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The Monowai Region.

(Being extracts from a lecture delivered at the Naturalist Society Institute, by Mr J. Fowler.)

Lake Monowai which lies about midway up in the western side of the Waiau River is the centre lake in a chain of five, commencing with Te Anau at the north, and ending with Poteriteri at the south coast. These five lakes, Te Anau, Mangapouri, Monowai, Hauaro, and Poteriteri, are situated on an immense geological fault which separates the Archaean mountain country of Fiordland from the tertiary sediments which lie between the Archaean on the west and the Matai system as appearing in the Takitimu and Longwood ranges on the east. This tertiary deposit is quite narrow near Monowai and Mangapouri, but coming south it spreads out to the westward and includes the Hump. It is quite possible that these tertiary beds spread over all this end of the island at one time for there is evidence that the older rocks have been pushed up through them, allowing the denuding agents opportunity to wear them away on the top, but against the mountains on either side of the valley are still to be seen the upturned edges of these beds showing at least a certain amount of movement, for all these marine sediments would be laid on the level. Professor Park when in this neighbourhood this year, records this feature as being noticeable up the west side of Lake Te Anau. This shows that the Archaean rock of Fiordland although composed of crystalline rocks of unknown age, are not without a history in their physical features. These features point to a time when they were far down below the weather agencies which have dissolved the surface crust of the earth, although they in their turn will follow suit.

The hills are shadows and they flow,
From form to form and nothing stands
They melt like mist the solid lands,
Like clouds they shape themselves and go.

I cannot find who was the first white man to see Monowai, but the late James McKerrrow carried out a topographical survey of it about sixty years ago. He climbed Himley peak on the south side of the lake and from there he sketched it and gave it the name Monowai, a combination from the Latin and Maori, meaning: "One stream," as he could only see one stream running into it. Speaking of the survey of Lake Monowai it is rather remarkable that during the last sixty years it has remained forbidden ground as far as the Survey Department is concerned. Go to the Survey Department to-day and ask for a map of this part and you will get one with no new work or names since 1870, but actually some of the then recorded features missed out. The one creek from which McKerrrow named it is omitted and some peaks on the south side are likewise forgotten. But had it not been for the hydro-electric undertaking, it is just possible that by the time another generation had passed it would have been omitted from the map altogether, its existence being regarded as a freak of the imagination of some lonely shepherd, and as fabulous as the phoenix or the kea that killed a sheep. To the north of Monowai are two small lakes, the larger known as the Green Lake, from its colour against bush at its southern end, and although the shores of this lake have been occupied as a sheep run since 1870, there is no mention of it on the official map.

Monowai Lake, which is shaped like a boomerang with one end bent too far in, lies in what was once the bed of a fairly large river, but during the glacial period it has undergone some strange alterations. What the ice did in its advancing stages is not apparent in the vicinity, but as it retreated it has left behind it the records of its retirement. Starting at the Waiau river you follow the Monowai flat for some miles, the flat is on a terminal moraine left behind by the glacier which came from the west and left its load of debris year by year as the warmer conditions prevailed. This process evidently went on until the foot of what is now the lake was reached. Then some climatic change had taken place which melted the ice so rapidly that the present lake bed, instead of being filled up with moraine deposit the same as the flat has been, now becomes a body of water held back by the moraine which we have just described. But the glacier is not quite melted, it is just shortened. From the mountain beyond it still pushes its way down carrying the load of fresh shattered rocks from the mountain peaks, but the present head of the lake is its limit and there it commences again to fill up a terminal moraine, in the same way for a mile or so. Milder conditions now prevail, and the top part of the glaci-

er melts leaving this barrier in the middle distance separating two portions of the lake. Now when the present lake filled to overflowing, a river commenced to flow over the moraine wearing down an outlet and swinging from side to side of the valley resorting the moraine heaps of stones left by the glacier and leaving a fairly flat boulder-strewn plain with the river still at work as we see it to-day.

The upper part of the lake above the middle barrier which the glacier formed in its later stage had, however, quite a different experience. When the upper portion of the glacier melted, forming another lake, and subsequent rains filled it to overflowing it found an easier outlet north of Mangapouri, and consequently did not cut or resort this chain of moraine hills as it would have done if it had to flow over it. So the head of Monowai stands to-day a dead end with no river running into it where the surrounding mountains show plainly the valley once continued. The other part being fed by a number of streams coming off steep mountains has long since filled up, as all lakes are in process of doing, and is now a tussocky flat with the stream wandering through it.

The conspicuous feature of Monowai is its want of watershed or catchment area. Along the south side of the lake the peaks rise abruptly to a height of three or four thousand feet and then slope away gradually for 10 miles or so to the Lilburn valley and Hauaro. Beyond its one stream which comes in on the north-west, and which the local run-holder describes as no size, there is nothing of any consequence running into the lake. The Green Lake which lies about a mile from Monowai and about a thousand feet above it drains to Mangapouri 15 miles away. If you take a line between the two points of the lake you are practically on the watershed between the Borland and the Grebe River on the north, and Monowai on the south. The distance between the two points being about nine miles, and the widest part about four miles, giving an area of about 20 square miles; then, for its one river, allow, say, six square miles, and say one mile wide on the south, on a coast line of thirteen miles, and the estimated area of the lake itself eleven square miles. This gives a catchment area altogether of fifty square miles. Lying into the inner bend of Monowai lake is Cleugharn peak rising to a height of 5100 feet, and stretching away to the northward is a chain of mountains, named in succession, Cleugharn, Cuthbert, Burns, Elorig. On the west side of Cuthbert peak and reaching a shoulder of Cleugharn lies the Green Lake already mentioned. It occupies what has been the western slopes of these peaks leaving only one side as it were to show the valley which separates the peaks starting close to the lake and running away from it, although a thousand feet above it. Peak and valley are therefore cut across by the wall of the lake, and into which you could throw a stone a thousand feet below. As to what agency has cut away this mountain side it is difficult to conjecture. If it was cut by a river, it has been before the ice period, for the south end of the Green Lake is blocked by the same barrier that closes the head of Monowai, and if the ice eroded it, it is still more difficult to understand as it lies so completely into the hills that one would think it would miss the pressure. But it is just possible that among the bush covered moraine hills may be some previously existing spurs which threw the force against the eastern wall. For while these spurs are ultimately cut off and left as islands, as to be seen in Mangapouri, Te Anau, Hauaro, still in the earlier stages they must thrown the ice against the opposite bank, the same as they did the water of a river.

To better understand the look of this country get a map that shows Monowai Lake. Start at the foot of it where the Monowai river comes out and travel in imagination, due west as if making for the other end of the lake, and you travel through about six miles of fairly flat bush. Then climb and come out on the open country on the slopes of Cleugharn. Here there is a comfortable hut, erected by the monks of St. Bernard (Cleugharn), or some other Samaritan endowed with a philanthropy of a romantic sort. Going another half mile westward you come suddenly out looking over the Green Lake. Right in front of you now, lies ridge after ridge of bush-covered hills intersected by an occasional small lake or tussock flat. To the south on your left hand lies the head of Monowai, but too low down for you to see it, on your right to the north is

the valley of the Grebe river flowing into Mangapouri and draining all this country in front of you, while to the west beyond peaks reaching from Monowai to Mangapouri. The four streams which form the Grebe river run in a southerly direction until they enter the Grebe valley then they turn to the north, showing as we have already mentioned a reversion in the course of the upper end of the Grebe river. Monowai lake is about sixty feet higher than Mangapouri, and the Grebe river although broken by a few rapids is comparatively flat with long reaches of calm water, so that the flat at the head of the river cannot be more than a few hundred feet above Monowai lake on the other side of the moraine barrier.

Some interesting information about Monowai lake is contained in a pamphlet issued by the Southland Electric Power Board recently. It is also referred to in a Government report on hydro-electricity, issued in 1904, wherein the flow is given as 700 cubic feet per second and the catchment area as 67 square miles, although the engineer, admits that the latter is only a guess. The Power Board in their pamphlet give the same (700), but make no mention of area which drains into the lake.

In regard to the flow of the Monowai river there is an interesting little study in the realm of psychology as demonstrating the growth of the silly folk-lore which characterises the less intelligent part of the human family; those who attribute the state of the weather to some acrobatic feat on the part of the moon, or who see the whole scheme of creation help up to victimise the individual whose number happened to complete the baker's dozen. Some irresponsible had said, the flow of the Monowai river never altered and the next repeated it, and so on until it got so commonly accepted by the people about there that they never thought to take the trouble to look and see if it was a fact. Consequently when the engineer for the Power Board went there he of course heard the same story, and having no occasion to doubt it, he put in his gauge where he thought would be a good place to record the flow of the water from week to week, but alas, when summer came and the river decreased, the gauge was left dry on the bank, the water ten inches below the level of the foot of it and three feet away. Yet to show how hard these beliefs are to die, even in the face of direct evidence, the pamphlet referred to, issued at the time that this gauge was standing three feet away from the water in the river, has the following: "The Monowai river is regarded by the oldest settlers as having a steadiness of flow which is remarkable. All statistics even tracing history back to the Maori period go to substantiate this view. It has never been known to get extremely low in its flow." Now let me say that from my observations the Monowai river is just like any other. It responds to the climatic and physical conditions just the same as any other of the rivers in the mountain country. The lake must rise a foot before the river can be up a foot, and therefore it will be slower in its rise and fall than if no lake existed, but it is exactly the same position as the Waiau, which is controlled by the holding capacity of Te Anau and Mangapouri, but he would be a bold man who would say that the Waiau river never altered.

The area of the Monowai Lake is given by the Board's engineer as eleven square miles. Now if we run up to 700 cubic feet per second for one year we get a depth if stacked in the lake of 72 feet or 6 feet per month to keep the stream going. Now if we take 72 feet deep on the eleven square miles of lake and spread it over the Government engineer's estimate of the catchment, 67 square miles, although I think 50 square miles is near the mark, we get 144 inches of rainfall. The evaporation in England is 30 inches a year, and I do not suppose it is any less in N.Z., which gives 174in. to which must be added the absorption by the forest which covers two-thirds of the area. The pamphlet says enough water will be stored by embankment to last two months. This means a bank twelve feet high. Now it is reasonable to suppose that more rain will fall in the months of June, July and August, than necessary, and that the storage will be full up by the beginning of September. Then when the spring rains come with snow in September and October. A quantity of water must be lost by overflow which, however must be added to the rainfall, putting it well over 200 inches. The nearest rain gauge to Monowai that I know of is at Mangapouri, 12 miles away, and there the record over a number of years is 42 inches, a long way short of 200, or if the catchment area should prove to be 50 square miles, 260 inches. The weakness of the Monowai scheme is the absolute impossibility of increasing the supply. Lake Cleugharn is being added to by bringing in the Harper river, and while the Power Board make some remarks about the

Waiau, it is not considered a practical undertaking.

often varies as much as 2 to 1, Westland for instance varying from 151 to 88 inches in different years, it shows that any undertaking of this sort should have a standard of at least 100 per cent. Hauroko Monowai seems a much better proposition for future requirements, especially as the water of Monowai could be added to it. I am afraid that future generations will not think much of a few enthusiasts who pushed through under the impression that life was too far spent to afford time to make investigations and obtain data, or of the 6000 others who went to the poll and voted with the same avidity with which they or their fathers purchase the picturesque Atlas some 30 years ago.

From a scenic point of view Monowai lake is disappointing. The complete lack of inlets or break of any kind gives it a monotony when seen from above, the only way you can see it at present; but the surroundings in the way of mountain peaks are very fine, and the view from the top of Cleugharn, Burns, or Rocky Top, just above Green Lake, cannot be excelled. In course of time a launch will no doubt be placed on the lake which will add much to the pleasure of a trip to this interesting spot, to which, I understand, a motor road will be constructed in the near future, and as this will only leave 14 miles to Mangapouri, six of which can be done on the steamer, the Waiau Valley may yet come into its own in the way of tourist traffic.

MOTORING NOTES.

NEW MOTOR-CYCLE HORN.

With the idea of operating a horn without having to remove the hands from the handle-bar, an English firm has patented a device that is intended to embody two bulbs in kneepads, from which rubber pipes are carried to a Y connection, thence by a single pipe to the reed. The advantages of such a horn, if properly controllable, would be approximate to those of an electric horn, and it should meet with a ready demand.

TEACHING DRIVING.

None of us like to risk losing a few teeth off the gear-wheel when teaching others to drive, and a very easy way of overcoming this is to seat the pupil in the car, jack up one of the back wheels, securely scotch the other, and then, having discoursed learnedly on the rudimentary idea of gear changing, start the engine and allow him or her to practise changing up and down until conversant with the position of the lever for the various ratios and also with the general feel of the controls. It is usually found that the steering of a car comes naturally to everyone, and it is only the gear changing that presents any difficulties. With the wheel jacked up and the hand brake half on, road conditions are practically reproduced and the inertia of the single wheel is not sufficient to cause any damage to the gears when a dud change is made.

NEW SOURCE OF ALCOHOL.

Much attention has been given in recent years to the question of manufacturing alcohol within the Empire for use as motor spirit. In the current number of the "Bulletin" of the Imperial Institute the possibility of utilising the mown flowers of India for the purpose is discussed. These flowers possess thick, juicy petals rich in sugar. They are used by the natives as a foodstuff and especially for the preparation by fermentation of an alcoholic liquor called daru or madder spirit. A single tree will yield as much as 200-300lb of flowers in a year. During the war the flowers were used in India for the production of acetone, and large quantities of the flowers would be available for the manufacture of alcohol, and would appear to be exceptionally cheap source of this material as the yield is high compared with that from potatoes and other materials commonly used, alcohol being 80 gallons or 95 per cent. alcohol being obtainable from one ton of dried flowers. It has been estimated that in the Hyderabad State alone there are already sufficient mown flowers for the production of 7,000,000 gallons of proof spirit per annum, in addition to that necessary for the local liquor requirements.

Japan is preparing to build a pyramid for the first Emperor, Jimmu Tennō, somewhere in the suburbs of Tokyo. It is the intention to make this the highest structure in the Far East.