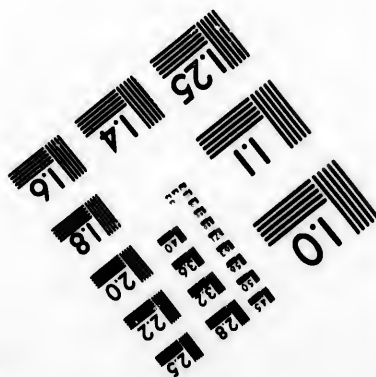
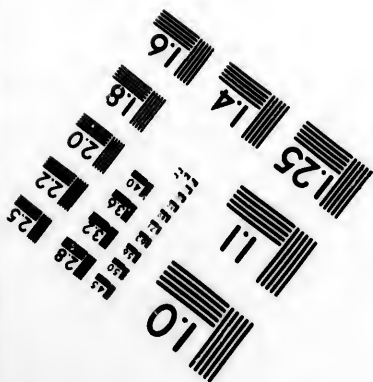
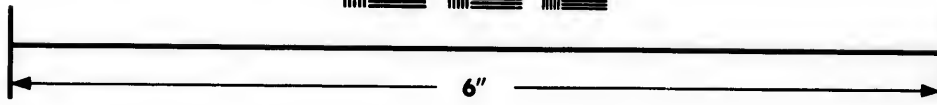
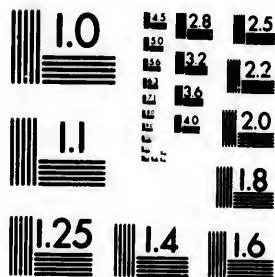


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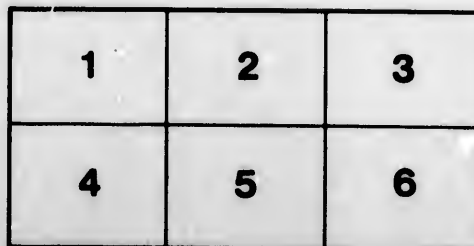
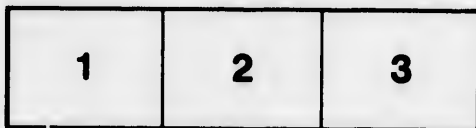
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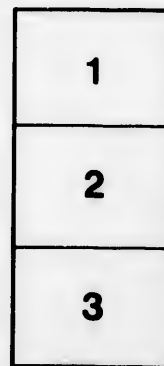
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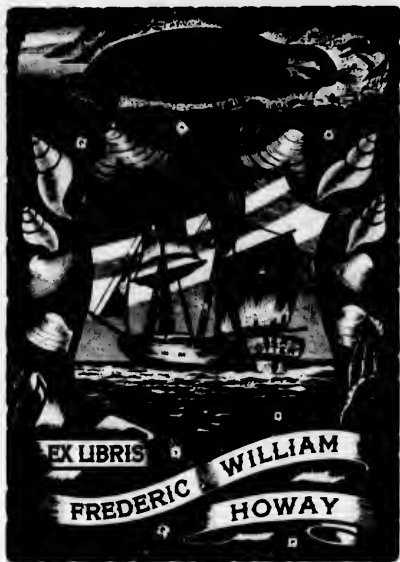
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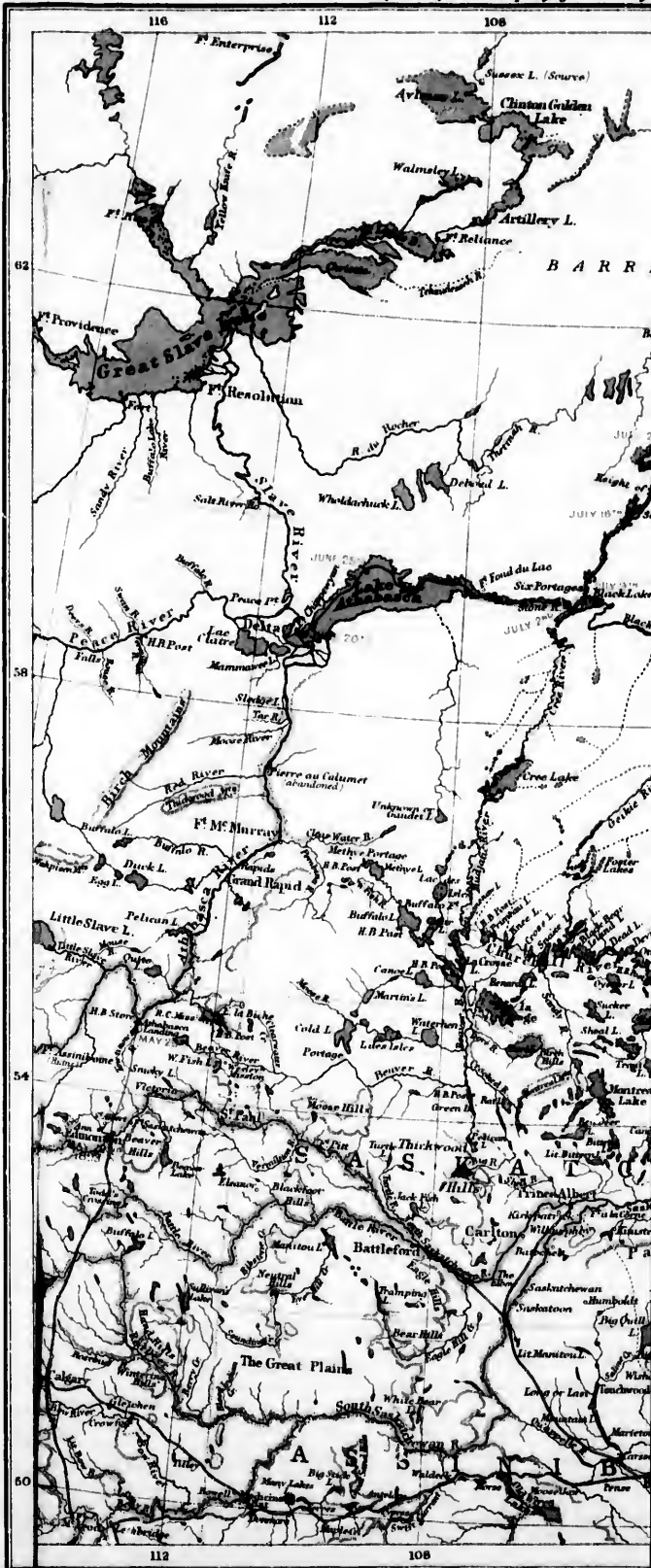


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MAP OF
Showing the Routes followed by J. BURR TYRRELL
Prepared from Map by J. W. Ty



Track of 1892 Expedition shown thus -----
 " 1893 " " " ----- *Published by*

MAP OF NORTHERN CANADA

Drawn by J. BURR TYRRELL in 1892 and 1893 while in charge of Geological Survey Expeditions.

and from Map by J. W. Tyrrell, C.E., Topographer to the latter Expedition.

THE GEOGRAPHICAL JOURNAL, 1894



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AN EXPEDITION THROUGH THE BARREN LANDS OF NORTHERN CANADA.*

By J. BURR TYRRELL, M.A., B.Sc., F.G.S.

IN the spring of 1892 the Geological Survey of Canada placed me in charge of an expedition sent to explore the unknown area, embracing about 60,000 square miles, lying north of the Churchill River and south-east of Lake Athabasca. We started from Prince Albert on the Saskatchewan River, and, travelling overland, crossed the height of land, and reached Green Lake, where the canoes were put in the water. The Beaver River was descended to Isle à la Crosse Lake, on the Churchill river. At the trading-post of the Hudson's Bay Company, at the south end of this lake, a half-breed and two Chippewyan Indians were taken on the party as canoe-men.

After descending Churchill River for 90 miles, we began the ascent of the Mudjatic River. We toiled at our paddles against its rapid current for ten days, until we reached its source in the middle of a flat sandy country. Crossing the height of land, here a sandy plain, we reached a small stream, which in a few miles flowed into Cree Lake. Standing on the summit of a rocky hill, on a beautiful bright evening in July, I enjoyed the rapture of being the first civilized man to look down into the clear depths of this large lake, and to gaze into the distance over its shining waters. Three days were occupied in crossing

Station.	Kilbo.		Mawenzi.		Taita ya Bura.	
	Dist. in miles.	Height in feet.	Dist. in miles.	Height in feet.	Dist. in miles.	Height in feet.
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Mogunda.....	—	—	—	—	46	7199
Vilimi Vivili.....	45	19,270	40	16,785	35	7229
Chala.....	—	—	21	16,798	42	7215
				16,799		7200

As regards Kilbo, the observation from Vilima Vivili is clearly the most reliable, but further observations are desirable. Of the other results the mean may be taken.—C.S.S.

* Published with the permission of the Director of the Geological Survey of Canada. Map, p. 480.

it, and then began the descent of the rapid stream which flows from its northern end. The lake lies on the line of contact of the highly altered Archean and the unaltered Paleozoic (Keewenawan) sandstones, and the river flows through country underlain by these latter rocks to the mouth at the south end of Black Lake. Black Lake was crossed and Black River was descended to Lake Athabasca, near the east end of which was a small trading-post of the Hudson's Bay Company. Black Lake and this portion of Lake Athabasca were also found to lie along the line of contact of the altered and unaltered rocks, their northern shores being granites and gneisses, while their southern shores are horizontal sandstones. After obtaining supplies the party returned to Black Lake, and ascended Black River to its source in Wollaston Lake, that large body of water from which issue two almost equal streams, the one flowing to Lake Athabasca, and thence by the Slave and Mackenzie rivers to the Arctic Ocean, and the other to Reindeer Lake, and thence by the Deer and Churchill rivers to Hudson Bay. A survey was made of the west shore of this lake, which was also found to lie at the contact of the sandstone and the gneiss. Geikie River, called after the eminent director of the Geological Survey of Great Britain, was found to flow into the south-west angle of the lake; and here the party was divided, the assistant with two canoes and four men being sent south by the regular Indian route through Reindeer Lake, while with one canoe and three men I ascended Geikie River to its source, crossed some low rocky hills which here constitute the height of land, and entered a beautiful lake surrounded by wooded rocky hills, which was called Foster Lake, after Dr. George Foster, the Finance Minister of the Dominion of Canada. We descended Foster River, portaging our stuff and canoe past its many wild falls and rapids, till we reached Churchill River, up which we travelled to Isle à la Crosse, and thence to Prince Albert. During the season we made 1300 miles of new surveys, 540 miles of which were on routes that had never before been travelled by white men, and 260 miles without guides of any kind except our instruments.

Further to the northward lay the great treeless area of the Barren Grounds. One of my Indian canoe-men had been there many (30?) years before, and would occasionally speak of the life led by him at that time, and of the nature of the country through which he had to travel. With his aid I learned of four canoe routes used by the Chippewyan Indians in their annual deer-hunting excursions to the edge of the barren grounds. Two of these routes were said to lead from two points on the northern shore of Lake Athabasca, one from the northern shore of Black Lake, and one from a point on Ice River, north-east of Wollaston Lake. All led through lakes and streams to the height of land, beyond which water was known to flow to the north, but, with the exception of the last route, nothing was known of the ocean to which these waters must be

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flowed. The last route was said to lead through Kasbatua or Ptarmigan Lake, and down the Kazandeze or Ptarmigan River to Hudson Bay. Indian sketches were obtained of all these routes.

On my return from the north, I offered to conduct an expedition through the Canadian Barren Grounds on one of these routes. The course from Black Lake was recommended as being the one likely to lead to the most important and extensive geographical and geological results. In the beginning of April instructions were received from the Director of the Geological Survey to prepare for an expedition. It was then too late to make any arrangement with the Hudson's Bay Company's fur traders on Lake Athabasca, but a letter was despatched to Isle à la Crosse trading-post on the Churchill River to send my old canoe used last year with two good canoeemen, to meet me early in June on the Athabasca River, while three Iroquois canoeemen were obtained at Caughnawaga, near Montreal, and J. W. Tyrrell, C.E., a surveyor who had already spent two summers and one winter on Hudson Bay and Straits, and who spoke the Eskimo language readily, was engaged as topographical and botanical assistant and Eskimo interpreter.

On May 7 the writer left Ottawa, the capital of the Dominion of Canada, for Edmonton, a terminus of the Canadian Pacific Railway on the Saskatchewan River. Two cedar canoes, each 18 feet in length, and with a carrying capacity of about 1800 pounds, had been sent on ahead from Peterborough, Ontario, but they did not reach Winnipeg until the day after our arrival there, and from there they had to be taken on by express with the party to Edmonton. At Winnipeg a circular letter was obtained from Mr. C. C. Chipman, Commissioner of the Hudson's Bay Company, to the officers in charge of all the northern trading-posts, instructing them to furnish me with any necessary supplies.

The provisions for the voyage were obtained at Edmonton, from which place we drove northwards with horses and carriages to Athabasca Landing, on the Athabasca River, where we put our canoes in the water, and on the evening of May 31 we started down the stream towards Lake Athabasca, leaving most of the provisions to be brought after us by the stern-wheel steamer belonging to the Hudson's Bay Company. These provisions did not reach Fort Chippewyan, on Lake Athabasca, until June 20, causing the party a delay of about ten days; but some of this time was improved in making a collection of fossils from the tar-bearing sandstones on the Athabasca River, from which no fossils had before been obtained. At Fort McMurray, on the Athabasca, we were joined by the canoe and two men from Isle à la Crosse, bringing the party up to a total of eight men and three canoes.

On June 22 we loaded our three canoes with all they would hold, bidding good-bye to the last traces of civilization, started from Fort Chippewyan along the north shore of Lake Athabasca. Here the survey must begin, for the shore ahead of us for 160 miles was unsurveyed.

The instruments carried for the work were one Hadley sextant with arc of 8-inch radius, one Gurley's solar compass, two Massey's floating boat-logs, one camera, one mercury artificial horizon, one pocket-chronometer, three good American watches, three prismatic compasses, one aneroid barometer, maximum and minimum thermometers, etc.

The north shore of Lake Athabasca was surveyed with the solar compass and floating boat-logs, checked by observations both for latitude and longitude. The rock was found to be red and grey Laurentian granite, gneiss, often highly garnetiferous, dark green Haronian schists, and white quartzites, the latter occasionally mixed with heavy beds of homatite and limonite, and reddish unaltered sandstones, of Cambrian (Keewenawan?) age.

The Hudson's Bay Company's trading-post of Fond du Lac, near the east end of the lake, was found to be deserted, and we continued eastward over our track of last year until we reached the north shore of Black Lake, where the Indian canoe route strikes off to the north. Here we were to leave all beaten paths, and to strike into the unknown wilderness, without any other guide than the little Indian map obtained the year before. To reach Black Lake from the west, we had been obliged to portage or carry our canoes and all our goods across two stretches of land with a total length of six miles and a half, and now everything had again to be carried over a portage which proved to be two miles and a quarter in length, and which brought us to the shore of a small rock-bound lake on a brook tributary to the Chipman River. This lake has an elevation of 200 feet above Black Lake, or 1200 feet above the sea. We then crossed six small lakes and an equal number of portages, the latter of which averaged nearly a quarter of a mile in length, until we reached Chipman Lake, a very irregular body of clear water surrounded by rugged granite hills. More than a day was spent in this lake looking for the mouth of the upper part of Chipman river. When found, the river was ascended through long narrow lake-like expansions of quiet water, up strong currents, and past five rapids, where we were obliged to portage our canoes 80, 1100, 300, 20, and 930 paces respectively. The last portage terminates at the south end of a large lake locally known as Big Lake, but which is here called Selwyn Lake. It has a length of 55 miles, and an elevation above the sea of about 1350 feet. The shores are generally wooded, the last portage being through a forest of small black spruce and birch, while some aspens are growing on the sides of the hills, and a few white spruce, up to 16 inches in diameter, rise from the stony flats by the streams. The temperature of the water in this lake was 58° Fahr. on July 15.

From the north end of this lake a portage a mile and a half in length leads across the height of land through woods of black spruce, over a morainic ridge, beside a wet valley closely wooded with tamarac, to a lake lying 50 feet lower than the last. This lake I have called Daly

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Lake, after the Hon. Thomas Daly, Minister of the Interior for Canada, under whose direction the expedition was sent out. After having travelled northward on this lake for 20 miles, a heavy west wind delayed the party a day and a half, camp being pitched behind a long bar of sand and gravel, which extended off into the distance in a direction south 40° west. Here a few small aspens were seen, marking the northern limit of this tree, while an occasional small white birch might be found in the thinly scattered groves of tamarac and black spruce, which are everywhere draped with festoons of long threadlike black lichen (*Alectoria jubata*). This lichen is one of the principal articles of food of the Barren Ground caribou in winter, when the ground is thickly covered with snow.

Around Daly Lake are many gently sloping stretches of bright green turf, looking like the beautiful green fields that were now so far to the south of us. Their surface was quite firm to walk on, and was covered with a thin growth of light green lichen, low bushes of cranberry, eyeberry, dwarf Labrador tea, etc. On digging below the surface, I found the subsoil to be composed entirely of bright yellow moss (*Sphagnum sp.*), which had ceased to grow, mixed with a few pieces of wood. At the depth of about a foot the moss was frozen together into a solid mass of ice. On the upper side of these open green fields there is usually a spruce swamp, where the moss is still growing beneath the shadow of the trees, while at the edge of the lake, perhaps half a mile distant, and from 10 to 40 feet lower down, are light yellow vertical or overhanging cliffs of peat, from which large masses of peat are constantly falling on the sandy beach. Digging in a short distance with my hammer into the face of the cliff, which averaged 12 feet in height, we soon reached the frozen moss; through it were many streaks of clear ice. It would appear, therefore, that these sloping bogs are growing on their upper sides, that they then become frozen and cease to grow, and move slowly down the gentle slopes, like true glaciers, until they are undermined by the waves, and break away in cliffs on the border of the lake.

At the north end of Daly Lake we entered a stream which is known to the Chippewyan Indians of Athabasca as the Telzoa, or Wide Shallow River, and camped, on July 23, on the mossy bog near the head of a rapid, where the river is spread thinly over a bed of boulders for a width of 250 yards. On its south side it had no other bank than the wall of moss and ice along the face of the bog.

While within the forest we had been tormented both day and night by immense swarms of mosquitos, but now, in the more open country, the black flies made it almost impossible to move about with any portions of our hands or faces uncovered.

The country that we had been passing through, all the way from Lake Athabasca, had been gently rounded rocky hills of Laurentian gneiss rising here and there through the sandy and stony till; but here, in north latitude 61°, west longitude 104°, the river enters a flatter

country, now expanding into small irregular lakes, and again contracting into swift rapids over boulders. The banks are everywhere ill-defined, and there is no sign anywhere of the stream having cut out a channel for itself. The country is generally low and mossy, dotted with occasional groves of small black spruce. Here and there long bars of sand and gravel extend across the country in a direction 60° S. 70° W., parallel to the direction of glaciation, keeping this course entirely regardless of surface contours. On the sides and crests of these ridges are groves of fine large white spruce rising to the height of 50 or 60 feet, and measuring 6 feet in circumference 2 feet above the ground. These trees were much the finest that we had seen anywhere since leaving Lake Athabasca.

Further northward, the country became more stony, and the west shore of Barlow Lake, in lat. 62° , is composed of low hills of boulders and irregular masses of granite. Trees are confined to a few isolated groves on the banks of the stream.

It was now five weeks and four days since we left Fort Chippewyan, and our provisions were disappearing rapidly, for we had seen no game that we might add to our stock from time to time; but on the evening of July 28, my brother shot a small poor doe on an island opposite our camp. The next morning, as we were paddling across Carey Lake, making for a high point with a huge boulder lying on its summit, one of the men drew my attention to an immense herd of caribou on the eastern shore. They were standing on low flat land, feeding on soft grass, and endeavouring to catch a little of the breeze from the lake, which gave them some relief from their habitual summer tormentors, the black flies. Swiftly, but quietly, we paddled to the shore, and that afternoon was spent in shooting a number of the best bucks of the herd. The continuance of the exploration depended on our obtaining an abundant supply of meat, and the knowledge of this fact added to our excitement, as we stood in the midst of the tens of thousands of deer, as they ran madly to and fro, endeavouring to escape from a danger which they could not understand. That evening we were tired as we returned to camp, and the men collected sixty-eight tongues from the deer that we had killed. I had determined, if possible, to kill fifty, but we had rather overshot the mark.

Our camp was close to a small grove of stunted black spruce and tamarac. The past ten days had been cold and wet, but the next three days were bright and warm, with a dry south-west breeze, and in that time we cut up and dried about twenty-five of the best of the deer that we had shot. Immense herds were still about us, but we did not shoot any. Instead of our rifles we took the camera, and, walking gently, we would often approach within a few yards of the animals as they were quietly grazing, and thus managed to secure thirty-seven photographs, showing the herds of deer in various positions. The animals were very lean and

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poor, but we prepared between 250 and 300 lbs. of jerked meat from the twenty-five that we were able to dry.

On August 1, leaving one man to attend the drying meat, we paddled over to the high point two miles north-west of camp, towards which we had been travelling when we first saw the deer. The point is a long sloping ridge 150 feet high, trending S. 75° W. Its surface is composed of boulders, chiefly of red granite, embedded in yellow sandy till, while on the southern side is an outcrop of coarse red granite, containing large crystals of pyrite. On its crest is a large boulder, 9 feet high, of coarse red porphyritic granite. On the top of this boulder we erected a cairn of stones, under which we put a Worcestershire sauce bottle, with a short record of our trip to that time, and a sketch-map of the course followed. In the centre of the cairn we planted a pole, from the top of which floated a Union Jack. Giving three hearty cheers, we returned to camp.

On August 2 we packed our dried meat in bales, and were off by nine o'clock. We paddled past Cairn Point, and across the lake to a small brook, at whose mouth is a grassy glade wooded with white spruce (*Picea alba*), some trees of which were 8 feet in circumference 2 feet above the butt, and 40 feet high. Beyond the brook is a high hill of bare red, whitish wreathing granite, the first hill of bare unbroken rock that we had seen for many days. During the next few days several bad rapids impeded our progress, and we followed the winding shores of several small lakes, in one of the last of which we came to a small island of almost horizontal and undisturbed white limestone of Cambro-Silurian age, very similar to the Trenton limestone in Lake Winnipeg. This small outline is of great interest, as giving some slight clue to the former great extension of the Palæozoic limestones over much of the north country.

Patches of snow on the sides of the surrounding hills now reminded us that we had reached a sub-arctic region.

On August 6, from the crest of a low hill near the last grove of small black spruce, we saw before us a great lake apparently covered with a solid sheet of ice. Our journey by water seemed to be at an end, and the men were anxious to turn back; but we pushed on, and when we reached the lake we found a narrow lane of open water close to the shore on which we could travel with our canoes between the ice and the land. The mist rising from the ice generally prevented us from seeing the lake at all clearly.

Shortly after entering the lake we were delayed for three days by a heavy storm of wind and cold rain, which afterwards turned to snow; and on the morning of August 11, as we were leaving camp, there was a thin skin of ice on the tarpaulins. That day we found the ice tight against the shore around the point of a high peninsula, and were obliged to search for a narrow place where we could carry our canoes

and loads across to the open water beyond. The same evening we reached another point against which the heavy ice was crowded, and as it was too late to attempt a portage, we camped for the night at the mouth of a rapid brook, where he had hoped to have found a few willows for fuel. No willows could be found, but the men succeeded in boiling water for tea with some green dwarf birch (*Betula glandulosa*).

The next morning we had the pleasure of seeing a clear channel of open water between the point and the ice, along which we were able to paddle with our canoes. We followed the shore inside of some long rocky islands, between the ice of the lake and the land. The shore everywhere descended easily in beautifully green slopes to long sandy beaches between rocky points. The country through which we had been passing all the way from Lake Athabasca had been underlain by red and grey granitoid gneisses of Laurentian age, but here we entered a country underlain by sandstones, conglomerates, red quartz, porphyries, and dark green traps precisely similar to the Keewnawan or Upper Copper-bearing rocks of Lake Superior, and probably of the same age.

We followed the shore of the lake closely, searching for the river that flowed out of it, until the evening of August 15, when another cold storm of wind and rain delayed us for two days. On the evening of August 17 we found the outlet of the lake, having followed the shore for 117 miles. The water in the lake is clear and pure, though it has a flat taste like snow-water. Whitefish are very plentiful in it. The lake is probably the Doobaunt lake which Samuel Hearne walked around in 1770, and it appears to be deep and of large extent, but its southern and part of its eastern and western shores were not seen.

The river discharging it, which flows from the bottom of a bay at its northern end, at first winds gently between sloping grassy banks, often covered with boulders. Here we saw the first unmistakable signs of an old Eskimo encampment—stone circles, dog whip-handles, stone arrowheads, pieces of the ribs of kyacks, etc.

A few miles below the lake the river rushes through a narrow gorge caused by the decay of a trap dyke, which has risen through the surrounding Keewenawan conglomerates. Past this gorge it was necessary to make a portage $2\frac{1}{2}$ miles in length. At its eastern end the portage runs over sandy ridges and terraces which appear to represent old raised sea-beaches, with an approximate elevation of about 400 feet above the present sea-level.

The next day, after crossing the portage, we paddled across a small lake and down the river till within a few miles of Lady Marjorie Lake, where we saw a solitary deerskin tent on the right bank, 10 feet above the water. Very soon we saw Eskimo running about, and it was evident that the camp was in consternation, for they had seen our three canoes coming down the river from the land of their hereditary enemies, the Chippewyan Indians. When we were within hailing distance, my

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brother called out, "Chimo, Chimo; Ta'appe tacco Innuik; Kudluna awunga" ("Peace, peace; we are glad to see Eskimo; we are white men"), on which a number of people rushed from the tent and answered, "Chimo, Chimo." We pulled in to the shore, and were met on top of the bank by a tall, fine-looking Eskimo with a spy-glass in his hand, and wearing a pair of moleskin trousers and a deerskin coat. He was quivering with nervousness, but after we had shaken hands I presented him with a plug of tobacco, which set him more at his ease. My brother talked to the man for a few minutes, and then the women unlaced the front of the tent, which had evidently been tied up as tightly as possible, and invited us to come in. The tent held one dual family consisting of one man, two wives, and five children. The man drew us a rough map of the river down to salt water, but he could give us no idea of the position of the mouth of the river, and he appeared to know nothing of Marble Island or the coast of Hudson Bay. However, the fact that this man had a telescope, two old guns, and a pair of moleskin trousers, assured us that he belonged to the Eskimo of Hudson Bay, rather than to those of the Great Fish River and the Arctic Ocean.

After remaining a few hours with this friendly family, we proceeded on our way, hoping to meet other camps of Eskimo on the banks of the river from time to time, and to gain additional information from them.

On Lady Marjorie Lake, where we spent two days in a search for our course, being delayed by heavy winds, we shot several fine fat bucks, and replenished our supply of fresh meat. Shortly after leaving this lake we travelled north-westward, down a well-defined river, and our hearts sank as the river took us further and further towards the north-west, for we were making straight for the Great Fish River, which flows into the Arctic Ocean, and while we were only about 100 miles from that river, we were 350 from the nearest point on Hudson Bay. At length we reached a wide sandy plain, on which we were overjoyed to see willows growing, while around were scattered drifted trunks of spruce trees a foot in diameter, and limbs of balsam poplar. We had reached the mouth of the west branch of the Telzoa River, the banks of which must be wooded not far above the forks.

It was August 25, we were in north lat. $64^{\circ} 36'$, and the night was cold, so that we enjoyed the luxury of a fire, while the men baked bread and boiled a large supply of meat. Our safest plan of operations was now to ascend the west branch of the river and reach the wooded country before the winter set in, and find our way to Great Slave Lake, or back to Athabasca Lake. But I could not forego the pleasure of tracing to its mouth the great river that we had descended so far. Therefore the next day we pushed on to Aberdeen Lake, whose gravel shores were still deeply scored by the shoving of the spring ice. That evening I called the men together and told them that they had a long journey yet before them, that the summer flowers had all withered, and

that winter would very soon be on us. If they wished to reach their homes they must exert themselves to the utmost. After that I had no reason to complain of their unwillingness to work. We continued our journey eastward, losing one day in a search for the outlet of Aberdeen Lake, and two days from a heavy storm, until on September 2 we reached the west end of Baker Lake, where old Captain Christopher had been before us more than a century and a quarter ago. We had now accomplished our journey through the unknown interior country, and had gained the first recognizable point since leaving Black Lake, 810 miles behind us. The shore ahead of us was still practically a *terra incognita*, but we knew that by following it we should eventually reach Fort Churchill. We had surveyed a line of the above length through the very middle of the area that we had set out to explore. Of the distance 538 miles were over lakes, where the distances were measured with a Massey's floating boat-log, and the bearings taken with a solar or prismatic compass; 272 miles were on rivers, where the distances were estimated and the bearings taken with prismatic compass; but the distances thus obtained were constantly checked by observations for latitude and longitude. The lengths of the portages were obtained by careful pacing.

The stormy weather of autumn had now set in, and often prevented us from launching our canoes for several days at a time.

In the past month the small Arctic caribou had been plentiful in the country through which we were travelling, so that we had no difficulty in obtaining an abundant supply of fresh meat, but these animals now became very scarce, and on September 3 we shot the last deer of the season.

The survey with solar compass and boat-log was continued along the north shore of Baker Lake, which was found to lie along the line of contact of the Laurentian gneisses to the north, and the red Keewenawan conglomerates to the south, the former including bands of crystalline limestone. The Keewenawan rocks had been traced from Doobaunt Lake to Baker Lake, a total distance of 225 miles as the crow flies.

At the head of the river flowing from Baker Lake we met the incoming tide, and as the currents in Chesterfield Inlet were therefore very irregular, it was no longer possible to use the boat-log with any degree of accuracy, and the remaining distances were estimated, checked by observations for latitude and longitude. Chesterfield Inlet was found to be a deep narrow tidal fiord, with shore of red and grey granite and gneiss.

On September 12 we reached a rocky point just south of the mouth of Chesterfield Inlet, where the heavy waves, driven in from the open sea by a south-east wind, obliged us to struggle ashore, and prevented us from starting out again on the same day. Behind our camp was a

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sandy terrace in which the Eskimos had dug the basements of many of their snow houses or tents, while around they had stood up on end many huge slabs of stone. We now began the heavy task of travelling down the tidal shore of Hudson Bay in our little open canoes. During the first three days the weather was beautifully fine, and we covered more than 100 miles of the distance, so that there appeared to be every chance of our reaching Fort Churchill on open water. To the right lay the bold rocky shore of dark green Huronian schists, while to the left Marble Island raised its bare white hills out of the dark-green ocean.

On the evening of the third day, as we were about to cross Corbett's Inlet, a heavy wind sprang up from the south-east, and forced us to camp on a small sandy island, where we were obliged to remain for a day and a half. On September 17 the wind went down, and we started to cross the 7 miles of open water which lay between us and the south side of the inlet. When about midway of the distance, a heavy north-west wind sprang up and increased to great violence, so that every moment we were in danger of being engulfed by the waves which broke over us, until we ran behind a projecting reef and were safe, but wet to the skin with salt water. Storm after storm now broke over us, and in twenty days, from September 15 to October 6, we were unable to advance more than 120 miles.

On the morning of September 20 the ice was three-quarters of an inch thick on the small ponds on the rocks; on the 22nd the ground was covered with a heavy fall of snow; and on the 25th we walked 20 miles, often on the crusted snow, in search of game, but all that we were able to shoot was one ptarmigan, which we divided for dinner.

Shortly afterwards one of the men had the good fortune to shoot a white bear, and for the next five days, during which time a heavy storm was raging, we subsisted on the meat of this animal. We had been able to collect some lichens and small plants from the tops of the knolls, and with these we occasionally made a small fire; but on the night of October 3 the wind went down, and the snow fell quietly and peacefully, covering hills and valleys with an even white sheet, and burying all the reindeer; so that there was no chance of obtaining even that any longer for fuel. This made our condition almost desperate, for we were then 270 miles from Churchill, on a bleak coast, with only a few pounds of bear's fat for food, without fuel, and 200 miles from the nearest wood. Two more days were spent struggling southward in our canoes, but at night and morning we had to carry canoes and cargoes a long distance to and from dry land, and, though we worked hard, we made only 12 miles.

On October 6 the winter had settled down on us with all its arctic rigour, and even in the sun at midday the thermometer remained considerably below freezing-point. We were without food or fuel, and our clothes were worn to rags. Two hundred and sixty miles of shore still

lay between us and Churchill, the nearest point where we could obtain supplies. Our canoes were loaded with specimens of rocks and minerals which we had collected, both in the interior and on the coast. It was clearly impossible to reach Churchill travelling as we had been travelling, and I therefore decided to leave everything behind us which was not absolutely necessary for the safety of the party. The shore was a vast snow-covered plain, but a slight gravelly eminence was chosen, half a mile from high-tide mark, and on it one canoe, all our rock specimens, instruments and whatever else was not necessary for our existence, were carefully piled in a heap and covered with tarpaulins. Our note-books, photographs, and collection of plants, with guns, ammunition, blankets, and two tents, were put in the remaining two canoes, and thus lightened, and with four men with paddles in each canoe, we started southward again, determined to reach Churchill by water if possible.

The shore was very flat, with a tide of from 12 to 14 feet, and at ebb tide the water was generally several miles from the line reached by it at high tide, so that we were able to land or launch our canoes but once in each twelve hours, namely, at the time of high tide. Any rocks seen on the shore were Laurentian granites and gneisses.

We struggled onward for ten days, living on what few ducks we could shoot in the open water. The weather was very cold, and the water that was splashed over us by the wind froze on our clothes and beards. We had constantly to break the ice from our paddles, as they became too heavy for us to swing. When night settled down on us on October 14 it was ebb tide, and we were out among ice and boulders almost out of sight of land. That night we spent in our canoes, one of our men having both of his feet badly frozen, while another was sinking rapidly with an attack of dysentery. On the afternoon of the 15th we gained some solid ice, and hauled our canoes over it to the shore, where we pitched a tent just as a heavy storm of wind and snow broke over us. There was now driftwood on the shore, and with it we made a fire and cooked some ducks that we had shot, getting the first food that we had tasted for thirty-six hours. Assured that we were not very far from Churchill, I sent two men on foot through the snow to the fort for assistance, and on the afternoon of the third day they returned with four dog-teams, bringing us pork and flour, and on October 19 we were carried to Churchill. Here we obtained shelter with the clerk in charge for the Hudson's Bay Company, and we received every kindness from the Rev. J. Lofthouse, the missionary to the Eskimo for the Church Missionary Society; but fresh meat was not to be had, and the men gained strength very slowly on the limited diet of salt pork, flour, and oatmeal.

We remained here until November 6, when we crossed the Churchill River on the new ice, and started on snowshoes for York Factory. We had secured one dog-team from the Hudson's Bay Company to carry our provisions and the man whose feet had been so badly frozen, while the

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other men were obliged to haul their bedding on small toboggans. Other dog-teams belonging to the Hudson's Bay Company assisted us for part of the way, as they were going to recover some stuff that had been left on the shore between York and Churchill by one of their officers in the latter part of September, it being considered impossible to travel further by water so late in the season.

When we arrived at Nelson River, the scanty supply of provisions that we had been able to obtain at Churchill was exhausted. The river was found to be full of running ice, so that we were unable to cross it either in the boat which we found there, or on the ice, and our party, now augmented by three local Indians, was obliged to remain on its bank for ten days, subsisting on the few rabbits, foxes, etc., that we were able to catch. The weather had been very cold, the thermometer often falling at night to 20° Fahr. On November 24 we arrived at York Factory, where we were able to procure a plentiful supply of provisions. The officer in charge here for the Hudson's Bay Company is a medical doctor from Aberdeen, Scotland, and as Michel, the man with frozen feet, was unable to walk, and we were unable to obtain transport for him, we left him under the doctor's care, to be sent out with the winter packet.

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We obtained another dog-team and provisions for twelve days, and on November 28 started on snowshoes through the deep unbroken snow for Oxford House, 250 miles distant. The country passed through was generally flat and swampy, and thinly wooded with small black spruce. Late on the evening of December 7 we arrived at Oxford House, tired and footsore after our ten days' walk. After a delay of six days, waiting for fresh teams of dogs, we again started and arrived at Norway House on December 20. Here the men from Isle à la Crosse and Prince Albert were paid off and sent home up the Saskatchewan River, while I obtained fresh dog-teams and drove southward across Lake Winnipeg to Lower Fort Garry, on the Red River, where we arrived on the evening of January 1, 1894, and the next day we reached Winnipeg.

During the course of the expedition we travelled, beyond our railway journeys, a total distance of 3200 miles, viz. 2150 miles in canoes, 610 miles on foot on snowshoes, 350 miles in conveyances drawn by dogs, and 100 miles in conveyances drawn by horses.

While so travelling we made the following surveys:—

Seven hundred and seventy miles over lakes, where the distances were measured with a Massey's floating boat-log, and, in order to avoid local attraction or weakness of the magnetic needle, the bearings were taken as much as possible with Gurley's solar compass. Two hundred and seventy-two miles of river, and 360 miles of the tidal shores of Chesterfield Inlet and Hudson Bay, where the distances were estimated and the bearings taken with a prismatic compass, the variations being constantly determined by the solar compass. Throughout the above distances

observations were taken with the sextant and artificial horizon as often as possible both for latitude and longitude.

The remaining portion of the shore of Hudson Bay, between where the instruments were left and Fort Churchill, about 250 miles in length, was geologically examined, and the position of the mouths of the rivers roughly ascertained.

A careful track survey was kept of the route travelled over on foot from Churchill to York Factory, a distance of 200 miles, the bearings being taken with a prismatic compass, and a rough track survey was also kept through the 400 miles of wooded country from York Factory to Norway House.

A very full collection of plants, including 229 species, was made by my assistant, Mr. J. W. Tyrrell, in the new country passed through. We also took 260 instantaneous photographs, which illustrate the principal physical features of that northern country, and the immense herds of reindeer that roam over it.

NOTE ON MR. J. B. TYRRELL'S MAP.—On this map are shown the results of two surveys, made by Messrs. J. Burr Tyrrell and J. W. Tyrrell, in 1892-93. On the first expedition Cree Lake was visited; a survey was made of the west shore, Wollaston Lake, and the positions of other important points were fixed. On the second expedition the instruments used were an 8-inch sextant and artificial horizon, a Gurley solar compass, Massey's logs, photographic camera, chronometers and watches, prismatic compasses, aneroid barometer, and maximum and minimum thermometers. The north end of Lake Athabasca was surveyed and fixed by observations for latitude and longitude. At Black Lake all beaten paths were left, and from this point many important corrections and additions were made to the sketch-maps previously existing. The topographical results of these two expeditions have been carefully laid down on the map.

