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Through the Barren Ground of North-Eastern Canada to the Arctic Coast

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In conclusion, we hope that the contribution contained in these two papers may have advanced knowledge in regard to the plant-geography of Yorkshire, and may have suggested methods of observation applicable elsewhere. Defects and oversights must exist, but we have tried to reduce them to a minimum, and trust that they do not affect the main features of the survey.

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THROUGH THE BARREN GROUND OF NORTH-EASTERN CANADA TO THE ARCTIC COAST.*

By DAVID T. HANBURY.

FORT RESOLUTION, near the mouth of the Great Slave river, may be taken as the starting-point in this sketch of my journey through the Barren

* See map, p. 236.

Ground of North-Eastern Canada. From this station, on July 13, 1901, I and the two companions whom I had engaged set out in two light canoes, with a small scientific equipment and with only such supplies as were strictly necessary for the earlier part of the journey. For the expedition to the arctic coast I had arranged that ample stores should be waiting in winter on board a whaling schooner, the *Francis Allyn*, somewhere near the mouth of Chesterfield inlet, probably at Marble island.

The first evening we camped on Stony island. In crossing the lake we passed a long group of small islands, which I had not seen on any map. On the north shore, as we paddled along, we found traces of the gold bubble which had risen and burst a few years before. On July 20



VIEW OF TYPICAL COAST, BARREN GROUND.

we reached the eastern end of the lake. Then we made the nine portages, one of them $2\frac{1}{2}$ miles long, and on the 23rd reached Artillery lake, whose lovely blue waters rippled in bright sunshine, while on either hand the so-called Barren Ground stretched green and gay with numberless wild flowers. Ascending the stream which flows into the lake, we reached the watershed on the 27th, and in the evening camped on Campbell lake, on the headwaters of the Ark-i-linik. The divide is only a low moss swale, about 300 yards across, where one could just observe the water trickling here to the west, there to the east. Next day we reached the irregularly shaped lake which I have called Abbott lake, and, on the following morning, proceeded down the western branch of the Ark-i-linik. A few miles east of Abbott lake, I found, as I had found in 1899, that my compass would not work; but after trying a few blind inlets, we made out the proper course. On the 29th we saw the first of

the spruce trees which distinguish the Ark-i-link down to about 20 miles west of Ti-bi-ilik lake, forming in many places a belt or fringe of woodland, the trees being sometimes as much as 2 feet thick at the ground.

On August 2 we reached a portage where the river cuts its way through felspathic granite (quartz in some places, in others biotite), whose beds dip at an angle of 60° . At the foot of the portage the formation changes to white sandstone, which continues with little interruption to the mouth of the main river. By August 5 we had passed all the portages, including that at a fall 30 feet high, and commenced (August 6) the descent of the main river.

On the 15th, near Ti-bi-elik lake, we met the first Eskimo, or Huskies, as I shall call them. Descending the lake, which is 13 miles long and 5 or 6 miles broad, we reached the mouth of the Dubawnt river, whose name is then given to the united stream. Accompanied by two Huskies, we held on our way, and on the 20th reached Udi-uk-tellig, a Husky camp, where, in conversation with my old friend Amer-or-yuak, I recovered my knowledge of the Husky language. We were detained by rain and wind (north-north-east and north-west), usual at this season, till August 25, when we resumed our journey. The river connecting with Baker lake is wide, deep, and swift, with steeply sloping banks, the country, especially on the north, being hilly and rocky. Halfway down the lake we were delayed by bad weather, then we had fog; but, steering by compass, we reached Maur-en-ek-uak, at the foot of the lake, on September 3.

Here the tide from Hudson bay rises 6 or 8 feet. Chesterfield inlet commences about 20 miles further down, at the end of the southern outlet of Baker lake. This channel, the last portion of the Dubawnt river, is deep, and the water flows with a strong current. With a fair wind we descended the inlet in three days, and (September 8) camped on the mainland coast, south of Fairway island. Back from the coast the land was undulating, stony, and rocky, dotted with small lakes and moss swamps. Birds (ducks, etc.) were numerous, and one day I stalked and shot a swan belonging to one of the flocks I had seen overhead. Having gone southwards looking for the whaler, we set out, on September 17, in calm weather, and crossed the channel (about 10 miles) to Marble island, rounded its south-western point, and entered the narrow passage leading to the harbour, but no ship nor any living creature was there, though barrel hoops and staves were lying about, and there were many graves. The island is of quartzite, white at a distance, but rusty or yellow close at hand. The harbour is good, except that its anchorage is insufficient, and we saw a track leading up the rocks to a small fresh-water lake.

Returning to the mainland, we resolved to go back, in the mean time, to Baker lake. Near the coast we found indications, chiefly in the form



VIEW OF THE COUNTRY ON KENT PENINSULA.



VIEW OF MOUNT HAR-LI-AR-LI (BASALT), KENT PENINSULA. ALTITUDE, 360 FEET.

of old Husky camps, that the Hudson bay Huskies are less numerous than formerly, and my inferences on this subject were confirmed by Amer-or-yuak. Proceeding up the inlet, I met at Nell-yuk-yuak, on September 28, Uttungerlah, an old Husky friend, and received from him letters which informed me that the *Francis Allyn* was lying at Dépôt island, a small, low rocky islet about 40 miles north of the mouth of the inlet. He had come in one of the whale-boats, and in this craft I reached the whaler on October 2. Three days later we set out in a fully laden whale-boat, and took a short cut along a shallow channel dug by the Huskies behind the peninsula (which maps do not show as a peninsula) at the north-end of the inlet, thus saving 20 miles. On October 12 we reached the Husky camp at the foot of Baker lake, and landed through heavy slob ice, just in time, for next day the river was frozen thick.

In the winter we had several hunting expeditions, one being towards Pelly lake, over new ground, which in this brief sketch I must leave undescribed.

My next move (December 26) was towards the *Francis Allyn*, where I had to prepare for the journey to the arctic coast. I made arrangements with Amer and Uttungerlah for their company to the north, settled on the route and other details, and then went to fetch the supplies. From the head of Chesterfield inlet to the ship the direct distance was about 140 miles, which, in travelling, we made about 180. The country was flat or undulating, and contained lakes, but neither our going nor returning need be described here. For the month of January, 1902, the mean temperature was $-30^{\circ}5$ Fahr., and the lowest reading for the whole winter was -57° Fahr.

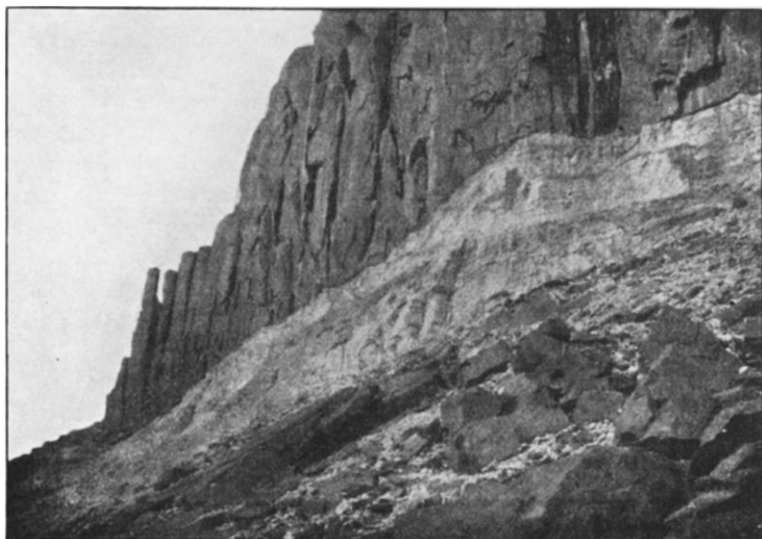
On March 9 we started on our long journey from the foot of Baker lake with two sleighs laden with stores, and a third carrying two canoes "nesting" on a frame, the three being drawn by twenty dogs. All of us walked, even the women and children who were to accompany us to Pelly lake. We went by easy stages, and on the 16th reached King-ak, near the lake-head. Here the minimum temperature was -51° Fahr. The whole southern shore of the lake is low, but about 2 miles to the south, a ridge parallel with it runs from near the Kazan river to King-ak, and opposite the middle of this ridge, but 8 or 10 miles to the south, is a conspicuous hill called No-a-shak.

King-ak stands on a bay, into which flows a very small stream. This is probably the place referred to by Captain Christopher, sent in 1761 to ascertain whether a north-west passage could be found by Chesterfield inlet. He mentions, as at the head of a large fresh-water lake (Baker lake), "a small river full of falls and shoals, not water for a boat," and seems not to have seen or heard of the Dubawnt river.

Travelling slowly past the shores of Schultz lake and Aberdeen lake, we reached Ti-bi-elik lake on April 3. Here three thermometers



MOUTH OF THE COPPERMINE RIVER.



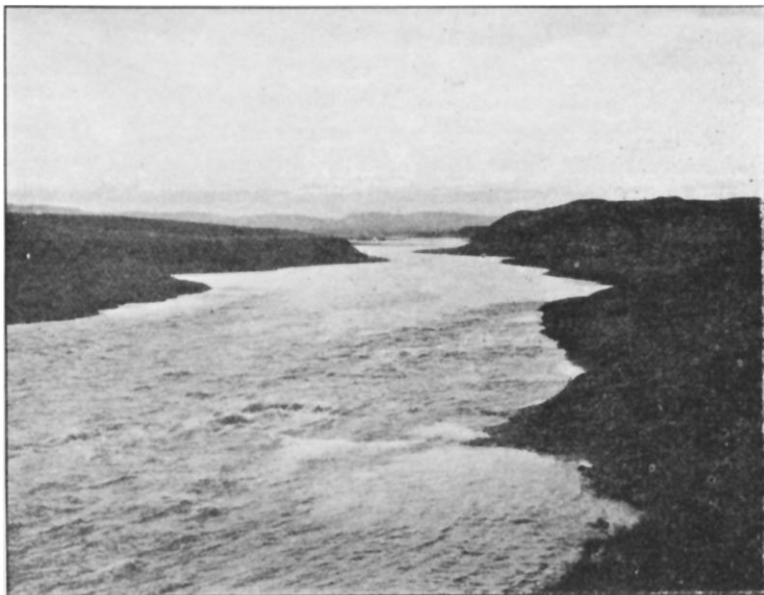
**PRECIPITOUS COLUMNAR BASALT OVERLYING LIMESTONE, FORDEN ISLANDS,
BATHURST INLET.**

gave $211^{\circ}4$ as the boiling-point, the temperature of the air being 32° , so that the altitude was about 313 feet. On April 5 we crossed the lake (6 miles), and next day set out due north, intending to follow the meridian of 101° as nearly as we could by dead reckoning. The country was flat, without rocks *in situ*, but red sandstone *débris* appeared. In 9 miles we found only one lake. Further on (April 7), the sandstone *débris* gave place to granite boulders and fragments. The boiling-point of two thermometers here was 211° , the air being at 28° , so that the altitude was about 515 feet.

On the 8th we crossed two small lakes and a low ridge, apparently dividing the waters flowing south from those flowing north to Back's river. The country was still flat, with low ridges and sand-hillocks. Next day we struck and followed a river flowing north. It proved to be the Buchanan, with banks usually low and sloping, but high in some places, with sandy hills back from either side. The ice on the river was 7 feet thick. On the 10th we camped in snow huts on a lake, to the west of which was a flat-topped gravel hill about 120 feet high. As we descended the river, its bed of granite boulders widened, and was now from 300 to 600 yards across. I could not determine my longitude, and was puzzled by the discrepancies between Tyrrell's map and the latest Admiralty chart, the mouth of the Buchanan being put on the former at $102^{\circ} 10' W.$, and on the latter at $103^{\circ} 10' W.$

On April 12 we fell in with a Back's river Husky, who took us to his camp. On the 14th we left the Buchanan, and, going 5 miles north-east, reached the south-west shore of Pelly lake, across which we travelled 6 miles to the north shore. Here the boiling-point given by two thermometers was $211^{\circ}5$, the temperature of the air being 30° , so that the altitude was about 260 feet. We searched for, but, owing to fog, did not find, a stream which we were told flows into Pelly lake from the north. On the 18th we followed an arm of the lake running north; then struck north and north-north-west, where the land became rugged with granitic rocks. On the 17th the maximum temperature had reached 32° Fahr., and on the 20th 36° Fahr. On the 21st an observation of the meridian altitude of the sun showed we were in lat. $66^{\circ} 25' 25'' N.$ Here the boiling-point was $211^{\circ}2$, the air being at 29° , and the altitude therefore about 414 feet.

Then the country became flat, and on the 22nd we reached Te-her-uak lake (but this seems to be a common word for "lake"). Travelling $8\frac{1}{2}$ miles from about the middle of the shore, we reached the foot of the lake, which, confined within low rocky shores, was irregular in shape, and contained many rocky islands. Next day we found the outlet, marked with stones set on end by Huskies. As we travelled northwards, April 23, it was difficult to tell whether we were on the river, or on lakes or moss swamps. An observation gave our latitude as $66^{\circ} 42' N.$, so that from Ogden bay in $67^{\circ} 36' N.$ we were distant 54 geographical



COPPERMINE RIVER.

miles. The rocks here were pinkish felspathic, smooth, but not striated so far as we observed. On the 25th we travelled on the river and lakes across a barren country with neither moss nor lichen, but we found heather for fuel. For several days we were detained by blizzards, but on May 1 we continued our way down the river past several frozen rapids, the rocky banks being sometimes 20 feet high. On May 2 we were in lat. $67^{\circ} 18' N$. We made long halts to avoid outstripping the deer in their migration to the north, and on one of these days I killed two arctic hares on rough broken ground. On the 8th we were nearly at the sea-level, two thermometers giving 212° as the boiling-point, and one $212^{\circ}.1$.

On the 10th we were about $67^{\circ} 26' N$., or about 10 geographical miles from Ogden bay, and I sent two Huskies north to prospect, giving them presents for the coast natives. Next evening they returned, bringing with them two coast Huskies, tall, strong, quiet men, differing in no way but in the cut of their clothes from the Hudson bay men. They seemed timid at first, but gained confidence, gave me much information, and agreed to accompany us.

On May 12 we were in lat. $67^{\circ} 29'$ and two days later we struck the arctic coast in lat. $67^{\circ} 44'$; and (as I subsequently puzzled out) at a spot a little to the west of McTavish point. The river had widened out, and the land was very low. Seven miles out on the ice we found a Husky camp of two snow huts, or "iglús," and three tents, containing

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five families and some visitors, forty-five persons in all. From that point our direction was westwards. Setting out on the 16th, we passed many bare, rocky islets, the distant mainland coast being visible as a low undulating ridge. On the 17th we camped beside rocky islets showing deep grooves and striæ, and broken off abruptly to the north. Other two days' travelling brought us to the tents of Huskies, strangers to my Arctic coast companions, and bearing a marked resemblance to the Mongolian type. They were friendly enough, but did not invite us into their tents. On May 22 I found we were in lat. $68^{\circ} 5'$. Here we boiled three thermometers, which showed respectively 212° , $212^{\circ} \cdot 1$, and 212° as the boiling-point.

After being detained by blizzards, we cut across White Bear point, and held for two days westwards, inclining slightly to the north. On May 27 we camped in our tent on the west of the portage across Bear



SMALL WATERFALL COMING INTO THE COPPERMINE RIVER.

point, and on the 28th, at some island rocks to the west of Dease point, we saw the midnight sun for the first time, though it had been visible



THE DIVIDE BETWEEN GREAT BEAR LAKE AND THE COPPERMINE RIVER. VIEW LOOKING NORTH TOWARDS DISMAL LAKE.

some days earlier. The mainland to the south seemed high and rocky ; Melbourne island appeared as a long low streak to the north.

On May 29 I found our latitude was $68^{\circ} 29'$. That day we reached the east coast of Kent peninsula, where Huskies were busy catching codling with copper hooks through holes in the ice. The weather was now warm ; the blazing sun melted the snow on the land, pools of water lay on the ice, and birds and beasts became more numerous.

The little inlet from Labyrinth bay on which we were camping was almost too small to have a name, but as, from its position, it seemed to deserve one, I called it Portage inlet. From its head there is only one mile's distance overland to It-ib-lair-yuak lake, which is 6 miles long, and has at its west end an outlet flowing into the inlet E-lu from Warrender Bay, on the west side of Kent peninsula, which is thus almost an island. With exception of the one-mile portage, there is an excellent canoe route, not only much shorter, but more sheltered than that round Kent peninsula.

We resumed our journey on May 31, and camped at the foot of the lake in a rocky country. A mile to the south-south-west was a basaltic hill (Har-li-ar-li) 360 feet high, as I made out by the Watkin aneroid, and precipitously cut on the east and south. On the ridges and hills here beds of marine shells were noticeable. Travelling along the south shore of the inlet E-lu, we passed on June 4 a hill called U-wei-yu-ullu, and on June 6 a similar hill, both being precipitous nearly all round,

and though less than 600 feet high, very prominent landmarks. About 9 miles further on, the E-lu inlet, which is about 12 miles across at its widest part, contracted to about $1\frac{1}{2}$ mile. The following day (June 7), after going 8 miles, we reached Warrender bay. The entrance to E-lu inlet is obscured by islands overlapping one another, and this fact accounts for its having been passed unnoticed by the surveyors of Melville sound. Crossing Hope bay, we went S. 30° W. to the high and rocky south shore of Melville sound, travelling 22 miles over smooth ice, on which a Husky killed five arctic hares with his bow and arrow. On the 8th we travelled west along the coast of the sound, and camped at a creek with a shoal sandy beach, where there was a Husky encampment called Sarker-wark-túk. A longish hill, 840 feet high, overlooked our camp. Dwarf black birch was abundant.

On the 15th I and two Huskies on a sleigh set out for Barry island (Iglor-yu-ullig), and next day reached its north shore. We found two small pieces of copper, and the rock formation showed that the metal was abundant and widely distributed. In returning (June 18) we made for the nearest land on the eastern shore of Bathurst inlet, and, crossing mountainous ground, reached our camp on the 19th. On the 22nd we journeyed 18 miles westwards, and camped on the west side of Cape Croker, which is an island separated from the mainland by a channel half a mile wide. Next day, in crossing Bathurst inlet, we reached a flat-topped precipitous island, basaltic, but with a bed of limestone as much as 60 feet thick underlying the columnar basalt. On the 25th, passing many other islands, we reached one where we searched for copper, and, though we found little, saw from the stains on the rocks that copper was present. On the 27th, at the north-west point of Lewes island, we found copper in flakes wedged vertically in the rocks, and also in small chunks. We picked up between 2 and 3 lbs. in less than three-quarters of an hour. The rock was easily cleft by a slight tap with an axe. The summer was now well advanced, birds, butterflies, and flowering plants being common.

On the 29th we reached Cape Barrow, off which are precipitous basaltic islands, and inland from which the country is rugged. Next day, 8 miles along the coast, at Utkúshik Karlúk, we found a soft stone from which the Huskies make kettles (*Utkúshik*). It occurs, grey and powdery-looking, among granitic rocks. On July 1 we camped a short distance east of Uni-a-lik, a river with a reputation for salmon. Here, in Gray bay, the ice was very rotten; but next day, beyond Hepburn island, the ice was good. As we advanced, however, it got worse. We all went through it several times, and the cracks became so wide that in crossing them we had to launch a canoe. Two of us were suffering from snow-blindness, and when less than 60 geographical miles from the Coppermine river mouth, I resolved to wait for open water. On the 12th we set out in the canoes, but the strip of open water was not

continuous, and it was not till the 18th that, after many portages, we reached the Coppermine.

Next day we paddled 9 miles up to Bloody fall, where we found a Husky camp, from which the occupants had fled on our approach, leaving everything behind. The stone kettles with boiled salmon were still warm. I took some half-dried salmon, and left for payment knives, files, needles, etc.

The fall is in fact a rapid, requiring half a mile's portage. Above this is a stretch of shoal (now and then deep) water with a swift current, which it took us all day to ascend, wading and walking the canoes. Higher up there were rapids, where the water was too swift



CAÑON AT MOUTH OF KENDALL RIVER.

for paddling and too deep for poling, and where the steep banks gave no footway for tracking, so that portaging could not be avoided. At such places it took all six of us to handle a canoe. We ascended the river for about 100 miles to the place where, nearly opposite each other the Mouse river and the Dismal Lakes river flow into the Coppermine. The river to the west offered fair canoe navigation, and we reached the Dismal lake (there is only one) on August 1. About 12 miles to the north-west we found the narrows, in lat. $67^{\circ} 21' N.$, as I made out. The altitude of the lake is about 860 feet, which is also, within a few feet, the altitude of the divide between the Coppermine and Great Bear lake waters. The portages across the divide were numerous and lengthy, and after having passed them I bade good-bye to the three Hudson bay Huskies who had attended me so far.

On July 29 and August 3 the maximum temperature was 65° Fahr., the highest registered during the journey. I wished to connect the survey of the east end of Great Bear Lake with that of the Coppermine, but scarcity of food and the difficulty of the shoal and stony Dease river required that we should push on. On the 19th we reached Great Bear lake, and on the 30th the long journey ended at Fort Norman, on the McKenzie river.

Generally speaking, the geology of the northland of Canada is not of a very interesting character, except perhaps to the student of glacial phenomena.

Plutonic rocks, granite for the most part, prevail. However, I came on limestone on the arctic coast, but I failed to discover any fossils, though I searched diligently for them. Large quantities of native copper were found on the islands in Bathurst inlet. It was in basaltic formation. I may be wrong about this, as my collection of geological specimens has not been examined yet. As it will be some time before I shall have finished writing up my notes, I have written the following short *resumé* of the different formations met with.

At the foot of Baker lake (Maur-en-ek-uak on my map), red or brown sandstone, classified Cambrian by the Canadian Geological Department. No fossils have ever been discovered. Between the north shore of Baker lake and Lake Garry on Back's river, the usual plutonic rocks occur, chiefly felspathic granite. About 20 miles south of Lake Garry are some exposures of white or grey quartzite, similar to that found on Marble island, which has been reported upon by Dr. Bell (Canadian Geological Survey Department). This quartzite is classed Huronian. As we approached Lake Garry, exposures of rock became less frequent; the land is of a sandy nature, and small sand-hills numerous. Between the head of Chesterfield inlet and Depot island (near Whitney inlet, on the coast of Hudson bay) are massive granite rocks, and the country is rugged.

Starting from the north shore of Ti-bi-elik lake, we travelled over flat or undulating country for 20 miles; no exposures of rock were seen, but sandstone *débris* scattered around. We then came on granitic boulders, but still no rock *in situ*. A short distance further north there was an outcrop of grey quartzite (Marble island). We then struck the headwaters of Buchanan river, a tributary flowing north into Back's river. Along Buchanan river are no rocks *in situ*; land sandy. Granitic rocks are *in situ* on Buchanan river, close to its junction with Back's river. North of Pelly lake, felspathic granitic occurs, smoothed but not striated by glacial action. A similar formation is found right up to Ogden bay on the arctic coast. The granite varies considerably in composition. Felspar is so much in the ascendant in some cases, that the whole country has a pink appearance; in other cases, hornblende is in the ascendant; in others, quartz. The rock is highly crystalline in most cases. Schists are conspicuous by their absence. Plutonic rocks are in evidence all along the arctic coast to Kent peninsula.

A peculiarity which I have noticed in a great many places on the northland of Canada is the occurrence of beds of shells (marine), on the tops of hills or raised spots at altitudes varying from 50 to 500 feet above the sea-level. These beds of shells were very common on Kent peninsula. Specimens of these shells, which I brought back on my last journey, and which were found to the south of Baker lake, were named for me by Dr. Dawson—*Laxicava rugosa* (L.), *Pecten Islandicus*, *Astarte Banksii*, var. *striata*, fragments of *Buccinum* and *Balanus*. It has always

been a puzzle to me to account for the presence of these beds of shells. I quote from Lyall, p. 168. "The occurrence of patches and beds of marine shells at altitudes varying from a few feet to 500 feet is probably due, *i.e.* their present elevated condition, to the action of great glaciers or ice-sheets pushing up portions of the sea-floor, possibly in a frozen condition, to the hill slopes on which they are now to be found."

Basalt was observed on Kent peninsula, which continues with breaks almost to the Coppermine river. Native copper is always vertically placed in basaltic formation, much disintegrated, and easily broken up. This formation, containing larger or smaller quantities of native copper, prevails on all the islands in Bathurst inlet (or rather, I should say, all that I visited). I have several specimens of this rock, showing exactly how the copper occurs. It is generally in the form of flakes which are always wedged in vertically, never horizontally. Why this should be so I shall not venture to guess. The copper is also found in lumps or nuggets, some of them very large.

Near Lewis island, in Bathurst inlet, is a bed 15 feet thick of limestone underlying 20 feet of basalt; no fossils in the limestone. In the islands north of the Cape Barrow limestone was seen, but not visited. Eight miles west from Cape Barrow, and about 5 miles inland, there is a spot or patch of soft grey rock, which occurs in felspathic granite formation. I call this rock kettle-stone, for it is the stone used by the Eskimo to make their stone kettles and oil lamps. It is most peculiar and its presence and origin are not very apparent. It is quite soft, and can easily be cut with an axe or knife. It may be the result of the kaolinization of the feldspar, caused by deep-seated chemical action. I do not advance this theory, however. Why it should occur at certain spots, or at all, is a geological puzzle. I have specimens of this rock, which is *in situ*, and also a kettle and a lamp made out of it.

The geology along the Coppermine has already been reported upon, I believe. No signs of gold were seen. The only other metal, other than the native copper met with, was iron, which is common everywhere in small quantities.

THE TERMINOLOGY AND NOMENCLATURE OF THE FORMS OF SUB-OCEANIC RELIEF.

The first meeting of a Committee of the Sixth International Geographical Congress appointed at Berlin in 1899 to consider a scheme of international nomenclature for the forms of sub-oceanic relief was held in the Hotel Nassau, Wiesbaden, on April 15 and 16, 1903.

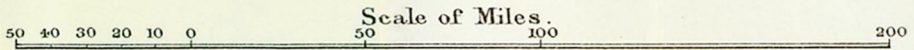
There were present, H.S.H. The Prince of Monaco; Prof. O Krümmel, Kiel; Prof. A. Supan, Gotha; Prof. O. Pettersson, Stockholm; Prof. Thoulet, Nancy; Dr. H. R. Mill, London. M. Sauerwein, aide-de-camp to the Prince of Monaco, acted as secretary of the Committee. Sir John Murray and Dr. Nansen, members of the Committee, were unable to be present.





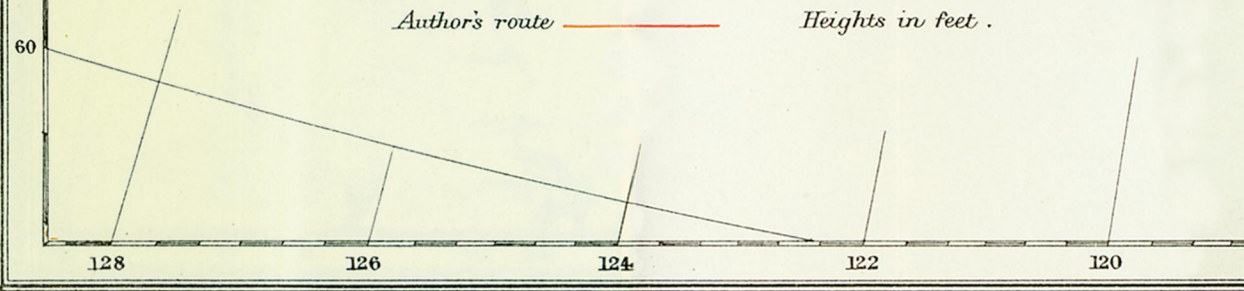


NORTHERN PART OF THE
DOMINION OF CANADA.
 illustrating the journey of
DAVID T. HANBURY.
 1901 - 1902.



Nat. Scale 1 : 3,500,000 or 55.23 miles = 1 inch.

Author's route ————— *Heights in feet.*



Secant Conical Projection

