied me as assistants. Within an hour after arriving at Port Arthur, the whole party was sent on by the Canadian Pacific railway to Wabigoon, which had been selected as the point from which a start could be made on the best route to the region to be explored.

Start from
Wabigoon.

After purchasing most of our provisions for the season at Port Arthur, I proceeded to Red Rock, where I succeeded in obtaining a canoe from Mr. Newton Flannigan, of the Hudson's Bay Company. I might here remark that canoes large enough for our purposes have of late years become scarce and difficult to obtain. But I had arranged with Mr. Alex. Matheson, the H. B. Co.'s agent at Rat Portage, to have two ready for me, and these were now sent to Wabigoon. On the 1st of July, having forwarded my supplies and the other two canoes from Port Arthur, I proceeded to Wabigoon, arriving there on the 2nd. Our journey began with a portage about nine miles long, in a north-north-easterly direction, from Wabigoon to Big Sandy Lake. The four bark canoes were carried across this portage on our men's shoulders, while most of the supplies were taken by waggon over a "tote-road." While this work was in progress, I proceeded to Rat Portage to procure some necessary supplies from the Hudson's Bay Company, and returned on the 6th. The portaging having been completed on that day we crossed Big Sandy Lake, and camped at the south-western extremity of Minnetakie Lake.

ROUTES FOLLOWED.

Sketch of
routes.

Before entering into details of my exploration and its results, the description will be rendered clearer by the following short sketch of the routes followed throughout the season. From Wabigoon, a general north-easterly course was followed, via Lake Minnetakie and Lake St. Joseph, the Albany and Attawapishkat Rivers, to James' Bay. The water-shed between the rivers just named was crossed from the highest of the chain of lakes on the Eabamet Branch, by which we left the Albany at about 90 miles in a straight line below the outlet of Lake St. Joseph. On crossing the height of land we struck the headwaters of a branch of the Attawapishkat, having a north-easterly course. This we followed with much difficulty to its junction with the main river, a distance of about thirty miles.

Soon after passing the height of land, I decided to send back Messrs. MacMillan and Murray with two of the men from Sault Ste. Marie to

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make a geological exploration of the route from Lake St. Joseph to Cat Lake and thence by Goose River to the west end of Lonely Lake. They explored about two-thirds of Cat River and returned via Lake Cat River. St. Joseph and the route by which we had entered it.

On arriving at the Attawapishkat River with my four men, I left the bulk of our stores in charge of one of them, and proceeded with the others to explore the river towards its source. Returning to this camp after a few days, we next descended the river to the sea, making a careful track-survey of it, taking numerous latitudes all the way to its mouth, a distance by the general course of the river of about 300 miles. We then coasted in our canoes to the mouth of the Albany Albany River. River. A detailed track-survey of this large stream was made from James' Bay to "The Forks" or the junction of the Kenogami, above which point I had surveyed both branches instrumentally in 1871. The Kenogami was ascended to Long Lake, from which, passing over the Lake Superior height-of-land, we descended the Black River to its intersection with the Canadian Pacific railway. As I was obliged to convey my men home to Sault Ste. Marie, the most direct route for doing so was by way of Port Arthur, which we reached on the 13th of October.

The different parts of the route above indicated will now be described with more particular reference to their geological features, but at the same time the geographical peculiarities, the aspect of each section, the timber, soil, climate, etc., will also be noticed.

PELICAN RIVER AND LONELY LAKE.

As the geology of the route between Wabigoon and Lonely Lake Post, via Frenchman's Head or "Lost Lake," was examined and reported upon in 1872, on this occasion, in order to explore new ground, I followed the main Pelican River from the point at which it Pelican River. turns off at right angles from Frenchman's Head Channel between Pelican Lake and Frenchman's Head Lake, and flows north-north-eastward into Lonely Lake. The Indians informed me that the outlet of Sturgeon Lake, which supplies a large part of the water of Pelican River, enters the north-east bay of Abram's Lake, and we ascertained in 1872 that the stream which we then descended, called Sturgeon Lake River, and which enters the eastern part of Minnetakie Lake, does not flow out of Sturgeon Lake at all. At a distance of six miles, in a straight line, from the above point of divergence from Frenchman's Head Channel, we came to the level of Lonely Lake at the foot of a slight rapid, down which we ran our loaded canoes without difficulty. The eastern part of Lonely Lake spreads itself in straggling

channels and bays over a much wider area than has hitherto been represented on the sketch-maps of the region.

Huronian
rocks.

The Huronian rocks are everywhere met with from Wabigoon to the south side of Pelican Lake, where they give place to Laurentian gneiss. Near the junction with the latter, the Huronian schists run about west with a straight course, and the distinct banded structure which here characterizes them is nearly vertical. Both Abram's and Pelican Lakes are traversed by partially submerged ridges of boulders, having the same south-westerly course as the glacial striae.

Gneiss of
Lonely Lake.

Along the Pelican River, the rocks consist of grey, banded gneiss, of which the strike is for the most part between east and north-east and the lamination is on edge. Gneiss, of common red and grey varieties, continued all along our course through Lonely Lake to its eastern extremity, but a marked change was noticed in the strike in the narrow north-westward "jog," where its course was about north with a dip to the east of from 10° to 50° . About the middle of this section of the lake, the gneiss is much broken and mixed with granite. The shores of the eastern part of the lake are mostly marshy, but at the eastern extremity, massive gneiss is seen, and at a point on the north-west side, two miles from the extremity, the strike of a similar variety was observed to be north-west. It may be here incidentally remarked that gneiss with a little granite and a few trap dykes, are the only rocks which have been observed on any part of this sheet of water, which is nearly 100 miles in length.

Pelican River is the largest feeder of Lonely Lake, and as its waters are tolerably clear, they impart the same character to the lake west of its mouth, but to the eastward the water of the lake acquires the brownish color of Root River, which empties into its eastern extremity.

ROOT RIVER.

Root River.

The general upward course of Root River, which is followed in going from Lonely Lake to Lake St. Joseph, has a north-easterly bearing, but the stream is very crooked, and it curves considerably to the south-eastward of a straight line. We followed this river to a point eighteen miles in a direct course from its mouth. Here the main stream bends off to the west, and we turned up a small branch from the north-north-east, which having no other name, we called Pond Lily Brook, and at the end of three and a-half miles, in a straight line, came to the height-of-land portage, half-a-mile long, leading over to the western extremity of Lake St. Joseph. The lower half of the eighteen miles of Root River which we followed, is a sluggish stream, expanding in several places into small lakes with wide marshy borders. On the

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above route, massive gneiss is exposed in many places all the way from the east end of Lonely Lake to the west end of Lake St. Joseph. On the top of the nearly bare hills of gneiss, on the west side of Pond Lily Brook, half way between its junction with Root River and the height-of-land portage, some angular fragments of fine-grained siliceous magnetite were found. The height-of-land portage, which rises only a few feet above the level of Lake St. Joseph, passes over bouldery and clayey ground, with a bog in the middle.

Magnetite.

LAKE ST. JOSEPH.

In 1885, Mr. Thomas Fawcett, D.L.S., measured a zig-zag line through Lake St. Joseph by means of the Lugeol micrometer, the angles being taken with the transit. In constructing the accompanying map, his distances have been adopted, while the details are taken from my own sketching, based on a track-survey made by a floating boat-log and careful timing of the speed of my canoe, all bearings being taken by a good compass.

Map of Lake St. Joseph.

The mean of ten barometric observations, noted on as many different days, on Lake St. Joseph, give its elevation as 1,172 feet above the sea. Its general course is east-north-east, true, and its length from the western extremity to the northern of its two outlets at its opposite end, is fifty-eight miles, and to the more southern outlet fifty-five miles.

Level of Lake.

The breadth varies from a quarter of a mile to three miles, with an extreme width of eight, measuring across points, but the average would be about one mile and a-half. It may, therefore, be described as a narrow straggling sheet of water of the above dimensions, the area of its water-surface being much reduced by the points and peninsulas and the great number of islands of all sizes, from three miles in length downward, which it contains. The largest space of open water is the Grand Traverse, at about two-thirds of the distance from the west end, which is three miles wide and measures eleven miles from south-west to north-east.

Dimensions.

The country around Lake St. Joseph may, in a general way, be said to be level, although some low rocky hills are to be seen in places. Ridges of granite, nearly destitute of timber, occur around the western mouth of Cat River, not far from the west end of the lake. To the eastward of the first narrows, east of the eastern mouth of this river, rounded hills of gneiss may be seen on both sides; and again on the west side of a northern arm, fifty miles from the west end. In the narrow section towards the east end, which has a general south-east course, but in which all the points and bays run north-east and south-west, a few low ridges of gneiss run parallel with these, and some long

Surrounding country.

rows of boulders or moraines, rising just out of the shallow water, have the same direction. It will be observed that while the general course of the lake is about east-north-east, the bays and points run more nearly north-east and south-west. A table of the directions of the glacial striae is given further on, from which their average bearing will be seen to be south-west, thus corresponding with the general trend of the depressions in the face of the country. At the "Fall Fishery Station," forty-four miles from the west end, the surface of the quartzose gneiss, which occurs there, is thoroughly planed off, and along with the striae, running S. 30° W., the bruised crescent-shaped marks, indicating great pressure, may be seen following each other in rows, their concavities looking south-westward, showing that the glacial movement was in that direction.

Soil. It would be difficult to estimate the proportion of cultivatable soil compared with the worthless area in the country adjacent to the shores of Lake St. Joseph, but the percentage does not appear to be great. In some places, both on the main shores and the larger islands, low banks of sand and of yellowish loam were seen, but, as a rule, the surface appears to be either too stony or too level and wet to give much promise as a farming region. The Indian name of Lake St. Joseph is "the lake of the swampy country."

Climate. The climate in the immediate vicinity of the lake, at all events, appears to be sufficiently good to admit of the growth of a variety of crops. At Osnaburgh House, near the east end, where the soil is of a sandy nature, the principal crop cultivated at present is potatoes, but early Indian corn, peas, beans, and a variety of roots and other vegetables, to say nothing of a profusion of flowers, were in a flourishing condition in the end of July. In former years, when cattle were kept at the post, barley was said to have been a regular crop. Hay grows very luxuriantly. I was credibly informed that pumpkins and muskmelons had frequently ripened at this establishment.

Timber. The timber all around Lake St. Joseph has suffered greatly from forest fires at many different times, from about a century ago to the present year. Parts of the main shores and many of the islands, especially in the neighborhood of the Grand Traverse, have escaped the fires, and here full-sized timber may be seen. The second growth woods are of all ages, from seedlings of a year or two, up to trees nearly as large as those of the original forests. As elsewhere in these latitudes, where the old forests of spruce, tamarac, balsam, white birch, etc., have been burnt, they are succeeded by a growth of mixed aspens and white birch, with a sprinkling of spruce, or else by one consisting almost entirely of Banksian pine. In regard to relative abundance, the trees found around the lake may be mentioned in the follow-

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ing order:—white and black spruce, tamarac, aspen, white birch, Banksian pine, rough-barked poplar, balsam, white cedar, pigeon cherry, rowan and black ash. The ground or mountain maple (*Acer spicatum*), which is interesting as an indicator of climate, is common, and it was traced for a long distance down the Albany. Of the above kinds of timber, the white spruce and the tamarac are the most important commercially. The cedar is confined chiefly to the immediate shores of the lake, where it often forms a continuous but narrow border. It has the same habit around the other lakes and along the rivers in the whole of this part of the Dominion. But it is also frequently found in large patches in the inland swamps of these regions. About twenty spruce logs, for sawing into boards, were lying at Osnaburgh ^{Saw logs.} House at the time of our visit. They would average eighteen or twenty inches in diameter at the butts, the largest being about two feet. The six largest showed the following number of rings of growth:—113, 97, 121, 116, 107, and 120, or an average of 112, these rings indicating, it is supposed, a corresponding number of years. A new tamarac flag-staff, which was about to be erected, measured about eighteen inches in diameter at the butt and showed 244 rings of growth.

The number of Indians living around Lake St. Joseph is not very ^{Indians.} great. They live principally upon fish in summer and rabbits in winter, but these resources are supplemented by geese and ducks in the spring and autumn, and occasionally by larger game, such as caribou and bears at any season. The fishes of the lake comprise white-fish, grey trout, sturgeon, pike, pickerel, yellow-barred perch, grey and red suckers, besides some smaller species.

ROCKS OF LAKE ST. JOSEPH.

The rocks observed on the shores of Lake St. Joseph will now be described. Leaving the portage at the west end of the lake, massive grey gneiss, striking about east and west, occurs on both sides at be- ^{Gneiss.} tween two and three miles, and again on the north side at four miles and a-half, where it strikes S. 80° W. About a mile further on the rock has changed to a light pinkish-grey granite of medium texture, ^{Granite.} which consists principally of felspar and quartz, the mica being in very small quantity. This rock extends up the channel which forms the western mouth of Cat River, for at least four miles, but the channel was not explored any further. Along the main channel of the lake, beginning at six miles from the extremity, a soft, glistening, green, calcareous ^{Green schist.} schist flanks this granite on its south side. This schist continues for ten miles, with a strike varying from S. 60° W. to S. 70° W. A small island at eighteen miles, consists of coarse, massive grey siliceous schist,

striking west. Another small island, half-a-mile north of the last, is formed of massive dark greenish-grey dioritic schist. A similar schist, running N. 80° W. was found on another island two miles further on, or about three miles east of the eastern mouth of Cat River. Half a mile east of the last-named island, a grey rusty-surfaced mica schist on a small island was found to run N. 60° W. At the western entrance of the narrows, twenty miles from the west end of the lake, green schists strike N. 50° W. The long island in these narrows consists of dioritic schist and conglomerate. An islet on the north side of the eastern entrance of these narrows, or about seven miles E. by S. of the eastern mouth of Cat River, consists of a massive coarse crystalline hornblende rock, becoming somewhat schistose on the south side. Its strike is east and west.

About a mile east of the last mentioned islet, both shores of the lake were found to consist of gneiss, so that the dividing line between the Huronian and Laurentian, which occurs in this interval, will be about twenty-four miles, in a straight line from the western extremity of the lake. Time did not permit of a fuller examination of the Huronian rocks of the western part of Lake St. Joseph, but the foregoing examples will serve to give an idea of their characters which, it will be observed, are somewhat varied.

The gneiss near its contact with the Huronian schists, and for some distance onward, strikes east and west, or parallel with the latter. At thirty-eight miles from the western extremity of the lake, a long bay runs off to the north-eastward. The gneiss in its vicinity is of a hornblende character, and its strike is S. 45° W. On the northern shore of the lake, forty-four miles from the west end, is the fishing station, already mentioned, at which large quantities of white-fish are taken late in the autumn or just before the ice forms. At this place the rock consists of light grey gneiss. A northward arm of the lake runs for six miles beyond the fishery, and the massive light-colored gneiss extends all the way to its extremity.

The rocks of the eastern part of the lake correspond with some of those of the Huronian series. On the northern side, at four miles from the southern outlet, or three miles from the Hudson's Bay Company's post called Osnaburgh House, which is situated opposite to this outlet, a grey mica-schist dips S. 60° E. < 60°, or strikes S. 30° W. It is cut by a wide vein of coarse light-colored granite, in which a considerable proportion of mica is mixed with the felspar and quartz. Opposite to this point is the mouth of a small river, called the Pedler's Path, which forms part of a route to Lake Nipigon. My assistant, Mr. Murray, ascended it for about six miles, in which distance he passed through three small lakes. He found the rock at the mouth to consist of rather

Dioritic schists.

Conglomerate.

Gneiss.

Strike.

Huronian rocks.

Mica schist and granite.

Pedler's Path.

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fine-grained hornblende schist, striking west. The long bay running northward from Osnaburgh House, was examined by Messrs. Murray and MacMillan to the extremity, from which the northern outlet of the lake flows. They found the rocks along the western shore to consist of hornblende and mica-schists with some fine-grained gneiss, all striking about east and west, except at the northern extremity of the bay, where a fine-grained gneiss had a north-westerly strike. The schists are traversed in several places by large veins of coarse granite, which having resisted denudation better than the surrounding rock, stand out as small points in the lake. On the east side of this bay, gneiss was the only rock observed north of the southern outlet, where, however, a grey mica-schist, striking north-west, occurs along with light-colored coarse granite.

East end of
Lake.

This completes the description of the geology of Lake St. Joseph as far as I was able to investigate it in the limited time at my disposal. It will be observed that the prevailing rocks around it are gneisses, but that Huronian schists, etc., extend between seven and twenty-four miles from the west end, and are again developed around the eastern extremity; also that granite prevails about the western mouth of Cat River, and this rock will be shown to extend from near the southern outlet of the lake for a considerable distance down the Albany River.

ALBANY RIVER—UPPER SECTION.

Leaving Lake St. Joseph by the southern outlet, at two miles down the Albany River, which takes its rise in this body of water, we came to Hugh's Creek Portage, on the north side, 460 paces long, with a descent of ten feet in the river. The rock is here dark green, fissile, hornblende schist, striking N. 65° W., nearly vertically. From the foot of this rapid an expansion of the river, called Deep-and-Shoal Lake, extends north-westward to the rapids at the northern outlet of Lake St. Joseph. A river without any recognized name enters the Albany from the south, six miles below the southern outlet. Two miles below Hugh's Creek Portage, a light pinkish grey granite makes its appearance on the points and continues for nine miles, or to the northern outlet of an expansion, three miles wide, called Atik-o-ki-wam or Deer Lodge Lake, which has two discharges that unite again only nine miles further down. The Albany, with its lake-like expansions, from its head at Lake St. Joseph to Deer Lodge Lake is shallow, and full of angular and rounded boulders of granite. The shores are mostly low and covered with brush and grass alternating with knobs of granite. The timber further back was burnt two or three years ago. At the northern outlet of Deer Lodge Lake, the rock is a somewhat

Hugh's Creek
Portage.

Granites.

- Diorite.** coarsely crystalline diorite, having a bright fracture, the crystals of black hornblende and white felspar together, giving it a general dark grey colour. It probably belongs to a large dyke cutting the granite. From Deer Lodge Lake we followed the northern and larger channel, which is broken by numerous rapids. Portages are required at four of these, the first being the Smooth Stoney Portage on the north side, at four miles, 715 paces long, with a fall of thirty-six feet. The others are called the three Kagami Portages, and all occur in the last mile before arriving at the junction of the two channels.
- Smooth Stoney Portage.** The 1st Kagami Portage, on the N. side, has a fall of five feet, and is 100 paces long.
- Kagami Portages.** The 2nd Kagami Portage, on the S. side, has a fall of 27 feet, and is 750 paces long.
- The 3rd Kagami Portage, on the N. side, has a fall of eighteen feet, and is 570 paces long.
- Granite.** Between the diorite at the outlet of Deer Lodge Lake and Smooth Stoney Portage, granite occurs in several places. At one locality in this interval a granitoid rock showed traces of lamination, running north-easterly. At the portage just mentioned, a massive grey granite gneiss strikes N. 30° E. At the first and second Kagami Portages the rock consists of fine-grained reddish grey granite, in which quartz is the most and mica the least abundant constituent; while at the third of these portages it is a pinkish-grey gneiss striking N. 60° W., with vertical lamination. A great rapid or chute occurs in the southern channel from Deer Lodge Lake where it falls into the other branch opposite to this portage.
- Gneiss.** From the foot of the long island just described, the general course of the river is north-eastward to the junction of the Etow-i-ma-mi River, from the northward, a distance of thirty miles. It is considerably broken by rapids, but we ran our loaded canoes down all except two of them, at which portages required to be made. Gneiss, which was generally coarse, grey, and massive, was observed in several places in the above thirty miles, and wherever the lamination was apparent, the strike was to the northwestward. At a southward angle of the river, about eight miles above the Etow-i-ma-mi branch, the Mischkow River falls in from the south.
- Etow-i-ma-mi River.** Below the Etow-i-ma-mi the Albany turns south-east for five miles, when it is joined by the Sha-bush-quai-a River from the southward. At two and a-half miles below the former branch, Huronian rocks make their appearance. They consist of light-greenish, rather finely crystalline hornblende schist; black, with some light colored schist, together with fifteen or twenty feet of fine-grained banded magnetic iron ore with slaty partings. A specimen of this ore was analysed by Mr.
- Huronian rocks.**
- Iron ore.**

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Kenrick of the Geological Survey, and found to contain 42.09 per cent. of metallic iron, and to be free from titanitic acid. Along with the magnetite is a band of iron pyrites, a few inches thick, with traces of copper. These rocks are so much disturbed that it is impossible to determine their strike. The joints in the hornblende schist are slickensided, and many of them are occupied by strings of calc spar.

A dark green hornblende schist occurs at two miles before coming to the Sha-bush-quai-a River, and strikes N. 70° E. < 90°. It holds patches of calc spar and quartz running with the cleavage. ^{Hornblende schist.}

The Eska-qua, or Green Bush Portage, being the 8th from Lake St Joseph, is met with at a mile and a-half below the Sha-bush-quai-a River. It is on the right or south side, and is 505 paces long. There is a nearly perpendicular fall in the river of fifteen or twenty feet, and the total descent at the portage is about twenty-five feet. The rock is a soft, green schist, striking N. 85° W. with great regularity. Specks of copper pyrites were found in small quartz veins in the schist at the foot of the fall. A mile below this portage, similar schist and a hornblende rock, having a pitted weathered surface, strikes S. 80° W. ^{Green Bush Portage.} ^{Copper pyrites.}

The Lower Eska-qua, or 9th Portage, on the right side, and 185 paces long, with a descent of twenty-five feet, occurs at two miles below the last. Soft green schist with calc spar in the joints and cleavage-planes is found here. One band shows a concretionary lenticular structure. The strike is S. 65° W., with a south-eastward dip of 75°.

The head of the 10th, or Snake Portage (Kenaibik Inigum), on the left side, is a mile and a-half below the last. It is 480 paces long, and the descent in the river is ten feet or more. Soft, green schist, striking S. 75° W. is here largely exposed. Much of it has the concretionary structure so often observed in the Huronian schists. It is traversed by a band or dyke of coarse, grey felsite, from nine to thirteen feet wide, in which grains of blue quartz are thickly disseminated. Its general course crosses the cleavage of the schist, but it bends suddenly at an angle of 55°. Large glacial furrows, running in a south-westerly direction, occur at Snake Portage. Between this portage and the inlet of Maminiska Lake, four miles further on, chloritic schists are exposed in two places, the strike ranging from S. 10° W. to S. 25° W., the bedding or cleavage being vertic. ^{Snake Portage.} ^{Concretionary green schist.}

The country on either side of the Albany River, all the way from Lake St. Joseph to where the Huronian rocks commence, below the Etow-i-ma-mi branch, is generally level, few hills of any kind being seen. The shores of the river are rocky or bouldery, but the banks often show gravel, sand, loam, and clay. But from the last-mentioned locality to Maminiska Lake and to the south of this sheet of water, numerous earthy-looking hills are visible. Wherever a view can be ^{Character of country.}

obtained over the country, long slopes or gentle undulations may be seen, the hill-sides being covered either with old timber or a second growth of aspen and white birch. Some small grey elm trees were observed at the inlet of Maminiska Lake, being the first noticed since leaving Minnetakie Lake, where a single small tree of this species was seen. A grove of black ash occurs with the elms, but this tree is not uncommon along the Upper Albany.

Maminiska Lake. Maminiska Lake runs north of east, and is about sixteen miles long. It is divided by a very narrow place, about half-way down, into two equal parts, each three miles wide. The rock at the narrows consists of a hard close-grained diorite, of a somewhat concretionary character. An obscurely stratified appearance in it has a west-south-westerly bearing.

Cedar River and Lake. Cedar River enters the north side of the lower division of Maminiska Lake. An Indian, whose hunting grounds surround Cedar Lake, at the head of this river, described it as being about the size of the lower division of Maminiska Lake, and containing many islands. It would appear to lie about thirteen miles north of the latter. He said there were six portages on Cedar River between the two lakes.

The outlet of Maminiska Lake is on the south side of the eastern half, and, after a rapid descent southward of two miles, the river falls into the head of Patawonga Lake.

Diorite. The 11th Portage, 110 paces long, by which we got past a steep chute, with a fall of eighteen feet, is on the left side, and about midway between the two lakes. The rock at this chute is a coarse, grey stratified concretionary diorite, with spots of light-coloured felspar and a smaller proportion of spots and patches of green epidote scattered irregularly through it. It strikes west, dipping southward at an angle of 60° to 70°, and contains a good many irregular veins of quartz, holding epidote and hornblende, the veins for the most part running with the stratification. A number of these veins, from three to fourteen inches thick, were carefully examined for metallic ores, but none could be detected.

Patawonga Lake. Patawonga Lake is about thirteen miles long, with a course bearing to the south of east, and varies from half-a-mile to two miles in width. It is surrounded by a level country. Two rivers flow into it from the south and one from the north. On the south side, near the outlet, schists, supposed to be Huronian, standing in a vertical attitude, strike east and west. An islet, about midway between the extremities, consists of a gneissoid rock, composed of quartz, hornblende, and a triclinic felspar, striking N. 75° W. Ordinary gneiss occurs on an island in the outlet.

Huronian schiste. Within the first two miles from the outlet of Patawonga Lake there is a strong rapid, with a descent of from twenty to thirty feet, requir-

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ing a portage (the 12th) of a few hundred yards, but it varies in ^{12th portage.} length according to the height of the water; and at three miles the river falls into Ka-wi-tos-kam-igamog Lake. This is five miles long and has a north-easterly course. It is remarkable for having a straight ridge of drift which forms an island nearly two miles long, running down the middle of its lower part. The 13th Portage, 290 paces long, crosses part of an island at one mile below the last lake, and the descent in the river is about twenty feet. Gneiss was observed in two places in the next two miles. At the end of this distance we entered a lake measuring about two miles along its north-west side, and which from its shape might be called, for convenience, Triangular Lake. The Eabamet River enters the north-eastern angle of this lake, while the ^{Eabamet River.} downward continuation of the Albany flows out of its south-eastern corner. From the junction of the Etow-i-ma-mi, mentioned above, to this lake, a distance of upwards of forty miles, the general course of the Albany has been about east, but it now turns south-east. Triangular Lake is within twenty miles of Abazotikitchewan Lake, at which I struck the Albany in 1871 when making a micrometer survey of a canoe-route from Lake Nipigon. From this point, the survey of the river was then carried down-stream to The Forks, or junction of the Kenogami. In order to connect the upper part of the river with ^{Connecting surveys of Albany River.} this survey, I sent Messrs. MacMillan and Murray to make a track-survey of the intervening link. They found the distance to be about twenty miles and the general course of the river south-east, as just stated, with only one rapid requiring a portage, between the points referred to. In this stretch, the river has the same general lake-like ^{Lake-like character of river.} character which it has maintained from the head of Maminiska Lake, a distance of twenty-six miles, and which continues to the foot of Makokibatan Lake, about thirty-four miles below Abazotikitchewan Lake, or for eighty miles in all.

Mr. MacMillan found gneiss here and there on the shores of the Albany for about half the distance from Triangular Lake to Abazotikitchewan Lake, but in the second part of the distance, hornblende schists, striking east and west, continued to the north side of the latter lake, where I had found similar rocks with granite and trap in 1871. ^{Belt of hornblende schist.} Gneiss, with a west and north-west strike, was then described as occurring all around the southern part of the last mentioned lake. (Report of Progress for 1871, page 109.) The breadth of the hornblende schist belt is apparently between six and seven miles, at right angles to the strike, and it is perhaps connected with the Huronian belt which I found between Lake of the Narrows and Martin's Falls, and which appears to be folded and repeated to the north of the part of the Albany referred to. (Same report, page 110.)

Leaving the Albany and following up the lowest section or link in the Eabamet River, a small stream unbroken by rapids, we entered Eabamet Lake at a distance of only about one mile. This sheet of water runs east-south-east and is about eleven miles long by one mile and a-half wide, and the stream by which we entered it flows out near the middle of the south-western side. In the vicinity of the outlet, micaceous gneiss dips S. 80° E. < 45°. About a mile from the upper end of the lake on the same side, ordinary grey gneiss strikes north-westward. On the north-east side, four miles from the upper extremity, a very micaceous grey gneiss, passing into mica-schist, strikes N. 60° W. and dips north-eastward at an angle of 70°. It is cut nearly at right angles to the strike by irregular dykes of a coarse, light grey granite, with branches following the lamination, holding considerable numbers of grains and small crystals of a green mineral which Mr. Hoffmann finds to be apatite.

Eabamet Lake.

Micaceous gneiss.

Apatite.

Felsite and dioritic schists.

Fishing Lake.

Huronian belt.

From the head of Eabamet Lake, the river is rapid and has an upward north-westerly course of three miles, with Round Lake (one mile in diameter) half way, and we then enter Fishing Lake. The rocks between these lakes consist of dark grey compact felsite in very even laminae and green dioritic schists, interstratified with a grey gneissoid rock, containing a triclinic felspar. The strike is east and west. These rocks are classified with the Huronian.

Fishing Lake runs north-north-east and is about eight miles long. No fixed rocks are seen on its shores. The rapid stream flowing into the head of Fishing Lake has an upward northerly course of four miles, and flows out of a lake about a mile wide and six miles long, running north-west. Coarse, grey gneiss occurs at the outlet of this lake. This point is thirteen miles north of the last gneiss seen near the head of Eabamet Lake, and as the strike of the Huronian rocks above the latter is east and west, the belt to which they belong has a possible width of the above amount, but it probably does not extend more than eight miles north of the head of Eabamet Lake, and it may be connected with the Huronian belt to the south-west, extending along the Albany from near the Etow-i-ma-mi branch to the outlet of Patawonga Lake, a distance of about thirty miles. Continuing northward from the six-mile lake referred to, after ascending another short link of river, less than a mile long, we entered a lake which also measures six miles from south to north, but which has an extreme width of about five miles. The shores of this lake, almost all the way round, consist of boulders and shingle. Gneiss was found *in situ* at three places in the northern part. The surrounding country is level, with the exception of an isolated hill about two miles from the south-west side of the lake, which is conspicuous from the rarity of any inequalities in the

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H. BELL, PHOTO. 1886.

HURON RIVER, NEAR ITS SOURCE.

PHOTOGRAPHERS: G. E. DESBARRATS & SON, MONTREAL.

REPRODUCED BY PERMISSION OF THE GEOLOGICAL SURVEY OF CANADA FROM A PHOTOGRAPH BY H. BELL, 1886.

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surface of the country in this region, no other hills having been seen on our route since leaving Maminiska Lake.

From the lake last described, we would have reached the Attawapishkat River most easily by crossing the height-of-land to the north-westward and descending the Martin-drinking River. We afterwards learned that the first portage leading to this stream leaves the western bay of the lake, and not the north-western, where we searched for it in vain.

Having no guide, we followed the only route we could find—which left the north-eastern extremity of the lake by a short portage into a tributary lake, four miles long, running in a north-easterly direction. From the head of this lake we crossed the height-of-land by a portage 880 paces long, and came to a lake one mile long, from which the water flowed north-eastward. The variation of the compass in this vicinity, from my observations, would appear to be less than 1° E.

BOULDER RIVER.

We descended the small river which has its source in this lake, to the Attawapishkat River, and found the distance, in a straight line, to be about twenty-five miles. The Indians do not navigate this stream, and as they have no name for it, we called it Boulder River, from the very bouldery character both of its bed and the country on either side. Its general course is pretty straight, and bears a little east of north-east. It consists of a series of short stretches of dead water, with bouldery rapids between them. At most of these, we were obliged to make portages on account of the small quantity of water flowing among the closely crowded boulders, although the descent might not be great. In some cases, however, a clear channel, down which canoes could be run, was formed through the midst of beds of boulders. The formation of these curious channels, which I have observed at bouldery rapids in many of the smaller rivers, north of the great lakes, may be due to the action of frazil or anchor ice in buoying up the boulders, so that they might be rolled or partially floated down the rapids by degrees, from year to year, until the existing channels were formed. We managed to float our canoes down some of the numerous rapids of this river by removing boulders. This process was resorted to whenever it could be done in less time than would be consumed in cutting out a portage-trail, unloading the canoes, carrying over everything and reloading. But in addition to clearing a considerable number of such channels, we made upwards of thirty complete portages, which required the trails to be cut through the woods in every instance. All

RES-PROCESS: G. E. DEBARKAT & SON, MONTREAL.

BOULDER RIVER, NEAR THE SOURCE.

18. B.C.
K.F. & L. G.S.C.

W. WELL. PHOTO. 1888

Route to
Attawapishkat
River.

Height of land.

Boulder River.

Natural
channels
among
boulders.

30 portages.

these operations entailed a great amount of labor, occupying from the 5th to the 18th of August. Soon after crossing the height-of-land, I left most of my party to bring on our larger canoes and supplies, and pushed on in a light canoe to the junction of Boulder River with the Attawapishkat, in order to ascertain whether it was possible to reach the latter at all by this route.

Sturgeon Lake. At seven miles before joining the Attawapishkat, Boulder River falls into a lake, three miles long, which the Indians call Sturgeon Lake, from the abundance of this fish to be found in it. While in the act of setting our gill-net, the evening we camped on its shores, a sturgeon, measuring upwards of five feet in length, was caught in it. Below Sturgeon Lake, the river is not so difficult as above; and after having advanced nearly to this lake with a sufficient supply of provisions for the remainder of the season, I sent back Messrs. MacMillan and Murray with two canoe-men, as already stated, and continued the exploration with the aid of the remaining four voyageurs.

Country on
either side of
Boulder River.

While the labor of cutting out portages and transporting our supplies was going on, numerous observations for latitude were taken, and I also explored the country for some distance on either side of Boulder River through a considerable part of its course. The surface consists of a series of rounded bouldery ridges of no great height, irregularly disposed, but running generally in a north-easterly and south-westerly direction, with swampy spaces, covered with a deep hummocky growth of sphagnum moss between them. In some sections, the timber had been burnt off the ridges and dry parts, exposing the naked surface, which was then seen to consist of boulders of all sizes and of a variety of kinds, mixed with some gravel and sand, and presenting a sterile and forbidding appearance.

Timber.

On the dry ground, the timber consisted of black spruce, tamarac, balsam, aspen and white birch, but on the wet level tracts, it was principally black spruce. All the rapids in Boulder River were overhung by thick groves of good-sized white cedar, and the same tree was met with in groups in some of the swamps at a distance from the river. The rough-barked poplar occurs near the stream, but was seldom seen inland. Common varieties of gneiss were noted in a number of places in the bed of Boulder River. There was no regularity in the general strike. Locally, the gneiss ran in various directions, from north-west to south-west.

Rocke.

Upward
exploration of
Attawapishkat
River.

Having reached the Attawapishkat River, I left my supplies in charge of one man on an island, half a mile long, which I called Nolin's Island in his honor, and taking the other three men, proceeded to explore the upward course of the stream. Its general direction was

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found to be about W. by N. At three miles we came to a very steep rapid, with a rise of fifty to sixty feet in about a mile and a quarter, which, for convenience, I called the Long Rapid. Notwithstanding the strength of the current my men poled our canoe all the way up. No rock *in situ* is seen, but nearly all the boulders which form the bed and shores of Long Rapid are more or less angular, and consist of an indistinctly and coarsely stratified grey syenitic gneiss, consisting of grey felspar, bluish-white quartz and black hornblende. The weathered surfaces are rough and pitted. My barometers showed the head of Long Rapid to be eighty feet above the level of the river at Nolin's Island. A mile further on, a lagoon occurs on either side of the river. I afterwards learned from the Indians of the country that there is a portage from the lagoon on the north side to another channel of the Attawapishkat, nearly as large as the one we were ascending, and which falls into it only thirteen miles, in a straight line, below this portage.

Portage to N. channel.

At the next rapid, which is only a short distance above the lagoons, the ascent is fifteen feet. Here the river rushes over and among large angular masses of pinkish-grey granite, consisting of an even mixture of quartz, felspar and mica, with a medium or fine texture. The appearances indicate that this rock exists in place just beneath.

Granite.

The finer materials of the drift along this section of the river contain a large proportion of soft, yellowish limestone, but there is besides, a hard, bluish limestone, containing chert, which frequently occurs also as good sized boulders. In addition to these, among the more noticeable constituents of the drift of this region, may be mentioned the dark grey, finely quartziferous felsite or greywacké, resembling dark sandstone or friable quartzite in appearance, and holding rounded spots of a lighter color, weathering into pits of the same form, which is so generally and abundantly diffused in the drift all over the country, to the west and south-west of James' Bay. Hard reddish and brownish sandstones, impure jaspery iron ores and red jaspers, having the peculiar oolitic structure of those of the Manitounuck and Animikie series, may also be mentioned among the constituents of the drift along this part of the river.

Composition of the drift.

Ascending the Attawapishkat from the last-mentioned rapid, we passed a dozen other rapids, alternating with small lake-like expanses, and at eleven miles, in a straight line from Nolin's Island, entered a direct south-westward continuation of the southwest arm of Attawapishkat Lake, but three or four feet below its level and separated from it by a short rapid, flowing out of the middle of the south side of the latter. The northern channel of the Attawapishkat River, above referred to, is said to discharge from the eastern extremity of this lake,

Attawapishkat Lake.

but this portion was not completely explored. Attawapishkat Lake is, however, apparently about nine miles long. Its inlet is near the west end.

LAKE LANSDOWNE.

Lake
Lansdowne.

Features.

Timber.

Routes to
Weenisk River.

Still following up the river, for three miles from the inlet of the last mentioned lake, in which the rise amounts to only a few feet, we entered the largest sheet of water on the Attawapishkat, but strangely enough the Indians had no definite name for it. I, therefore, proposed to call it Lake Lansdowne, in honor of the Governor-General of the Dominion. As explained in my summary report, it was found to have a length of about thirteen miles, from south-east to north-west, and an extreme breadth of about ten miles. Lake Lansdowne is diversified by many beautiful islands, two of which measure about four miles each in length. The bays and points have all a north-east and south-west direction. A large, rounded, but not high hill, covered with second growth deciduous timber was seen in the western part of the lake, near the inlet or mouth of the upward continuation of the Attawapishkat River. The points and islands in the northern part of the lake are higher than elsewhere and have steep, wooded slopes, but they appear to be all composed of drift, and no rock *in situ* was seen anywhere around the lake. Long narrow moranes or rows of boulders extend south-westward off the extremities of some of the points and islands along the north-east side. Except where forest fires have run, large spruce and tamarac trees, and some cedars were observed on the islands and on the mainland near the lake, and also along the river between it and Nolin's Island. The mouth of the upper division of the Attawapishkat River, which the Indians described as a wide tranquil stream, is in the south-western bay of the lake. The Martin-drinking River, by which we should have travelled from the second highest of the Eabamet chain of lakes, enters a bay on the south side between the inlet and outlet. On the opposite side of the lake, a brook is reported by the local Indians to enter the first bay northward of the outlet; and by way of this stream, there is said to be a canoe-route to a lake on the Weenisk River, described as being as large as Lake Lansdowne, and called Wa-pi-quai-o Lake. Another canoe-route to the same lake was stated to begin in one of the northern bays of Lake Lansdowne, and a third route, which, however, strikes the Weenisk River above the lake referred to, was described as beginning in a bay a short distance south-west of the one last mentioned. Wa-pi-quai-o Lake would appear to correspond with "Weenisk" Lake of Arrowsmith's map, as the Indians stated that it receives a large stream from the west and discharges the Weenisk River to the north.

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A triangular island, measuring about a mile and a half on each side, is formed at the outlet of Lake Lansdowne by a small channel north of the main discharge, by which we entered. In the bed of the southern channel, at a mile below the outlet, there is an exposure, at low water, of a grey, friable, "pepper and salt" gneiss, with a few reddish grains. The strike is S. 75° W., but the stratification is not conspicuous.

Below Nolin's Island, at the junction of Boulder River, the Attawapishkat flows eastward and is interrupted by three rapids in the first four miles. Its course then forms a semi-circle to the southward, four miles in diameter, and has marshy lagoons on either side. From the most south-easterly of these, a trail leads directly to Martin's Falls on the Albany. An intelligent Indian, who had just come from that trading port, informed me that the trail keeps the same bearing all the way, and on plotting it upon the map of my surveys of the two rivers, the position of the post is found to be directly in the line of this trail. The distance is about sixty miles, and the Indians report the country as level and covered with sphagnum. The trail is said to be crossed by five streams flowing into the Attawapishkat and only one into the Albany.

At the termination of the above semi-circle, the channel we have been following joins the north branch from Attawapishkat Lake, the two branches here flowing towards each other from exactly opposite directions and meeting in the same line which bears about N.N.E. and S.S.W. The distance from the southern outlet of the lake to this junction is about twenty miles in a straight line.

For thirty miles below this junction, the general course of the river is about east, and in this distance, it maintains a pretty uniform character, being alternately swift and rapid with long bends. The banks are of boulder-clay, ice-swept and sloping gently down from the brink to the summer level of the water, the whole height being about thirty feet. The surface of the country on both sides is low and level, as indeed it has been all the way from Lake Lansdowne. Except where the timber has been destroyed by fire, there is a good growth of spruce, tamarac, balsam, poplars and white birch along the banks of the river, but it does not extend far back, the country generally being open sphagnum swamps with small scattered tamarac and black spruce trees.

Three miles below the junction of the two channels, dark grey hornblende gneiss is exposed on the south side. It is distinctly bedded and strikes N. 50° W. < 90°. Half a mile further down, grey, strongly banded or ribboned gneiss strikes with regularity, N. 60° W. At a strong rapid, thirteen miles below the junction, a considerable

From Nolin's
Island
downward.

Trail to
Martin's Fall.

Channels join.

Character of
banks.

Timber.

gneiss.

area of fine-grained light reddish-grey contorted gneiss is exposed, the general strike of which is east and west. At nineteen miles below the junction, the river makes an "elbow" to the south-west and receives, at the angle, a large brook from that direction. On the south side, just below this brook, coarse grey gneiss is met with, striking from S. 40° to S. 60° W., but mostly in the latter direction, and dipping to the south-eastward at an angle of 40°. Two and a-half miles further down, similar gneiss has an average strike of S. 50° W., with a dip to the south-eastward. \ Knobs and hummocks of this rock continue in the channel and on the right bank for more than a mile farther. In the last eight miles of the above thirty miles stretch, the river divides itself among numerous alluvial islands, one group of which (ten or twelve in number), is about two miles in breadth.

Alluvial islands. Another Indian trail to Martin's Falls leaves the river at the termination of this stretch. The distance is about fifty miles and the country traversed is described as a sphagnum swamp similar to that crossed by the trail to the same post which has been mentioned as leaving the Attawapishkat higher up. The old timber is still standing along the banks in some parts of the above section of the river, but as a rule, the forest consists of a second growth of poplars, white birch, spruce, tamarac and a little balsam. Here, as elsewhere, along this river, much of the timber has been killed by fires within the last few years and only bushes and young trees have yet replaced it. Small black ash trees have been noticed here and there, all the way from Lake Lansdowne to beyond the termination of the present stretch, and white cedars have been of frequent occurrence, except where the ground is unfavourable for their growth.

Trail to Martin's Falls. Timber. At the termination of this thirty miles-stretch, the general course of the Attawapishkat changes to N.N.E., for about sixty miles, or to latitude 53° 0' 0", where a brook falls in from the left or west side. In the first nine miles of this distance, the river divides into two main channels, with several smaller ones, all flowing sluggishly through a level country between low alluvial banks. The place where they come together again is called Mattawa by the Indians and is a favourite burying-place for their dead. From Mattawa, the stream again becomes swift and rapid, as it was above these islands, and the banks resume their ice-swept bouldery and clayey character.

Course of river changes. Mattawa. At eight miles below Mattawa we passed the last exposure of Archaean rock on the river. At low water it forms a conspicuous island in the middle of the stream and consists of a strongly banded mottled grey gneissoid rock, but is composed of light-coloured felspar and black hornblende. The strike is straight and regular, N. 5° E. and the dip is eastward at an angle of 45°. It is cut by a dyke of the

Last exposure of Archaean rocks.

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DEVONIAN LIMESTONES IN BANKS OF ATTAWAPISHKAT RIVER,
ABOUT 200 MILES FROM ITS OUTLET.—NATIVES IN FOREGROUND.

R. B. L. PHOTO

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same composition, ten feet wide, bearing due north, with smaller dykes running in other directions. A dislocation was noted running S. 60° W., towards which the stratification bends in approaching it from either side. Several boulders of a reddish grey syenite were observed at this locality, which exactly resemble the syenite in the Huronian rocks of Shebandowan Lake.

Three miles below this rocky island, the river cuts through ridges of bouldery clay, capped with gravel, about 200 feet high, which here appear to run about north and south. From where the river enters these earthy ridges, its course is eastward for about four miles, after which it resumes the general north-north-east trend and flows with a smooth swift current, unbroken by rapids, such as are of frequent occurrence in the upper reaches, for twelve miles, between banks from twenty to forty feet high, composed of sandy and pebbly yellowish clay with some boulders.

At the foot of an eastern "jog" in the river, about eleven miles further on, or sixteen miles in a straight line from the above mentioned island of gneissoid rock, unaltered limestone is seen in the right bank for the first time *in situ*. The strata are horizontal and consist partly of compact yellowish drab, rather thin beds, together with a larger proportion of porous and rusty looking layers, associated with iron-stained yellowish marl. The only fossils observed consist of large fucoids which cover the surfaces of some of the beds. Below this locality, yellowish limestones are exposed almost continuously in the banks or bed of the river for the next thirty-four miles. They often form cliffs from fifteen to thirty feet high, which are sometimes a mile or two long. Thick layers were observed in a few places, but, as a rule, the beds are thin. The strata appear to the eye to be quite horizontal, except in two localities where very local gentle undulations were observed. The river in this section is wide, shallow and swift.

In the above N.N.E. stretch of about sixty miles, the Attawapishkat receives no tributaries from the west that we could detect, except two or three small brooks, and the larger one at its termination, which has been already referred to. But it is joined by a considerable number of branches from the east in the same interval, the largest of which falls in at about forty miles down or eight miles below the first appearance of the horizontal limestone. The latitude of the mouth of this river, from the mean of two very closely agreeing observations is 52° 41' 11". A party of Indians of the country whom we met here had no name for this stream, and I propose to call it Streatfield River, after the Governor General's secretary. The accompanying illustration is from a photograph looking down-stream, which was taken opposite the mouth of this branch. It is a good representation of the

Ridges 200 feet high.

First horizontal limestone.

Limestone cliffs.

Streatfield river.

character of the Attawapishkat where it flows over the horizontal limestones.

Timber.

Along the upper part of this stretch (of sixty miles) the timber is mostly green, and some of it is of fair size, but throughout the greater part of the distance the woods have been burnt at different periods many years ago, and, whether original forest or second growth, the trees are generally of small size. In some parts, spruce and tamarac are mixed with the poplars and white birch, but in others the coniferous and deciduous trees occupy separate areas. The sections of old timber and second-growth alternate at intervals of varying length with others more or less recently burnt and not yet reforested. The white cedar is scarce, but an occasional tree is found in favorable

Last black ash.

situations much further down the river. The last black ash observed on the Attawapishkat was passed in this section. An Indian from the Wai-nusk River, who was ascending this stretch, and who had never before been so far south, informed us that he had here seen the cedar for the first time in his life. He had not yet noticed the black ash, and had never even heard the Indian name of the tree.

Black Fence River.

Horizontal limestone.

The next stretch of the river from the junction of the above mentioned brook, in latitude $53^{\circ} 0' 0''$, bears E.N.E., and is about thirty miles long, terminating where the stream is joined by a very large branch from the west, called the Muckitat-michigan or Black Fence River, which, as far as could be seen, has the same general course as the united waters for some distance below. The horizontal limestone is exposed on both sides nearly all along the upper six miles of the stretch under description, but in the remainder of it the banks and bed of the river consist of drift, which is largely made up of the limestone debris. The country on both sides is level throughout this portion of the river. A large brook falls in from the south at six miles above the termination of this section.

Timber.

The timber along both banks in the upper twelve miles of this reach consists of old green spruce of fair size, but in the remaining eighteen miles the green and recently burnt timber alternate in short sections. In some parts the fire was actually burning as we passed by.

Stretch of 135 miles.

The general course of the Attawapishkat, from the junction of the Black Fence River to its mouth, is about S. 70° E., and the distance in a straight line about 135 miles. The river has now become much larger, and it flows for many miles with a swift current between rather low banks of drift, the country on both sides being level. This latter character continues all the way to the sea. From this large branch to the mouth, the Attawapishkat is characterized by great numbers of islands. In the upper half of this long reach, only half-a-dozen tributaries were observed, and scarcely any at all in the lower

Many islands.

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half, which may be due to the even nature of the surface of the country and its general and uniform slope to the eastward, thus causing the drainage to pass off in parallel lines direct to James' Bay.

Nineteen miles below the Black Fence River, the Missisaguigan, or Big Lake River. Big Lake River, a good-sized stream, falls in from the south, opposite the upper part of an island three miles long. In the sandy banks, about the lower end of this island, marine shells were observed for the first time. The species collected are *Saxicava rugosa*, *Tellina Greenlandica*, *Cardium Islandicum* and *Mya truncata*. The barometric readings would give this locality an elevation of about 500 feet above the sea. Horizontal beds of limestone occur in the bottom of the river, five miles above this point, and again at three miles below it, at the head of an island, which is over six miles long, and may be called Big Island. From the foot of Big Island, the river forms a semi-circle to the south, four miles in diameter, and then it divides into channels, which form four islands, with a total length of six miles. The water is shallow and the descent rapid in these channels, each of which is flanked by cliffs, about twenty feet high, of yellowish, crumbling, earthy limestone. This rock, and indeed all the limestones met with so far on this river, resemble those of the Churchill and the Kenogami Rivers, which are of Silurian age.

Marine shells.

Limestone cliffs.

Silurian age.

For the next twenty-three miles, the river flows southeast, and has upwards of twenty islands in this part of its course. On one of these, about a mile in length, occurring about the middle of this stretch, and which we called Rainy Island, the following fossils, as determined by Mr. Whiteaves, were collected in thinly-bedded limestone:

Favosites.—Species undeterminable. One fragment. Corallites about two inches in diameter; tabulae complete. Rainy Island fossils.

Strophomena.—Species undeterminable. One valve.

Euomphalus (or *Pleurotomaria*), nov. sp. Four casts of the interior of the shell.

Straparollus, allied to *S. Nevadensis*. One cast of the interior of the shell.

Fragments of two other species of gasteropoda.

Orthoceras, nov. sp. Four or five specimens of the siphuncle only.

Mr. Whiteaves considers these fossils to be of Devonian age.

Devonian age.

Throughout the above twenty-three miles, the river is generally wide and smooth, with low banks, composed of drift, while flat-bedded limestone is occasionally seen in the bottom. At the end of this distance, however, a sudden change takes place, and for thirty-three miles, or to the head of Lowasky Island (the general course being east) the river flows with a rapid current, between cliffs, and among almost innumerable islands of yellowish limestones, all having an

Limestone cliffs and islands.

Structure of limestone.

average height of about forty feet. These limestones have a singular structure. They consist of great, spongy and cavernous masses, often occupying the full height of the cliffs, which may be described as gigantic concretions, alternating with thinly-bedded portions, the lamination of which appears bent at all angles, to accommodate itself to the spaces between the concretionary portions. Close to the latter, the lamination often follows the contours of their outlines, but further away it dips at more moderate angles. The islets, which are thickly scattered among the larger islands in this part of the river, often appear to consist of single masses of this kind. Their surfaces, generally present a massive and very uneven, or rugged, appearance, but they sometimes show numerous patches of more or less concentric lines, marking a subordinate or internal, indistinct concretionary arrangement, or the edges of the thin beds, which have remained in basin-like forms, in the depressions on their exteriors. Both the massive and laminated varieties have a yellow or yellowish-grey color on fresh fracture, but the old surfaces have weathered to a blue or ash-grey. The accompanying sketches represent the appearances of the cliffs and islets in this part of the river.

Many islets.

The porous or cavernous masses are largely made up of fossils, although the number of species does not appear to be great, while the thinly-bedded inter-spaces contain but few. Mr. Whiteaves has determined the following from the specimens brought home, and he considers them to indicate the Devonian system:—

Devonian fossils.

Favosites, species undeterminable. One fragment. Corallites polygonal; their maximum diameter five mm.; tabulae complete, arched and crowded.

Meristella (*Whitefieldia*), nov. sp. allied to *Whitefieldia tumida*, Dalman (sp.) and *W. nasuta*, Conrad.

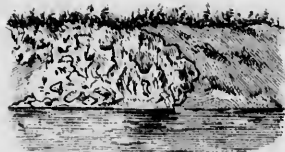
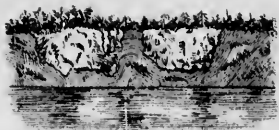
Strophodonta, species uncertain, but allied to *S. concava* or *S. amplexa*.

Caverns.

Long cylindrical corals, like *Amplexus* or *Zaphrentis*, and a large trilobite, apparently allied to *Bronteus*, but resembling *Proetus* in the broad outer margin of the pygidium, were also observed, but owing to the friable nature of the rock, specimens for identification could not be obtained. The numerous caverns, often of fantastic shape, but seldom of very large size, in the cliffs and islets of this part of the river, give the scenery a very singular and picturesque character. The Indians from the Equan River (the next large stream north of the Attawapishkat) report similar light-coloured, cavernous rocks, along the lower portion of its course.

Equan River.

At forty-four miles before coming to its mouth, the Attawapishkat divides into two channels. We followed the southern or smaller of Lowasky River. them, which is called Lowasky River on Arrowsmith's map, and the



CAVERNOUS LIMESTONE ON ATTAWAPISHKAT RIVER.

FROM SKETCHES BY DR. R. BELL.

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island between it and the northern or larger channel, which has the above length (44 miles) may be called Lowasky Island. The limestones above described extend for a few miles down the southern branch, and there may be small channels in this neighborhood between the two branches, but in the rest of its course the Lowasky River presented little requiring description. The banks, which are generally low, consist of bouldery clay, with stratified gravel or loam occasionally at the top. Numerous shallow rapids occur. The tide extends to the foot of three such rapids, close together, about eleven miles from the mouth. A channel, which appeared to be a feeder, but which may be a discharge, occurs at four miles from James' Bay. In the marshes on either side of the mouth of the river, we observed great numbers of geese and ducks as we passed out to sea, on the 7th of September.

Throughout the long stretch from Black Fence River to the sea, the country on both sides maintains the same level and swampy character which has been described as prevailing higher up. The timber on the borders of the river, where still green, is smaller along this section than along the upper parts. Some portions, consisting principally of spruce and tamarac, appear to belong to the original forest, but much of it is no doubt second-growth, and these two species are then usually mixed with poplars and some small white birch. The growing timber, whether original or second-growth, is not often continuous for any great distance, being interrupted nearly the whole way by frequent sections of burnt ground.

From the barometric readings obtained on Lake Lansdowne, this sheet of water would appear to be about 960 feet above the sea, which shows that the general fall in the surface of the country between it and James' Bay must be very gradual indeed. It is a remarkable fact that we did not require to make a single portage in the whole distance from this lake to the sea, and I could hear of no portages the continuation of the river above the lake. The Indians describe the latter as a wide and tranquil stream, expanding into several lakes along its course.

Sturgeon are abundant in the lakes of the Attawapishkat, and they appear to constitute the principal food of the few Indians who inhabit the country. Whitefish are also caught both in the lakes and along the river itself. Pike and suckers are abundant in all the waters. The Canada goose breeds in considerable numbers in the open swamps behind the wooded borders of the lower section of the river, and the young birds, ready to fly, were congregating in flocks, all along the lower stretch, in the end of August and the beginning of September. The dusky and other species of ducks were also numerous, and the yellow-legged plover was very abundant. We saw a few cariboo and several black bears while descending the lower part of the river.

Indians.

The Indians of the Attawapishkat and Weenisk districts appear to have diminished greatly in numbers since the last sixty or seventy years. At that time several trading posts were maintained in this territory, where none now exist. We met with only a few families, but a good many Indian graves were noticed along the banks of the river. Those living far up the stream never go to the sea. One old man with whom we talked had never been at any trading post. Few of them had ever seen a white man before. One young man whom we fell in with on Attawapishkat Lake accompanied us up to Lake Lansdowne, and after a few days' acquaintance, I had no difficulty in engaging him to go with us to James' Bay, and thence up the Albany, from which he was to cross by one of the Martin's Falls trails to his own river again.

Kapushkow River.

After leaving the southern mouth of the Attawapishkat, we reached the Kapushkow River in our canoes in three hours and a half, the distance being only about ten miles. Starting from this river early next morning (8th September), we ran the whole distance to Fort Albany the same day, by sailing and puddling, arriving there late in the evening. The shore of James' Bay between the two rivers is extremely low. The beach along high-water mark is sandy and marshy, but when the tide is out, reefs of boulders and stones, which look interminable, stretch out to sea as far as the eye can reach. The tide had fallen some time before we approached the Albany River, and in order to get past these reefs in our canoes we were obliged to go so far out to sea that the tops of the trees on the nearest part of the shore were barely visible at a few points. Even at high water, it requires an experienced pilot to take a sail-boat over these extensive bouldery reefs. We were told that the water is so shallow that no large vessel could pass between the west shore of James' Bay and "Agoomska" Island. This large island lies nearer to the west shore of the bay than is represented on the maps, and it is called by the Indians of the region Agimiski or Akimiski.

Fort Albany.

Low shore.

Bouldery reefs.

Akimiski Island.

ALBANY RIVER.

Mouth of Albany River.

Where the Albany River flows into James' Bay, the coast is as low as possible, the water in front very shallow, and the country inland level and swampy. As the water of the bay is receding rapidly (in a geological sense), it becomes difficult to draw the line between the sea and what may be considered land. Fort Albany, one of the oldest and largest trading posts of the Hudson's Bay Company, is built on the south side of an island of the same name, six miles long and two and a-half wide, lying just inside the present mouth of the river. The channels on either side are of about equal size. Below it are two islands

Albany Island.

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of sand and mud, covered with grass, sedges and bushes, but Albany Island is the first one which is timbered. As the mouth of the river and the adjacent shores are so difficult to define, all measurements of distances in the following description of the river will be taken from the Fort itself, which is situated about seven miles in, from the general line of the present mean high tide mark. Tide-water extends for only about three miles above the Fort. Tide-water.

As stated in a previous part of this report, in 1871 I made a micrometer and compass survey, with numerous latitudes, of the Albany from Abazotikichewan Lake downwards to The Forks, or junction of the Kenogami or Long Lake River, and thence up this river and via Long Lake and Pic River to Lake Superior. A track-survey having been made the present season of the upper part of the Albany, from Lake St. Joseph to Abazotikichewan Lake, the lower section of the river, extending from the mouth to The Forks, was all that remained to complete the survey of the whole stream. It was only possible with the time and means at my disposal to make a track-survey of this part, Track-survey. on our return journey last autumn, but this was done with great care, and having ascertained the latitude and the variation of the compass in numerous places, I think the resulting map will prove very nearly correct.

In size, the Albany is comparable with the Ottawa, and at high water it might be navigated by powerful river steamers from the mouth to Martin's Falls, where the first portage occurs, a distance of about 250 miles, following the general trend of the river. Its upward course, from Fort Albany to The Forks, bears about S. 45° W. (true) and the distance, in a straight line, is about 131 miles. For sixteen miles above the Fort, the river is wide, between the main shores, and full of islands of various sizes, and although the descent in the above distance is rapid, this portion may be called its delta. The channels spread widely over the flat-lying Devonian limestones, and the Lower and Upper Big "Falls," the strongest rapids below Martin's Falls, occur in this part. Big Island, which is the largest of this group, is six miles long. At thirteen miles from the Fort, a channel leaves the main river on the north side, and flows directly to the sea, falling into it several miles northward of Albany Island. Islands near mouth.

For nearly twenty miles above the head of the delta, the river flows in a single channel free from islands, but from thence upward to The Forks, a considerable number are met with. The largest of them are Fishing Creek (five miles long), Black Bear (seven miles), Norran's and Chee-pye Islands. Large islands.

Some rivers and numerous brooks fall into the Albany below The Forks, from the swampy country on either side. The larger tributaries

are Lower Fishing Creek from the south, almost opposite Fort Albany, Upper Fishing Creek, from the north, at about one-third the distance to The Forks, and two other large brooks from the same side a few miles below it; Chemahogan River, from the south, at two-thirds of this distance, and the Chee-pye River, eight miles further down. The latter is the largest branch below the Kenogami. The Henley River falls in from the north, ten miles below The Forks. Henley House, a former Hudson's Bay Company's post, was built on a gravelly island, which is now being swept away, at the north of this stream. Several lakes, abounding in fish, are said to occur on the course of this river.

From The Forks all the way down to the delta, the Albany flows in long sweeping curves, with a pretty uniform current, broken by occasional rapids. The elevation of The Forks, from barometric observations, is about 300 feet over the sea, which would give an average fall of about two feet in the mile, following the course of the stream. In two of the stretches, known as the "Long Openings," the river is so straight that, sitting in a canoe and looking from one end of them, the sky and water appear to meet on the horizon.

The country on either side is quite flat, and behind the strips of forest, which extend to a varying breadth from the banks of the river, it is covered with sphagnum, with only stunted tamaracs and black spruces at wide intervals. In some parts, it is so open as to be called "plains," and on these the cariboo are found occasionally in considerable numbers, especially during the winter.

Bluffs of stoney clay, fifty feet or more in height occur along some sections, but, as a rule, the banks are lower. Both sides are completely ice-swept throughout the entire length of this stretch. There is often a cut-bank a few feet high at the top, but from the foot of this, the wide shore slopes gradually down to the low-water level. The upper portion of this slope, comprising the greater part of its breadth, is paved with boulders and worn stones, all crowded closely together and forced down to an even surface by the repeated moving pressure of the river ice as it is carried rapidly along during the spring freshets. The rise and fall of the river between high and low-water marks would appear to average nearly thirty feet, but where temporary ice-jams have occurred, it sometimes exceeds this. The Indians say that it rarely overflows any of the country beyond the banks.

Thin horizontal beds of light yellowish-grey limestone, of Devonian age, begin at the first rapid, about three miles from Fort Albany and are exposed almost continuously in the bed of the river for several miles above. The descent in the stream is so rapid that the thickness of the level strata over which it falls, must amount to, at least, twenty

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VER-PROCESS; G. E. DEBARRAT & SON, MONTREAL.

R. BELL, PHOTO., 1886.

ALBANY RIVER, FIVE MILES BELOW THE FORKS;
SHOWING ICE-SWEET SHORES: "PAVEMENTS."

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Ptilodictyon

Meek's specimen

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Strophomena

perfect specimen

Strophomena

S. Patersoni

S. concava

Orthis, sp.

Spirifer

Meristella

Atrypa reticularis

Centronella

Concordia

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Mr. Whitwell

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Report for 18

or thirty feet in this part of the river. Flat beds of similar limestone were seen here and there, sometimes covering considerable areas in the bed of the river, but rarely in the banks, to within about fifteen miles below The Forks. From this circumstance and owing to the level and undisturbed nature of the country, as well as from the abundance of angular fragments of Devonian limestone in the drift all along, there is no doubt that the Albany flows over flat-lying strata of this system, from the point above named to its mouth. The following is Mr. Whiteaves' list of the fossils collected in the above section of the Albany :

- Syringopora Hisingeri*, Billings. One small fragment. List of fossils.
Heliorhynchum Canadense, Billings. One small but nearly perfect specimen and two fragments.
Favosites hemispherica, Yandell and Shumard. One fragment. Corallites one mm. in diameter: tabulæ complete.
Favosites, species indeterminate. Fragments. Epitheca thick and strongly developed: corallites two mm. broad: tabulæ complete.
Dictyonema, species indeterminate. One specimen.
Ptilodictya Gilberti, Meek, var. One specimen which resembles Meek's species in its microscopical characters, but in which the frond is apparently undivided.
Strophomena rhomboidalis, Wilckens. One well-preserved and nearly perfect specimen of each valve.
Strophodonta demissa, Conrad. Four ventral valves.
S. Patersoni ? Hall. One fragment.
S. concava ? Hall. An exfoliated cast of a ventral valve.
Orthis, species indeterminate. One specimen.
Spirifera, two or three species. Fragments only.
Meristella, nov. sp., allied to *M. unisulcata*, Conrad.
Atrypa reticularis, L. Two specimens.
Centronella glans-fagea, Hall. One perfect specimen.
Conocardium trigonale, Conrad. Two specimens.
Proetus crassimarginatus, Hall. One pygidium.

Mr. Whiteaves remarks that the above fossils "are clearly of Devonian and probably of Lower Devonian age."

Beginning at about fifteen miles below The Forks and extending thence for some miles up-stream, yellowish limestones, some of the beds being of a very spongy or finely vesicular character, are exposed at a few places along the north-west shore of the river. These limestones may belong to the Upper Silurian System, like those higher up the Albany and also on the Kenogami. (See Geol. Survey Report for 1871.)

Post Pliocene shells.

Marine shells of Post Pliocene age, washed from the river banks, were observed in many places all the way from the sea to The Forks. They were abundant in a modified grey clay in the north-west bank, from Cap Island, thirty miles below The Forks, for a number of miles upward. The following species were collected in this section: *Tellina Greenlandica*, *T. proxima*, *Saxicava rugosa* (valves closed), *Cardium Greenlandicum*, *Mya truncata* (with the epidermis), *Astarte Laurentiana*.

Timber.

Forest fires have destroyed much of the timber along the banks of the part of the Albany now under description. Old spruces and tamaracs of good size are still green in some sections, but second-growth timber, much of it well grown up, prevails for the greater part of its length. A good deal of both kinds have been only recently burnt. In addition to the spruce and tamarac, balsam, aspen, rough-barked poplar and white birch occur all along. Banksian pine and ground maple were observed in the upper part. White cedar was first seen about twenty miles below The Forks. Grey elm and black ash were noted on the Kenogami just after we left the Albany or some distance further north than they were observed when surveying this river in 1871. Groves of both these kinds of trees are found on the alluvial flats at the mouths of all the branches of the Kenogami. Cedar of good size is common all along the banks of this stream. It may be remarked that the occurrence, or otherwise, of certain trees along a river like the Albany may be due to the nature of the ground as much as to latitude.

Kenogami River and Long Lake.

The Kenogami River and Long Lake were surveyed and reported upon in 1870 and 1871, and nothing requiring special description in this place was observed on our homeward journey, with the exception of some facts as to the drift, which will be mentioned further on.

Black River. The rocks along the Black River, by which we travelled from Long Lake to the Canadian Pacific Railway line, as stated in my summary report, were found to consist of crystalline schists and diorite, granite, syenite and gneiss, but further exploration will be required in this region before anything definite can be said as to their distribution.

Courses of glacial striae.

LIST, SHOWING THE COURSES OF THE GLACIAL STRIAE IN THIRTY-FIVE LOCALITIES IN THE REGION EXPLORED IN 1886.

The glacial striae were carefully looked for wherever the solid rock was exposed, and their course was recorded in all cases where it could be distinctly seen. Exceptional instances, such as those on nearly vertical walls of rock, or on very uneven surfaces, are omitted from the following list. The bearings refer to the magnetic meridian, but the differences between them and the true bearings are not great, as the line of no variation passes through the central part of the region which they cover.

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Pine Lake

1. Minnetakie Lake, 8 miles from S. W. extremity..... S. 45° W.
 2. do. 3 miles S. of Abram's Chute, at the outlet.... S. 40° W.
 3. Abram's Chute..... S. 10° W.
 4. Islands in the middle of Abram's Lake (below Chute)..... S. 40° W.
 5. Island in Lonely Lake, 10 miles due east of H. B. Co.'s post.... S. 60° W.
 6. Point in Lonely Lake, 13 miles eastward of H. B. Co.'s post.... S. 25° W.
 7. Point on N. shore of Lonely Lake, 16 miles eastward of H. B. Co.'s post..... S. 55° W.
 8. Rapid at mouth of Root River, E. extremity of Lonely Lake... S. 45° W.
 9. Root River, 5 miles in a straight line from its mouth..... S. 50° W.
 10. Root River, 10 miles in a straight line from its mouth..... S. 45° W.
 11. N. side of L. St. Joseph, 4½ miles from W. extremity..... S. 30° W.
 12. Western mouth of Cat River, 9 miles from W. extremity..... S. 45° W.
 13. Island in Lake St. Joseph, 18 miles from W. extremity..... S. 60° W.
 14. Islet in Lake St. Joseph, 4 miles E. of E. mouth of Cat River.... S. 15° W.
 15. Islet in Lake St. Joseph, 7 miles E. by S. of mouth of Cat River.. S. 45° W.
 16. Fall Fishery on N. shore of L. St. J., 44 miles from W. end..... S. 30° W.
 17. Extremity of N. arm of Lake St. J., 50 miles from W. end..... S. 30° W.
 18. Northern outlet of Deer Lodge Lake, on the Albany River, 13 miles below Lake St. Joseph..... S. 20° W.
 19. First Kagami Portage, Albany R., 22 miles below Lake St. J.... S. 40° W.
 20. Albany River, 2½ miles below Etow-i-ma-mi Branch..... S. 25° W.
 21. Narrows about middle of Maminiska Lake..... S. 65° W.
 22. Middle of Patawonga Lake..... S. 75° W.
 23. Outlet of Eabamet Lake..... S. 80° W.
 24. North shore and also head of Eabamet Lake..... S. 75° W.
 25. Inlet of Sturgeon Lake, Boulder River..... S. 70° W.
 26. Attawapishkat River, 3 miles below junction of the two channels from lake of the same name..... S. 60° W.
 27. Attawapishkat River, 13 miles below the above junction..... S. 42° W.
 28. do. 22 miles below the above junction..... S. 22° W.
 29. do. 23 miles below the above junction..... S. 15° W.
 30. do. Last exposure of Archæan rocks, or 8 miles below Mattawa..... S. to S. 10° E.
 31. Attawapishkat River (on limestone), about 75 miles from southern mouth of river..... S. 18° W.
 32. Attawapishkat River (on limestone), about 66 miles from southern mouth of river..... S. 8° to 12° W.
(Old set.)
S. 60° to 70° E.
(New set.)
 33. Attawapishkat River (on limestone), at head of Lowasky Island, about 44 miles from southern mouth of river..... S. 02° W.
 34. Attawapishkat River, southern channel or Lowasky River, about 40 miles from southern mouth of river..... S. 35° W.
Older, all round to S. 80° W., newer.
- (At this locality the stræ are newer in proportion as they become more westerly.)
35. Kenogami River, 8th Portage (in going up), about 20 miles below Pine Lake..... S. 40° W.

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General direction.

From the foregoing list it will be observed that the general direction of the glacial stria is to the south-westward, as it is elsewhere throughout the great Laurentian region between James' Bay, Lake Winnipeg and Lake Superior. In descending from the Laurentian plateau along the Attawapishkat River the course of the striation becomes more and more southerly, but on the horizontal limestones further down the stream it runs in various directions between west and south at the same localities.

Drift deposits.

The drift (principally boulder-clay) which overspreads the palaeozoic basin westward of James' Bay appears to be a continuous sheet varying probably between thirty and ninety feet as far as can be judged by the sections along the rivers. Over the generally level surface of the Laurentian rocks further west, the thickness is more variable, but it seldom appears to exceed 100 feet, and it becomes thinner and more irregular as we rise higher and get further inland, and in these regions the fundamental rocks protrude themselves more frequently through it. It is of a looser and less clayey nature on the higher grounds than elsewhere, and consists largely of washed gravel and shingle.

Remarkable features.

Along the Attawapishkat, Albany and Kenogami Rivers, as well as on the west coast of James' Bay, the most remarkable feature in the composition of the drift is the abundance of pebbles and boulders of dark grey granular siliceous felsite or greywacké. It constitutes the greater number of the boulders and pebbles of the extensive reefs which have been referred to, between Akimiski Island and the west shore, and is abundant among the boulders of the coast between Rupert's House and Moose Factory. Well-rounded fragments of this rock are also found along the Moose and Missinaibi Rivers, and as far west as Lonely Lake, and southward to Lake Superior. It is characterized by round spots, from the size of a pea to that of a cricket ball or larger, of a lighter colour than the rest of the rock, which weather out into pits of the same form. Microscopic sections show that it is composed principally of small angular grains of felspar with other's, somewhat rounded, of quartz, the interspaces being filled in with a dark green amorphous mineral. This rock occurs *in situ* on Long Island, off Cape Jones, on the east main coast, where it strikes south-westward or with the greater length of the island. The same rock, no doubt, continues under the sea for some distance in the direction of its strike. The abundance also of rounded pieces of hard, banded, siliceous hæmatite in the drift of both the Attawapishkat and Albany Rivers is another striking feature which was alluded to in reference to the latter in 1871. (Geol. Survey Report for 1871, page 112.)

Hæmatite in drift.

Composition of the drift.

After careful observations as to the nature of the drift along the rivers mentioned, the following appears to be about the relative abun-

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dance of its boulders and pebbles: the unaltered limestones which occur *in situ* immediately beneath; the dark grey siliceous greywacké above described; compact hard blue limestone; gneiss syenite and granite; crystalline dark, grey and mottled and porphyritic diorites; slaty and jaspers banded hæmatites, compact siliceous magnetites, sometimes consisting of pure ore and fine-grained quartzite in thin alternate layers; quartzites of different shades; hard red sandstones and conglomerates; chloritic and hornblendic schists; dull red jaspers with oolitic structure like those of the Manitounuek or the Animikie series, or mixed with streaks and small disseminated spots of the peroxides of iron; compact amygdaloids; brecciated hard blue limestone; drab-coloured clay ironstone.

From our present knowledge of the distribution of the flat-lying palæozoic rocks west and south-west of James' Bay, it is pretty cer-

Extent of
palæozoic
rocks.

tain that they occupy an area as extensive as the whole region between the Ottawa River and Lakes Ontario, Erie and Huron. The contours of the outer margins of this basin, as well as those of the different horizons within it, as far as they have yet been determined, indicate that its geological centre or highest point is under James' Bay, off the mouth of the Albany River. In such an extensive and undisturbed basin, the occurrence of Carboniferous rocks might appear possible, and if they existed at all it would probably be near this centre. But the total absence of any trace of them in the drift which has come from that direction, and spread itself over the extensive region alluded to, leaves very little hope of finding such rocks in this part of the Dominion. The Devonian rocks no doubt underlie a great part of James' Bay, and they probably occupy a still greater area of the extraordinarily level bottom of the main body of Hudson's Bay itself, and here there would be a greater probability of the occurrence of Carboniferous rocks than in James' Bay. Yet no evidence of their existence has so far been afforded by the drift of the shores of the larger bay, or in any part of the surrounding country which has been examined.

Absence of
Carboniferous
rocks.

Judging from the approximate distribution of the rocks in Hudson's and James' Bays, and the courses which were probably followed by the drift, as indicated by the glacial striation all around these bays and in the great interior regions to the south-west of them, the drift of the country to the west and south-west of James' Bay would be derived from the bottom and east side of this bay, or it may have partly come originally from the site of Hudson's Bay, and thence been transported over the floor of James' Bay to the country referred to.

Source of the
drift.

On the Kenogami, at six miles by the stream above the mouth of the large southern branch called the Bagutchewan, the river makes a

sudden bend to the north, and about a mile further another similar bend. These unusually sharp curves, which are unlike any others in the course of the stream, appear to be caused by the river traversing pre-glacial excavations in the Silurian strata, which here consist of dull-red, coarse, somewhat indurated arenaceous marl, with green blotches and layers. These excavations had become filled up with loose materials before the formation of the present river channel. At the lower bend, gravel fifty feet deep is exposed in the south bank. At the upper bend, the excavation of the Silurian marls is plainly seen. Starting from the level of the river, the lower ten feet of the filling of this hollow consists of boulder-clay. Upon this rests a bed, six to eight feet thick, of soft lignite, containing many flattened stems of small trees, which are partially carbonized, but are somewhat elastic when newly excavated and still wet. The lignite bed is overlain by thirty or forty feet of rudely stratified red and grey drift, holding rounded boulders and many pebbles. Marine shells were observed in the drift along the Kenogami almost up to this point, which, according to my barometric readings, would have an elevation of about 500 feet above the sea.

Pre-glacial excavations.

Lignite.

Marine shells.

Acknowledgement.

Before concluding this report, I wish to acknowledge our usual indebtedness to the officers of the Hudson's Bay Company for personal courtesies or assistance in promoting the objects of our survey. I would mention the following gentlemen who aided us during the past season:—Messrs. Chief Commissioner Wrigley, Newton Flannigan, Alexander Matheson, John Hourston, R. C. Wilson, William Mackay and Isaac Hunter.

1. Pier
2. Argy
3. Gray
4. Lime
5. Pam
6. Calli
7. Eupr
8. Apan
9. Helio
10. Chera
11. Metra
12. Sicya

APPENDIX I.

LIST OF LEPIDOPTERA COLLECTED IN THE SOUTHERN PART OF KEEWATIN DISTRICT.

BY DR. R. BELL.

The following Lepidoptera were collected in 1883 while exploring the country from Wabigoon Lake to Red Lake, by way of Lonely Lake, which adjoins on the west that explored in 1886. The species were determined by Major H. H. Lyman of Montreal, with the exception of the last two, which were named by the Rev. George D. Hulst of Brooklyn, at Major Lyman's request:—

1. *Pieris napi*, Esper., var. *oleracea-aestiva*, Harris.
2. *Argynnis polaris*, Boisd.
3. *Grapta Progne*, Cram.
4. *Limenitis Arthemis*, Drury.
5. *Panphila metacomet*, Harris.
6. *Callimorpha Lecontei*, Boisd.
7. *Euprepia Americana*, Harris.
8. *Apamea nictitans*, Bkh.
9. *Heliophila pallens*, Linn.
10. *Chorodes transversata*, Drury.
11. *Metrocampa margaritata*, Linn., var. *perlata*, Guen.
12. *Sicya macularia*, Harris.

