

SOME SCIENTIFIC OBSERVATIONS, AND THE FIRST ASCENT OF MOUNT VANCOUVER, ST. ELIAS RANGE

By N. E. ODELL

IT was in the year 1741 that the Danish navigator, Vitus Behring, then in the employ of the Russians, is said first to have sighted the great snowy mountain range of southern Alaska, the most shapely and spectacular peak of which he named Mt. St. Elias, in honour of the patron saint of the day. Some geographers have applied the name 'St. Elias Alps' to this great range of ice-bound peaks which stretch for some 180 miles or more along the Pacific Coast, and which cuts off Yukon and a small part of British Columbia from access to the sea. Yet there is a good deal about the mountains and glaciers of the St. Elias Range that can be said to give them more of a Himalayan than an Alpine character. Where, except in the Himalaya, and but a few other ranges, can one see such high summits as Mt. Fairweather, 15,300 ft., in full stature from its base at sea level to its culminating peak; or Mt. St. Elias itself, sweeping up to an altitude of 18,008 ft. from the great Malaspina Glacier, which descends to tide-water; or again, Mt. Logan, standing north of Mt. St. Elias in Yukon Territory and the highest summit in Canada, which towers to an altitude of no less than 19,850 ft. a.s.l.?

Mountaineering in this region is attended by its particular difficulties, scale, inaccessibility, etc., and consequently ascents in the main range have been conspicuously few, and mostly far between in time. In fact apart from Mts. Fairweather, Crillon, etc., at the south-east end of the range, it is virtually only Mt. St. Elias itself that has received any attention from mountaineers. Early attempts on the latter included that by Lieut. Seton-Kerr, R.N., with an American party, in 1886, when this enterprising Naval officer solo reached about 7200 ft.; and in 1888 the English expedition of W. H. and Edwin Topham, who made a bold attempt on the peak to an altitude of 11,460 ft. W. H. Topham was a member of our Club and had made some pioneer ascents in Canada, Mt. Topham in the Selkirks being named after him. Later, were the two important expeditions of Prof. I. C. Russell, the American geologist, who not only paved the way for the Duke of the Abruzzi's attempt in reaching 16,000 ft. (Russell's Col) on Mt. St. Elias, but did outstanding geological work in the adjacent mountains: these enterprises, in 1891 and 1892, which showed remarkable evidence of vertical uplift of as much as 5000 ft. in the main range, have never been followed up.¹

¹ I. C. Russell: *Second Expedition to Mt. St. Elias*, 13th Ann. Rep. of U.S.G.S., 1891-92: Pt. II. Geology, Washington, D.C., 1893.



'AIRTRIP' CAMP, SEWARD FIRN-FIELD: MT. VANCOUVER ON RIGHT (HIGHEST PEAK AT LEFT END OF SUMMIT CREST); INSTITUTE PEAK, LEFT CENTRE. BASE NUNAVAK, MIDDLE DISTANCE EXTREME LEFT.



NORTH FACE OF MT. ST. ELIAS FROM SEWARD FIRN-FIELD (EARLY MORNING LIGHT).

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Then in 1897 came the classical effort of the Duke of the Abruzzi when success on Mt. St. Elias was at last achieved, as recounted by Dr. Filippo De Filippi in his book *The Ascent of Mount St. Elias*. And it is of interest to mention that the summit was not reached again until the Harvard Mountaineering Club, under Maynard Miller, did so in 1946 by another route from the southward.

The only other notable attainment in the neighbourhood, and that an outstanding one, was the successful climb of Mt. Logan in 1925 by a combined Canadian and American party. Mention should also be made of the work of the survey parties of the International Boundary Commission which delimited the frontier between Canada and Alaska during the first two decades of the century. That fine mountaineer and surveyor, H. F. Lambart, was with the Canadian contingent in their difficult work on the northern flank of the St. Elias Range, when minor ascents were made in the establishment of survey stations. He too was one of the party which reached the summit of Mt. Logan in 1925.

It was during the operations of these latter parties, as well as in the views from Mt. St. Elias and Mt. Logan, that there had been observed a vast inter-montane basin, situated immediately along the Yukon side of the main range. Occupying an area of some 750 square miles and filled with snow and ice, it had been named by the Boundary Commission the Seward Glacier. Actually it is a névé, or firn-field, whose only outlet is by a channel southward through the main Range to feed the great Malaspina (piedmont) Glacier. This outlet is some 15 miles long by $3\frac{1}{2}$ broad, and it was not surprising later to find that the ice moving through it had the exceptional speed of 14 to 16 ft. per day, as measured by the photogrammetric survey conducted by Walter Wood.

The Arctic Institute of North America (New York branch), having planned a considerable programme of field research, which should include glaciological investigations along the lines of those conducted in recent years in Europe, decided that this inter-montane basin, occupied by the Seward firn-field, would have much to recommend it provided an air-approach could be made and suitable landing found on the firn. Another point was a suitable base for the take-off. The latter requirement could be admirably satisfied at Yakutat Bay, where in the vicinity of an old Indian village a large war-time airfield had been established, which was now administered by the U.S. Civil Aeronautics Authority. The scheme of the Arctic Institute envisaged by its sponsors Walter Wood (Director of the New York branch of the Institute) and Prof. R. P. Sharp (California Institute of Technology), was put into effect as a first instalment in 1948, and referred to as Project 'Snow Cornice.' The Institute is a joint Canadian and American organisation, with centres at Montreal as well as New York, and an important item in its property is a 'Norseman' aircraft. The latter had been fitted with a new design of landing gear comprising skis and retractable wheels. So that having taken off the runways normally at Yakutat, it could alight on skis on the snowy surface of the Seward basin. This, however, required considerable skill at times, particularly

under conditions of ground-fog, and hummocky surface as the season advanced, when too what we called 'firn-pipes' of ice projected above the general surface: these seemed to be the result of channels of melt-water which had percolated down through the firn early in the season. Nor was taking off from the variable surface at all easy on many normal occasions, but the skill and experience of our excellent 'bush' pilot never failed in these nor in other respects.

Last summer's (1949) expedition, the second instalment of Project 'Snow Cornice,' was again led by Walter Wood, and the writer, having completed his year's Visiting appointment at the University of B.C., was glad to accept an invitation from his old Greenland companion of 1933 to accompany the expedition as geologist. Moreover, my wife could accompany me on the grand trip up the coast of B.C. and Alaska and make herself useful as general factotum at the coastal base at Yakutat.

From Yakutat the flight to the advanced base on the Seward was spectacular in the extreme. One flew for some 55 miles over the vast extent of the Melaspina Glacier, whose total area amounts to about 1500 square miles, then up through the gap in the main range which is occupied by the tumultuous ice-stream of the Seward outlet, above referred to, to land on the firn-field at an altitude of about 6000 ft. There at 'airstrip' camp was established the main station for the glaciological studies which during two summers have been conducted by Prof. Robert Sharp and his team of four graduate students. An outline of these studies I have recently given in *Nature* 165, p. 337, 1950. One item of general interest in their determinations was the thickness of the firn and ice within the Seward basin, which, measured by seismic means, seems to be about 2000 ft.

But everything is on an immense scale in this region, with great icy peaks towering above the vast snow fields and their true dimensions most difficult to assess. The huge mass of Mt. Logan stood about 20 miles away, and it was hard to believe that its summit crest was some 10 miles long, and its rocky southern wall, seamed by great couloirs, nearly 14,000 ft. high. Nearer at hand were the graceful snowy summits of Mt. Cook (13,760 ft.) and Mt. Augusta (14,070 ft.), both of course virgin. Then, standing at the eastern end of the basin was Mt. Vancouver, whose uplifted bulk and often clouded crest, triangulated at 15,700 ft., seemed on some occasions near and at other times remote and inaccessible. It had, however, been marked down by Wood as a possible and worthy ascent which could be undertaken without hindrance to the programme of research.

In 1948 there had been established on a rognan (less correctly 'nunatak') near the foot of Mt. Vancouver a main research station, some 2 miles from the 'airstrip' camp. This consisted of a Jamesway hut, 16 × 24 feet, and weighing some 3400 lbs., which had been flown in in 45 packages from Yakutat, thus providing comfortable shelter for seven men at least. This fabric hut had withstood the winter in remarkable fashion, and was available for our use last summer. It was of

interest that the minimum thermometer left during the winter had recorded no more than -46° F. From this camp as my main base I set out on skis for my geological examination of the district. It was necessary sometimes to travel half-a-dozen miles or more to reach certain rock outcrops or mountain walls, and conditions of running on snow and ice, amongst crevasses, or in cloud or fog varied very much. On occasion it was possible to be conveyed by plane to some of the remoter areas to the westward, but the demands otherwise on the services of our 'Norseman' were considerable and at times urgent.

As to the nature of the rocks and their structure, briefly it should be said that the heart of the St. Elias Range consists of a metamorphic series of sedimentary origin, viz. slates with quartzites and some marbles, in all probability of Palaeozoic and Mesozoic age. Into this series has been intruded a number of igneous rocks, varying from granite to diorite, which regional compression has usually converted into gneiss as seen in the field. Dykes of black dolerite cut the whole complex. The great masses of Mt. Logan, Mt. St. Elias and Mt. Vancouver are examples of granitic intrusions, which by their superior durability, aided possibly by differential uplift, have maintained their topographical pre-eminence.

Growing on rocks up to 7000 ft. or more were found many alpine and arctic plants, with mosses, lichens and even dwarf willows in places. A variety of spiders, moths, butterflies, birds and even humming-birds were found. And one curious discovery, which I made not far from the foot of Mt. Logan, was of ice- or glacier-worms. They were not more than an inch in length, and appeared like little wriggling pieces of black cotton moving over the snow surface. In Alaska their existence has been doubted for years: in fact they are a standing joke, comparable to the 'abominable snow man' or the Loch Ness 'monster'! Nevertheless, they are a peculiar worm, belonging to the genus *Mesenchytraeus*, which chooses to live on the glaciers, or in their melt-water, and so far they have been found over a range of the North America Cordillera extending from Alaska to northern California. It would be of interest to know if they exist elsewhere, and in a recent letter to *Nature* (164, p. 1098, 1949) I solicited information on this point.

As already mentioned, a much anticipated item in our programme was the ascent of at least one of the grand peaks in the neighbourhood, and there was much to recommend Mt. Vancouver. This magnificent mountain, named in honour of the great English navigator who first surveyed the local coastline, rose right above our main research station, or 'Base Nunatak,' and to those of us who were mountaineers it was necessarily a considerable challenge. Moreover, Mt. Vancouver was the highest unclimbed individual mountain in North America, although not actually the loftiest unascended peak: the latter is King Peak (17,130 ft.) which is really a satellite of Mt. Logan. A bold attempt on Vancouver by a party of four under Maynard Miller was made during the first instalment of Project 'Snow Cornice' in 1948, but it had failed at an altitude of nearly 13,000 ft. Walter Wood, himself

enthusiastic about the idea, was anxious to accomplish the climb before we were all involved in our various researches and other obligations, and so plans were made with that in view.

In order to reduce the time-factor and to assist us generally in the venture, the 'Norseman' plane was called into service to parachute supplies and equipment for us, if possible, at convenient points along our route of ascent. This necessitated the 'Norseman' flying considerably higher than its known altitude-ceiling: it actually accomplished about 15,300 ft. in flying round the highest peak of Mt. Vancouver. Loads of food, stoves and tents were duly dropped by parachute in the vicinity of our anticipated Camp 1 at about 8500 ft., and also for Camp 3 at approximately 12,500 ft. This was no easy operation, and our excellent 'bush' pilot, Maurice King, showed great skill and judgment in carrying out these drops on to a restricted mountain ridge.

Five of us started off on June 28 from the base camp at 6000 ft., and very heavily loaded we travelled on skis for some 4 miles up the glacier to its head near the foot of the great western ridge of Mt. Vancouver. There we parked our skis and had to climb a rocky wall or glacis with stretches of steep snow, which brought us to the high glacier basin or cirque already chosen for the site of Camp 1. In spite of thick mist and light snow we duly found the parachuted box of equipment which could be easily spotted by its marker-signal fitted with red pennant. Camp was soon established, and that night it snowed pretty hard. Next day was not good so that little could be done in route-finding on the cirque-wall above us. Consequently Walter Wood and Wm. Hainsworth went down to base for further supplies and to make a radio signal. The following day McCarter, Peter Wood and I climbed an easy couloir and tackled the main western ridge which ran steeply up above our camp. It was heavily corniced in places, and we had to be extremely careful about not climbing too far out on these treacherous masses. There was a little rock work, and later followed a feature that two only of us tackled that day. This was a high rise of ice in the ridge, virtually a great step of some 450 ft. which needed a considerable amount of skill and steadiness to surmount. It was about the greatest technical difficulty of the whole climb, requiring step-cutting in hard ice in the lower part, and step-kicking with crampons in snow set at a high angle in the upper portion. On this steep exposed pitch we fixed a 500 ft. rope to facilitate the descent. Owing, however, to the rope being required higher up on the ridge, on our final descent later it was necessary to climb down this fearsome pitch unprotected, when too the snow and ice were in a rotten condition: a performance that one would not care to repeat.

One of our party, Peter Wood, had unfortunately earlier damaged his hand. Consequently, it was considered inadvisable for him to continue the climb, and at Camp 1 our party was re-arranged. On July 1 four of us started up on two ropes: Walter Wood and William Hainsworth, and Robert McCarter and myself. We had only climbed to the top of the couloir when Wood complained of nausea and sickness, due

to the fumes from the leakage of a gasoline can which had saturated his parka and pack on the way up to Camp 1. It was indeed a tragedy that he, the organiser of the whole enterprise, a keen and able mountaineer as well as President of the American Alpine Club, should be faced with abandoning the climb, so losing the much craved opportunity of making a fine first ascent. Walter Wood's place was taken by Bruce-Robertson, the medical officer of the Expedition and a member of the Alpine Club of Canada. With him and F. S. Smythe *et al.* I had made a new climb, viz. the first ascent of Windy Castle, near Jasper in 1947. He had flown across from Toronto, and reached our Seward base camp and then Camp 1, just in time to make himself available.

So we were now an Anglo-Canadian-American party of four, and all our efforts and experience were going to be called upon, together with some luck in the weather, if we were to reach the top of Mt. Vancouver. We found a good spot on a broadening of the ridge at about 10,300 ft. for Camp 2, and we had to contend with a bitterly cold wind sweeping across the ridge during relay operations to stock and equip the camp. It was very cold at night and a violent wind drumming on the tent prevented any sleep. The morning of July 3 broke clear and the wind lessened, so we continued the climb mostly over steep ice and snow, and only short stretches of snow-covered rock. The higher we climbed the better the weather. By 6.45 P.M. that day we had reached the steep icy flanks of what had been dubbed 'Institute Peak' in 1948, which is really a satellite of Mt. Vancouver (to complete the association, 'Arctic Peak' is another so named!). It was here on the flanks of Institute Peak, or beyond, that we expected to find the highest parachuted box containing another tent and stores. None too soon we spotted it below us, half snow-covered on a steep slope averaging 37° and not far above a deep schrund, into which it might well have slipped. We were not long in cutting out a platform for the tent, and so cold was it, before we had finished the job, that one at least of the party was threatened with frost-bite. However, a good hot dinner cooked on the parachuted Colman stove put us in fine fettle, and we retired to our sleeping bags to sleep the somewhat fickle sleep of high altitudes, though in this case not more than 12,500 ft. Our tents were 'paired Whympers,' viz. two units that could be zipped together to form a vestibule, which served as an entrance and kitchen: an admirable design of Walter Wood's, that made for increased comfort and convenience.

Next day we were enveloped in clouds, and during the morning nothing could be done. It cleared in the afternoon, however, and we were able to climb to the summit of Institute Peak above us, an ascent of not more than 600 or 700 ft., though a pioneer one! The Norseman flew over Camp 3 and swooped to signal to us. Later we heard that they had considered the weather good enough for us to have climbed Vancouver that day, rather than Institute Peak, a verdict with which we heartily disagreed!

On July 5 we woke to sunshine and scattered clouds, though the peak of Vancouver itself was obscured. We left Camp 3 at about 7 A.M. and

on two ropes traversed along the steep snowy northern flank of the main ridge, broken into many ice cliffs and schrunds. This seemed preferable to the narrow and often corniced crest of the ridge itself. In about 3 hours from camp we reached a broad saddle or col, at an altitude of rather more than 13,000 ft. Here I was surprised to find a belt of loose blocks very like moraine. Whether this represents the effects of a once higher stand of the regional ice-sheets, or a purely local deposit, it was very difficult to say. However, the highest U-shaped cols in the range east of Mt. St. Elias itself were observed to be about 11,000 ft., a fact of some significance with respect to this 'moraine.'

Above the saddle was varied climbing, and then a steep snow ridge, which gave out on to a broad shoulder. As we were without crampons we had intervals of step-cutting and kicking in hard snow and ice. Moreover, whilst the others had nails, Bruce-Robertson and I had rubber Bramani (Vibram) soles on our boots. I may say that this was my first experience of a much debated foot-wear, and from extended use of Bramani soles on this Expedition I consider that they are an advantage for mixed work involving crampons, skiing, and of course dry rock climbing: but they are a distinct danger on snow-covered and greasy rocks in particular. There can be no doubt that the nailed boot is still the best for all-round mountaineering.

The next feature was a long steep ice-slope, below which, through blown clouds, we thought we had obtained a glimpse of the highest peak. That, however, *was* our last glimpse: for eventually in driving chilly mist we made our way up ice-cruled slopes and a snow ridge for some 800 ft. to the culminating point of the mountain. It was 3.50, and whilst we were indeed gratified to be standing at last on the undoubted top of Mt. Vancouver, naturally we had much hoped for a view from so commanding a position. We wanted particularly to look along the one mile and a half of summit ridge, and compare the relative heights of the North-west peak, on which we stood, with the South-east point which was the one that had been triangulated 50 years ago by the International Boundary Survey at 15,700 ft. The latter figure was obtained, however, by long rays of over 50 miles from the coast, and the North-west peak of Mt. Vancouver could not be seen. From the results of our own photogrammetric survey, as well as from aerial views when flying closely round the summit, we are convinced that the North-west peak is the higher by some 100 ft. or more. But thick clouds and frozen mist unfortunately quite prevented our levelling along the summit crest to make more certain of this point. We waited for about half-an-hour, and then thoroughly chilled we retreated, but not before trying to fix a flag of parachute silk as a survey beacon. In an endeavour to obtain some geological specimens from the highest rock outcrops, Bruce-Robertson had to lower me about 120 ft. down the steep northern flank of the summit cone. But that was insufficient, and I had to unrope and climb down farther. In bitter wind and driving blizzard I managed with great difficulty to chip off a few flakes from an extremely tough block. In



MT. LOGAN AND McARTHUR PEAK (NEXT TO RIGHT), FROM WEST RIDGE OF MT. VANCOUVER AT CA. 12,000 FT.



UPPERMOST PART OF WEST RIDGE OF MT. VANCOUVER, FROM CAMP III.

microscopic section this proves to be a mixed metamorphic rock, mainly an arkose or greywacke. The mountain is chiefly composed, however, of igneous rock, varying from granodiorite to veins and sills of aplite. In a crevice in this the highest rock outcrop, about 150 ft. below the actual summit, I deposited a tin with a record of our names, in case a rival party of American climbers, who had an astounding plan of ascending Vancouver from the Hubbard Glacier, should also happen upon the spot! But it may be advisable for any future visitor to be geologically-minded to actually discover this record!

Our long descent to Camp 3 was accomplished without incident, but not without some fatigue on account of the soft and rotten snow, and the treacherous condition of schrund-coverings and bridges in many cases. Delayed by my geologising Bruce-Robertson and I were a good deal later than Hainsworth and McCarter, but we scored by their having a good supper all ready for us. After a 14 hours' day with nothing to drink, it was remarkable how much soup in particular we disposed of, with cheese, jam, biscuits and tea rather than the heavier meat available. On the mountain itself we made great use of that sustaining Italian food, 'Pan Forte,' a mixture of nuts in a sweet fruity matrix, manufactured at Siena and obtainable in New York. Our only regret that evening was seeing the top of Mt. Vancouver entirely clear of cloud!

It took us two more exacting days to make the descent to the Base Nunatak, and these were not altogether without incident. In evacuating the upper camps, it was desirable to recover as much of the more valuable equipment as possible, such as tents, stoves, etc. This meant that it was necessary to climb down carrying very heavy loads. In my own case I had a considerable additional weight of geological specimens, apart from some scientific instruments: the latter too was the case with Bruce-Robertson who had his very complete range of medical kit. At Camp 2 we foregathered for a meal late in the afternoon, and then decided to continue to Camp 1. The crux of the descent below Camp 2 was the very steep 450 ft. ice pitch that was in rotten condition, as already related, and unprotected by fixed ropes, which had had to be left on a pitch above. With our very heavy loads, and insufficient rope to lower them to any safe spot, it was a tricky if not hazardous performance that occupied nearly two hours. Bruce-Robertson's performance was especially meritorious, since he had a damaged foot punctured by a crampon. Our last hazard in failing light was the descent of the 1000 ft. couloir above Camp 1. As we were about to start down, part of my load came adrift and my rucksack containing all my geological specimens, instruments, camera, note-books, etc. fell off and commenced to roll and slide down the couloir, before I could catch it. Down and down it bounded and went out of sight, and I gave vent to a cry of despair that Bruce-Robertson will not in all probability soon forget; for I was convinced of the loss of all my records and more valuable effects, on the scale of some of my Himalayan scientific losses. In anguish and thoroughly chastened I reached the bergschrund about 900 ft. below, and there was my rucksack, which had jumped the latter,

still intact and its contents undamaged! A miraculous escape indeed! The kindly Hainsworth came up to meet us and assisted Bruce with his load, in view of his crippled condition, into Camp 1 by about 10 P.M. A good supper was already brewing, and it was a contented and happy party that turned in for a remarkably sound sleep. Next day in hot sun and soft snow we continued down in no undue hurry to the Base Nunatak camp, being very grateful for the use of our skis on the lower glacier.

We felt especially gratified that by international co-operation success on this superb mountain had been achieved. And superb, impressive mountain it certainly is, whether seen from the Seward firn-field, or from the air, as we frequently had the opportunity to do. But it was on one particular occasion that we had our grandest opportunity for an aerial view of Mt. Vancouver. This was during a survey flight from the Seward 'airstrip' that carried us past the immense eastern and northern precipices of Mt. Logan, and on northward over the great Logan Glacier; then threading our way between the giant summits deeper in Yukon Territory especially Lucania (17,150 ft.), Steele (16,439 ft.), and Walsh (14,498 ft.), two of which had been first climbed by Walter Wood some years before. For me it was not only scenically grand in the extreme; but how remarkably enlightening the aerial view of the geological structure of this remote and difficult region! We came in sight of beautiful Kluane Lake and the Alaska Highway, which later my wife and I were to traverse en route from Fairbanks to Whitehorse; and then we turned south past Mt. Alverstone and Mt. Hubbard, which lie due east of Mt. Vancouver, and are points on the International Boundary. As we circled over the huge crevassed Hubbard Glacier towards the north-eastern precipices of Vancouver, our engine began to splutter ominously, but soon picked up again on being switched over to another tank. It was astounding now, poised in space at 12,000 ft. to view our route up Mt. Vancouver. We could only congratulate ourselves that we had been able to accomplish so long and arduous a climb when we did 6 weeks ago. A dive over the western ridge, and along the southern cliffs of the mountain, soon brought us in a series of steep spirals to our 'airstrip' on the Seward firn-field. In two hours' flying time we had covered about 200 miles over some of the ruggedest and most inaccessible mountain country in all North America.