No. XII.—A Ramble up the Maich Water. By James S. M'Lennan.

[Read 9th November, 1893.]

A RAMBLE up a river valley has attractions to men of varied tastes and divers pursuits. The naturalist, bent on acquainting himself with the various forms of animal life, finds here a suitable locality for his observations; the botanist can obtain a great variety of objects to arrest his attention, call forth his curiosity, and satisfy his thirst for knowledge, in the trees, plants, ferns, and lichens which adorn its slopes, clothe its fields, fringe its cliffs, and cover its rocks; and the lover of the beautiful in scenery can find much to please him; and if with the eye to appreciate, he has the hand to pourtray the scenes he surveys, many of them will afford him delight to paint, and will give delight by being painted. The disciple of old Izaak Walton will, if the waters of the stream flowing through the vale be free from impurities, often resort thither to pursue his solitary amusement; and while doing so, and when his sport is ended, will confess that fishing amid such scenes, even though the take be small, is "idle time not idly spent." It would even seem, if we are to credit the tuneful sons of genius, that river valleys are the peculiar haunts of the Muse, for one well qualified to decide this point has said in words much admired by Coleridge:—

"The Muse, nae poet ever fand her,
Till by himsel' he learn'd to wander
Adown some trotting burn's meander,
And no think lang;
Oh sweet to stray and pensive ponder
A heart-felt sang."

But last, and not least, such localities possess great attractions for students of the stoney science. The scaurs of Boulder-clay, the mural precipices with their varied strata and interesting fossils, the exposures of igneous rock in masses, dykes, and floats, the striated rock-surfaces of the glacial period—all these, and many more, form delightful subjects of observation to every votary of field geology.

The Maich is a small mountain stream, which, rising near the foot of Mistylaw—one of the highest of the Kilbirnie range, and the highest hill in Renfrewshire—flows for a distance of some seven miles in a south-easterly direction, and falls into the north-western end of Kilbirnie Loch. For the greater part of its course it forms the boundary between the counties of Renfrew and Ayr.

The valley extending from Kilbirnie station to Castle Semple had, at no very distant date, its lowest portion covered by the waters of a lake some six miles in length. This lake has been gradually lessened in area by the materials silted into it from the time when the slopes of the Boulder-clays and glacial drifts were exposed to the denuding action of rains and rills, and by the debris carried into it by the Maich and Calder Waters on its western slope, and by the Rowbank, Mains, and Willowyard burns on its eastern side. A portion of it known as the Barr Loch was artificially drained about the beginning of the present century, and now forms excellent cornland. South of this last-named loch lie "the Meadows," through a portion of which the Glasgow and South-Western Railway has been formed. In the construction of the line at this place great difficulty was experienced on account of the soft and muddy nature of the ground, and it was only by driving down long piles that a firm and permanent roadway could be made. Kilbirnie and Castle Semple Lochs, as we know them, are the remaining fragments of this once extensive lake, and they are united by a sluggish stream called the Dubs. The former of these lochs is 1½ mile long by ½ mile wide, with a varying depth reaching as much as 33 feet. It is 94 feet above sea-level, and lies on the water-shed between the waters carried to the Clyde by the Dubs and the Black Cart, and those borne to the sea at Irvine by the Garnock. At its southern end its extent has been somewhat lessened by the heaps of rubbish from the Glengarnock Ironworks which have been run into it. Nearly twenty-three years ago three crannogs, or lake dwellings, were found in this portion of the loch, and two canoes, each formed of a single oak-tree, were also discovered in it. One of these, 18 feet long by 3 feet broad, and nearly 2 feet deep, contained a three-legged bronze pot and a lion-shaped ewer. The pot is 11 inches in diameter across the mouth, 14 inches high, and weighs 28 pounds. The ewer is larger and more ornamented than one figured and described in Wilson's "Prehistoric Annals of Scotland," and is 8½ inches high, 8 inches long, 8½ inches round the body, and weighs 4 pounds. "It is made of yellow bronze, and seems to have been used for holding liquid."

In starting our ramble up the Maich, from the place where it enters Kilbirnie Loch, and walking on to the Carse Bridge which

carries the Kilbirnie and Lochwinnoch highway across it, we observe that its channel has been cut through the alluvium brought down from its upper reaches. This, as shown by an adjoining section, consists of 2 feet of fine earthy matter, and 4 feet of gravel intermingled with rounded boulders varying from 1 foot to 2 feet through their longer axes. The gravel and boulders are mostly composed of porphyrites and amygdaloids, with a few sandstones and ironstones, and occasional small pieces of dark-coloured shales. These last, from their fragile character, were ill-qualified to sustain the rough usage they must have undergone in the rocky bed of this rapid stream, so they are small in size and few in number. I failed to note any limestones in this exposure. This alluvium has been spread over a considerable area, and now forms the best soil of three farms all bearing the name of "Carse." The hilly nature, and heavy rainfall, of the Maich basin, and the consequent velocity and size of its current, along with the width and depth of the gorge it has hollowed out, can well account for the extent of the alluvial matter which has been deposited by it.

Passing Carse Bridge, we come upon the lower Boulder-clay, through which the stream has cut down to the white sandstone which here and for some distance further forms its bed. This sandstone has its upper surface roughened and indented with circular depressions, and some of its thinner layers present examples of what may be annelid borings.

The clay presents the usual colour which it bears over Carboniferous areas—a dark grey—caused by the grinding action of land ice over the dark shales and coals of the district. "As this vast ice sheet moved forward it rasped and planed down the asperities of the rocks over which it passed, leaving their surface smoothed and polished, and covered with parallel rectilinear striæ and grooves like those on the rock-floors in present Alpine regions." Examples of these striations can be seen farther up the stream near the farmhouse of West Auchenhain, and still better ones are found on a rocky ridge a little to the west of the height crowned by the cairn erected to the memory of the late Mr. Cochran-Patrick younger of Woodside and Ladyland. Several instances of the smoothed and rounded ridges known as "drums" are also met with—that which has the farmhouse of Barrhill on its summit forming a prominent feature in the landscape.

In our upward course the gorge deepens, and amid the trees which grow on its northern slope we notice the remains of several "ingaun ees" which reminds us that we are on the coal measures of the Dalry basin. Close below the Carse, an exposure of the "main" coal is seen running along the southern bank for 16 yards.

This coal is 3 feet thick, is underlaid by black shales, and surmounted by sandstone layers of 4 feet, shale of 1 foot, and sandstone beds of from 12 to 15 feet in thickness. There is an interesting example of a fault seen above the main coal exposure, both sides of it being well displayed, and the broken and compressed character of the sandstones and shales contiguous to it being very evident.

A little further up the stream this coal is again seen protruding from a bank of sandstone. Its position has been caused by a fault which has given it an upthrow of several feet, but it lies quite level, and the western side of the fault is well seen. The superincumbent sandstones and shales are well represented, and the section with its grass-covered top is nearly 50 feet in height. This coal is supposed to crop out in an eastern direction parallel with the "smiddy" coal, which is met with 30 yards above the first waterfall. In the Dalry basin this coal is found 10 fathoms higher up than the main coal, and is 2 feet in thickness. Here also the black-band ironstone—15 inches thick—is met with 30 fathoms below the main coal, and we discover it a little further up—a short distance below the first waterfall, where the stream rushes over a ledge of white sandstone some 6 feet in height. This ironstone has a considerable area, as it has been wrought more than a mile to the east of its exposure on the Maich, whence it extends in a south-western direction—by Kilbirnie and Dalry—for a distance of nearly 8 miles.

Continuing our upward walk we come upon a fine display of strata on the northern bank, consisting of a 5 feet post of black shales at the bottom, then 4 inches of clay ironstone, $2\frac{1}{2}$ feet shales, 3 inches of ironstone, 10 feet of dark shales, 2 inches of ironstone, 9 feet of shales, and 10 feet of sandstone on the top. This section dips to the south at a low angle, and at its highest part brings to view a 6 inch seam of coal resting on 2 inches of fireclay, then 4 inches of ironstone, 2 feet of black shales, and, lying exposed in the river-bed and showing a light purple colour, some 6 inches

of clay ironstone. These ironstones, when subjected to the action of the air, generally bear a dull brownish colour, but the purple tint shown by those in the bed of the stream here may be caused by the peat-coloured water flowing over them. Where exposed to the action of the atmosphere alone the colour is not so pronounced. Some 300 yards further up this ironstone is seen stretching from side to side of the stream, lying at a gentle slope, and presenting an uneven surface; it reminds one of a well-built "damback." It occurs again a little higher up, lying nearly level, and forms the bed of the stream for a considerable distance. This exposure recalls to mind a similar one I have seen in the channel of the Nethan Water near Tillietudlem Castle.

One of the best sections on the banks of the Maich is met with nearly direct north-east of Barrhill farmhouse, where are displayed in succession some eighteen different layers of shale, coal, and ironstone, in fine form and of considerable extent. The sandstones, which are found at the top of the last-mentioned exposure, are awanting here. About 6 feet from the bottom this face presents a 3½ feet bed of dark shale, the lowest part of which is almost composed of mussels, and this overlies a 3-inch band of ironstone containing similar shells. At the upper end of the section a Miocene dyke, 5 feet in breadth, crosses the stream, and on its western side rises perpendicularly for 12 feet. From the diversified forms assumed by the rock in cooling it resembles a piece of rudely built cyclopean masonry. A second and similar dyke, 20 feet broad, runs across the stream a little higher up.

Continuing our upward course we arrive at a bend of the river where the Carboniferous limestone appears, and which at Broadstone, in the parish of Beith, attains a thickness of 100 feet. In a paper read before this Society,* it is thus detailed:—A bed of white clay, 1 foot; thin coal and shales, 3 feet; main limestone post, 5 feet; two-feet limestone post, 2 feet; calcareous shales, 2 feet; blue limestone post, from 2 to 13 feet; coarse sandy limestone, from 4 to 10 feet; shales, 40 feet; and Hillhead limestone, 40 feet. In the section we have now reached, however, there are more than 80 feet of strata awanting, and the dark shales, 11 feet; the main post, 2 feet; the calcareous shales, 2 feet; the limestone post, 3 feet; and the underlying coal are all that remain.

* *Transactions*, vol. iv.

It is interesting to note the varying depths at which the lower limestone is found in this portion of the Dalry basin, as these give evidence of a very striking change of level. It has been stated that if a line were drawn across the valley from the Maich to Broadstone the limestone will be found cropping out at both places at a height of nearly 300 feet above the level of the sea; while at the Carse, in the middle of the valley, the surface is 90 feet over sea-level, and the position of the limestone 500 feet below it. Thus, in a distance of not more than four miles, there is a difference of 800 feet in the position of this limestone.

In our ramble thus far up the stream we have seen exposed about 700 feet of strata belonging to the coal measures, but the fossils so far as noticed are neither abundant nor well-preserved. Some 12 yards above the limestone exposure the igneous rocks come to view, and all the remaining course and basin of the Maich is occupied by them. Their junction with the coal underneath the limestone is not visible. They consist here of trap tuff, greyish red in colour, and in some places crossed by what looks like calcite. A boss of volcanic agglomerate in the middle of the stream attracted my attention, and I spent some time extracting the small, smoothed, gravel-like stones enclosed therein.

The Maich basin is situated on the eastern slope of the hills which extend from Ardrossan to Lochwinnoch. These, along with the uplands of Renfrewshire south of the Clyde, are a continuation of the elevated ridge of trap heights, which include the Campsie and Kilpatrick Hills, and reach to within a short distance of the town of Stirling. They are all of volcanic origin, similar in structure, and of the same geologic age, with the exception of the Miocene dykes which traverse them. They are composed of a great succession of lava flows, chiefly of the kind known as porphyrite, interbedded with layers of fine ash, or tuff, and coarse volcanic agglomerate. These trap rocks in their eastern and western areas are found to overlie the calciferous sandstone series.

The trap rocks have been divided into two groups—the *acidic*, those in which silica predominates; and the *basic*, those in which the earthy bases and metallic oxides are in excess. The former class have less specific gravity than the other, and are supposed to have been erupted from a lesser depth beneath the surface than the basic group. It is stated by Professor Judd that in times of great

volcanic activity in Scotland the earlier lava flows were generally of the acid group, whilst those erupted at the close of the periods belonged to the basic class, and I believe that the bedded traps of the Ayrshire hills near Largs chiefly belong to the former variety. These rocks consist of many varieties of felstones, varying in texture from compact to porphyritic and amygdaloidal felstones. These differences have probably been caused by the rapidity or slowness with which the rock cooled from a molten condition, as, from experiment, we know that the same mass will yield a compact basalt when suddenly cooled, and when subjected to a slower cooling it will produce a soft and earthy tuff. The amygdaloidal structure is more commonly found among the felspathic or acid group than in the doleritic or basic class, which seems to imply that the former kind has had more aqueous vapour locked up amongst its mineral elements than the deeper-seated basic lavas.

Although the trap rocks comprising the hills of Ayrshire and Renfrewshire mostly belong to the acid group, still examples of the basic lava-flows are met with in the sheets and dykes of dolerite of supposed Miocene age. It is thus to the long-continued action of the great palaeozoic volcanoes of Western Scotland that the formation of these extended ranges of hills is due.

Many of the felstones of these hills, as those of the Maich basin, have a brownish and, in some places, a very distinct red tinge of colour. In the bed of the Garnock, two miles above Glengarnock Castle, a fine exposure of this red felstone is seen. The colour is due to the presence of the peroxide of iron in the rock, and to the complete oxidation of its iron elements. In several places we noticed that these rocks were interstratified with layers of volcanic ash of a greenish, or grayish-green, colour. Near Laigh Glengarth, on the southern bank of the Maich, is a good section of this ash, nearly 15 feet high.

We occasionally pick up small pieces of barytes in the bottom of the stream, and a little above Ladyland House, on the northern side, a vein of this mineral, 10 inches thick, can be seen. In the basin of the Calder Water, farther to the east, barytes occurs in such mass that it is quarried and ground into a powder, which is said to be used almost entirely for the adulteration of white lead.

In our ramble we now arrive at the well-wooded grounds of

Ladyland, which, on their northern side, are bounded by the Maich. We notice the luxuriance of the trees—mostly hard-wood—with their size of trunk and "wide protection of bough" indicating the fitness of the soil derived from the decomposition of the trap rocks, with their mineral ingredients—lime, soda, potash, and iron—to produce such richness of vegetation.

Here, also, are the highest and finest of the waterfalls to be met with in the course of this stream. As showing the steep rocky character of this rivulet, it may be mentioned that in 5 miles of its course it flows over no less than nine waterfalls, varying in height from 4 to 12 feet; and of these two are met with in the sandstones, and the rest in the porphyrites. After passing the reservoir which supplies Lochwinnoch with water, the banks of the stream are bare and treeless, and the exposures of rock similar to those we have already passed. Several Miocene dykes occur, and some interesting specimens of potholes. These latter are circular in form, of a foot or two in depth, and some of them contain the rounded stones which have formed them, through the continuous action of the water producing a circular motion, and consequent friction, sufficient in time to excavate the holes as we now see them.

Close to the shepherd's house at Cock-ma-lane, we reach the eighth waterfall—a mass of dark porphyrite, surmounted by a ridge of reddish-grey amygdaloid—above which the stream flows through an open moor in a shallow channel with grass-covered banks. Higher up the rocks in the bed of the stream exhibit in some places a pale, almost whitish colour, but above the last waterfall its course presents no further interest to the geological rambler.