# Transactions

OF THE

# BANFFSHIRE FIELD CLUB.



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## SATURDAY, AUGUST 29, 1903.

### EXCURSION TO ENZIE.

The Banffshire Field Club had an excursion to the Enzie district to-day. The Banff excursionists left with the 1.45 train, and arrived at Portgordon about 3 p.m. The company, which had been augmented by additions at Portsoy, Cullen, and Buckie, proceeded to Mills of Tynet, where they were taken in hand by Mr Hugh Ross, who led them along the face of the cliff, and pointed out the famous Tynet fish beds. No fossils were got, but Mr Ross showed a number of specimens containing the remains of fish, the result of former excavations. Most of the party tried their hand at breaking up the nodules found in one of the shale bands in the east sandstone cliff, but without result so far as finding fossils was concerned. Bidding adieu to Mr Ross, the excursionists proceeded along the road to Burn of Gollachy, where the outflow of lava was pointed out and the effect it had upon the rocks with which it came in contact. This is an interesting spot for geologists, and the conglomerate cliffs below the mills were greatly admired. During the lengthened walk the botanical members of the party found a good deal to interest them. The gigantic burdocks in the face of the cliffs at Tynet were much admired, as were also the abundant display of Golden Rod and Grass of Parnassus below the Mills of Gollachy. The beautiful Water Crowfoot (*ranunculus aquatilis*) was also met with on the journey. The party then walked back to Portgordon in a condition to enjoy the excellent tea mine host of the Hotel prepared for them, and returned by the 7.44 train.

The following notes on the Old Red Sandstone of the Enzie were prepared by Mr James Buie, Portsoy, in connection with the excursion:—

In its Old Red Sandstone formation the Enzie presents an interesting field of study for the geologist. Beside the well-known ichthyolite beds on the Tynet, many interesting stratigraphical sections are to be seen in the cliffs of that burn; while perhaps the most interesting features in the district, at least for petrographical study, are the igneous lavaform rocks, of which the best exposure occurs in the burn of Gollachy in the vicinity of the old woollen mill.

We may commence our afternoon's work by noticing some of the more prominent and interesting features to be seen in the cliffs of the burn of Tynet, being the section we have selected to visit first. The O.R.S. formation, as represented not only in this district, but generally on the south side of the Moray Firth, belongs to the mid division of the O.R.S. general formation, as shown by the suite of fossils found at such centres as Gamrie, Tynet, and at Dipple on the banks of the Spey, &c. The lower division of the system, as represented on the southern flanks of the Grampians, and containing a different suite of fossils, is here awanting. Compared with Gamrie, the formation in the Enzie is but meagre, whether as regards the volume of its component parts, or its lithological diversity—if we except the igneous irruptive rocks of the Enzie. The rock, for instance, exposed in the cliffs of the burn of Tynet consists to a large extent of a greatly disturbed series of strata, repeated by a complicated set of faulting, to which more particular reference will subsequently be made. As regards the formation in the Enzie, a traverse of the lower part of the burn of Tynet will supply a tolerable conception of the succession. If we walk up along the stream to some distance above the mills, we shall see not only the basal beds of the formation, but can also note its relation to the older system of rocks upon which it reposes. Here, as in various other parts, we find appearing from beneath the overlaying O.R. rocks, the gneisses,

schists, and quartzites, upon the tilted and denuded ends of the strata of which the younger rocks are built with a high degree of unconformity. The strata of the gneissic system strike S.-W., and dip S.-E. at inclinations ranging from 40 degrees to 90 degrees; while the strata of the younger formation strike nearly E. and W.; and dip N.-W. at a gentle inclination varying from 5 degrees to 7 degrees. In contrast to this, in other parts of the crust of the earth, as in Lanark and Peebleshire, and in the S.-W. of England, we find the basal beds of the O.R.S. formation reposing conformably upon, and graduating down into, the upper beds of the Silurian system—showing that in such cases the work of deposition had been going on quietly and uninterruptedly there, while in these northern parts a long series of powerful disturbances had been taking place; but no strata were being deposited, or, if deposited, it had been subsequently all swept away before the commencement of the O.R. epoch. Without meantime going farther into this question, or hazarding an opinion as to the actual depth of strata or the number of recognised and distinct formations required to bridge over the gap between the fundamental gneissic system, and the more recent O.R. mid division, it may be incidentally mentioned, that one fractional part we know to be here awanting, viz., the lower O.R.S. division, as represented on the southern flanks of the Grampians chain, attains a depth of considerably over a mile; yet this can only represent but a minor part of the total depth awanting. But to resume our remarks on the succession of the rocks constituting the mid division of the O.R.S., as far as developed on the Tynet. At the point already referred to on its banks where the unconformable junction occurs between the older and more recent formation, we find, as in every analogous situation, that the basal beds of the O.R.S. consist of a thick mass of conglomerate, with intercalated bands of red sandstone, the latter in some cases attaining considerable proportions, or even supplanting the conglomerate so as to constitute the actual base, as appears to be often the case at Gamrie,

As we ascend the red sandstone generally begins to predominate over the conglomerate, till the latter either in part or entirely disappears, when the formation passes into a thick stratum of deep red sandstone. It is in this section, but more especially towards its higher part, that we find intercalations of hard semi-crystalline limestone bands, together with those softer bands of shale in which are found embedded the ichthyolite-bearing nodules. Above this series comes an upper thick bed of conglomerate, differing as regards some of its constituents from the lower conglomerate. This upper conglomerate is again surmounted by intercalations of coarse and fine sandstone bands, which finally graduate up into a mass of red sandstone, in which no shale bands are, as a rule, to be seen. These complete the Tynet section, the highest beds represented elsewhere bring there denuded away.

Having thus far traced the succession of the strata, we may next refer to some of the more striking features to be seen in the cliffs in the vicinity of the mill. Of these the most prominent are a complicated set of faults which have affected chiefly the rocks on the west side of the burn. In the west cliff, at some distance south of the mill, the first of these is noticeable. There we observe that a mass of rock containing, at least, one rather thick shale band, in which bones of the coecosteus have been found, has been brought down, bringing the fossiliferous shale band at one of its ends down to the level of the bed of the stream. In the course of its descent, we see that, though its strata are not fractured, their dip has been violently altered, being now quite divergent from the normal dip of the adjoining strata in the cliff—a result which shows that when the downthrow was in progress the rock was still in a plastic condition. An examination of the strata on either side of this dislocated mass of rock shows that the faulting has by no means been confined to it. On the immediate north side of this rock a mass of rock of far greater dimensions has also sustained a downthrow, though one of less degree than the adjoining smaller mass.

On the same side of the burn, but somewhat over 100 yards farther north, occurs the next prominent instances of faulting. In tracing northward the strata constituting the cliff on the west side of the burn, and containing limestone and shale bands, exactly similar to those on the east side of the burn, containing ichthyolite bands, we find their prolongation abruptly truncated, and their place taken by a huge wedge-like mass of the upper conglomerate that has been brought down. Further, in examining the cliff beyond this dislocated mass, instead of finding the series of strata constituting the cliff on the south side of the fault resuming their place on its north side, as they would have done had no further dislocation taken place, we find that the total series amounting to a depth of nearly 50 feet, and also the overlaying upper conglomerate bed, amounting to about the same depth, have entirely sunk out of sight beneath the level of the bed of the stream; while in their place the cliff is entirely occupied by the red sandstone that overlies the upper conglomerate. The fault here exhibited is by far the greatest to be seen in the cliffs in the vicinity of the mill, though from other parts of the O.R. formation downthrows of far greater extent might be instanced. In the eastern cliffs of the vicinity no doubt faults of equal extent occur, but they are obscured by soil and debris. So far as the rock is exposed evidence of minor faulting and dislocation do appear there. These disturbances and dislocations among the rocks supply an apt illustration of the instability of what we are fond to regard as the solid crust of the earth. It is not to be supposed that these disturbances were peculiar to such remote epochs as that of the O.R.S. They have taken place in every period down to the latest tertiary, wherever the deposition of sediment was taking place, and are no doubt going on at the present time beneath the bed of the ocean. Before leaving the spot, brief allusion may be made to the ichthyolite beds. Though visitors have often certain spots pointed out to them, and generally confine their attention to such points as being the most conveniently accessible, it is by no

means to be supposed that these are the only fossilferous centres, or perhaps even the best as at present existing. By the earlier workers among these rocks, such as Mr Martin and Dr Malcolmson, fossils were found in various parts —some of them rather inaccessible—which have since remained unexplored. Apart from the shale bands altogether, ichthyolite bones have been found even in the conglomerate beds. The best known fossiliferous deposits are two shale bands in the east cliff between 20 and 30 feet up from the bed of the stream. In the upper bed specimens of peterichthys, cheiracanthus, and diplacanthus, &c., are most frequently found; while in the lower bed specimens of osteolepis cheirolepis, and dipterus, &c., occur. Specimens, or more frequently bones, of coecosteus are found in sections of the same bed exposed in both the east and west cliffs, one of which beds is that already referred to as occurring in the faulted section of rock. Our concluding remarks on the Gollachy district must now be brief, though in many respects it is the most interesting of the two. On the shore between the mouth of the burn of Gollachy and that of Buckie denuded remains of some portions of the upper beds of the mid O.R. formation occur. These consist of fragmentary beds of conglomerate, beds of red sandstone and of limestone, together with others of breccia set in a calcareous matrix. In some of these calcareous beds impressions of plants have been found, including the fine caste of a fern. But the most interesting feature in this region are the lava-form rocks in the burn of Gollachy. This rock, at first taken for a volcanic ash by Mr J. Grant Wilson, one of the staff of the Geological Survey, who mapped the district, was, after a microscopic examination, pronounced by Sir A. Geikie to be a true lava flow. While parts of the rock may be found which partake of the character of a lava flow, and under the microscope would show as such, careful examination of the rock in the vicinity of the mill has made it evident to the writer that the mass of rock is of a different character. But further discussion of this question and other evidence must meantime be postponed.