Chapter 1 Geology of the North-West Highlands. Introductory

By J. Horne

In the North-West Highlands of Scotland four great rock-groups are remarkably developed, each characterised by a peculiar type of scenery and illustrating in a vivid manner the intimate relation that exists between geological structure and the evolution of mountain-forms. Each group has impressed its own individuality on the landscape in such a manner as to arrest the attention not merely of the geologist but even of the casual and unscientific traveller. These four groups are in consecutive order from west to east-1st, the Lewisian or Fundamental Gneiss; 2nd, the Torridon Sandstone; 3rd, the Cambrian formation; and 4th, the Eastern Schists. Ever since the time of Macculloch, at the beginning of last century, the stratigraphical position and relative age of these rocks have been a subject of animated discussion and, for a time, of keen controversy. Relying on the apparent order of superposition, the earlier observers naturally inferred from the magnificent sections laid bare along the western fjords and on the grand escarpments and dip-slopes of the mountains that the Eastern Schists follow the Cambrian strata in conformable sequence. But the geological structure which seems at first sight so simple, has proved, on later detailed examination, to be extremely complicated. The apparent succession has been found to be deceptive, and the superposition, which is undeniable, is now ascertained to be due to great terrestrial displacements, which have no parallel elsewhere in Britain.

At the outset it is desirable to indicate briefly the distinctive surface-features and field relations of these rock-groups, so that the reader may form some conception of the history of a region which presents such fascination for the geologist. The several areas covered by the respective formations will be best understood from the geological map which accompanies this Memoir.

1. Along the western seaboard of the counties of Sutherland and Ross, the Lewisian or fundamental gneiss forms an interrupted belt stretching from Cape Wrath to Loch Torridon, and thence to the islands of Rona and Raasay. Throughout this belt of country bare rounded domes and ridges of rock, with intervening hollows, follow each other in endless succession, forming a singularly sterile tract, where the naked rock is but little concealed under superficial deposits, and where the surface is dotted over with innumerable lakes and tarns. (Plate 1)Over wide areas the elevation of this undulating rocky plateau is comparatively uniform, save near the great escarpments of Torridon Sandstone and Cambrian quartzite, where the Lewisian Gneiss sometimes forms prominent peaks and lofty crags, as on Ben Stack (2364 ft.), near Loch Laxford in Sutherland, and on Ben Lair, near Loch Maree (2817 ft.) in Ross-shire.

The various rocks comprised under the designation of Lewisian Gneiss may be said to form the foundation stones of Scotland. They occupy a well-defined position beneath the Torridon Sandstone and Cambrian strata. Their banded and foliated structure was, by the older investigators, regarded as indicating them to have been originally sedimentary deposits that have been rendered crystalline by various metamorphic processes. The detailed examination of the region, however, leads to the conclusion that these rocks may be arranged in two great divisions — (1) a Fundamental Complex, composed mainly of gneisses that have affinities with plutonic rocks, and to a small extent of crystalline schists and limestones which are probably of sedimentary origin; (2) a great series of igneous rocks intrusive in the Fundamental Complex in the form of dykes and sills.

The rocks that have affinities with plutonic igneous products have a wide petrographical range, and comprise ultrabasic, basic, and more acid materials, such as pyroxenites, hornblendites, together with pyroxenic, hornblendic, and micaceous gneisses. Sometimes they appear in an amorphous form, like ordinary eruptive masses, sometimes with crude banding due to a rough parallel arrangement of the constituents, and yet again, over wide areas, with well-defined foliation. In certain tracts they are thrown into gentle arches and troughs, and in others they are sharply plicated with nearly vertical axes. The altered sediments embrace such familiar types as quartz-schists, mica-schists, graphite schists and limestones, which in hand specimens are indistinguishable from similar rocks in the metamorphic series in the counties of Banff, Perth and Argyll in the Eastern Highlands.

After the gneisses of the Fundamental Complex had acquired their mineral-banding, a subsequent uprise of igneous materials took place along more or less highly inclined fissures. These igneous protrusions, which now appear as dykes and sills, form one of the most striking features of the Lewisian gneiss. (Plate 2) In the undeformed areas they may still be traced through the Fundamental Complex with as much ease as the Tertiary basalt-dykes in the west of Scotland can be followed through the Jurassic strata. Like the gneisses which they traverse, these intrusive masses have a wide petrographical range, including ultrabasic, basic, intermediate and acid types. By the help of these intrusions much light has been thrown on the subsequent modifications of the Lewisian Gneiss.

After the eruption of these various dykes and sills, and long before the deposition of the overlying Torridon Sandstone, the whole region of north-west Scotland was subjected to terrestrial stresses which affected both the Fundamental Complex and the intrusive masses which penetrate it. These movements have followed lines or planes of disruption which traverse the gneiss plateau in various directions, sometimes at an oblique angle to the course of some of the intrusions or nearly east and west, and again approximately parallel with the trend of the basic dykes or W.N.W. In the former case, the dykes have been deflected from their normal course, and have undergone such an internal reconstruction as ultimately to pass into hornblende-schists. In like manner, the coarse gneisses with mineral banding have been rapidly folded, a molecular re-arrangement of their constituents has been superinduced, and they are now seen to pass into granulitic gneisses, which, in some instances, are indistinguishable from certain types of altered sediments.

Similar changes are observable when the lines of movement are more or less parallel with the course of the basic dykes, but, in ,such cases, both the members of the Fundamental Complex and the later intrusions may be plicated on nearly vertical axes or thrown into broad arches and troughs. Here again it can be demonstrated that, by differential movements of the constituents, new foliation planes have been developed alike in the dykes and gneiss. In certain areas the basic dykes appear merely as bands of hornblende-schist in the midst of biotite-gneiss, having thus become an integral part of the complex.

From such evidence, which will be presented in full detail in the sequel, the general principle is deduced, that under the influence of earth-movements which operated in pre-Torridonian time, coarsely-banded gneisses with massive intrusive dykes may be entirely reconstructed and may pass into granular and granulitic gneisses and schists, the planes of foliation being more or less parallel with the axial planes of folding or lines of disruption.

In connection with these reconstructed gneisses and the accompanying lines of movement, bands of mylonised or ground-up rocks (Lapworth, 1885) occasionally occur, which, under the microscope, show the various stages in the breaking down of the original constituents.

All these varied phenomena are undoubtedly of pre-Torridonian age, for the shear-lines and the reconstructed gneisses and dykes can be traced across the plateau of Lewisian gneiss till they disappear under the great escarpment of overlying Torridon Sandstone. This evidence is still further strengthened by the occurrence of fragments of these materials in the basal breccias of that formation.

If the stratigraphical relation of the altered sediments of the Lewisian gneiss to the gneisses that have affinities with plutonic rocks could be definitely ascertained, it would possess much geological interest, in view of the great antiquity of these sediments and the relative ages of the original types of gneiss. There is no clear evidence that these types are intrusive in the former, but, in certain places, the two are so intimately associated as to suggest that the rocks of igneous origin may have been injected into those of sedimentary origin. On the other hand, there is undoubted proof that, north of Loch Maree, the altered sediments rest on a platform of gneiss and are locally overlain by gneiss with basic dykes, the superposition of the gneiss on the sediments being there due to folding and thrusting.

One of the most impressive features in the history of the Lewisian gneiss is the abundant evidence of prolonged denudation between the cessation of the terrestrial movements just described and the deposition of the Torridon Sandstone. During the protracted interval represented by this denudation the gneiss-plateau formed a land-surface which was carved into lofty hills with craggy slopes and deep valleys. This fragment of primeval Europe has been preserved under the pile of coarse Torridonian grits and sandstones which is now undergoing slow removal by the agents of waste.

The observer may climb one of these Archaean hills, following the boundary line between the Lewisian rocks and the younger formation, and note, step by step, how the sub-angular fragments of hornblende-schist that fell from the pre-Torridonian crags are intercalated in the grits and sandstones, thus indicating the slow submergence of the old land-surface beneath the waters of Torridonian time. Between Loch Maree and Loch Broom it is possible to determine the orientation of these buried valleys and to prove that some of the hills exceeded 2000 feet in height.

There can be no doubt, therefore, that the unconformability between the Lewisian gneiss and the overlying Torridon Sandstone represents a vast lapse of time. It is analogous to that at the base of the Old Red Sandstone in the Eastern Highlands and at the base of the Trias in England, and differs in a marked degree, as will presently be shown, from the boundary between the Torridonian and Cambrian strata.

ii. The contrast between the scenery of the Lewisian gneiss and that of the overlying Torridon Sandstone is extremely marked. The rounded domes and ridges of gneiss pass underneath a great pile of grits and sandstones, which rises into picturesque mountains over 3000 feet in height. Owing to the gentle inclination of these strata, the successive outcrops form a series of parallel bars or terraces which can be traced by the eye for miles along the eastern margin of the old gneiss plateau. They are intersected by numerous joints and small faults along which erosion proceeds more rapidly, and the escarpments are thus broken up into huge buttresses that in time become isolated from the main area of the formation. (Plate 1) and (Plate 3)

The Torridon Sandstone has been divided by the Geological Survey into three groups, of which the middle or Applecross division has the greatest development and widest distribution.

Consisting of coarse sandstones or arkose with scattered pebbles, he members of the Applecross group range from Cape Wrath to Sleat in Skye, preserving throughout their individual characteristics and peculiar bedding. It is remarkable that their enclosed pebbles include pieces of quartzite which show contact-alteration, spherulitic jaspers that have been formed by the silification of liparites, and spherulitic felsites which closely resemble those of Uriconian age in Shropshire. As these fragments have all been derived from formations that are not now visible anywhere in the western part of the counties of Sutherland and Ross, they furnish further evidence of the denudation of the Archaean plateau in pre-Torridonian time.

The members of the lowest (Diabaig) division have not been recognised north of Assynt, and as they are traced southwards to Skye they gradually increase in thickness from 500 feet in the Loch Maree district to about 6000 feet in Sleat. In the sandstones of this group and of the overlying division lines of heavy minerals, such as magnetite, ilmenite, zircon and rutile frequently occur.

The sediments of the upper division (Aultbea), though of local development between Loch Ewe and Loch Broom in the west of Ross-shire, are of considerable interest owing to the occurrence of certain phosphatic nodules in dark micaceous shales. The chemical composition of these nodules would of itself suggest a probable organic origin, and in support of this inference it may be mentioned that Dr. Teall has found them to contain spherical cells with brown-coloured fibres, which appear to be organic structures. (Plate 52). With this exception, no undoubted organic remains have been found in the Torridon Sandstone. These Torridonian deposits were grouped with the Cambrian system of Wales, until 1901, when the discovery of the *Olenellus* fauna in the overlying quartzite-limestone series demonstrated that they must be older than even the lowest division of that system and are thus of pre-Cambrian age. The observer who climbs the mountains of Torridonian rock will not wonder that they should once have been relegated to the Old Red Sandstone, when he notes the unaltered character of these sediments, the freshness of their constituents and the absence of kaolinisation in the felspars. Yet, while this is their normal character, it is worthy of note that where they have come under the influence of the great post-Cambrian earth-movements, they have been so altered as to approach the type of crystalline schists.

iii. The third of the rock-formations, formerly grouped by Murchison with the Silurian system, but now proved to contain organic remains of Cambrian age, presents a succession of strata herein the lowest and most prominent subdivision is a group of quartzites. Though only about 500 feet in thickness, these pale siliceous rocks form a conspicuous feature in the landscape, seeing that they give rise to snow-white escarpments and outliers which cap the mountains of Torridon Sandstone or even of the Lewisian gneiss. (Plate 4)Sometimes they form long-dip slopes, as on the west side of Loch

Eireboll or in the mountains in the Dundonnell Forest south of Loch Broom, where they retain with remarkable freshness the striae produced during the glaciation of the region. Next in order come two sub-zones together about 70 feet thick, comprising brown dolomitic shales followed by a band of quartzite (*Salterella* grit) which have yielded the *Olenellus* fauna. These are overlain by the dolomite and limestone, which reach their greatest development (1500 feet) in the Durness basin.

One of the prominent structural features in the North-West Highlands, which catches the eye of the geologist, is the boundary line between the white Cambrian quartzite and the dark red or brown underlying Torridon Sandstone. As shown by Professor Nicol and Sir Henry James this line marks not merely the junction of two distinct groups of sedimentary strata, but a great unconformability which can be traced from north to south across the counties of Sutherland and Ross into Inverness-shire. It further implies prolonged marine denudation and differs completely in character from the eroded land-surface at the base of the Torridon Sandstone. The detailed mapping shows that during the interval of time represented by this unconformability, the Torridon Sandstone was gently folded, a vast thickness of strata was then removed and the Lewisian gneiss was exposed over wide areas, before the marine sediments of Cambrian time were laid down. Hence we find in that region numerous instances of that remarkable structure — the double unconformability — so well displayed on the hill slopes south of Loch Assynt, where the edges of the nearly horizontal Torridon Sandstones are transgressed, bed after bed, by the more highly inclined Cambrian quartzites, till the latter rest directly on the Lewisian gneiss (Figure 31) (Figure 36). By this means also various outliers of Torridon Sandstone were formed, to the east of the present apparent limit of the formation, which were carried westwards by the later post-Cambrian movements. It is further interesting to observe that wherever the surface of the Lewisian gneiss can be examined underneath the basal quartzites, the felspars in the rocks that formed the old sea-floor show a peculiar type of decomposition and the gneisses themselves are epidotised.

An attentive examination of the North-West Highland region proves the accuracy of Professor Nicol's conclusion that the limestone is the highest member of this system. No evidence now remains to show whether or not the Cambrian limestones and dolomites were covered by conformable sediments of younger date, for the record is interrupted at that horizon by a great series of displacements to which allusion will presently be made.

After the deposition of the Cambrian dolomites and limestones, and before the development of the post-Cambrian movements, the members of that formation and of the underlying Torridon Sandstone were pierced by sheets or sills and plutonic masses of various igneous materials. Though traceable from Loch Glencoul to Ullapool, they are specially numerous in the neighbourhood of Inchnadamff, where they form noticeable features in the landscape, and where many of them appear on certain definite horizons. These rocks have been ascertained by the work of the Geological Survey to possess considerable interest from a petrographical point of view, inasmuch as they indicate that the plutonic masses have been formed by the consolidation of alkaline magmas rich in soda. At one end of the series is the quartz-syenite of Cnoc na Sroine, and at the other basic augite-syenite, nepheline-syenite and borolanite. The sills and dykes comprise two well-marked types, vogesites and felsites with alkali felspar and aegirine, which may represent the dyke form of the magmas that gave rise to the plutonic masses.

The dolomites of Cambrian age both in Assynt and Skye have been further shown to present features of special interest owing to the important changes which they have undergone from the intrusion of igneous materials. In the former district this contact metamorphism has been produced by the plutonic masses of post-Cambrian age, — quartz-syenite, nepheline-syenite and borolanite, which occur in the Cnoc na Sroine mass, and in the latter district by Tertiary igneous rocks. Professor Heddle first called attention to the presence in the Assynt marble of structures resembling those of *Eozoon* in the Laurentian limestone of Canada. Dr. Teall has pointed out that the marbles within the contact zone in Assynt contain, among other minerals, brucite, diopside, forsterite and tremolite. Those with brucite are of special interest, because they belong to a type hitherto unrecognised in the British Islands, though long known from the neighbourhood of Predazzo in the Tyrol. No less interesting are the exceptional types found in contact with borolanite and augite-syenite which contain a green aegirine-augite, identical with that in the augite-syenite. The marbles of Assynt and Skye may be inferred to be for the most part altered dolomites, and their alteration appears to have been accompanied by dedolomitisation, due either to the development of magnesian silicates, such as forsterite and tremolite, or to the formation of periclase or brucite.

iv. The most important feature in the geology of the North-West Highlands, which renders this region of surpassing interest to the geologist, is the evidence relating to the terrestrial movements that took place in post-Cambrian time. From a detailed examination of the structures in the field and from certain experimental researches, which will be referred to in the sequel, it can be seen that, under the influence of horizontal compression or earth-creep, the rocks in that area behaved like brittle rigid bodies, and were folded over each other, snapped across, piled up and driven westwards in successive slices. The stable area lay to the W.N.W. the compressing or tangential force came from the E.S.E. Hence we find, both in the incipient flexures and in the overfolds, that the eastern limbs dip at gentle angles to the E.S.E., while the western limbs are more highly inclined. Further, the minor reversed faults and great disruption lines or thrust-planes, save when subsequently folded, likewise dip to the E.S.E.

A careful study of these structures in the field has shown that certain zones in the Cambrian formation, — the basal limestone, the Serpulite Grit and the "Fucoid Beds" have yielded readily to the intense lateral pressure, for they have been piled up in small slices that dip at an oblique angle to the plane along which they have been driven. (Figure 31) and (Figure 28) But such structures appear only in advance of, or beneath, the great disruption lines or thrusts which are arranged in definite order from west to east. The more westerly of these thrusts detach, bring up and drive westwards portions of the old floor of Lewisian gneiss, together with the Torridon Sandstone and many of the fossiliferous zones of the Cambrian series. The slices of Lewisian gneiss sometimes exceed 1000 feet in thickness, and they present the characteristic types of these rocks as developed in the undisturbed area to the west. In certain localities inversions occur on a stupendous scale, as, for example, to the north and south of Stromeferry, where a portion of the old Archaean floor of gneiss has been turned upside down and there reposes on the inverted basal beds of the Torridon Sandstone which dip at gentle angles to the E.S.E.

The most easterly and perhaps the most powerful of these disruptions, to which the name of "Moine Thrust" has been given, differs from all those to the west in two important points. First, the materials overlying that plane comprise the Eastern Schists — the fourth of the great rock-groups referred to at the beginning of this Chapter — which possess different petrographical characters from the displaced masses to the west. Secondly, in some instances, the strata overlying this plane have been driven so far west — for ten miles at least in the Durness area — that they rest almost directly on the undisturbed Cambrian rocks. Hence arise those deceptive sections where there seems to be a normal sequence from the fossiliferous Cambrian zones into the Eastern Schists.

These displacements were accompanied by differential movement of the component materials of the rocks affected, and resulted in the development of new structures which reach their highest limit of metamorphism along the belt of strata in association with the Moine Thrust. There a prominent zone of crushed or mylonised rocks is usually to be seen. The Lewisian gneiss, Torridon Sandstone, and Cambrian quartzite have been so sheared and rolled out that they now present new divisional planes parallel with that of the Moine Thrust. The Lewisian gneiss shades into flaser-gneiss with lenticular or phacoidal structure, and ultimately passes into a banded rock like a platy schist. The pegmatites show beautiful fluxion-structure, with felspar "eyes" like rhyolites.

No less interesting and important is the evidence furnished by the deformation of the sediments. In the case of the "pipe-rock zone" of the quartzite, the vertical worm-casts have been bent over and flattened till they become parallel with the plane of thrust, and the beds have been much attenuated. In the Torridon grits and sandstones, the quartz-grains have been drawn out into lenticles that wind round the "eyes" of felspar; sericitic mica appears in the divisional planes, and in some instances biotite has been developed. Thin pegmatites, containing quartz, felspar, and chlorite, appear in the deformed grits, though only to a small extent. In all cases the planes of schistosity in these altered sediments are roughly parallel with the great disruption planes.

Regarding the age of these post-Cambrian movements, it is obvious that they must be later than the Cambrian limestone and older than the Old Red Sandstone, for the basal conglomerates of the latter rest unconformably on the Eastern Schists and contain pebbles of basal quartzite, pipe-rock and dolomite derived from the Cambrian rocks of the North-West Highlands.

Only a brief reference need be made here to the Eastern Schists that appear to the east of the Moine Thrust-plane. Excluding the belt of mylonised rocks, usually found in association with that displacement, this group comprises flaggy

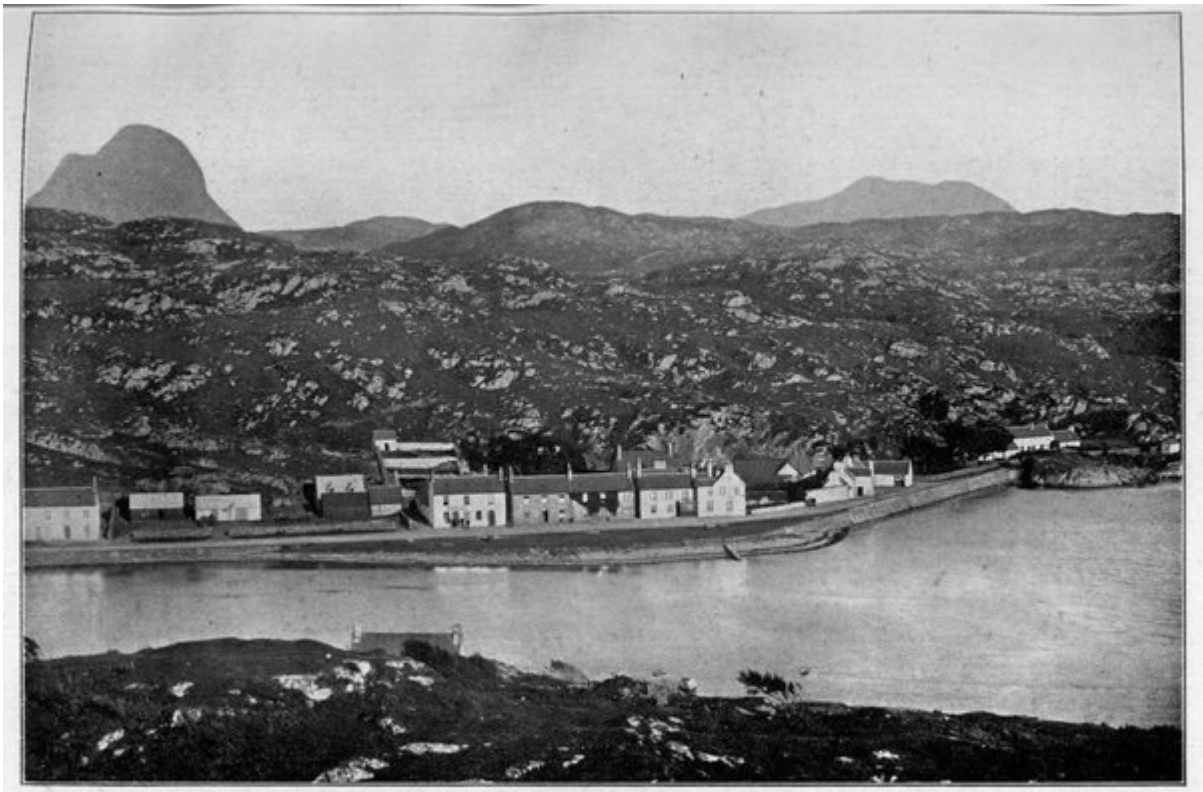
quartzose schists with muscovite, quartz-biotite granulites, and garnetiferous muscovitebiotite-schists, which together evidently represent an altered sedimentary series. Occasional inliers of gneiss of Lewisian types, either deformed or reconstructed, appear east of this great thrust-plane. These schists are inclined at gentle angles to the E.S.E., like many of the displaced materials that underlie them.

Owing to the system of parallel joints which traverse these crystalline schists, the streams carve in them deep clefts or steep-walled gorges, of which the finest example occurs in the river Broom near Braemore. Usually they form stretches of rocky moorland, partly covered with peat, and sometimes they give rise to lofty mountains such as Ben Hope (3040 feet), with great escarpments showing the divisional planes of the metamorphic series.

In order that the relations of the various rock-groups in the North-West Highlands may be clearly apprehended the subjoined table is here given, showing the successive formations in the order in which they are met with on the ground and in which they are described in the present volume.

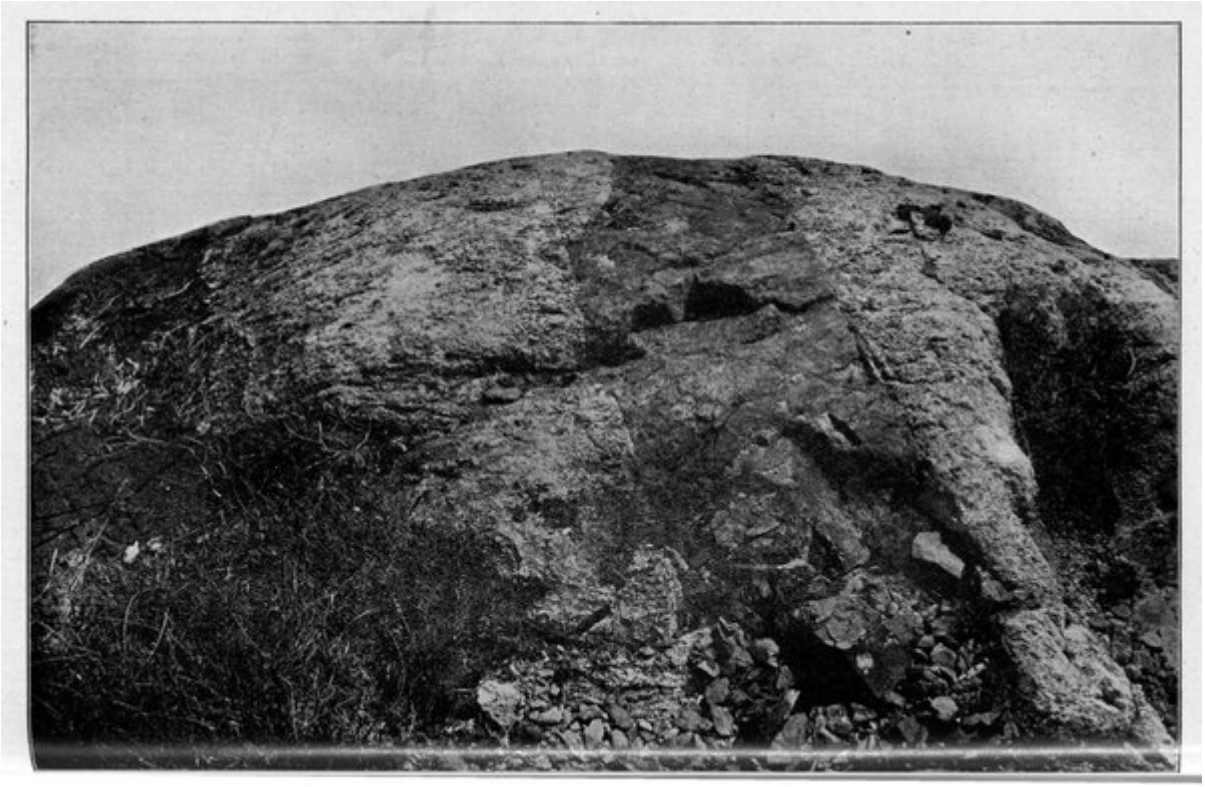
iv. Eastern Schists	Flaggy quartz-schists, quartz biotite granulites and garnetiferous muscovite-biotite-schists with occasional inliers of deformed or reconstructed Lewisian Gneiss. Zone of mylonised rocks usually at the base of this series.
[Great Disruption Line — the Moine Thrust	— which has driven the Eastern Schists (iv.) over the rocks below (iii., ii., i.)]
Cambrian	3. Dolomites and limestones with certain fossiliferous zones. 2. Serpulite Grit and Fucoid Beds yielding the *Olimellas fauna.* 1. Quartzites with worm-casts in the upper portions and false-bedded grits below.
	[Unconformability — Plane of marine denudation.]
ii. Torridonian	3. Sandstones and dark micaceous shales. 2. Thick series of coarse sandstones and grits with conglomerate bands. 1. Dark and gray shales with calcareous bands, fine-grained sandstones and grits with epiclotic grits at the base.
	[Strong Unconformability — Highly-eroded land surface.]
i. Lewisian	Complex of pyroxenic, hornblendic. and micaceous gneisses with certain crystalline schists that represent altered sediments. This complex is pierced by ultrabasic, basic, and acid intrusions in the form of dykes and sills.

Brief allusion may be made in this preliminary statement to the overwhelming evidence of repeated and prolonged denudation in the North-West Highlands. The materials that overlie the Moine Thrust-plane originally stretched far to the west of the present main outcrop of that plane. By the removal of these materials from an area many square miles in extent, we are enabled to study the complicated structures that once lay buried under a covering of the Eastern Schists. Again, by the recession eastwards of the great Cambrian and Torridonian escarpments, the gnarled Lewisian Gneiss, once so deeply buried under these formations, has been once more exposed, and has revealed some of the topography of the oldest land-surface known to exist in Western Europe, while at the same time the successive protrusions, dislocations, and displacements of the remotest Archaean ages have been laid bare to our eyes.

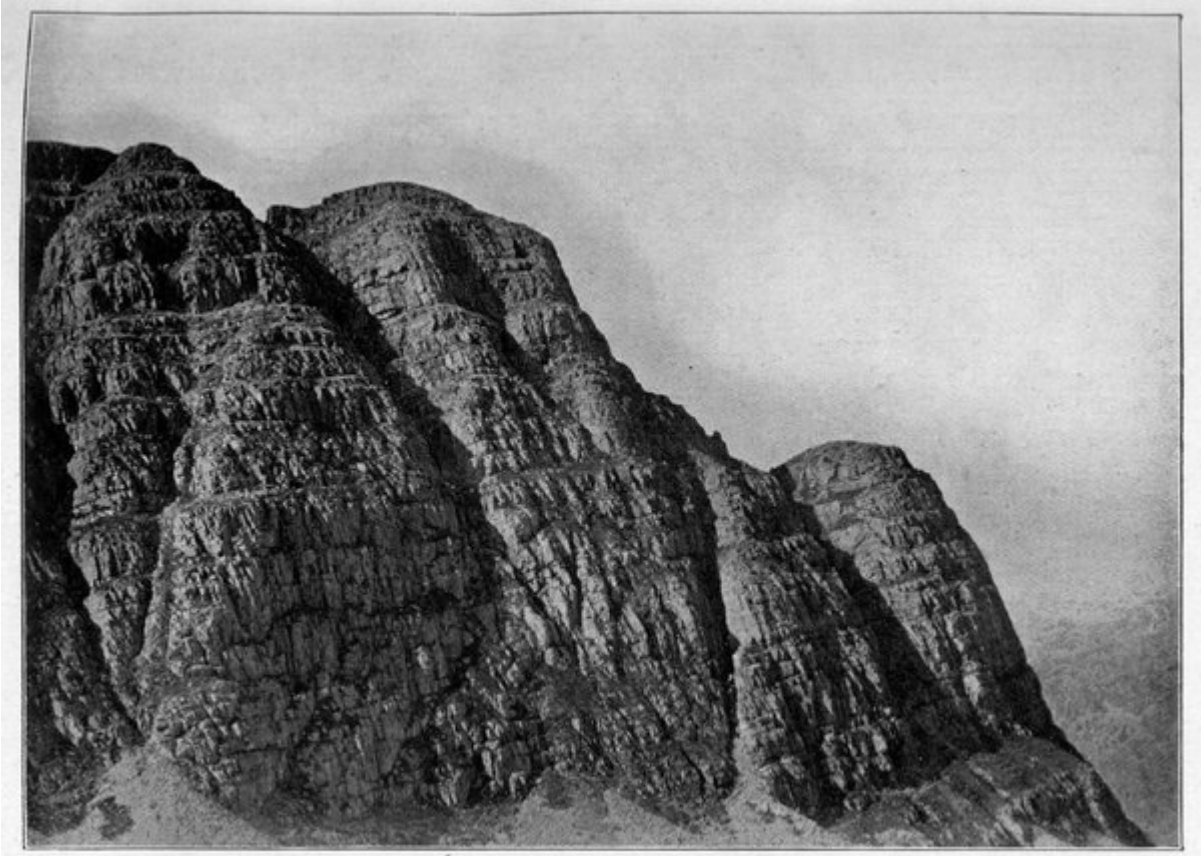


Plateau of Lewisian Gneiss, south-east of Lochinver, Sutherlandshire. Suilven and Cùl Mòr in distance.

(Plate 1) Plateau of Lewisian gneiss, south-east of Lochinver, Sutherlandshire; Suilven and Cùl Mòr in distance. B40.

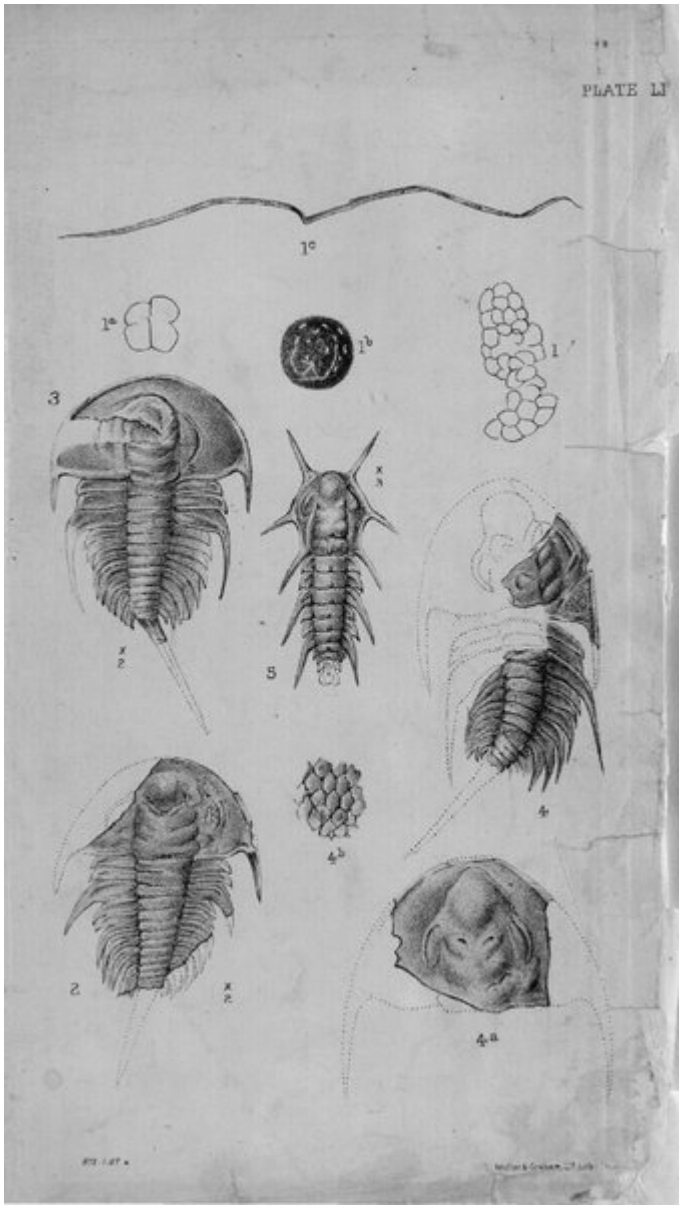


(Plate 2) Epidiorite dykes in thrust Lewisian gneiss, Heights of Kinlochewe, Ross-shire. B62.



Torridonian Precipices: Sgurr na Caorach, Applecross, Ross-shire.

(Plate 3) Torridonian precipices, Sgurr na Caorach, Applecross, Ross-shire. C49–50.



(Plate 52) The figures 1, 1a, 1b, 1c represent traces of supposed organisms in phosphatic nodules from the Upper Torridon shales of Cailleach Head, Loch Broom; magnified about 60 diameters. See page 288. 1. Irregular mass showing cellular structure. 1a. Group of four cells. 1b. Black sphere with perforations. 1c. Brown fibre. 2. Olenellus lapworthi, Peach. Enlarged 2 diameters. 3. Olenellus lapworthi, var. elongatus, Peach. 79 4. Olenellus reticulatus, Peach. Natural size. 4A. Olenellus reticulatus, Peach. Natural size. 4B. Olenellus reticulatus, Peach. Test enlarged to show nature of ornamentation. 5. Olenelloides armatus, Peach. Enlarged 4 diameters. Figs. 2–5 from " Fucoid beds," Cambrian, Meall Ghiubhais, Kinlochewe, Ross-shire. Copied bypermission of the Geological Society from Quart. Jour. Geol. Soc., Vol. L., 1894. Pls. XXIX., XXX., XXXI., and XXXII., pp. 674, 675.

Unconformability of Cambrian Quartzites on Torridon Sandstone. Loch Coire Mhic Fhearchair, Beinn Eighe, Ross-shire.

(Plate 4) Unconformability of Cambrian quartzites on Torridon sandstone; Loch Coire Mhic Fhearchair, Beinn Eighe, Ross-shire. C31.

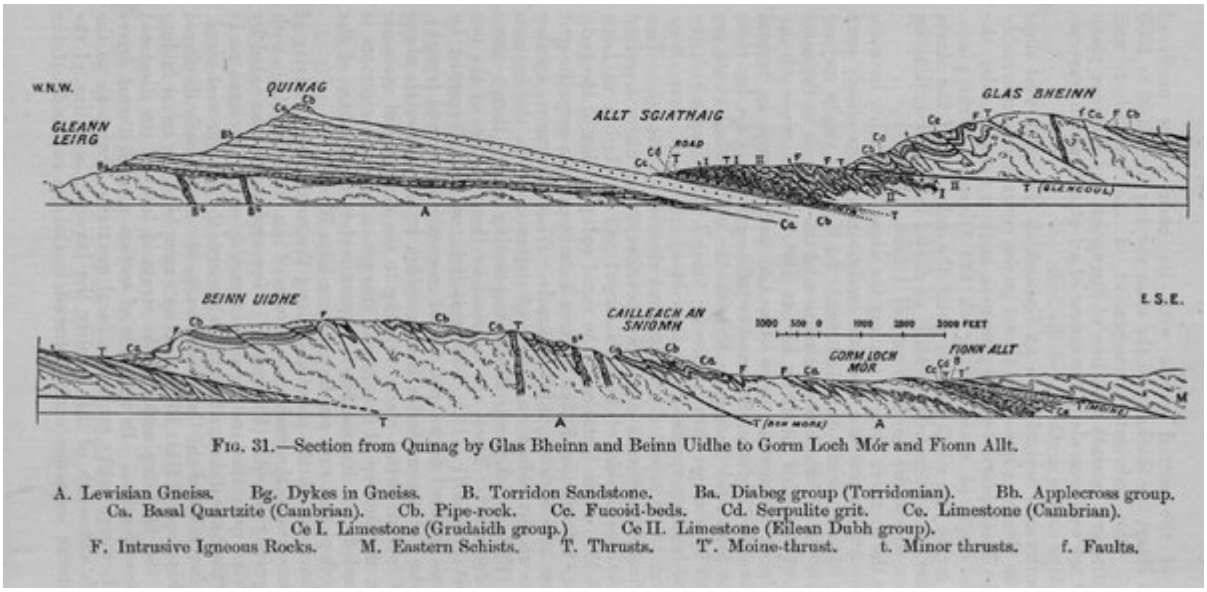


Fig. 31.—Section from Quinag by Glas Bheinn and Beinn Uidhe to Gorm Loch Mór and Fionn Allt.

A. Lewisian Gneiss. Bg. Dykes in Gneiss. B. Torridon Sandstone. Ba. Diabeg group (Torridonian). Bb. Applecross group. Ca. Basal Quartzite (Cambrian). Cb. Pipe-rock. Cc. Fucoid-beds. Cd. Serpulite grit. Ce. Limestone (Cambrian). Ce I. Limestone (Grudaidh group.) Ce II. Limestone (Eilean Dubh group). F. Intrusive Igneous Rocks. M. Eastern Schists. T. Thrusts. T'. Moine-thrust. t. Minor thrusts. f. Faults.

(Figure 31) Section from Quinag by Glas Bheinn and Beinn Uidhe to Gorin Loch Mar and Fionn Allt. A. Lewisian Gneiss. B^G. Dykes in Gneiss. B. Torridon Sandstone. Ba. Diabeg group (Torridonian). Bb. Applecross group. Ca. Basal Quartzite (Cambrian). Cb. Pipe-rock. Cc. Fucoid-beds. Cd. Serpulite grit. Ce. Limestone (Cambrian). Ce I. Limestone (Grudaidh group.) Ce II. Limestone (Eilean Dubh group). F. Intrusive Igneous Rocks. M. Eastern Schists. T. Thrusts. T'. Moine-thrust. t. Minor thrusts. f. Faults.

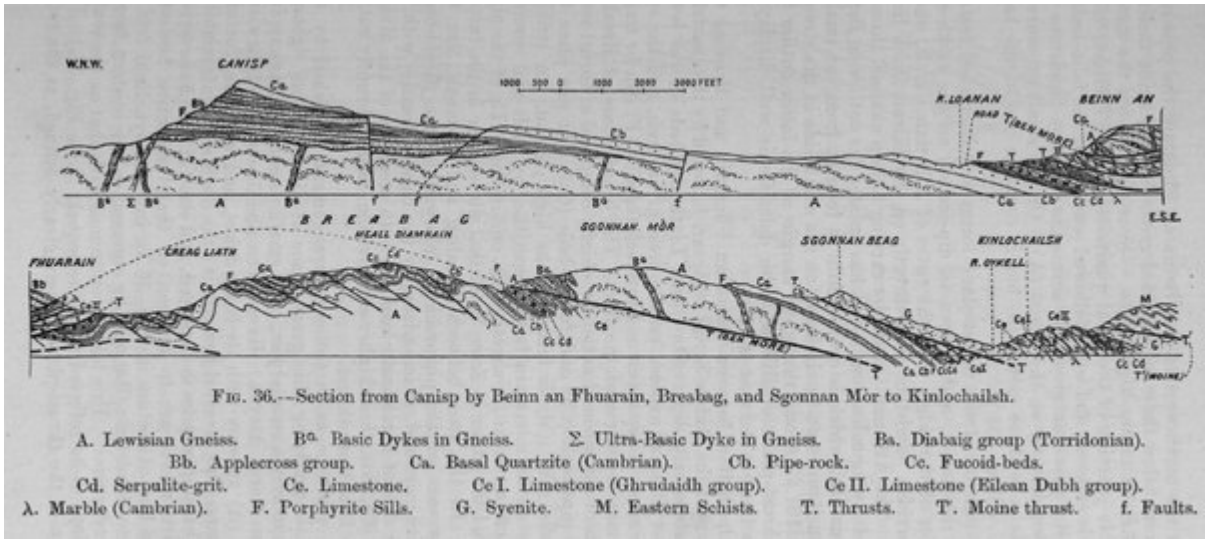


Fig. 36.—Section from Canisp by Beinn an Fhuarain, Breabag, and Sgonnan Mòr to Kinlochailsh.

A. Lewisian Gneiss. Bᵃ. Basic Dykes in Gneiss. Σ. Ultra-Basic Dyke in Gneiss. Ba. Diabaig group (Torridonian).
Bb. Applecross group. Ca. Basal Quartzite (Cambrian). Cb. Pipe-rock. Cc. Fucoid-beds.
Cd. Serpulite-grit. Ce. Limestone. Ce I. Limestone (Ghrudaidh group). Ce II. Limestone (Eilean Dubh group).
λ. Marble (Cambrian). F. Porphyrite Sills. G. Syenite. M. Eastern Schists. T. Thrusts. T'. Moine thrust. f. Faults.

(Figure 36) Section from Canisp by Beinn an Fhuarain, Breabag, and Sgonnan Mòr. to Kinlochailsh. A. Lewisian Gneiss. Σ. Basic Dykes in Gneiss. E. Ultra-Basic Dyke in Gneiss. Ba. Diabaig group (Torridonian). Bb. Applecross group. Ca. Basal Quartzite (Cambrian). Cb. Pipe-rock. Cc. Fucoid-beds. Ce I. Limestone (Ghrudaidh group). Ce II. Limestone (Eilean Dubh group). G. Syenite. M. Eastern SchisT's. T. Thrusts. T'. Moine thrust. f. Faults Cd. Serpulite-grit. Ce. Limestone. λ. Marble (Cambrian). F. Porphyrite Sills.

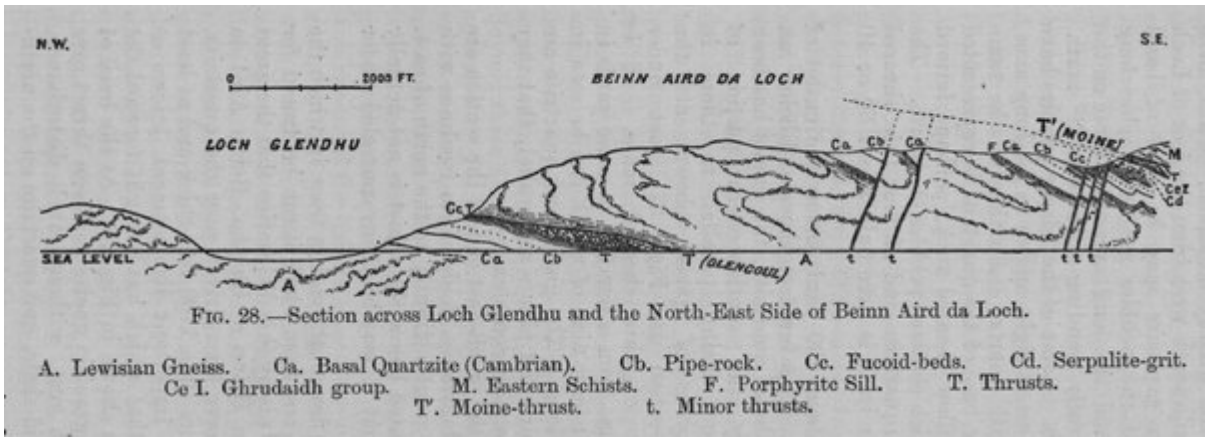


Fig. 28.—Section across Loch Glendhu and the North-East Side of Beinn Aird da Loch.

A. Lewisian Gneiss. Ca. Basal Quartzite (Cambrian). Cb. Pipe-rock. Cc. Fucoid-beds. Cd. Serpulite-grit.
Ce I. Ghrudaidh group. M. Eastern Schists. F. Porphyrite Sill. T. Thrusts.
T'. Moine-thrust. t. Minor thrusts.

(Figure 28) Section across Loch Glendhu and the North-East Side of Beinn Aird da Loch. A. Lewisian Gneiss. Ca. Basal Quartzite (Cambrian). Cb. Pipe-rock. Cc. Fucoid-beds. Cd. Serpulite-grit. Ce I. Ghrudaidh group. M. Eastern Schists. F. Porphyritc Sill. T. Thrusts. T'. Moine-thrust. t. Minor thrusts.