the recurrence of similar opportunities in the future.

There are many persons who have long wished that an international scientific association should be formed, where those of similar pursuits could meet one another, and, as it were, exchange thought between the nations. All acknowledge that the chief value of the large general associations lies in the stimulus of personal intercourse and discussion; and this would doubtless apply still more decidedly to an international society. The principal purpose of its meetings would be, we doubt not, to secure that stimulus.

An international scientific association would necessarily be largely European, and Americans would have to cross the ocean to attend its sessions. But with our habits of active travel, this necessity cannot be thought likely to prove a serious obstacle to our active participation in the association; which might, too, at some time, be induced to follow the example of the British association, and meet upon our side. Perhaps no opportunity will soon recur so favorable for the formation of the suggested association as the meeting at Philadelphia, and it seems very possible that the initiative may be there taken. The two English-speaking races can then act in concert, and, by a double appeal, more easily achieve the result than either could alone. America takes no share in the international complications which agitate Europe, and is therefore a friend with all, and might, on that account, the more readily inaugurate such a general movement.

Some limitation would necessarily be made upon the membership of the body suggested, confining it, perhaps, to original investigators. It is a question how far the indiscriminate presentation of scientific communications could be made feasible; for, if the whole of the annual additions to science were to be presented, the association would sit the entire year. Obviously some restrictions are requisite: their character must be decided by discussion and experience. Thus, formal addresses upon special subjects, or discussions limited to specified topics, might serve the purpose; or it might be considered wise to follow the example of the new Society of naturalists, which devotes its attention to the ways and means, the practical technique, rather than the results, of science. We hope that the plan we have briefly indicated will meet at least with consideration, and awaken discussion, so that it can be ascertained whether it ought to be pursued farther. It is too early yet to venture upon any definite proposals.

THE ALASKA MILITARY RECONNOISSANCE FOR 1883.[1]

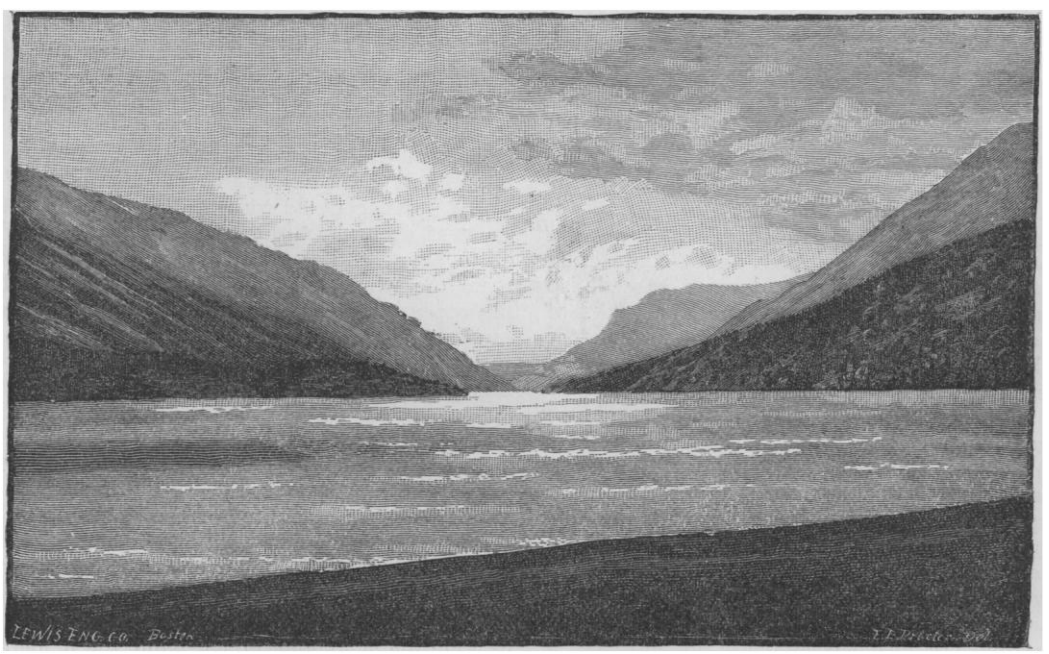
LEAVING Tahk-o, the Yukon, for the first time, assumed something of a riparian air, the draining river being nine miles long. It is from three hundred to four hundred yards in width, very swift, and the first part of its course full of rocks and great bowlders, that make its navigation hazardous for even a stanch raft. On its right-hand bank stood a roughly built Tahk-heesh house, the only one on this part of the Yukon River for hundreds of miles on either side; and even it was deserted. The next lake was nearly thirty miles long, and appreciably wider than those through which we had sailed. I called it Lake Marsh, after Professor Marsh of Yale college.

I have spoken of a great number of glaciers that were constantly encountered, and the white condition of the water emanating from them. In Lake Marsh the water near the shores was very shallow, owing to large deposits of this fine glacier mud; and we often found it impossible to get much nearer the beach than sixty to eighty yards, although our craft drew less than two feet of water. When a high wind lashed the lake into waves, these mud deposits gave a clear-cut outline between the whitened water within their exterior edges and the deep blue water beyond, that showed in many places an extension of the deposits of four hundred to five hundred yards from the beach. It is possible that the stages of water may vary in Lake Marsh at different seasons sufficient to lay bare these mud-banks, or cover them so as to be navigable for small boats; but there seemed to be a wonderful uniformity in the depth of the water over these banks in every part of the lake, being about eighteen inches. Through this tenacious mass, that even threatened to pull off our rubber boots, we would have to carry our camping-material each evening as we went into camp, and each morning as we broke it for our departure. The trees on the hills overlooking the lake, as had been often noticed before on the upper waters of the Yukon, all leaned more or less conspicuously towards the north, or down stream, thus plainly showing the prevailing direction of the stronger winds. Faint signs of terraces were still to be seen on the hillsides; but they were lower, nearer together, and not so well marked as on Lake Nares. The level ridges on the eastern hills were still covered with the luxuriant yellow grass of last year's growth, and, as we viewed

[1] Continued from No. 55.

them from the lake, turned one's thoughts to the stubble fields of grain in temperate climes.

On the 28th, on Lake Marsh, a spirited rain and thunder shower lasted from 12.45 P.M. to 2.15 P.M., and is, I believe, the first thunder-storm recorded on the Yukon, it being unknown on the lower river, according to all accounts. It brought us a head wind; and, after dying out, a favorable breeze sprang up, and kept us going until 12.30 next morning, so essential was it for us to take advantage of all favorable wind. At midnight it was so light, however, that but one star could be seen in the unclouded sky, — the planet Venus. For the first time bathing was possible in the lakes, although not pleasant, except on very warm, still days.



LAKE BENNETT FROM PAYER PORTAGE.
Iron-capped mountains on the right, covered with fog.

The northern shores of Lake Marsh are especially flat and boggy, making our camps very disagreeable. Our rough mode of navigation also suffered from the ceaseless banks of 'glacier-mud' as we approached its outlet, most of which was probably deposited by a large river (the McClintock [1]) that here comes in from the east, — a river so large that we were in some doubt as to its being the outlet, until its current settled the matter by carrying us into the proper channel. This channel much more closely resembled some of the streams in temperate climes than any we had met. Its flanking hillsides of rolling ground were covered with spruce and pine, here and there breaking into pleasant-looking, grassy prairies, while its own valley was densely wooded with poplar and willows of several varieties. These latter, in fact, encroached so closely upon the very water's edge in such impenetrable confusion that camping-places were hard to find, unless a spur from the hills, covered with evergreens, wedged its way in on the river's face to break the continuity of this barrier to a night's camping-place. The raft's corduroy deck of pine poles often served us for a rough night's lodging.

Muskrats were plentiful in this part of the river, and in the quiet evenings a number could be traced at once by their wedge-shaped ripples as they were swimming about. Small broods of ducks were also occasionally noticed, and numbers of the great American diver were seen on almost all the lakes.

On the 1st of July, with a Tahk-heesh Indian as a guide, we approached the great rapids of which we had heard so much. An inspec-

[1] In honor of Vice-Admiral Sir Leopold McClintock, Royal navy.

tion of them showed that they were really quite formidable and dangerous for any sort of craft whatever. Nearly five miles in length, the first half or three-quarters of a mile is through a cañon from fifty to sixty feet deep, where the original stream is contracted to one-eighth or one-tenth its former width, and through which the river fairly boils. This cañon, the only true one on the Yukon River,[1] is composed of basaltic columns, so regular that they are not unlike representations of the Giant's Causeway on the Irish coast. In the centre of its length it expands into a large, circular, basaltic basin seventy or eighty yards wide, or double the width of the cañon proper; and here the water's edge could be reached on the west shore. After leaving the cañon, the channel expands into a sheet of rushing rapids, often three hundred to four hundred yards wide, broken by rocky bars into frothy chutes full of bowlders and foaming and bristling dams of lodged and water-logged timber, ten times more dangerous than the cañon itself, although not so in appearance. About four miles of this brings us to the end, where the river, again contracting into a few yards, shoots down a cascade so narrow and swift that the ascending banks of rock are covered with the rushing current that falls over their sides in sheets, and makes it a veritable funnel of foaming water.

Through this cañon, rapids, and cascade we shot our raft July 2, losing the two side-logs in a collision in the cañon with its basaltic columns, and, just below the cascade, hauled in for repairs, and to redeck the raft with the fine straight spruce and pine poles that we here found in large quantities, thoroughly seasoned by some fire that had destroyed them two or three years before. Like all the Coniferae growing in dense masses, these timber districts have their periodical devastations of fire; and years after, the fallen timber, coupled with the new growth, makes pedestrianism border on the impossible.

A few Tahk-heesh Indians had been employed by us in our labors around the Miles' cañon and rapids;[2] and I was forced to contrast their great kindness to each other, and especially to their women, with the conduct, the very reverse, in the Chilcats. These Chilcats, in tracking canoes up the Dayay, refused to convey the loads of their fellows not provided with these craft, although to have done so would have necessitated no extra labor, thus compelling the latter to carry their packs as they did over the Perrier Portage. They would not even ferry them over the swift Dayay, forcing them into long détours or perilous crossings up to their middle in the rapids. Even in cases of sickness they would do nothing for their comrades, unless compensated by a part of the payment.

Grayling were caught in large numbers in and around these rapids, some four hundred to five hundred being secured by the party. They were also caught in straggling numbers from Lake Bove, until White River, below old Fort Selkirk, was reached. Moose and caribou (woodland reindeer) tracks were abundant, but no animals seen; and the dense swarms of mosquitoes were amply sufficient to convince any one that the tracks of an animal were the only part that could remain in the country during this part of the year. These pests, coupled with the gnats, were the greatest discomfort that the party was called on to bear; and there was no cessation from them the whole length of the river, although the upper part was much the worst. The dense smoke of the camp-fire was always crowded with the party whenever the wind was not blowing, and meals were eaten under mosquito-bars for protection. From the time the snow is half off the ground until the first severe frost comes, no one disputes the valley with them. Dogs have been known to be killed by them; and, after two or three months of the closest intercourse with them, I was willing to believe the Indian stories that they even slay the brown and grizzly bear of these regions.[1]

I noticed that a Tahk-heesh Indian, in arranging his head and breast-band for a load, pulled the former forward until taut, and the latter just far enough beyond to allow the width of his hand between them, when they were considered adjusted. I had also noticed this among the Chilcats.

One evening, about eight, while encamped some four hundred or five hundred yards below the cascades in the Miles' rapids, we could hear dull, heavy concussions in single blows, at intervals of every two or three minutes. It was noticed by more than one, and thought by some to be possibly distant thunder, although it sounded strangely unlike that noisy

[1] I mean by a *true cañon* one with perpendicular or practically perpendicular sides, although every precipitous and deep valley in the west is often called a cañon. With such an understanding, it would be impossible to tell where a cañon ended and a valley commenced.

[2] Named after Brevet Major-Gen. Nelson A. Miles, U.S. Army, commanding department of Columbia, in which Alaska is situated.

[1] This statement is asserted as a fact by some Indians and white traders, who state that the bear, in trespassing upon a swampy habitation of mosquitoes, instead of seeking safety in flight, rears upon his hind-quarters, and fights them bear-fashion, until his eyes are closed by their repeated attacks, when starvation is the real cause of death.

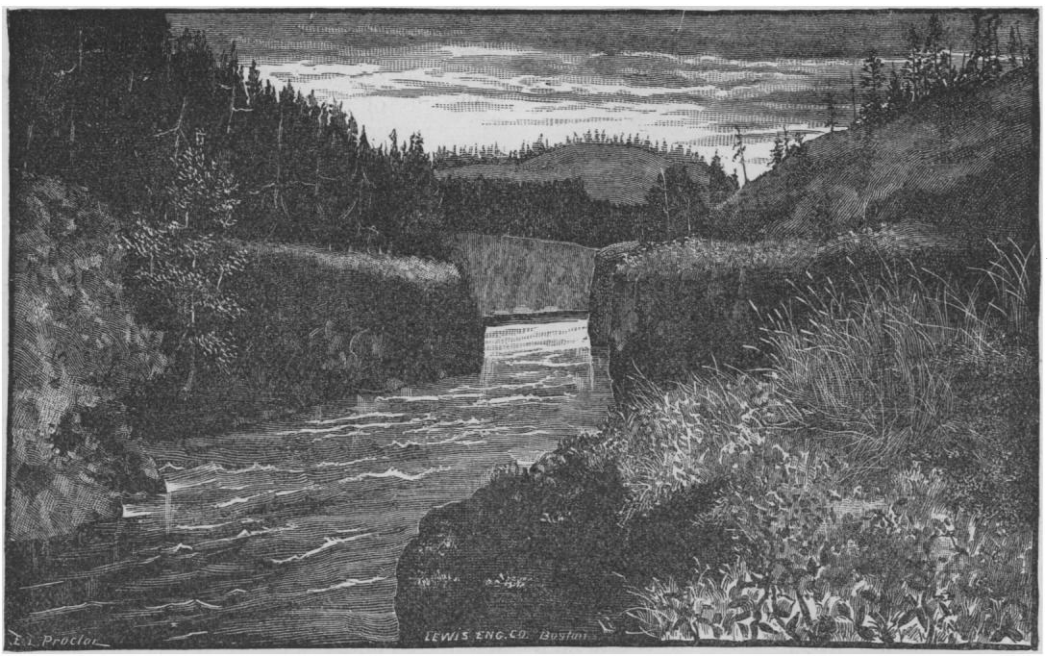
element; and the sky, too, was cloudless. A very light series of earthquake-shocks also seemed a poor theory; and there was but little left to attribute it to, except the cascades, which, I believe, have been known to cause earth-tremblings and analogous phenomena.

About noon on the 5th of July we passed the Tahk River (Tahk-heen-a of the Indians) coming in from the west, and which is probably two-thirds the size of the Tahk-heesh, as the Indians call the Yukon proper. While the former river is the smaller, its bed and valley apparently determine the general characteristics of the stream farther on, the Yukon here noticeably changing from high bold bluffs of clay to lower shores wooded to the water's edge. The last of the chain of lakes was reached the same day, and we were prevented from taking advantage of a good wind by a three-hours' detention on a sand-bar that the river had made almost entirely across its mouth. This lake was called by the Indians Kluk-tas-si; and, as it was one of the very few pronounceable Indian names of this section of the country, I retained it, although it is possible that this may be the Lake Labarge of some books, the fact that it is the first lake above old Selkirk being the only data in its favor, while its relation to other important points are equally against it. Like Lake Marsh, it is full of mud-banks; its emerging waters being clear, while its incoming supplies are loaded with deposit. So full of these is Kluk-tas-si, and so much more contracted is the water-way through them, that I think we were able to detect a slight current when making our way along in the blue water. This was especially noticeable when the wind died down to a calm. Despite all this, Kluk-tas-si was better for making landings on its shores than Marsh. It seems that it must be a mere matter of short geological time when these lakes will be filled by deposits, and converted into limited parts of the river. Such ancient lakes are noticeable in the course of the great stream farther on. The west bank of the last lake is very picturesque about fourteen or fifteen miles from its entrance, where large towers of red rocks throw up their conspicuous flanks on what seems to be a well-marked island, but which is really a part of the mainland, our Indians assured us. Here, also, comes in a river, say the same authorities, abounding in banks of the same material, and called by them the Red River. The frequency of this name in geographical nomenclature was sufficient reason to abandon it; and I named the rocks and river (the latter we never saw) Richthofen rocks and river, after Freiherr von Richthofen of Bonn, well known in geographical science. The right bank seems to be made of rounded hills of gray limestone, being picturesquely striped with the foliage of the dark evergreens growing in the ravines. A number of salmon-trout were caught in this last lake (the first one was secured in Lake Bove), the largest of which weighed over eight pounds, the limits of our pocket fish-scales.

On the 9th, at 10.30 A.M., we bade adieu to lake navigation, our hearts much lighter for the fact. That same day we saw a grizzly or immense brown bear, whose rapid departure gave us very little chance for close inspection. Our Indians say in regard to the scarcity of game, that the moose and caribou follow the snow-line as it retreats up the mountains in the spring and summer; also that the moose do not build 'yards' in the winter, as in Maine and the Canadian provinces. On the same day we passed the mouth of the Newberry River (after Professor John S. Newberry of New York), coming in from the east, about a hundred and twenty-five yards wide; and the Yukon at once became very much deeper, swifter, and the water of a darker hue, showing that the Newberry drained a considerable amount of 'tundra' land, or land where the water, saturated with the dyes extracted from dead leaves and mosses, is prevented from clarifying itself by percolating through the soil, by an impervious substratum of ice, and is carried off by superficial drainage directly into the river-beds. Forty miles farther on, measured along the stream, comes in the D'Abbadie,[1] over a hundred and fifty yards wide at its mouth, and said to be over two hundred and fifty miles in length. It notes an important point on the Yukon River as being the place at which gold in placer deposits commences. From the D'Abbadie to the very mouth of the great Yukon, a panful of 'dirt' taken from almost any bar or bank with any discretion, will, when washed, give several 'colors,' to use a miner's phrase. Another forty miles, and the Daly River comes in from the east, forming, with the Newberry and D'Abbadie, a singular triplet of almost similar rivers. The last I have named after Chief-Justice Daly of New York, a leading patron of my Franklin search expedition.

The prevalence of the larger rivers to the east showed this to be the main drainage area of the upper Yukon, a rule broken only by the Nordenskiöld River coming in from the west,

[1] M. Antoine D'Abbadie, membre de l'Institut de France, Paris.



VIEW IN MILES' CAÑON FROM ITS SOUTHERN ENTRANCE.
The only cañon, and head of navigation, on the Yukon, 1866 miles from Aphoon mouth.

fifty miles beyond the Daly, and the peer of any of the three. We passed its mouth the 11th, and that same day our Indians told us of a perilous rapid ahead that the Indians of the country sometimes shot with their small rafts; but they felt very anxious in regard to our very bulky and clumsy one of forty-two feet, as there were some sharp bends to make. Reaching the rapid on the 12th, I found it to be a contraction of the river-bed into about one-half its usual width of five hundred to seven hundred yards, and further impeded by a number of massive trap rocks, thirty to forty feet high, lying directly in the channel, and really converting it into three or four well-marked channels, the second one from the east being the usual one used by the Indians, but rejected by us on account of a necessary sharp turn. We essayed the extreme right-hand passage, although running waves three and four feet high were seen in its boiling current, but still the straightest, and therefore the best. On these rocks innumerable numbers of gulls had sought a breeding-ground, safe from all intrusion, and saluted us with a perfect din of screamings as we rushed by. This extreme right-hand channel through which we shot, I believe could be ascended by a river-steamer with a steam windlass, a sharp bend in the river-bank giving a short and secure hold; and, if I am right in my conjectures, Miles' Cañon and rapids mark the head of navigation on the Yukon for very light-draught but powerful river-boats, or a total navigable distance of eighteen hundred and sixty-six miles from the Aphoon mouth. I named this picturesque little rapid after Dr. Henry Rink of Copenhagen, a well-known Greenland authority.

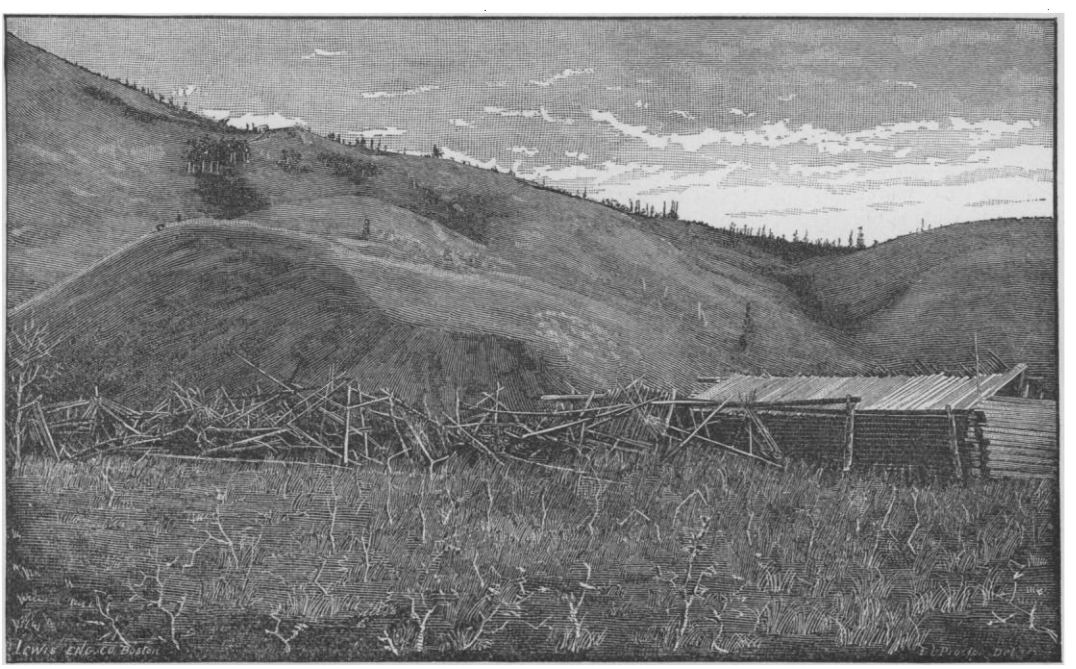
After the Yukon receives the many large rivers I have noticed, it swells out into quite formidable proportions, interspersed with many islands, all of which are so loaded with great piles of driftwood on their upper ends, that, when in one of these archipelagoes, the scene up and down the river is quite different. The river also becomes very tortuous in many places; and at the mouth of the Nordenskiöld a conspicuous bald butte could be seen directly in front of our raft no less than seven times, on as many different stretches of the river. I called it Tantalus Butte on the map.

The day we shot the Rink Rapids we also saw our first moose ploughing through the willow-brush like a hurricane in his endeavors to escape, — an undertaking in which he was successful. That same night we camped near the first Indian village we had met on the river, and even it was deserted. It is called Kit-

ah-gon (meaning the place between high hills), consists of one log house about eighteen by thirty, and a score of the brush houses usual in this country; that is, three main poles, one much longer than the rest, and serving as a ridge-pole on which to pile evergreen brush to complete the house. This brush is sometimes replaced by the most thoroughly ventilated reindeer or moose skin, and in rare cases by an old piece of canvas. Such are the almost constant habitations of these abject creatures. In the spring Kit[l]-ah-gon is deserted by the Indians, who then ascend the river with loads so light that they can be carried on their backs. By the close approach of winter-time they have worked so far away, accumulating the little salmon, moose, black bear, and caribou, on which they are to subsist, that they build a light raft from the driftwood on the islands, and float down to live in squalor through the winter. These rafts are almost their sole means of navigation from Miles' Cañon to Fort Selkirk, and the triangular houses almost their only abodes; and all this in a country teeming with good enough timber for log-houses, and plenty of birchbark for canoes. Kit[l]-ah-gon is in a beautiful large valley,[1] as its name would impart; and I was surprised to see it drained by so small a stream as the one, but ten or fifteen yards wide, which goes out at its foot. Its proximity to the Pelly forbids its draining a great area, yet its valley is much the more conspicuous of the two. Photographs of it and adjacent scenes on the river were secured before departing, and a rough 'prospect' in the valley showed 'color' enough to brighten the hopes of some enthusiastic miner for something he would prize more highly.

From Kit[l]-ah-gon to old Selkirk is but a little over twenty miles; and the river is so full of islands in many places, that for long stretches we could hardly see both banks at a time. This, I think, is one of the ancient lakes to which I have alluded, although the report of a professional geologist would be needed to settle such a matter. I was very anxious to determine the relative sizes of the two rivers that joined just above Selkirk, as upon this determination rested whether the Pelly or the Lewis River of the old Hudson-bay traders was the Yukon proper; and I was fully prepared to make exact measurements, soundings, rate of current, and other data if necessary, to settle the point. This was only needed in a rough manner, however, as the preponderance of the Lewis River was too evident to require any exactness to confirm it.

[1] Von Wilczek valley, after Graf von Wilczek of Vienna.



INDIAN VILLAGE OF KIT[L]-AH-GON IN THE VON WILCZEK VALLEY.
It is deserted in summer, and occupied in winter.

The ratio of widths is about five to three, with about the ratio of five to four in depth; the latter, however, being a very rough approximation. At old Fort Selkirk nothing but the chimneys, three in number, are left standing: the fate of this post has been alluded to in an earlier part of the article.

The latitude of Fort Selkirk is 62° 45′ 46″ north, and its longitude 137° 22′ 45″ west (Greenwich). Altogether on the Yukon River, this far, there had been taken thirty-four astronomical observations, four hundred and twenty-five with the prismatic compass, and two for variation of compass. I hope they have been sufficiently accurate; at least, to subserve all practical purposes of exploration in this country, until more exact surveys are demanded by the opening of some industry or commerce, should that time ever come. No meteorological observations were taken, the party not being furnished with instruments, and the rapid passage through a vast tract of country making their usefulness to science highly problematical. The nearest point to the upper Yukon, at which regular observations of this character are recorded, is the Chilcat salmon-cannery of the North-west trading company on Chilcat Inlet. The two are separated by the Kotusk Mountains, making meteorological inferences, therefore, very unreliable. Nearly a hundred botanical specimens were collected on the upper Yukon, and have been placed in the able hands of Mr. Watson, curator of the Harvard herbarium, for analysis. While only a limited and crude amateur's collection, it may throw some little light on the general character of the flora, as limited to the river-bed, which we seldom left in our more important duties connected with the main object of the reconnoissance.

The map is necessarily condensed for so large an area; and having been made hurriedly, and expressly for this article, it is not wrought so much for topographical effect as exactness within the limits possible under such circumstances. The map which will accompany my official report is on a much larger scale, and much better prepared in details. To Mr. Homan, my topographical assistant, is due all the credit relating to the map-making department, except simply the astronomical observations, and in those requiring an assistant, when he acted as recorder. The above account has mostly been taken in chronological sequence from my daily journal, and matters of the same character have thus been separated in different parts of the article. If, with all these defects, I have made clear my small addition to geographical research to the readers of *Science*, I shall feel deeply repaid for the great labor I had in securing it.

In my geographical nomenclature I have tried to observe the following rules. Wherever a descriptive name would assist any future traveller in identifying the object, I have applied it, to the exclusion of all others, Indian or civilized; as, Red Butte, Bald Hill, Cone-Hill River, Haystack Island, etc. Where Indian names are simple, I have tried to retain them, as Kotusk, Tahk-o, Tahk-heen-a, Kluk-tas-si, Dayay, etc. In all other cases, where the object was deserving of being named, I have not hesitated to attach the names of men worthy of such distinction, both personal friends in all branches of science, and those who have done something for geographical research, and without regard to country. In my larger map I have also added the native names, where they could be secured.

The total length of part first, the part explored and surveyed by this reconnoissance, was 538.8 miles; the total length of the raft-journey on part first, from camp on Lake Lindeman to Fort Selkirk, 486.8 miles; the total length of the raft-journey on Yukon River, from Lake Lindeman to Nuklakayet (being the longest raft-journey in the interest of geographical science), 1,303.2 miles; the length of Yukon River, 2,043.5 miles.

FRED'K SCHWATKA,
Lieut. U. S. Army.

NOTE ON THE FLORA OF THE UPPER YUKON.

LIEUT. SCHWATKA was able to make a small botanical collection from about the head waters of the Yukon, which is of considerable interest as an indication of the climate of the region, and as showing the range northward into the Yukon valley, of some species previously known scarcely beyond the British boundary. Lieut. Schwatka, ascending from the head of Chilcoot Inlet, crossed the main coast-range by the Perrier Pass at an altitude of 4,100 feet, coming at once upon the source of the Yukon River, in latitude 59° 40′. A descent of twelve miles brought him to Lake Lindeman; and upon the borders of this and other lakes within a distance of twenty-five miles, nearly equally on both sides of the sixtieth parallel, the larger part of the collection was made, between the 12th and 15th of June. The specimens gathered even at this date were in full bloom, excepting a few indicated in the following list