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Exploration in the Canadian Rocky Mountains

Author(s): J. Norman Collie

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graciously pleased to attend several meetings of our Society. The Duke accepted the office of Honorary President of the Sixth International Geographical Congress in 1895, and delivered an admirable speech of welcome to the geographers from all the countries of the world, at the opening evening meeting. We trust that His Royal Highness will be pleased to accept the offer of Vice-Patron of this Society, in succession to his father.

His Majesty the King is Patron of our Antarctic Expedition, and I am sure we all confidently hope that its young and very able commander will illustrate the opening reign of Edward VII. by his contributions to geographical science, as Sir James Ross did that of Queen Victoria. Such patronage will not fail to be a great encouragement to officers and men.

We all most earnestly hope that not only geographical discoveries, but successes of all kinds, may brighten and render famous the reign of King Edward VII., that every blessing may attend him, and that he may long be spared to reign over a loyal and united people.

GOD SAVE THE KING.

EXPLORATION IN THE CANADIAN ROCKY MOUNTAINS.*

By Prof. J. NORMAN COLLIE, F.R.S.

IN February, 1899, I read a paper before this Society wherein I described two journeys, one taken during the summer of 1897 with Mr. G. P. Baker, and one with Messrs. H. E. M. Stutfield and Hermann Woolley in 1898. During these journeys we explored the eastern side of the Canadian Rocky mountains for a distance of nearly 100 miles, from Laggan on the Canadian Pacific railway to the sources of the Athabasca river. One or two explorers had been through the country before—Dr. Hector, Prof. Coleman, and Mr. Wilcox—but they had for the most part followed the valleys; few attempts had been made to investigate the great snow-fields and the surrounding peaks that form the backbone of the country. We penetrated into the very heart of three out of the four great plateaus of ice and snow—the Wapta, the Freshfield, and the Columbia *névés*; also by ascending some of the high snow-peaks near to these central reservoirs of ice, we were enabled to obtain considerable knowledge of the whole range.

The Columbia ice-field is by far the biggest accumulation of glaciers we have yet seen. It covers an area of at least 100 square miles; moreover, from a geographical point of view it claims additional interest, for it is the source of the great rivers, the Athabasca, the

* Read at the Royal Geographical Society, January 14, 1901. Map, p. 332.

Saskatchewan, and the Columbia. Also, probably some of the highest peaks in the Canadian rockies, Mount Columbia, Mount Alberta, and Mount Bryce, surround this desolate spot. Another peak, the Dome, situated near its centre, on whose summit we stood in 1898, is probably the only mountain in North America the snows of which, when melted, feed rivers that flow into the three oceans—the Atlantic, the Pacific, and the Arctic.

Although, therefore, we had obtained a fair knowledge of the eastern side and the centre of the range, yet to the west an unknown country lay. What was there on the other side of the Freshfield, the Lyell, and the Columbia groups? Were there great glaciers and further outlying mountains? Did the valleys run straight to the Columbia, or, like those on the eastern side, lie parallel with the range? Were the bottoms of these valleys underneath the high mountains three, four, five, or even six thousand feet above sea-level, like those on the opposite side? and were there any passes over which an easy trail might be made? Some vague knowledge of these western mountain fastnesses had been acquired from the summit of Mount Athabasca (11,900 feet) by Woolley and myself in 1898. West of Mount Forbes I had seen a high mountain with glaciers on its flanks, and tipped with ice and snow. South of Mount Bryce there seemed also a gap in the range, darkened by dense woods, that apparently led from the west branch of the north fork of the Saskatchewan over the divide, to the lonely valleys of the west. Another high peak reared its head far into the sky westward of Mount Columbia; and the immense expanse of the ice-field between Mounts Columbia and Bryce was seen gradually bending down westwards to a deep green valley filled with pine woods and leading in a southerly direction, whilst far away over several ranges of lesser peaks we thought that we could see the valley of the Columbia running north-westwards parallel with the mountains.

After we had returned to Banff, Stutfield visited Donald to inquire about the possibilities of getting down this Columbia valley. He was told that a pack trail had been cut as far as Boat Encampment, or, as it is now called, the Big Bend, this trail being used by prospectors and others going to Tête Jaune Cache and the headwaters of the Fraser river. But he could obtain no information about the land that lay between that trail and the main chain of the mountains. He, however, made up his mind that if it were possible to cut a trail up either the Bush or the Wood river, much of the uncertainty that enveloped these western valleys might be cleared away, and perhaps, should we be fortunate enough to reach the base of either Mount Columbia or Mount Bryce, these giant peaks might be ascended more easily from the western than from the eastern side. Stutfield therefore wrote early in the year to T. E. Wilson, of Banff, who has always supplied us with men and horses, asking him to make inquiries about

the Bush valley. Wilson therefore went over to Donald, where he met a trapper who eight years before had been up the Bush river as far as the foot of the main range. This trapper gave it as his opinion that the muskegs, the river, and the thick timber would make it extremely difficult, if not impossible, for horses. This seemed to be in the main probably true, for Hector had found great difficulty in forcing his way down one of these western valleys, the Blaeberry. Wilson also, many years ago, had been obliged to abandon all his horses in the same creek, only recovering them a week later by the help of several men, who returned with him and eventually cut them out of the thick timber.

In 1897 Baker and I also had entirely failed to make our way down this creek, and finally only escaped by traversing a new and high pass to Field on the south. When, therefore, Stutfield asked me last summer to join him in his expedition up either the Bush river or the Wood river, I felt that we were attempting a much more difficult task than anything we had done before on the eastern side of the mountains. One thing, however, was certain—a good trail existed along the Columbia river as far as the Big Bend, and should we decide to turn up the Bush river, although it would no doubt be difficult, still the actual distance up the Bush river to the snow-fields on the divide could not be much over 25 miles. Our party consisted of H. E. M. Stutfield, S. Spencer, and myself, Fred Stephens as headman, C. Black, H. Lang, and A. McAlpine.

On July 29 we started from Donald along the Columbia trail. The Waitabit and Bluewater creeks were soon passed, but the fact that the volume of water in them was small and did not contain glacial *débris* obviously meant that no great area of mountain country was drained by them; also that either they came from lakes, or had their rise in the small foothills where no glaciers existed. Our trail from Donald to the Bush river lay through dense forest nearly all the way; nowhere could an extended view be obtained, and the Columbia river was left far off to our left. For just below Donald the river makes an abrupt turn to the westward through a canyon, made, no doubt, long ago by the water finding a weak spot in a low range of hills which lies nearly parallel with the valley of the Columbia. The trail led us along the eastern side of this low range, and, as it ultimately happened, we never saw the Columbia again till we returned to Donald.

The vast forest through which we travelled far surpassed in size anything that we had seen on the other side of the range, huge pines, cotton-wood trees, and firs reaching to a height of 150 feet or more. The undergrowth was very dense; cedar, white maple, and alder (near the streams) abound, whilst the fallen trunks of dead trees, sometimes 6 or 8 feet through, lay scattered with others of lesser size in every kind of position. Some in their fall had been arrested by

others, and were waiting for the first gale to bring them crashing to the ground; whilst at the will of every breeze that wandered through

the upper branches of the higher trees, these half-fallen monarchs of the forest would break the heavy stillness of the air by their complaints

and groans against their more sturdy brethren for thus preventing them lying at peace upon the moss-covered ground below. Others that had lain for perhaps scores of years in the wet underbush had decayed and rotted, leaving rich masses of decomposing vegetation, from which smaller trees had sprung that in their turn also must fall and suffer the same change. There is a marvellous fascination about these immense quiet and shady fastnesses of the western valleys. As one wanders day after day through this underworld, cut off from the glaring sun of noonday and the blue sky, hardly a sound breaks the stillness, whilst all around the ruin of ancient woods lies piled with a lavishness most absolute—that of Nature's self, the tangled wreck of a lifetime, the luxuriant growth of centuries.

Here it was that we first made the acquaintance of that pest of British Columbian forests—the devil's club, a plant with large and broad leaves and a stem covered with spikes. Amongst the moist undergrowth this plant grows to a height of 5 or 6 feet, trailing its stems in every direction, and emitting a dank, unwholesome smell. These spikes, when they enter the flesh, break off, producing poisoned wounds which fester, and whilst cutting trail it is impossible to prevent the long twisted roots flying up occasionally, leaving their poisonous thorns in all parts of one's body. After crossing the Blue-water we followed a smaller creek, the Blackwater, in an almost northerly direction. This latter rises in some lakes, one of which at least is full of rainbow trout averaging about three-quarters of a pound. The highest of these lakes, which is situated on what might be termed a low pass, is about 800 feet higher than Donald, and from that point to where the Bush river is reached the trail descends. These lakes must be situated 5 or 6 miles from the Columbia river.

On August 3 we reached the Bush river, a deep, sluggish, and muddy stream, about 200 yards wide, and running between steep banks that obviously earlier in the year had been overflowed. It must be deep, for even at the bank there is 8 feet of water. The thick forest comes down to its very edge, and the floods that earlier in the year were produced by the melting snows had deposited for some considerable distance away from the stream a white sticky mud amongst the roots of the trees; swamps, too, were of frequent occurrence, and the thickets of willows, alders, and other small trees, together with much fallen timber of a larger size, made all hope of getting the horses through such a forest seem absolutely impossible. We found three boats moored at this crossing, two on one side and one on the other, with what appeared to us very insecure fastening—merely an old rope attached to a small stake driven into the mud on the top of the bank. These boats are for the use of travellers who are journeying to the Great Bend, and had been brought down the Columbia from Beaver creek. Stephens crossed over in one to the opposite side, to find out whether any trail

existed up the Bush river on the northern bank; but as only thick woods and swamps were discovered, he returned.

The weather now was very hot and sultry, and we camped near the Bush river by a small lake. That evening and night swarms of the most voracious mosquitoes I have ever come across nearly drove us distracted; as it was quite impossible for us to protect ourselves, early next morning a rapid retreat was made 5 miles back along our trail, to a spot less inhabited by this maddening scourge.

A mountain spur, forest covered, now divided us from the upper part of the Bush river. Over this we hoped to find a way. During the whole of next day Stephens and Lang were engaged in cutting

FOREST SCENE, BRITISH COLUMBIA.

about a mile of trail through the woods to the bottom of the steep ascent of about 1000 feet that led to the top. It would have been folly to attempt to take heavily laden ponies up this hillside; so, to get over the difficulty, the whole of next day was spent in completing the trail to the summit, and at the same time transporting half our baggage to the top, where it was left. From the summit of the ridge, which I have called Mount Pisgah, we got our first view of the snow mountains and of the valley through which we should have to wander for probably many days before arriving at the promised land. The country that lay stretched out before us at our feet made us feel very undecided whether to be pleased or otherwise. Certainly there were no narrow canyons

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or defiles that would require lengthy *détours* up precipitous hillsides, and the valley was long, flat, and open; but we could see muskegs, streams, and shingle flats all tangled together, looking like a skein of ravelled grey wool thrown down between the dull green hills; whilst the main river, winding first towards one hillside, then towards the other, sometimes branching, again reuniting, formed a veritable puzzle of interlacing channels, islands of pebbles, stretches of swamps and small lakes, all hopelessly intermingled. At another place the water would spread itself far and wide over the flat floor of this desolate valley, and we wondered how long it would be before we could win to the foot of a splendid snow-peak that stood boldly up alone and solitary some 12 or 15 miles away. We hoped that this mountain was Mount Bryce, but, as it turned out later, we were destined to be disappointed.

Next day we loaded all the horses early with the remainder of the baggage. As there was no water on this mountain, at least anywhere near where we should be, it was absolutely necessary to get down on the other side the same day. This we eventually did, but only after nearly twelve hours' fighting with the forest. During our descent to the Bush river, one of our horses stampeded from the trail for about fifty or a hundred yards; but we could not stop to extricate him from the maze of fallen timber, even although he was laden with bacon, and it was not until next day that Stephens rescued him by the help of an axe, no doubt very thirsty and hungry. By barometer we were now just about the same height as Donald—2500 feet. During the night the barometer fell two-tenths of an inch, and next day we were treated to the kind of weather that more or less lasted till the end of our trip—rain, dull grey sky, and lowering clouds over all the mountains. As a matter of fact, we afterwards discovered that last August was the most unsettled and the wettest that had been experienced in the Canadian Rockies for many years.

On the 10th the provisions that had been cached on the mountain were brought down by Stephens, whilst I got my first experience of a kind of work that later was often to be reserved for me, namely, trail-cutting. To any one unaccustomed to using a heavy Canadian axe in a thick forest, it is decidedly hard work. Not only is one ignorant of how to cut through the fallen pines in the most expeditious way, but one is using a set of muscles rarely employed by the average man who follows a professional life in a large town. I should strongly advise any one visiting these western woods of Canada to take a light axe that can be used with one hand; for the brushwood it would be invaluable.

The next day, Saturday the 11th, saw us start along the southern bank of the Bush river. Hemmed in by the river against the hillside and the occasional muskegs, progress was very slow, and at last Stephens

thought we might try to ford the main stream, which at this point was about 200 yards wide. Here our troubles began. No sooner was Stephens about halfway across, than half a dozen of our baggage animals followed him. This, of course, should have been prevented, for, as it turned out, under the opposite bank the river was both deeper and stronger. There Stephens narrowly escaped drowning, when his horse, during a violent effort to climb the opposite bank, finally fell over on to him in the deep water. Lang also had managed to cross; but we, wishing neither to get wet to the skin nor to be swept down-stream, waited where we were. Finally, after unloading the horses, Stephens built a very shaky kind of raft, on which he and Lang

BUSH RIVER AND RAFT.

attempted to return. The main current, however, soon caught them, and they were swept rapidly past us down-stream. Just below this, Lang, probably in an attempt to pole the raft in water which must have been at least 10 feet deep, lost his balance and fell overboard into the icy water, his heavy boots dragging him down, and but for the presence of mind of Stephens, who crawled along the raft with a pole just long enough to reach Lang, there is little doubt that in a few moments he would have been drowned. There is no difficulty in launching a raft into the centre of a swift-flowing river, but to reach land again is a very different thing, and if it had not been possible to throw a rope to these two as they drifted rapidly round a sharp bend in

the stream about a quarter of a mile below, perhaps they might have sailed in a very short time to the unknown lower reaches of the Bush river. That night we camped on wet mud all together in one tent (the other was across the river), glad, however, that nothing worse had happened. Next day, undaunted by his experience, Stephens started to build another raft on a more magnificent scale, whilst I cut trail along the steep hillside that came down to the river's bank. This time success crowned Stephens' efforts, for by himself he got across, drove the horses back unloaded through the stream, and finally arrived safely with all our precious baggage on the raft.

On the morrow, some 3 miles further up the valley, we nearly lost all our meat. This was whilst we were edging along a narrow piece of very muddy land between the swamps and the river. Two mares deliberately walked straight off the bank into the main stream, which was at that point over 10 feet deep, and running strongly. One of them had 250 lbs. of bacon on her, consequently she went straight out of sight, but came up again for a moment some 20 yards lower down, only to disappear again. Fortunately, her next appearance was close against the bank, when two of the men promptly seized her. The other mare had also been washed against the bank, but, being unloaded, was easily hauled out; the other, however, with the bacon was underneath a mass of willows, and all we could do for some time was to keep her head above water, as she could not touch bottom. Eventually, by the help of a rope taken from one of the packs and seven men pulling, she was landed on her side on the bank, half-strangled; but our meat was safe. Again that night we had to camp in a swamp.

The days that followed were all spent in much the same fashion as the preceding ones. The river kept us prisoners on the south bank till the afternoon of the 16th, when we crossed at a place where it is spread out over a wide area of shingle flats, and camped at a point just opposite a shoulder of the high peak we thought was Mount Byrce, also just short of where the river forks. In ten days we had only made about 10 or 12 miles at the most as the crow flies, and in height had risen about 300 to 400 feet. Down the valley the main river winds backwards and forwards across the valley with innumerable side channels. The banks are covered often with a dense growth of willows, behind which are swamps and small lakes, fed often, no doubt, by the main river when in flood. Beyond these swamps rise the valley-sides, clothed in the densest forest. Our way was alternately through all of these, sometimes climbing and log-hopping up the hillside, cutting through the accumulated fallen rubbish of years, sometimes splashing and plunging through the swamps, sometimes fording side streams, sometimes squeezing our way through dense thickets of willow; all were tried, and we were entirely unable to say which was worst. Stephens was of the opinion that the north side, if we could have reached it, would afford much

better going; perhaps it might, certainly it could not be much worse than the south side.

The Bush river flowed from our camp in a westerly direction, but about half a mile up-stream the main valley was blocked by mountains, two valleys joining at this point, both being nearly at right angles to the valley we had been in for the last ten days. We were under the impression that the high peak that had been in front of us all the way up the Bush river was Mount Bryce, and therefore expected to find the

THE HAUNT OF THE WILD GOAT.

Columbia ice-field not many miles away round the corner to the north. Next day it rained steadily, and we did nothing; but on the morrow, as it cleared somewhat in the afternoon, leaving the horses, we climbed about 2000 feet up the mountain spur that lay between us and the north fork of the Bush river.

The mists lay low on the snow-peaks, but we saw that about 2 miles up the north fork a valley came in from the east, and glaciers lay at its head some 5 or 6 miles distant. The north fork itself stretched

away for miles, filled with dense pine woods ; occasionally small shingle flats could be seen, and under the dull grey sky presented a dreary and inhospitable appearance. But Stephens talked of shooting cariboo, goat, and perhaps, if we were very fortunate, some big horn sheep. Black, however, gave it as his opinion that it was a country forsaken both by gods and animals, much to be condemned, and no fit place for a white man. Still, the appearance of the valleys puzzled me ; it was somehow very different from what I had expected.

On the morrow Stephens went out to investigate the north fork, whilst Stutfield and I crossed the river, and after several hours of log-jumping of a most tiring description, we reached the south fork a little above where it joins the other stream. At this point the stream runs through a deep chasm cut out of the rock 200 feet deep. Here our exploration stopped, for we could not cross the river ; so, finding the whole hillside covered with blaeberries the size of small grapes and of exquisite flavour, we had our lunch, and then returned to camp. One thing only had we discovered : far away up the north fork, how many miles we were unable to tell, we had seen Mount Columbia a beautiful pyramid of snow surrounded by great glaciers. Fred Stephens and Lang had been 4 or 5 miles up the north fork, passing a small shingle flat and the mouth of the valley that came in from the east. They reported that the fallen timber was dreadful, and that trail-cutting would be necessary every step of the way ; moreover, that along the west bank gullies and steep hillsides with occasional small precipices seemed to entirely prevent us getting the horses along, unless we could cross the stream to the eastern side. By this time we were beginning to get anxious, for we had been out twenty-two days, which left us only a fortnight more. Something must be done, and quickly. Next day, therefore, August 20, Stutfield, Spencer, and I decided to climb to the top of the peak that lay in the angle between the north fork and valley up which we had come. As it turned out, it was both the finest and the most fortunate day of our trip. All the mountains of the main range were free from clouds, and we had a superb view from the summit of the peak when we got there. During the whole of the remaining fortnight that we were in the mountains the clouds never entirely lifted from the high peaks, and had we missed the view that we got on that afternoon, much of the knowledge of the geography of the district would never have been acquired.

The climb of about 5000 feet was very fatiguing ; we had to fight almost every inch of our way through thick scrub or fallen timber. Just as I arrived within 100 feet of the summit, and was coming round a corner, I almost ran into an old he-goat ; he was less than 100 yards away. After he had looked at me for some time, he went on eating, so I photographed him. Certainly he could have never seen a human being before.

Once on the summit, I at once recognized why the head of the valley had seemed different from what I had expected. Ten miles or more to the northward, up the north fork, was Mount Bryce, and beyond that Columbia and the great snow-field, with even the Twins showing far away at the headwaters of the Athabasca. Almost due east was Mount Lyell; we were therefore 10 to 12 miles south of where we expected to be. The mountain we had been calling Bryce, at the head of the Bush valley, was another peak altogether, and one that I had marked as "high peak" on the 1899 map. To the left of this lay Mount Forbes in the distance, whilst far away at the head of the south fork, rising from a great snow-field and glaciers, were the Freshfield group.

CAMP SCENE.

This explained why the Waitabit and the Bluewater creeks contained no glacier water; for the Bush river, and the Bush river alone, drained the whole area, from Mount Freshfield on the south, the back of Mount Forbes, and the western side of the whole Lyell ice-field to the north of the Columbia ice-field, which, splitting into several large glaciers, poured down in magnificent cascades of ice to the green pine woods that filled the valley below. And another point of considerable interest was the very low altitude of the valleys. At our camp at the forks of the Bush valley, just under the high peak we have named the Bush peak, we were only 2800 feet above sea-level, and looking up the north fork to the foot of the glaciers under Mount Columbia, the valley seemed to

rise but little—certainly nothing near 1000 feet. This Bush valley is therefore by far the lowest of any valleys that lie directly under the highest peaks.

But with this discovery of where we were came the extremely unpleasant fact that the Columbia ice-field, which was our goal, lay nearly 15 miles away up a valley, every yard of which would have to be cut with an axe. If we had already taken ten days to do about 10 miles, probably we should take at least a fortnight to force our way to the head of the north fork. And with this reflection we returned to our camp in the valley, somewhat disheartened and sad, for our plans would have to be changed, and as far as we were concerned, the finest snow-peak in the Rockies, Mount Columbia, would not be climbed by us that year.

During the day Stephens and Lang had been cutting trail to the mouth of the north fork, and along this trail we started next day with the intention of going as far up the valley as possible. In a very short time we were forced down to the side of the river, over which we could not pass in the state of flood in which it was in. We might have spent the remainder of the day cutting through another half-mile or so of fallen timber, but we were all heartily sick of the work; so, turning our horses' heads straight up the hill, after a long day, we found ourselves at timber-line, and about 700 feet below the top of the mountain we had been up the day before. Stephens had some idea of working along the hillside high up near the limit of the trees; but, as it turned out, we could not possibly have taken the horses further, for great ribs of rock seamed the hillside further on, entirely barring the way.

We were now at a height of about 7300 feet, and out of the wet valley below—no mosquitoes or flies, and a magnificent view in almost every direction; so, next day being moderately fine, we again ascended to the top of the peak above the camp, photographed, surveyed, and mapped as much of the country as possible. Stutfield spent the morning looking for the goat, but without any result. But in the afternoon he successfully stalked some across a small valley to the west, and shot one of them. That evening it began to rain; it continued all the next day and night and the following day, finally, on the third night, turning into snow. On the morning of the 25th it stopped, but it was impossible to do anything, as the whole hillside was one sodden mass of melting snow. The magnificent effects of great masses of clouds rolling about in the Bush valley below, with an occasional gleam of sunshine, gave us hopes of better weather; but the clouds never cleared away from the high mountains, and on the 26th an attempt to climb a big peak that lay behind our camp was carried out in dense mist. The weather seemed going from bad to worse. Reluctantly we retraced our steps on the 27th back to the camp at the foot of the hill, where we had cached about half of our provisions.

Whilst we were at the high camp, I had noticed that on the south side of the Bush valley, at the head of a small creek, an obvious pass seemed to lead through the mountains straight to the head of the Blue-water creek and so to Donald, and I had hopes that perhaps we might find a short cut home by that route; also at the same time be able to investigate the mountains that lay between the Blaeberry creek and the Bush valley. On the 28th we started down the valley with the intention of making our way up this creek to the pass, but we were unable even to begin the ascent of the creek with the horses; the usual fallen timber lay piled even thicker than usual, and a canyon with precipitous sides would have forced us far up on to steep hillsides, where

THE BUSH PEAK.

horses would hardly have been capable of going. We camped on the banks of the stream, amongst some large timber.

The view down the Bush river to the foothills that shut off the valley from the greater valley of the Columbia was exceedingly fine. In the foreground water and shingle stretched in desolate fashion westward to where ridges of dark pine woods sloped down from dusky peaks above, sending out point after point to strengthen the forms of the middle distance; whilst beyond, far away across the Columbia, the Selkirk mountains raised their snow-peaks into a calm clear sky, a mysterious land unexplored and unknown. Through a rift in the clouds in the far west shone the setting sun, tinging the dull grey clouds overhead

and the stealthily flowing river below with its many-coloured fires. The great gnarled trunks of pine and fir, festooned with moss, fungi, and grey lichen, the dead and drooping branches, and the half-fallen decaying trunks propped up in dreary melancholy array, caught for a moment the sunset's ruddy glow, whilst the mysterious shadows of the dense forest behind darkened by contrast. A faint evening breeze softly moved the upper foliage, a couple of inquisitive chipmunks were chattering near at hand, and a small stream could be heard whispering amongst the thickets down by the bank of the main stream.

Such evenings compensate one for many a wet dreary day spent amongst the great mountains. Nature suddenly offers them to the traveller without any toil on his part. He has only to sit watching, surrounded by the dark forest, the stretch of waters, and the ever-changing glory of the sinking sun; then, unmindful of the worry of yesterday or the uncertainties of the morrow, amidst the great stillness he feels with absolute conviction one thing and one only—that it is a good thing to be alive and free. Civilized life no doubt teaches us much, but when one has once tasted the freedom of the wilds, a different kind of knowledge comes. The battling with storm, rain, cold, and sometimes hunger, and the doubt of what any day may bring forth, these at least teach that life, that mere existence, is beyond all price.

Next morning, August 29, we climbed a hill that lay about 4 miles back from the river and to the south. This was necessary in order to find out how the valleys ran, and how the peaks were situated in that part of the country west of the Freshfield range and south of the Bush river. It was one of the most tiring expeditions I have ever taken up a mountain. To start with, there was the usual fallen timber, rendered still worse by small undergrowth; then a steep hillside of several thousand feet, where we had to struggle hard for every foot gained. Pushed back by small bushes, stopped by huge logs, stifled by the hot moisture-laden air, we dragged ourselves up foot by foot till at last we shook ourselves free from the woods, and were able to easily finish the climb on firm rocks and in the open air. The main chain of the Rocky mountains was in cloud, but fortunately there were no high peaks to the south-east, south, and west, so I was able to complete my plane-table survey of that district. We then returned by a somewhat different route, hoping that it would be easier, but eventually found ourselves cut off from the camp by a large muskeg, the dangers of which, however, we disregarded, and, wading straight through it, got back to dinner.

Three days later saw us at Fish lake again, where we built a raft, and spent Sunday, September 2, catching and eating rainbow trout. On the following day we made great efforts to catch No. 2, the west-bound train, at Donald, so that we should reach the hotel at Glacier that evening. The west-bound train, "No. 2," finally arrived at about four o'clock in the morning.

Our trip was ended : of course one is never satisfied, and we should have liked to have done more. We had, however, found out nearly all we wanted to know about the geography of the district.

Practically, the whole district between the Wood river and the Blaeberry creek is drained by the Bush river ; the Waitabit and Blue Water creeks merely take the water from the foothills. A large glacier exists at the back of the Freshfield group ; this is the source of the south fork, whilst the Lyell and Columbia glaciers feed the north fork of the Bush river. Another system of glaciers that lie to the west of Mount Bryce feed two tributaries of the Bush river that flow southward and parallel with the north fork. The magnificent snow-capped peak, about 13,000 feet high, standing almost over the junction

THE SPENCER RANGE.

of the north and south forks is not Mount Bryce, as we had supposed, but is a new unnamed mountain. I think that, as it can be seen all the way up the Bush valley, it ought to be named the Bush peak. The great depth of the Bush valley is also of interest, and the fact that, to start with, both from Mount Freshfield and Mount Columbia, the valleys lie parallel with the main chain shows that probably the same forces that fashioned the valleys on the eastern side also made those on the west. This pressure, in many places at the headwaters of the Bush river, had contorted the rock into the most fantastic bends and loops. The strata sometimes would be perpendicular, and again within a few hundred yards twisted into S-shaped figures and crumpled forms. This contortion seemed general, and far more pronounced than anything that I have seen on the eastern side of the mountains. The general lie of the country was a series of more or less tilted strata facing north-east, with gentle slopes towards the south-west and precipitous faces towards the north-east, the ranges consisting chiefly of Carboniferous and Devonian limestones.

Prof. Bonney, F.R.S., has kindly examined one or two rocks that were brought home. In the bed of the Bush river there was a considerable amount of limestone with fossil corals in it. Prof. Bonney

describes it as follows: "It appears to belong to the genus *Lithostrotion*, and one at least is very like the *Martini* of Britain. This belongs to the Carboniferous limestone age." Another limestone: "Contains numerous fragments of organisms, but ill preserved, some, perhaps foraminifera, are like an ostreod, others probably mollusca." A third limestone: "The ground mass appears to retain traces of organisms and show signs of pressure. The round spots are puzzling; the mode of occurrence suggests oolitic grains, but they have a coarse granular structure—perhaps recrystallization has taken place."

There seems to be only one pass below timber-line connecting the Bush valley with the east side of the range. This I had seen when on the summit of Mount Athabasca. My friend Charles S. Thompson, of Chicago, explored the pass this summer by way of the west branch of the north fork of the Saskatchewan. As he is the first person who has been on its summit, I have called the pass Thompson pass. It is 6800 feet above sea-level, and below timber-line.

The question of passes and sources of rivers amongst the Canadian Rocky mountains is a most interesting one. On the Athabasca pass, a small tarn called the Committee's Punch Bowl drains both ways. Ross Cox gives an accurate description of it in the 'Fur Hunters of the Far West.' He says, "We reached what is called the great height of land. At this place a small circular basin of water 20 yards in diameter, dignified with the name of a lake, out of which flow two small creeks; the one discharges itself into Portage (*i.e.* Wood) river, that on the east joins the Athabasca. Prof. Coleman gives a similar description. Just south-east of the Athabasca pass lies Fortress lake, discovered by Prof. Coleman. This lake is about 8 miles long, and here the same thing happens. "The lake has a curious subterranean outlet in a tributary of the Chaba river, but sends most of its waters into the Wood river." *

Probably, if there were a lake on the summit of the Blaeberry, a similar state of affairs would be found, for the summit is quite flat, Dr. Hector's description being as follows: "The summit is wide and spacious, a few swampy streams flowing east, a little further on a small creek issuing from a number of springs flowing westward." When going west by the railway from Donald to Glacier House through the canyon that the Columbia has cut between Donald and Beaver Mouth, it seemed to me possible that centuries ago there had been a large lake filling the Columbia valley to the south from Donald to the upper lakes. This lake would again be reproduced if the canyon between Donald and Beaver Mouth were filled up for a height of less than 200 feet. Donald is 2530 feet, whilst the upper Columbia lake is 2700 feet. The south end of the upper Columbia lake is only cut off by about 2 miles of swamp from the Kootenay river. All along the

* Prof. A. P. Coleman, *Geographical Journal*, January, 1895, p. 58.

wide Columbia valley from Donald to the lakes are well-marked terraces of white calcareous mud, whilst at the bottom of the valley are a chain of great swamps. If the whole of this valley had at any time been a large lake, chiefly or wholly draining to the south,* it is quite likely that the Kootenay river, as it breaks into the wide valley just below the Columbia lakes from the north-east through a rocky gorge, would gradually have silted up the south end of the lake, so raising the height till at last a weak spot was found at the north end, and the whole drained away down the present valley of the Columbia. Moreover, if one looks at the direction in which the Spilimichene and the Shuswap creeks flow, it looks as if they at least were flowing into a river whose course was south, and not north. Now, if in former times this great lake had drained south, then the old headwaters of the Columbia were in the Bush river, and its source was amongst the great glaciers that sweep down from Mount Columbia and the Columbia ice-fields. Surely, for the birthplace of one of the most magnificent rivers of the West such a spot is more fitting than a swamp amongst the foothills! Surely its source should be where the huge snow-clad peaks rise high into the clouds, where the avalanche thunders, where the dark precipices keep guard over the valleys beneath, and where the Rocky mountains culminate in one great effort; for there, amidst ice and snow in the glacier caves, is born the Athabasca, that old river of the lonely northland; and there arise the rivulets that later become the mighty Saskatchewan!

Before the reading of the paper, Sir THOMAS HOLDICH, Vice-President, in the chair, said: Prof. Norman Collie is no stranger to you. It is not so very long ago that he told us of his adventures in 1897-98, and now he will again take us into the untraveller paths of the Rockies, north of the Canadian Pacific railway, and I am sure will give us a most interesting paper about that country.

After the reading of the paper, the following discussion took place:—

Sir THOMAS HOLDICH: *Apropos* of this interesting paper, a letter has been received from Mr. Whympster, the well-known mountaineer and explorer of American mountains, which, with your permission, I will read to you.

"I regret that I cannot be present at the reading of Dr. Collie's paper on the 14th inst. I have just returned from a run over the Canadian Pacific railway, and have twice passed within sight of the slopes where his journey commenced, and saw a fair sample of the forest through which he had to make his way.

"The whole continent was under snow, from 6 inches to 3 feet deep, and this rendered the extraordinarily intricate interlacement of the fallen trunks more apparent than it is in the summer-time. It was obvious that no beasts of burden could be led or driven through such a tangled mass of timber without a way being prepared for them, and it appeared to me that progress might easily be reduced to a mile per day. The ranges, which are traversed from east to west by the Canadian

* Compare G. M. Dawson, "Preliminary Report on the Physical and Geological Features of that Portion of the Rocky Mountains between lats. 49° and 51° 30'," Part B, 'Annual Report,' 1885, pp. 28-32.

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Sources of
by Walter
G.P. Baker
Heights m

Pass to
Brazeeau R.

SKETCH MAP OF THE
CANADIAN
ROCKY MOUNTAINS

BY
J. NORMAN COLLIE F.R.S.

Sources of Information:- Maps by Drewry and MacArthur, by Walter D. Wilcox, by C.L. Noyes and C.S. Thompson and G.P. Baker and J.N. Collie.
Heights marked with an asterisk (1300*) approximate only.

Scale of Miles.

Natural scale 1:500,000 or 7.9 miles = 1 inch.

Routes ————— Heights in feet.

Published by the Royal

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