

*Explanation of the Geological Map of the North of Scotland.*

[PLATE XII.]

THIS little sketch-map of the geological structure of the North of Scotland is offered as the simple outline of that which must be considered a new classification of the stratified rocks of that region. It is drawn on precisely the same scale as the geological map of the Highlands (by Professor Sedgwick and myself) published in 1827 (Trans. Geol. Soc. 2nd ser. vol. iii. pl. 13), in order to show the great changes which have since been made in the classification of the rocks. From that time, and even up to the year 1856, all those red and purple sandstones and conglomerates which are now shown to underlie the Lower Silurian rocks on the West were coloured similarly to the Old Red Sandstone of the East Coast, which is superposed to all Silurian rocks. This great error has indeed been rectified in the recently published map of Scotland by Professor Nicol, as resulting from observations which he first made conjointly with me. But in making this improvement upon the map of Macculloch, and indeed on all former maps of Scotland, Professor Nicol has not yet seen fit to adopt my much broader view, as demonstrated by the natural features of the North-West Highlands, of the existence of a zone of fundamental gneiss (*a*), which, underlying all the Cambrian and Silurian rocks (*b, c*), is entirely separated from other gneissose and micaceous crystalline rocks (*d*), which clearly repose upon fossiliferous Lower Silurian rocks (*e*) (in the state of quartz-rock and crystalline limestones).

Convinced that this order is established on sound evidence in the western parts of Sutherland and Ross-shire, I have ventured to place upon the same general Lower Silurian horizon (*d*) the various flaglike, crystalline, stratified rocks, whether gneissose, quartzose, micaceous, chloritic, or argillaceous, which spread over the counties of Inverness, Argyll, Moray, Banff, Aberdeen, Perth, &c. Yet, whilst I believe that the gneiss, mica-schists, and clay-slates which clasp round the granites and porphyries of the Grampians are of the same age as the strata (to a great extent lithologically similar) which overlie the fossil-bearing limestones and quartz-rocks of Sutherland and Ross (*e*), I by no means pretend to affirm that the older or fundamental gneiss (*a*) may not be reproduced in some districts of this vast and wild country, in respect to large tracts of which this little map must be considered as suggestive only. If, however, my data in the North-West be fairly established, and the structure of Sutherland and Western Ross be maintained southwards throughout the Highlands, then certainly a greater change of geological equivalents will have been established than any which has taken place in our day in the



British Islands. Vast breadths, in short, of the so-called "primary" crystalline rocks, which were considered to be antecedent to all strata containing the remains of animal and vegetable life, must in that case be considered as simply metamorphosed Lower Silurian rocks, the inferior portion of which is charged with the reliquæ of former life. Let me, however, here observe that, although the largest portion of the diversified, crystalline, stratified rocks of the Highlands which lie to the south of the great Caledonian Canal are coloured and lettered similarly to the micaceous and gneissose flagstones (*d*) which overlie the lowest fossiliferous rocks of Sutherland and Ross (*c*), I think it is probable that the quartz-rock and limestone which range from the island of Jura on the S.W. to Portsoy and its environs on the N.E., as well as certain embranchments amid the Grampians, and a quartzose zone near Loch Linhhe and Ben Nevis, may prove to be of the same age as the unquestionably Lower Silurian strata of the west of Sutherland and Ross (*c*). These zones are accordingly represented under the lighter colour (*c*), but with a mark of doubt; for I have not determined (as in Sutherland and Ross) that they rise out from beneath other crystalline rocks. These portions of the map are therefore to be viewed as hypothetical only; for it is quite possible that in examining this vast area, so penetrated by igneous rocks, other geologists may discover many natural phenomena unknown to me.

I must also explain, that, whilst a few lines placed upon the north-western portion of the map show that the *prevalent* strike of the fundamental gneiss (*a*) is from N.N.W. to S.S.E., and that the general direction of the fossiliferous quartz-rocks and limestone (*c*), as well as the overlying mica-schists, &c. (*d*), is, on the contrary, from N.N.E. to S.S.W., there are many local deviations from those lines, none of which can be laid down on such a scale, nor indeed attempted, until good detailed maps be extended to the Highlands.

The zone *d*, as explained in my memoir read Nov. 16, 1859, represents what may be considered the lowest portion of the Llandeilo group in its North American *facies*, and in no way occupies the place of the "zone primordiale" of Barrande, or the Lingula-flags. The last-mentioned is absent in the North of Scotland; and its non-existence is accounted for by the transgression and break which exist between *b* and *c*, as shown in the sections.

An attempt is also made for the first time to subdivide the Old Red Sandstone of the north of Scotland into three parts, as marked by modified tints of the same colour,—the lower being red conglomerates and sandstones, the middle the Caithness flags, and the upper the yellow sandstones of Sutherland, Ross, and Moray (on the Findhorn). From the latter group, however, I have deemed it right to separate provisionally the highest portion of such yellow sandstones, known as the *reptiliferous* sandstone of Elgin. Not that I have been any more satisfied than when I wrote my last memoir, that in the low country near Elgin, so obscured by drift, any transgression can be detected between the sandstones charged with fossil fishes of the Old Red age and those overlying strata

which contain reptiles ; but having throughout my geological career invariably bowed to the weight of palæontological evidence, and being assured by Professor Huxley that these reptiles have strong affinities with known forms of the Trias, I leave these peculiar sandstones provisionally in that category, placing marks of interrogation against them. For, after all, they may be neither Old nor New Red Sandstone, but may represent some intermediate deposit! The Lias and Oolite of the east coasts of Sutherland and Ross, as in the Hebrides, are grouped together under one colour. The patches of Lias in Moray are too small to be marked.

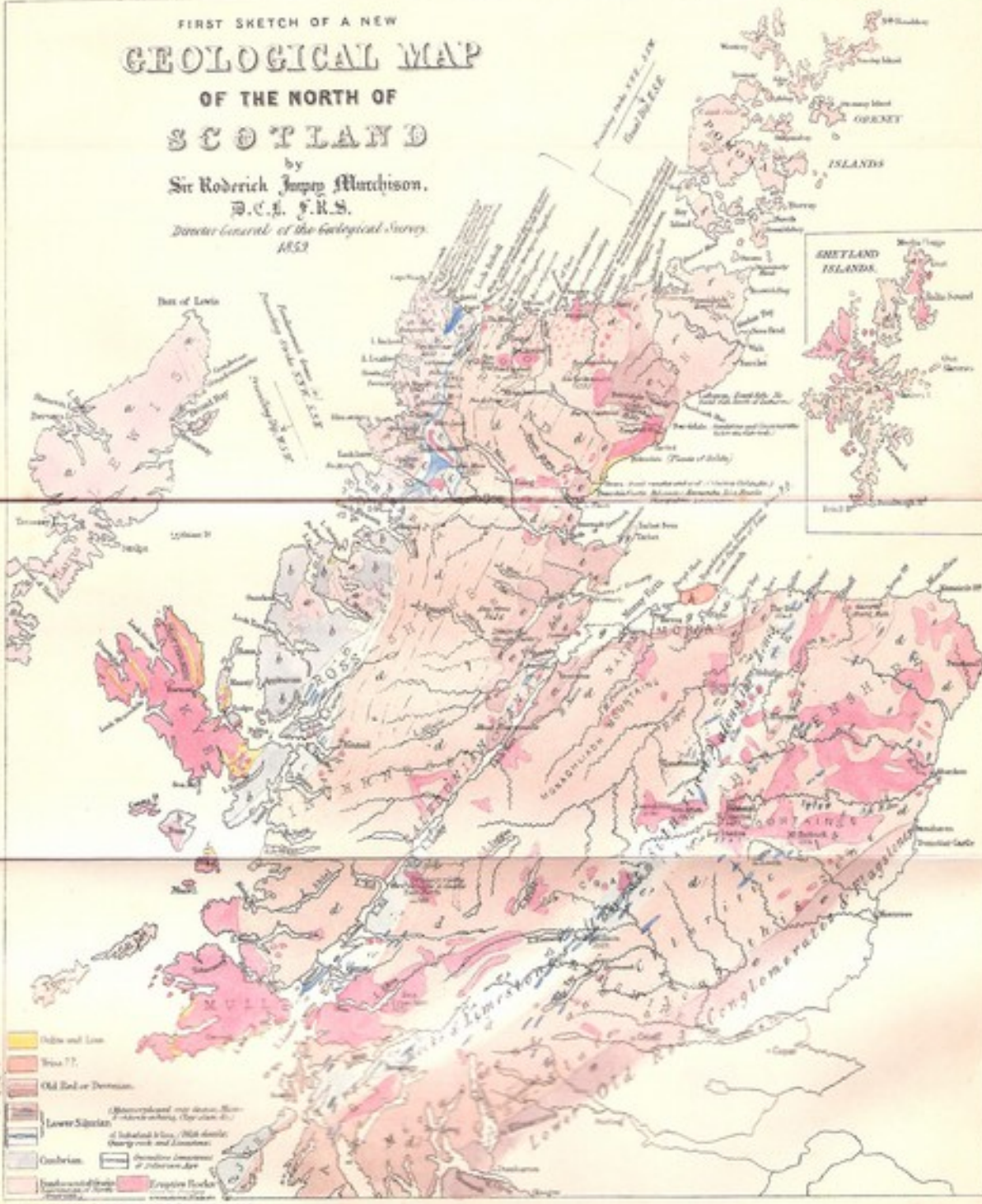
This little sketch-map is, I repeat, intended as the basis merely of a new classification, and lays no claim to precise demarcations of the outlines of the formations. If, after the many other researches which perhaps it will incite, correct general results should follow, my object will have been attained.

All the igneous or eruptive rocks are simply represented under one red colour.—R. I. M., January 25, 1860.



# FIRST SKETCH OF A NEW GEOLOGICAL MAP OF THE NORTH OF SCOTLAND

by  
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1853



- Yellow: Lewisian Gneiss
  - Orange: Dalradian
  - Red: Old Red Sandstone
  - Dark Red: Lower Silurian
  - Grey: Cambrian
  - Light Grey: Devonian
  - White: Eruptive Rocks
  - Blue: Glacial Deposits
- (Unconformable over Devonian, Cambrian, Silurian, Ordovician, etc.)  
of Scotland & Ireland, with details of quartz rock and limestone.  
Devonian Limestone of different ages  
Eruptive Rocks