

ATLASES.

Bacon, G. W., F.R.G.S.—New Complete Atlas of the World, containing all the latest Geographical Discoveries throughout the various Countries of the World, with General Description, Alphabetical Index, and Gazetteer of 1000 principal towns. London: edited and published by George Bacon, F.R.G.S. Price 2*l.* 15*s.*

This Atlas is for the most part composed of the maps of the "Dispatch Atlas," which was published about thirty years ago. Attempts have been made to correct these and bring them up to date, but an experienced eye will at once detect many errors and omissions. The most accurate portion of the Atlas is the manner in which the railroads have been laid down, but even in this respect there are serious errors, as for instance in the case of maps 101 and 102, on one of which the Northern Pacific Railway, which has been working through for some years, is said to be a proposed line, and on the other the Canadian Pacific Railway is shown as incomplete. The topography is very poorly shown and contains numerous mistakes, some of the geography laid down being that given in the original maps, exhibiting the state of our knowledge thirty years ago.

Berghaus' Physikalischer Atlas (begründet 1836 von Heinrich Berghaus). 75 Karten in sieben Abteilungen, enthaltend mehrere hundert Darstellungen über Geologie, Hydrographie, Meteorologie, Erdmagnetismus, Pflanzenverbreitung, Tierverbreitung und Völkerkunde. Vollständig neu bearbeitet und unter Mitwirkung von Dr. Oscar Drude, Dr. Georg Gerland, Dr. Julius Hann, Dr. G. Hartlaub, Dr. W. Marshall, Dr. Georg Neumayer, und Dr. Karl v. Zittel, herausgegeben von Professor Dr. Hermann Berghaus. Achte Lieferung. Inhalt: Nr. 30, Isothermen von Europa. Nr. 49, Florenkarte von Afrika und Australien. Nr. 57, Amphibien und Fische. Gotha, Justus Perthes, 1887. Price 3*s.* each part. (*Dulau.*)

British Empire.—The Colonial and Indian Atlas of the —. W. & A. K. Johnston, Edinburgh and London, 1887. Price 5*s.*

This atlas consists of twenty-nine sheets of maps, some of which are far superior to any that have been produced in the cheaper class of English atlases, of which so many have been published during the past and present year. The eight maps of the Indian Empire are specially worthy of notice, and appear to have been taken from the Royal Atlas. The maps of Canada and Australia are also good, evident care having been taken to use the best and most recent materials in their construction; the same remark applies to the smaller and inset maps. Though not part of the British Empire, the well-executed plan of the Suez Canal which is given, is a very useful addition to the Indian and Colonial maps which this class of atlas usually contain. As the expense of mounting full-page maps on guards would have considerably added to the cost of production, and consequently have raised the price, a system of dividing the maps by a blank margin in the centre has been adopted, by which means the whole of the map is open to view instead of being hidden in the centre, as it would be if this precaution had not been taken.

EDUCATIONAL.

Palestine.—Pictorial Map of Palestine, giving a bird's-eye view of the Holy Land, and showing the peculiar features of the country, Jordan valley, the Ravines and Towns. Important events indicated by distinctive marks. By Frances H. Wood. Size 68 inches by 34 inches. Mounted on linen and varnished, with roller and Handbook. Price 9*s.* 9*d.* To be obtained, post free, from the author, Beckenham, Kent.

This would more properly have been called a picture than a map. It is very misleading as regards vertical scale, and though it might convey to the mind of a child some general notion of the positions of places of interest, it would at the same time give very false ideas as to the magnitude of the area embraced, and surface conditions of the country. It may also be remarked that the lettering is very indistinct.

PROCEEDINGS
OF THE
ROYAL GEOGRAPHICAL SOCIETY
AND MONTHLY RECORD OF GEOGRAPHY.

The Alpine Regions of Alaska.

By Lieut. H. W. SETON-KARR.

(Read at the Evening Meeting, March 14th, 1887.)

Map, p. 330.

ALASKA, or the north-west corner of North America, was bought from Russia by the United States twenty years ago. It is bordered on the east by British territory, and extends from 55° north latitude far into the Arctic Zone and offers one of the best regions for the study of the formation, movements, and extent of glaciers, especially that part of it which we visited and explored for the first time.

Having left England last April for the purpose of visiting these alpine regions, I found on reaching Victoria another expedition bound for the same spot, namely, Mount Saint Elias, and was allowed to join the party. It was equipped by the *New York Times*, and consisted of Lieut. F. Schwatka and Professor Libbey, jun., of Princeton College, N.Y.

On the conclusion of this expedition, I went on alone to the north and west, instead of returning by the United States man-of-war which came back for us in September; and I found that the glaciers were quite as extensive on the west of Mount St. Elias as they are on the east of it, while one of immense extent, near Cape Suckling, was named the Great Bering Glacier, this being the portion of America which that explorer first sighted.

Having now returned from my six months' exploration, and as the first traveller in the footsteps of Cook to make a complete circuit of this coast from St. Elias to Prince William Sound and thence to the westward, my impressions have been, that the St. Elias alpine region offers one of the best places for the study of glacial phenomena under the most powerful conditions. The air is warmed and charged with vapours by the Pacific currents, including the Kuro Siwo or so-called Japan current. It is suddenly confronted by a vast range of mountains rising directly from the ocean's edge. The result is a snowfall unusually heavy, and the

thickest and most extensive glaciers after those of Greenland or the Arctic regions.

Along the whole of this difficult coast, bordered as it is by a gigantic wall of icy mountains facing the sea and rising abruptly from its brink, from the end of the Inland Passage at Cape Spencer as far as Prince William Sound, there are only two spots where any shelter exists with a safe landing-place all the year round—namely Yakatat village and Kaiak. But at seven other points the Indians can land during the fine summer months, namely, at Lituya Bay, at Dry Bay, at the river near it, at the head of Yakatat Bay, at Icy Bay, at Cape Yagtag, and at a reef near Icy Cape.

None of the old navigators saw the true character of the flat broad plains which border this coast. To the east of Yakatat Bay, and to the east of Icy Bay, there exist small areas of flat land which are covered with a forest of spruce and cedar. But every other plain or flat expanse consists of ice, and is covered with stones and moraines. In other words, the country that intervenes between the range of the St. Elias Alps and the sea (from Cross Sound to the Copper river) with the exceptions I have mentioned, consists entirely and exclusively of glaciers and nothing else. The terminal moraines of these glaciers are so gigantic and extensive that the ice itself lies buried under millions of tons and hundreds of square miles of loose rocks and stones which it has carried down with it from the mountains in its slow and gradual advance. Large as are these moraines the bare ice is correspondingly immense in its extent. What we named the Great Agassiz Glacier is probably about 600 square miles in extent, and its moraines between one and two hundred; and what we named the Great Guyot Glacier, on the west of it, is of quite unknown extent. Where it projects into the sea the ice cliffs are 300 feet high. This forms Icy Cape. We saw no icebergs here, probably because the current carries to the westward the masses that fall off into the sea.

Vancouver described the coast between Yakatat Bay and Icy Bay as "a barren country composed of loose stones." No one could have guessed, without landing, that all these loose stones were the moraines of the glaciers which lay beneath them. But when we landed at Icy Bay and inspected the so-called barren country, it was seen that below the stones and rocks there lay solid ice ranging from three or four hundred feet in thickness in some places to six or seven hundred feet in other places. These moraines or accumulations of rubble and stones upon the surface of the ice at Icy Bay change and move with the ice so slowly, that parts are covered with brush and thicket of great density—so dense that it cost us many hours of labour to cross a mile of it.

La Pérouse, too, like all the navigators who have sailed along this coast, mistook the true nature of what he saw. He thought the ice, where it protruded from under the stones, was snow lying upon the

ground. He wrote that "masses of snow covered a barren soil unembellished by a single tree; this plain, black as if burned by fire, was totally destitute of verdure."

Forty miles W.N.W. from Cape Phipps lies Cape Sitkagi, which is the Pointe de la Boussole of La Pérouse. Vancouver's Cape Riou, about 15 miles N.W. by W. of it, is the Low Cape of Tebenkoff.

Icy Bay is merely a shallow crescent in the coast-line, though Tebenkoff marks 12 and 15 fathoms, and 5 fathoms at the head at a point on the chart which is now many miles from the sea, and consists of the gravelly and partially dry estuary of the river.

Mount St. Elias (according to Prof. Davidson's 'Coast Pilot of Alaska') lies in lat. 60° 22' 6", and long. 140° 54'. Dall, the American surveyor, makes it 19,500 feet high; the Admiralty chart, 14,975 feet; the Russian chart, 17,854 feet; Grewink, 16,754 feet; and D'Agelet, 12,672 feet. It is thus one of the few mountains whose height exceeds the first estimations. It is said to have been in eruption in 1837 and 1847. If this be true, the eruption could hardly have issued from the summit, which is a sharp rocky peak, but rather from what much resembles an old crater on its south-east base, and which the maze of crevasses on the glacier prevented our approaching; but we found no traces of volcanic action. In the Report of the U.S. Coast Survey Mr. Dall says, "After a thorough search I have been able to find no trustworthy account of any eruption." St. Elias is, I believe, the Russian patron saint of thunder, which, strangely enough, is very rarely heard in the neighbourhood of Mount St. Elias. The massiveness of the peak made it appear to me not to be higher than 15,000 feet. The breadth of its form and the high mountains behind it have perhaps been the cause of its height having been underestimated. St. Elias has thus undergone promotion. Mount Hood, in Oregon, has suffered from treatment the very contrary, because it stands alone. It was originally, by a "rough" estimate, 17,000 feet high (I quote from an article in *The Times*). A "close" estimate made it 16,000 feet. Some measurements by angles dropped it to 14,500 feet, and a triangulation to 13,000. The first aneroid taken up was said to have made it 12,000 feet, and afterwards a mercurial barometer brought it out 11,225 feet; so that if these reducing processes go on, Mount Hood may, in the words of a pioneer of that region, "finally become a hole in the ground."

The scene or view of the St. Elias range from Yakatat is one of the most wonderful in the world. Mount St. Elias, hitherto considered the highest mountain in North America, stands upon the ocean's edge, from which it rises sheer to 20,000 feet—a mass of snow and ice from base to summit—the longest snow-climb in the world short of the Antarctic regions. Its summit has always been marked in modern maps (though not in that of Tebenkoff, which has formed the basis of all these maps) as exactly on the 141st meridian, which is the boundary line, as though two

nations were chary of claiming a summit which belongs to one of them; and what is more curious still, as exactly 10 leagues from the shore. This was the extreme limit to which the narrow strip of coast called South-east Alaska could extend inland. If the summit of the watershed came within that distance, the boundary was to follow that. If the shore-line has been correctly charted, I found that the summit was east of the meridian of longitude just mentioned. It was also more than ten leagues from the shore-line of Icy Bay. Mount St. Elias is therefore in the British Empire. It is to be supposed, as a San Franciscan officer remarked to me, that war will not ensue with reference to this question.

Vancouver (July 1794) writes: "At eight in the evening, Mount St. Elias bore by compass N. $73\frac{1}{2}^{\circ}$ W., and Mount Fairweather, N. 10° E. The length of time we had been in sight of these very remarkable lofty mountains afforded us many observations for ascertaining their situation, whence the former appeared to be in latitude $60^{\circ} 22\frac{1}{4}'$, longitude $219^{\circ} 21'$. Until past eleven at night, Mount St. Elias was yet within our visible horizon, appearing like a lofty mountain; although at this time it was at a distance of one hundred and fifty geographical miles." This is in longitude $140^{\circ} 39'$ W. from Greenwich, and more than thirty miles from the sea. We left Sitka on July 10th, in the U.S. man-of-war *Pinta*, for the Indian village in Yakutat Bay. We reached it on the 12th. There is a small landlocked harbour here; five Indian houses form the village. After waiting here for four days, trying to hire a large canoe, the vessel took us to the foot of St. Elias. Besides two white men and an Indian interpreter we had hired from Sitka, three Indians were brought from Yakutat, making a total of nine persons.

We were landed on July 17th, at Icy Bay. But not without difficulty, for the surf on this coast is heavy and constant. On the beach were an immense number of bear tracks; one of our men, who stayed at the base camp, killed three of these animals, while we saw another in the very heart of the icy region. A number of immense torrents reach the sea all along this coast. There are at least three between Point Riou and Point Sitkagi. So large is the body of fresh water brought from the glaciers by these torrents, that the sea is fresh on the surface and fit for drinking more than a mile from shore, notwithstanding the constant and strong current which sets from the eastward. But the extent of the glaciers, whose melting produces all this fresh water, is also immense. From the highest point attained in our ascent of St. Elias, nothing could be seen in the distance but plains of ice, much more extensive than I had ever seen before. The largest of these rivers issues from under the ice which has bridged it over, or buried it, just at the meeting of the Guyot and Agassiz Glaciers. It was called the Jones river; and up this river we had to make our way on the 19th of July. This river spread out into a fan-like delta, the apex of which was near what looked like a green wooded hill, which had

a curiously uneven outline like the teeth of a saw. Meanwhile, we were almost constantly wading in ice-cold water, and some quicksands had to be crossed, than which there is, I suppose, no sensation more unpleasant. It seemed as though an elastic crust of glacier mud were floating on a liquid mass below, and might break and let one in at any moment. But when at last this occurred to one of us, he sank, to our relief, no farther than his middle, saying he had struck bed-rock, or more probably the bed of the stream. About five in the afternoon we were near enough to the green hill (as we had thought it to be) to discover that it was nothing more nor less than a very large glacier, which we named, as I have said, the Agassiz Glacier, its front part being quite buried under enormous quantities of moraine, and overgrown with birch and willow. Large streams welled up from between the rocks at its foot, one of which we named the Fee River. This huge moraine must be one of the most extraordinary in the world. A great thickness of ice lies buried underneath it. It is now advancing faster than it can melt away, for the forest is being gradually swept down before it.

After waiting for two days in order to bring up more supplies, we started once more, and after penetrating for a mile through the thick brushwood on the moraine, we found that vegetation ceased altogether, leaving nothing but hillocks of stones heaped together on the ice, and more or less compacted by age.

The moraines of the Great Agassiz Glacier were mostly composed of granite, and those of the Great Guyot Glacier of slate. A wide depression in the glacier marks their line of junction, under which, unseen and unheard, flows the great river.

At dusk we were brought to a standstill by a large lake covered with icebergs, which we named after the President of the Italian Geographical Society (Castani). Beyond it lay a range of hills which we named the Chaix Hills, after the venerable Swiss professor of geography. At this point, one of the party getting lost detained us for two days. This was camp number three. Professor Libbey had thought this large lake could only be passed by our keeping to the east. I considered the west to be the best way. We both therefore set out in opposite directions to make sure. The Professor, as I have said, was unfortunately absent for two days without being able to find a practicable route. But meantime I had found a way on to the Chaix Hills. The way lay across a patch of timber, which subsequently became an island, but which when I first found it was not an island at all. On one side it was bordered by the ice-cliffs of the glacier, and nothing intervened between it and the Chaix Hills but a broad plain of gravel like the damp bed of a large river, or like part of the bottom of the lake, the waters of which seemed to have sunk below their usual level. Less than twenty-four hours later this river-bed—for such it was—was covered by 20 feet of muddy water, rushing past at racehorse speed, carrying with it icebergs and trees. A large

chain of lakes had been dammed up and had burst loose again. The fires we had made along its banks to guide the lost one back to camp had set the small forest ablaze.

The ice was gradually advancing, and the pine trees were in process of being mowed down by the advancing glacier and ground up into mere heaps of matchwood. Three destructive agencies were thus at work at the same time within a yard or two of each other—fire, water, and ice. This breaking loose of the river accounted for the marks of sudden risings and fallings in the water-level on the distant flat-land of Icy Bay, where the vast mud-flats were always damp, as if from periodical inundations.

Our next day's march took us right to the base of Mount St. Elias, up a great glacier descending from the face of the mountain, which we named the Tyndall Glacier. The mocassins of our Indians were now for the second time worn out. But in any case they would have refused from superstitious fear to proceed with us any farther.

At half-past four next morning, we left our fifth and last camp for the final ascent. The party then consisted of Lieut. Frederick Schwatka, Joseph Woods (one of our two hired men) and myself. As the only one with any alpine experience, I tied Mr. Schwatka in the centre of the rope, and Woods and myself at the ends. As we approached the great bend and ice-fall of the Tyndall Glacier, the crevasses became covered with fresh snow. Mr. Schwatka's great weight—eighteen stone—would have made it very difficult for us had any of the snow bridges over the crevasses given way, and as it drew on towards midday these became quite soft.

We were now aiming for one of the bare rocky ridges which descend direct from the upper snow-fields. We soon found we were wasting much valuable time in trying to thread the labyrinth of crevasses without advancing at all nearer to the peak itself, which now was clouding over. Only one day's provisions remained. This was hardly enough even for an immediate return. We now felt the consequences of our delay of two days during the loss of Prof. Libbey. If the snow over any of the fissures had given way under Mr. Schwatka, we might have had very great difficulty in raising him to the surface again. With a couple of Swiss guides, and a whole fortnight, or even a week, at one's disposal, a great height would have been attained, if not the conquest of the actual summit. The state of the weather, and the time that would be wasted in passing the icefall, compelled us at last to attack the rocky ridges of the west spur, which seemed to present no difficulties which we could not overcome. Mr. Schwatka was unable, through illness, to ascend beyond a certain point, but I continued the ascent up a steep arête.

At a height of 6500 feet I could see the country to the north-west and south-east. It consisted entirely of plains of ice. Above the height

of 6900 feet I was in the clouds, and therefore saw nothing. It was only obvious that the summit of the ridge was reached by the fact that the ground in front commenced to fall away to the westward.

It was now about six in the evening, and I was alone upon the summit of the western ridge or spur of Mount St. Elias.

As shown by aneroid, the altitude was 1490 feet above where I had left Mr. Schwatka, who had retained one of the two large mercurial mountain barometers. Professor Libbey was meanwhile making simultaneous observations below at our fourth camp, with the second of these large instruments. The readings were afterwards connected with those at the base camp at Icy Bay, and gave for the point I had reached a total height of 7200 feet above the sea-level. To traverse the ridge itself towards the main peak was impracticable. The only thing that remained was to retrace one's steps and rejoin the other two who were waiting below. It was claimed in New York papers that this was the highest climb above the snow-level hitherto recorded. And where is the snow-level on Mount St. Elias? If the snow-line is defined as the limit downwards of the region of perpetual snow—in other words, as the height above the sea-level below which all the snow that falls annually melts during summer—then we were of opinion that the snow-line on the south side of St. Elias is only 400 feet above the sea-level. It is only on the coast that there exists such a heavy snowfall. The south-east winds are the rain-winds. Here the moisture they bear is condensed and precipitated for the first time. Further inland the humidity must be less.

It would probably be below the mark to name two thousand four hundred (2400) square miles as the area of the flat glaciers which bound the coast between Cross Sound and the Copper river, exclusive of the snow-fields of the range, or the inland glaciers.

I would distribute this area as follows:—700 square miles between Cross Sound and Yakatat, 700 thence to St. Elias, and 1000 between St. Elias and the Copper river.

At midnight on the 30th July we tried to leave Icy Bay to return to Yakatat in our whale-boat, which belonged to the *Pinta*. But the surf was too heavy, and we were swamped at midnight. The darkness of the night and the exceeding coldness of the water of Icy Bay added to our difficulties.

The following night, or rather at early dawn on the 1st of August, we were successful in making our escape from Icy Bay, though at the cost of abandoning most of the baggage. We sent the Indians back for these things later on. They succeeded in bringing them away in canoes after waiting some weeks for the surf to subside.

The boat which had been left with us by the U.S. man-of-war, was in every respect too large and heavy for nine men to drag when it was loaded with baggage. Without undue delay it would have been

impossible to procure a large canoe from the Yakatat Indians, and although we waited for several days in hope of doing so, the result only served to strengthen the impression we had formed of this tribe, and to emphasise the oft-repeated advice, that a sporting or exploring party should have the ability to render themselves independent of their assistance.

It should be mentioned that we found Icy Bay a shallow indentation in the coast-line, quite undeserving in every way the name of a bay, and with no protection even in the mildest weather from the long curling breakers that sweep in from the wide Pacific. It was almost the only thing which the natives had told the truth about; though from their evident desire to exaggerate every obstacle we had not placed much faith in their representations.

The man-of-war returned, as promised, early in September. Meanwhile, a small trading schooner had called, belonging to four Swedes who had settled on Kaiak Island for the purpose of hunting sea-otters. There are many places, especially near the Aleutian Islands, where Scandinavian hunters have made a temporary abode. They form the finest race of settlers that can anywhere be found.

I left the expedition at Yakatat, and on the 9th of August, I started on a journey to the north and west in this small schooner to Kaiak Island, and from thence in a canoe by the Copper river to Prince William Sound. When I left Yakatat and sailed westward I had thought that Icy Cape was the last great glacier which reached the sea from the St. Elias Alps. But I found that a plain of ice as large or larger than the Agassiz Glacier exists to the eastward of Cape Suckling, which I named Great Bering Glacier.

After staying with these hospitable Swedes on Kaiak Island, I went on in a large canoe, accompanied by two of the Swedes, an Indian medicine-man, and three Indians, to reach Cape Martin, the east corner of the great estuary or delta of the Copper river. Here, just as at Yakatat, is an Indian village, where a strong spirit is distilled from sugar. The whole village was drunk, and the inhabitants very rude and boisterous. After a considerable delay we succeeded in getting away from them. We next beached the canoe not far to the westward, and dragged it over the sandbars into the tidal lagoons of the Copper river. A vast expanse of mud was found, over which it was easy to drag the canoe with small fatigue. When the tide rose, recourse was had to paddling.

From our camp on the 23rd of August, 1886, on an island in the centre of the tidal lagoons of the Copper river estuary, a wide panorama was spread out before us. Northward the eye plunges for 50 miles into a valley from which the river issues. From Cape Martin, the south-east point of the delta, to the spot where the hills on each side first commence to close together—a distance of 20 or 25 miles—there stretches a

low dark range, from 3000 to 4000 feet in height, on which I counted eighteen small glaciers on the summits and four large ones in the valleys below. This line of mountains is broken midway by a gap eight miles wide, which allows a glimpse of an extensive snowy range lying behind it. The highest peak seems at least 13,000 or 14,000 feet high, with six others not quite so lofty.

The opposite or west shore of the delta of the Copper river is of much more remarkable formation. From the spot where the valley opens out, as far as the middle point of this west side, the mountains project out into the tidal alluvial plain. On this part I counted fifteen small summit glaciers and two large glaciers in the valleys, spreading out after the manner of Alaskan glaciers in the shape of an extended fan to the level of the river. But from this point westward to Cape Whitshed (25 miles) the shores form a deep wide bay, with hills thickly timbered below and devoid of glaciers above. Here are placed the two small Indian villages of Oodiak and Alanuk. But though, just here, there is no ice on the summits, there are three large valley glaciers descending from a group of snow-mountains lying behind; one of these is a double glacier. From this point westward the mountains are not so high, until Cook's Inlet is reached.

Nuchuk is an Indian village on a large island at the entrance to that wonderful inlet, Prince William Sound.

We reached Nuchuk on the 26th of August. A white trader lives here. It was one of the old Russian fur-trading posts. The schooner was expected daily, but it was not until the end of October that she arrived. I had long given up all expectation of seeing any vessel until the spring, and was preparing for a winter's journey round Prince William Sound. The Sound is surrounded by moderately high mountains on the east side; few reach to 10,000 feet. Those of the Kenai Peninsula are lower and less bold in shape. Everywhere the north sides are bare. The south sides are thickly wooded to 1000 feet with spruce and alder.

After crossing the Sound on the 25th October to the Indian village of Chenega, we left it through one of several channels which exist between Montague Island and the Kenai Peninsula. As we skirted the Kenai Peninsula I could see many glaciers reaching the sea. The mountains from which they descend seem to protect Cook's Inlet from the rain which is so prevalent in Prince William Sound.

The summer in Cook's Inlet is one long spell of clear warm weather, and it has earned the name from the miners who have visited it of "Summerland." The west shore of Cook's Inlet is mountainous and wooded up to a height of 1000 feet. The eastern shore is flat. Canoe travel is very rapid in Cook's Inlet at the commencement of the flood tide, when the incoming water covers the sand, which appears to vanish beneath it like a sinking stone.

Mount Ilyamna (12,000 feet) and Burnt Mountain (11,200 feet) are both on the western side of Cook's Inlet, and both active volcanoes. Augustin Island, close by, is also active, and broke out a short time ago with great violence, covering the sea with dust.

Ivan Petroff who made a census of most of the Indian tribes in 1879, and who was sitting by my side during the fearful murder, at our supper table, by a Russian madman, of the general agent of the Alaska Commercial Company, is the only person who has set foot upon the sides of Mount Ilyamna. The fierce brown bears of Alaska are very numerous in these volcanic regions; the explanation of this is to be found in the fact that the natives will not approach any of the volcanoes. The deer and bear—the latter more particularly—seek these regions instinctively, untrodden by man's foot as they are, and untrodden as they will ever be by the foot of any Indian.

John Bremner, a miner (whose simple diary I found at Nuchuk, recording the extraordinary events he witnessed among the Copper River Indians, and his life for seven months with this depraved and dissolute clan), found that it was impossible to persuade any one of the tribe to approach within several miles of Mount Wrangel, a volcano which rivals St. Elias in height. He however, alone, and in the dead of winter, made an attempt to reach its crater, when one of his snow-shoes breaking, he was compelled to return. The part of his diary referring to this daring adventure is as follows (the spelling being corrected):—"Nov. 16th, 1884. I made the attempt to get to the volcano (Mt. Wrangel) and failed. I got within about one mile of the crater when one of my snow-shoes broke, and I came very near passing in my checks. Before I could get back to the timber several of my toes froze, and my ears you ought to see them; they would match a government mule's. I do not think it is possible to make the ascent in the winter, but I think it would be easy in the summer. I could not get any of the natives to go with me. They are afraid to go anywhere near it." Still more is this the case on Unimak Island, where in addition to the feeling of reverence and horror with which Mount Shisaldin inspires them, the superstitious thoughts which the story of the Russian massacre has left in their minds, is an additional cause of fear, and this large island is totally uninhabited.

I add another extract from his diary:—

"Feb. 3rd, a beautiful day, not a cloud in the sky. I was treated to a sight to-day that I wish you could have seen; the Volcano has been very quiet a good while, but to-day it is sending out a vast column of smoke and hurling immense stones hundreds of feet high in the air; the masses it is throwing up must be very large to be seen here, at least thirty miles in an air-line distant from the mouth of the crater; it has made no loud reports, only a sort of rumbling noise.—Feb. 4th, a little colder, but pleasant. The Volcano has stopped throwing stones or

making a noise but is still sending out an immense cloud of smoke. It is very beautiful, not a breath of wind, and the smoke ascends to a great height in an immense column before spreading out."

Mount Pavlov is another volcano near the end of the Alaska Peninsula, which broke out into eruption last August with great violence, and destroyed a portion of itself. None of these volcanoes have been examined or explored.

The admixture of Russian blood seems to have prolonged the life of the Indian races in Prince William Sound and Cook's Inlet. They seemed a far finer set mentally and physically than the Yakatats, who are pure Indians. The character of the Yakatat Indians has not varied much since Ismaelof and Belcharof (1780) gave the following description of them:—"They cut their beards and paint their faces with stripes of various colours. These people have neither laws nor religion. They worship, however, crows, from which they affect to be descended. Among other objects of barter, the natives offered two boys about twelve years old." When we arrived, the Yakatat Indians had lately been tearing up their blankets, as they do each spring after a period of debauch.

There remains in the alpine regions of the North Pacific a wide field for explorers. Mounts Crillon, Fairweather, and La Pérouse, respectively 15,900, 15,500, and 11,300 feet high, are not quite so striking as St. Elias, but much nearer to civilised settlements. Probably, it would be easier to land at the wonderful inlet of Lituya Bay, than at Icy Bay, and it would certainly be easier to leave. There is no permanent Indian village here, but the natives put in to camp sometimes.

Lituya Bay is close to Mount Fairweather. The vessel of the U.S. Coast Survey entered it and compared it to the Yosemite Valley in California with the addition of glaciers. La Pérouse entered it and lost a boat and its crew, through misfortune and ignorance, on the bar at the entrance. Indians can land at Dry Bay, or at the mouth of a nameless river near at hand. At this point exists the only pass known over the St. Elias Alps—known to the Indians, and known to them alone, and traversable only in winter.

Dry Bay, from Indian report, must be nearly as interesting as Lituya Bay. It is nearly certain that a large Indian village exists somewhere in the neighbourhood; and by taking a small light canoe here, one could reach Yakatat by means of the series of lagoons behind the beach.

There is a large blank space upon the map of Alaska, lying between Cook's Inlet and the great Yukon river. It is as unknown as any of the unexplored regions on the globe. Indian report avers that there exist ranges of very lofty mountains, and that rivers lead to chains of lakes.

If any future expeditions should start for Mount St. Elias there

should be in the party experienced mountaineers, and it should land either on the west side of Yakatat Bay, or at Cape Yagtag, near Icy Cape, where there is said to be a reef which affords protection against the surf. It should number at least six persons, so as to be independent of the Indians, or at least not wholly dependent on them. If Yakatat Indians are hired, as many of them as possible should be engaged up to ten; but if Indians are brought from Chilcat not so many will be required.

The main object should be to be able to camp long enough on the spot to ascertain the easiest way of ascending Mount St. Elias, by "packing" with this object enough provisions to the base (three days' travel) to last for a fortnight. If the mountain is to be ascended at all, it will only be accomplished by experienced *alpinists*.

We next touched at Kodiak, where occurred the murder, to which I have alluded, of the general agent of the Alaska Commercial Company. We were seated in a small room after dark at supper. As the meal was nearly finished a shot was fired at us from the outside through a double glass window, which was smashed to atoms, filling the room with smoke, covering the table with fragments of broken glass, and killing the general agent, who was sitting by my side, besides severely wounding another occupant of the room. An insane Russian had fired into a crowd of unsuspecting men with a charge of buckshot! He had evidently aimed at the agent.

The schooner remained some days at Kodiak, and then sailed for San Francisco, where I arrived on the 15th of November.

The following discussion ensued:—

Mr. D. FRESHFIELD regretted that he could not add anything to Lieut. Seton-Karr's narrative from personal knowledge of the mountains of Alaska. But as the paper read had been somewhat brief, the meeting would perhaps allow him to offer some general remarks on the present position of mountaineering as a branch of geographical research. He would then take in detail certain points raised by Mr. Seton-Karr, and he would conclude by quoting some valuable notices of the same region, recently published in America. He had sometimes been tempted, while listening to the papers read at the Society's meetings, to amuse himself by inventing fancy classifications of the travellers who appeared before them. A learned German supplied him with the first classification. Herr Schwarz* said that there were two great classes of travellers, those who sought for lateral progress and those who strove for vertical advance—the ordinary traveller who tried to get as far as possible from his fellows, and was, therefore, something of a misanthrope, and the mountaineer whose endeavour was to get a little nearer to the angels, and who might be called a philangelist. Another authority divided travellers into seafarers, landfarers, and snowfarers. Such a division might serve to enforce at least one useful lesson, that the craft of going above the snow-level was as distinct a craft as that of navigation, and that it is as impossible to explore efficiently snow-mountains without it,

* 'Ueber Fels und Firn; die Bezwingung der mächtigsten Hochgipfel der Erde durch den Menschen,' &c., Leipzig, 1884.

as it is for a landsman to explore beyond low-water mark. Some people found it hard to understand this; and great nonsense was frequently talked by those who forgot that mountain people were not necessarily mountaineers, that they were often incapable of giving the smallest assistance to mountaineers, and that their testimony as to the practicability of ascents was worthless. Before the days of De Saussure no Alpine peasant had ascended any Alpine snow-mountain. At the present time it was proper to call attention to De Saussure, because this year was something more than a jubilee, it was the centenary of the ascent of Mont Blanc by the illustrious Genevese. His was not the first ascent of Mont Blanc, for that mountain had been climbed the year before by Balmat and Dr. Paccard, but it was the first properly recorded ascent, and, therefore, the ascent that had been most valuable to, and was best remembered by, the world. Its value was not, however, immediately manifest. Two fellow-citizens of De Saussure—Rousseau and Voltaire—set men's brains spinning in a different direction. It was not till within the last thirty years that De Saussure's travels had borne full fruit in the thorough subjugation of the Alps. By the present generation the exploration of the Alps had been taken in hand and finished, the secrets of the snow had been explored, and the icy wastes had been turned into the health-giving playground of Europe. The word "inaccessible" had been banished. From the Maritime Alps to the Gross Glockner not a single pinnacle raised its head unconquered. Augustus raised a trophy on the Maritime Alps above Monaco and inscribed it—"Devictis Alpibus gentibus a mare supero ad inferum": now a monument could be raised to De Saussure, "Devictis Alpibus." He did not desire to exaggerate the part of mountaineering in the exploration of the earth, the portion of which under snow was comparatively small. But he wished to show that mountaineers had been well employed, although their labours had occupied but a small space in the 'Proceedings' of the Geographical Society. A double reason might be given for that. First, they had been chiefly engaged in completing the task before them—exploring the Alps. The ice-craft learnt in Europe had as yet only been brought to bear in a few isolated instances on more distant ranges. Secondly, the Geographical Society had kept its eyes fixed beyond Europe, and had excluded from its sphere European travel and research. In Germany it would be found that Payer's Alpine and Arctic papers equally found a place in the leading geographical magazine.* When he first frequented the Royal Geographical Society he was astonished to find that they had not the maps made by his friend the late Mr. Adams Reilly of the chain of Mont Blanc and the southern slopes of the Pennine Alps in their Map-room! He believed that the Society's gold medals had been given for much less hard labour and geographical research and accurate and artistic map-making than were embodied in these sheets.† But now the Royal Geographical Society and the Alpine Club were about to be forced into connection. The Club had done its work in Europe and would have to turn to other places. The maiden peaks of New Zealand, the Caucasus, the Himalaya, and the Andes would no longer be the objects of the occasional pursuit of a few chartered libertines; they would be constantly run after by a crowd of admirers. South America had already found its De Saussure in Mr. Whymper, whose long-promised work they must all look forward to with great interest. He was sorry that he could not say that North America had yet found a De Saussure. The journeys of Mr. Seton-Karr and Lieutenant Schwatka must rather be compared to the travels of

* Petermann's 'Geographische Mitteilungen,' Ergänzungsheft No. 17, and *passim*.

† Mr. Adams Reilly's MS. maps are now, by the permission of the Alpine Club, on view for a short time in the Map-room.

Pococke and Windham, the two adventurous tourists who went to Chamonix forty years before De Saussure, and visited the Montanvers. The party whose adventures had just been described were doomed to failure, for the expedition was not sufficiently provided with mountaineers. Lieut. Seton-Karr's own Alpine experience was limited, and he had with him a companion of eighteen stone; and to attempt to take such a companion up a mountain 19,000 feet high was a Quixotic enterprise. He did not think that Lieut. Seton-Karr need have felt any anxiety as to the trouble he might have had in lifting Lieut. Schwatka out of a crevasse. Alpine ropes had been thoroughly tested, and none of the ropes in use would bear the shock of an eighteen-stone man falling suddenly. To come now to some of the points in the paper, he would first refer to the name of the mountain—Mount St. Elias. It was curious to find in such a region the name of St. Elias. Why should the prophet Elijah be connected with that great mountain? Wherever the Eastern forms of Christianity prevailed, the prophet Elijah or Elias seemed to be the peculiar patron of mountain peaks. If they looked at the map of Greece they would find his name and chapel on the top of many mountains; and on Olympus, instead of an altar to Zeus, there were convents dedicated to St. Elias. In the Caucasus the primitive tribes who had been driven into the hill-fastnesses by the Circassians, were said to believe that the prophet Elijah frequently appeared on the highest mountains, and to appease him with milk, butter, and beer.* Various explanations were given of this connection. Some people thought it was because the Greek Church attached so much importance to Elias's part in the Transfiguration; others said that Elias the prophet had, through a similarity of name, succeeded to the altars of Helios, the sun.† Another possible explanation might be found in a survival of the belief attributed (2 Kings ii. 16) to the sons of the prophets, who sent out a search expedition of "fifty strong men" to look for Elijah, because they thought, "Peradventure the Spirit of the Lord hath cast him upon some mountain." Of all the mountains on which the prophet's name had since been cast Mount St. Elias must be the farthest and the loftiest. With regard to the height of St. Elias, 19,500 feet might now be fairly taken as settled. Mr. Elliott, in his recently published 'Arctic Province,' spoke of Mr. Baker, who made the triangulation, as "one of the most accomplished mathematicians in the United States Survey." Another accomplished surveyor, Lieut. Allen, had, he stated, ascertained that Mount Wrangel rose 18,400 feet over the forks of the Copper river, and that those forks were over 2000 feet above the sea. That would make Mount Wrangel 1000 feet higher than Mount St. Elias, so that after all the United States might be happy in possessing the highest peak of the North American continent. He need hardly say to anybody in the room who had any experience in mountaineering that he utterly disbelieved in the ascent of Mount Wrangel by the miner, quoted by Lieut. Seton-Karr. He did not believe that he got anywhere near the top of the mountain, or even much further than its base. That a solitary man should ascend nearly to the summit of a peak of 20,000 feet, in that latitude, in winter, was absolutely incredible. With regard to the statement in the paper that the snow-level on the seaward slope of Mount St. Elias was only 400 feet, Mr. Elliott described the forests of Prince William Sound, a little farther west, as rising to 1000 feet, and the snow-level as between 3000 feet and 4000 feet; and another explorer had collected botanical specimens at between 1000 and 3000 feet. The ascent of Mount St. Elias would probably prove the longest snow tramp in vertical height on the earth's surface. But, whatever the snow-level might be, the height reached by

* Klaproth, 'Voyage au Caucase,' vol. i. ch. 13.

† Bent's 'Cyclades.'

Lieut. Seton-Karr above the *sea-level* did not equal that of the summits of Elbruz above the Caucasian snow-level; and the pretensions of the New York newspaper with regard to this ascent must therefore be dismissed. He wished to ask Lieut. Seton-Karr if there was any chance of an explorer being able to cross the Indian pass from Dry Bay and get round by the lakes north of Mount St. Elias to the forks of the Copper river near Mount Wrangel? Such a tour, combined with the ascents of Mount St. Elias and Mount Wrangel, would probably be the most interesting mountain excursion possible in North America. He regretted very much that, owing to the non-arrival of the photographs that Lieut. Seton-Karr expected, he had been unable to illustrate his paper with the lantern. He hoped that mountain travellers in future would take photographic machines with them and make good use of them. It was a very easy thing to do. He had himself carried Mr. Donkin's camera nearly up Mont Blanc, and every one knew what superb plates Mr. Donkin produced. With regard to the accessibility of the region described in the paper, he had recently received an illustrated pamphlet, published by the Northern Pacific Railroad, and written by Lieut. Schwatka.* It contained a promising account of the facilities soon to be afforded to travellers. It was in contemplation to build an hotel at Glacier Bay, close to Mounts Crillon and Fairweather, and to run excursion steamers from Sitka to Icy Bay. When travellers frequented these coasts the weather promised to be as great a topic of conversation on Alaskan steamers as it was at Swiss table d'hôtes. The rainfall at Sitka was 85 inches, but there were said to be 100 fine days in the year. At Glacier Bay, Mr. Wright, in August, out of 29 days, had 14, or nearly half, "beautiful beyond description." The witnesses were very contradictory, for another officer described the weather as "boisterous winds chronic, and howling gales frequent." Mr. Seward, on the contrary, thought the climate was infinitely superior to that of Northern Germany; but he was a politician, and not a disinterested one (for he had had a share in the purchase of Alaska), and therefore was politically biassed, and could hardly be expected to tell the truth. In conclusion, he would give very briefly the main facts contained in an important note which had been published in the 'American Journal of Science' (January 1887) by Mr. Wright, who made some prolonged observations at the head of Glacier Bay, on a large glacier called the Muir Glacier. It was found that that glacier occupied a vast amphitheatre, with a diameter ranging from 30 to 40 miles, with nine main and seventeen smaller branches. The main trunk was two miles wide. It entered the ocean with a sea-front of a mile, rising in cliffs 300 feet in height. Bergs containing 40,000,000 cubic feet broke off from it. From measurements taken with care at the end of summer, the period of greatest motion, the velocity of the ice was ascertained—and this was a fact well worthy of attention—as 70 feet a day in the centre, and 10 feet in the margin of movement! Now, 1½ foot a day was about the motion of the Mer-de-Glace, and 55 feet in the year that of the Aar Glaciers. The only observations at all comparable in their results with those of the Muir Glacier were those of the Jakobshavn Glacier in Greenland, where the motion was said to be 3½ miles a year.† Despite this rapid motion, Mr. Wright stated that a period of glacier decrease was going on in Alaska, corresponding to that in the Alps and in the Caucasus, apparently just terminated. A still more remarkable fact was ascertained in the discovery of a forest buried in sand, from which the ice had recently retreated. Mr. Wright showed that the sand had been deposited by streams dammed by a side glacier during a long previous period of advance of the ice. The ice had

* 'Wonderland, or Alaska and the Inland Passage,' by Lieut. Schwatka.

† See 'Alpine Journal,' vol. xii. pp. 229-30, for a summary of the most recent statements and conclusions as to glacier motion.

then passed over the sand without disturbing it. In this instance the ice had been partially supported by a spur of rock, and therefore its whole weight had not pressed on the sand. But Mr. Wright went on to say that "the capacity of the ice to move without disturbing them over such gravel deposits as cover the forests, is seen in the present condition of the south-west corner of the glacier itself. As the ice-front has retreated along that shore, large masses of ice are still to be seen lapping over upon the gravel. These are portions of the glacier still sustained in place by the underlying gravel." This, of course, was important evidence with regard to the boring faculty of glaciers. It seemed as if it would prove a confirmation of much that was written in Mr. Whymper's Alpine volume. He (Mr. Freshfield) had never been disposed to believe in the enormous powers attributed to glaciers as bores. They scraped and polished to a great extent, but he did not think that they dug deeply. They were not so much the sculptor's workman as the sculptor himself. Their share in hill structure was to give it artistic merit; to round a corner and polish a boss. Those who were interested in glaciers should not fail to study a very beautifully illustrated official report, published at Washington,* on all the glaciers in the United States, excluding those of Alaska. The conclusion that Englishmen would arrive at would be that the glaciers of the rest of North-west America were a very poor lot—hardly worth looking at from the picturesque point of view, and scarcely equal to those of the Pyrenees. Another result would be to make Englishmen envy the Americans the amount of money which their government could afford to devote to the illustration and publication of scientific reports. He congratulated Lieut. Seton-Karr on the success that he had obtained in approaching the mountain and visiting the more remote parts of the Alaskan coast. Those who went first, and opened the way, were not less entitled to credit than those who came afterwards, and reaped the fruit of their predecessors' labours.

Mr. CLINTON DENT (President of the Alpine Club) said he had been very much interested in the paper, for it dealt at once with mountain and geographical exploration. He could fully endorse what Mr. Freshfield had said, that, to attack a mountain 19,500 feet high, with the very remotest prospect, not of success, but of attaining any height whatever, the expedition must be specially equipped. There must be no one in the party who was not a mountaineer. With regard to trusting to the natives, experience in Alaska would prove to be the same as in the Andes, as originally it was in the Alps, and as he had the opportunity last summer of finding it was in the Caucasus. Until the natives were educated to become mountaineers they would never be of the least use. The Swiss peasants had, however, been educated until they had become instructors of those who educated them. Among the natives in mountainous countries there was always at first an amount of superstition, and which resulted in a dread and abhorrence of attacking the higher peaks. It followed that to attain any success, even apart from reaching the summit of such a formidable mountain as Mount St. Elias, the explorer must be provided with those who could act the part of porters, and who were thoroughly reliable. From the description that had been given of the mountain, he fancied that the ascent must be one of a most formidable nature from its great length, and he considered that the route which had so far been followed was hardly likely to prove the right one. It appeared to him to be a very long way round, affording no opportunity for bivouacking sufficiently high. From the last camp the party seemed to have started with an idea that they could go up a height of something like 15,000 feet in a day, but in such cases 6000 feet was an exceedingly good day's work. With Mr. Freshfield, he congratulated Lieut. Seton-Karr on having broken new ground, and on having

* 'Report of the Geological Survey,' 1883-4.

shown that in Alaskâ there were glaciers and mountains of the highest interest to every one connected, not only with geography, but also with the sister science, which he hoped geography would adopt, orography.

Lieut. SETON-KARR said the Indians had a pass from Chilcat to the north of St. Elias to Mount Wrangel down the Chichitka river. The Copper river had been ascended by Lieutenant Allen in 1884. The Indians, however, only crossed the pass in winter when the streams were frozen, but it might perhaps be done in summer. The snow-level depended on the snow-fall, and the conditions of St. Elias were such that the snow-fall was very heavy. Damp winds came up from the Pacific, and were condensed on the snow mountains which were immediately at the ocean's brink; the result was a very heavy snow-fall, greater than in any other part of Alaska. There was, therefore, more snow to melt, and consequently the snow-line descended lower. He judged it to be 400 feet, but other travellers might make it even lower. No doubt some of the glaciers were decreasing, but others at Mount St. Elias were advancing and getting larger. All the forest land which he saw was being destroyed by their advance. With regard to the weather, as a rule, June and July were fine. There was not a single drop of rain during the whole fortnight he remained on the slopes of Mount St. Elias, although it was cloudy. After that bad weather set in, and it rained the whole time he was in Alaska.

The CHAIRMAN (Mr. Francis Galton) congratulated Lieut. Seton-Karr on the opportunity he had had of exploring a country where the forces of nature were to be seen acting on a very large scale. The journey had evidently been performed under circumstances of great difficulty. We might expect a more detailed account in the narrative of his journey which he is about to publish. He experienced many difficulties which he has not mentioned in his paper, and on more than one occasion he was in peril of his life. It was to be hoped that Alaska would be further explored, and that fuller knowledge would be obtained of its most interesting characteristics.

Between the Nile and the Congo: Dr. Junker and the (Welle) Makua.

By J. T. WILLS.

(Read at the Evening Meeting, March 28th, 1887.)

Map, p. 330.

I NEED hardly remind you that in the fertile part of Central Africa, in the belt of tropical rains and rich vegetation which stretches from the Zambesi to Senaar and Lake Tsad, river navigation is the only means of cheap transport: and boats almost the only alternative to slave portage. Rivers are here the trade routes and the lines upon which European influence must advance; and the big navigable rivers, with the exception of the Niger Benue and Zambesi, almost all flow to one of three points, Berber, Lake Tsad, and Stanley Pool, of which the last is alone at present accessible to us.

Let us first look for a moment to the history of river exploration round the region in question. The first central African river to be explored and used was the Nile. Eighteen centuries ago, in the reign of the Emperor Nero, two Roman centurions explored and navigated the Nile 500 miles beyond Khartum as far as the *sudd*, where they found