Chapter 2. Outline of the literature

<ref>In Appendix iv., p. 588, will be found a full list of the geological literature; in the present chapter reference is made only to the more important contributions.</ref>

Preceding the more strictly geological literature of the Isle of Man, we find in various early topographical accounts the usual desultory scraps of geological information. Governor Sacheverell, for example, in his "Account "<ref>An Account of the Isle of Man its Inhabitants, Language, Soil, Remarkable Curiosities etc. etc., by W. Sacheverell, late Governor of Man, 1702. Reprinted by the Manx Society, vol. i., Douglas, 1859.</ref> published in 1702, refers to the mines of Lead, Copper and Iron<ref>P. 17 of Manx Soc. reprint.</ref>; and to the occurrence Of trees interred in the bogs of the Curragh, of which he notes that they are discovered by reason of no dew resting on the ground' above them.<ref>Ibid, p. 19.</ref> He mentions also a mineral spring or pool in Kirk-Christ Rushen "of vitriolic quality… . which probably proceeds from the frequent spewings of copper, that are discovered on all sides of these mountains".<ref>Ibid, p. 18.</ref> Governor Waldron's account printed in 1731,<ref>The History and Description of the Isle of Man, its Minerals, etc., by G. Waldron, London, fol. 1731, and 12 mo., 1744.</ref> in spite of the reference in the sub-title to "Minerals", deals with the superstitions of the people rather than with the natural features of the Island. Bishop Wilson wrote a description for an edition of Camden's "Britannia" published in 1772, afterwards reprinted in the collected edition of his works.<ref>The Works of T. Wilson, D.D., Lord Bishop of Sodor and Man, compiled by the Rev. C. Cruttwell, to which is added his History of the Isle of Man. Bath, 1781.</ref> He mentions that in the Curragh where bogs had been drained and brought under husbandry, very large trees of oak and fir were found, "not promiscuously, but, where there is plenty of one sort, there are generally few or none of the other"; also that the limestone rocks (Carboniferous Limestone) "especially about Bally-lool, are full of petrified shells of different kinds, and such as are not now to be found on these coasts". The red freestone (Peel Sandstone) around Peel, and the blue slate, which at Spanish Head was wrought in long beams of tough stone 12 to 15 feet long and "strong enough to bear the weight of the highest stack of chimnies", are also described; and in referring to the mines of lead, copper and iron, he notes also that no coal was found, though several attempts had been made to discover it. Some items of similar information may likewise be found in Townley's book,<ref>A Journal kept in the Isle of Man, with observations on the Soil, Clime and Natural Productions, etc. Whitehaven, 1791.</ref> issued in 1791, and in that of Feltham, in 1798.<ref>A Tour through the Island of Mann, etc, by J. Feltham. Bath, 1798.</ref>

The study of the geology of the Island may he said to have commenced with the publication of Woods' "Account" in 1811,<ref>An Account of the Past and Present state of the Isle of Man, including… . a sketch of its Mineralogy by G. Woods., London, 1811.</ref> though it appears that as early as 1801 William Smith had obtained sufficient information to enable him to construct a rough manuscript map of its rocks.<ref>See Prof. J. W. Judd on "William Smith's Manuscript Maps", in Geol. Mag., dec. iv., vol. iv. (1897), p. 447.</ref> Woods roughly classified and described the strata according to the then prevalent ideas as to "primitive" and 'transition' rocks, and outlined their distribution in a small map which appears to be the earliest published geological map of the Island. In the central massif he recognized greywacke, clay-slate and mica-slate, resting on granite; and in the Carboniferous area transition-limestone and breccia. The sand and "common clay" of the northern plain and the peat of the Curragh were also observed, and attention *was* drawn to the presence of blocks of granite on South Barrule which have been so frequently discussed in the later literature. His description of the state of the mines is full and interesting, and his work, as a first sketch, has considerable value, though its scientific importance was dimmed by the more authoritative publications which followed soon afterwards.

In the following year Mr. T. Quayle published his "General view of the Agriculture of the Isle of Man", which contains much information regarding the rocks and soils of the island, and has for frontispiece a coloured "Map of the Soil", which is really a geological map.<ref>London 1812, 8vo., pub. by G. Jr W. Nicol.</ref>

The next decade constitutes one of the most fruitful periods in the geological annals of the Island, its stratigraphy being independently made the subject of personal investigation by no less than three well-known members of the little band of British students of the new science, viz., Berger, Macculloch and Henslow.

To the student of Manx place-names these early geological treatises, in which the names of localities are phonetically spelt, may be recommended for the information they afford as to the old pronunciation, now in many cases obsolete and forgotten.<ref>E.g. Kreevey (Woods), now Greeba; Borroilva (Berger, now Barrule; Dhooden (Henslow), now Dhoon.</ref>

Berger published the result of his investigations, illustrated by a geological map and sections, in 1814<ref>Mineralogical Account of the Isle of Man, by J. F. Berger, M.D. — Trans. Geol. Soc., vol. ii. (1814), p. 29.</ref> In his classification, under the head of "Primitive Rocks" are placed "Granite" and "Clay-Slate"; under "Transition Rocks" "greywacke" (described as "thick-slaty", as compared with the "thin-slaty" clay-slate) of several varieties; and under "Floetz-Rocks", "limestone", "amygdaloid" (under which term the Carboniferous Volcanic series is indicated), and "Sandstone" (including the Carboniferous Basement Conglomerate of Langness and the Peel Sandstone). The details given in respect to these divisions are of unequal value and tinged with theoretical misconceptions, but are not wholly obsolete and may still be read with profit by the student of the Manx Slates. Besides the "Compound rocks in *situ*", Berger also describes at considerable length the erratic boulders, under the heading of "Compound rocks not in *situ".* His interesting historical notice of the minerals and mines has been largely made use of in preparing Chapter 13 of the present work (see p. 482).

In 1819, Dr. Macculloch included a general account of the Island in the second volume of his great work on the Western Isles,<ref>A Description of the Western Islands of Scotland, including the Isle of Man, etc., by John Macculloch, M.D., 3 vols., London, 1819.</ref> and appended a geological sketch-map and some plates of sections. His description of the physical characteristics of the area is admirable. He recognised that the greywacke and clay-slate formed one series, and comments frequently on the difficulty in distinguishing between the "fissile tendency" (cleavage) and the true bedding in these rocks. His outline of the stratigraphy corresponds in the main with that of Berger, but is fuller and better proportioned, and is illumined by many comparisons with the geology of Western Scotland.

In 1821, Prof. Henslow made a notable addition to the subject in a paper purporting to supplement and criticise that of Dr. Berger,<ref>Supplementary Observations to Dr. Berger's Account of the Isle of Man, by J. S. Henslow —Trans. Geol. Soc., vol. v. (1821), p. 482.</ref> illustrated by sections and by a map which showed many improvements over its predecessors. This memoir is more purely geological than the previous contributions, the mines and minerals being scarcely mentioned, while the strati-graphy is described with a wealth of local detail which bears testimony to the careful character of the investigation. The two chief granitic areas of Foxdale and the Dhoon were for the first time accurately delineated, and the associated elvan dykes identified; the presence of "trap-tuff" as well as amygdaloid in the vicinity of Scarlet was demonstrated, and the relation of this material to the limestone discussed; the granitic blocks on South Barrule were recognised as having been transported, and the "diluvial matter" of the north more clearly defined; and the occurrence of remains of the Irish Elk in a fresh-water deposit at Ballaugh was described. In fact, after Henslow's labours we may regard the main outlines of the geology of the Island as having been established upon an accurate basis, which has served for all the superstructure of detail raised by subsequent investigations.

A rather acrimonious correspondence between Berger and Henslow followed the publication of this paper, the references to which will be found in the Bibliographical Appendix (p. 588).

With the exception of some short notes relative to the discovery at Ballaugh of the fine skeleton of Irish Elk now preserved in the Edinburgh Museum, between 1821 and 1825, and brief papers on the shells of the Glacial deposits in 1841 by Edward. Forbes (who was a Manxman by birth), and in 1843 by H. E. Strickland, no noteworthy addition was made to the literature until 1846, when the Rev. J. G. Cumming began to publish the results of his observations.

Cumming was for some years the Vice-Principal of King William's College, at Castletown; and he made excellent use of the opportunities afforded him for acquainting himself with the detailed geology of the complicated Carboniferous basin of that district. It is only after a close survey of this area that one can appreciate to the full the acumen and thoroughness which distinguish all the work of this investigator. But while the Carboniferous rocks of the South and the drifts of the Island generally were the chief objects of his attention, his observations in every division of its stratigraphy were careful and valuable. His papers published in the Quarterly Journal of the Geological Society for 1846 and 1847<ref>"On the Geology of the Isle of Man. Pt. I. The Palaeozoic Rocks of the Island".—Quart. Journ. Geol Soc., vol. ii., pp. 317–335. "Part II. The Tertiary Formations".—Ibid., pp. 335–348. "On the Geology of the Calf of Man". Ibid., vol. iii., p. 179.</ref>

were accompanied by more detailed geological maps and sections than had hitherto been attempted, and in 1848 he issued a descriptive work on the Island,<ref>"The Isle of Man; Its History, Physical, Ecclesiastical, Civil and Legendary". 8vo. London. 1848.</ref> in which its geological features received full treatment. Later papers of less consequence came from his pen in 1854 and 1855 (see Appendix 1v.,p. 589); and in 1861, after his official connection with the Island was severed, he wrote an excellent guide-book for a London publisher,<ref>"A Guide to the Isle of Man", etc., etc. Stanford, London. 1861.</ref> which contains his latest summary of Manx geology.

Cumming seems to have been the first writer to apply modern stratigraphical terms to the rocks which we now call the Manx Slates. These in his first book he referred, with some hesitation, to the Lower Silurian as then understood, while in his latest work he defined them as "rocks which it may be convenient at present to include under the general term Cambro-Silurian,intending thereby all the rocks under the Upper Silurian of Sir Roderick I. Murchison".<ref>Stanford's Guide, ed. 1861, p. 158.</ref> The Peel Sandstone and the Conglomerate resting unconformably on the slates at Langness he classified as Old Red Sandstone, but noted that at the latter locality the conglomerate "passes by a regular, gradation into, and appears as a lower member of, the Carboniferous Series"<ref>Stanford's Guide: ed 1861, p. 160.</ref>, and he considered that the same conditions would be found at Peel if the higher strata had been preserved. The Carboniferous Limestone Series he divided into Lower Carboniferous Limestone or Castletown Limestone; Upper Carboniferous Limestone or Poolvash Limestone, belonging to the Yoredale, Series; and Posidonia Schist or Poolvash Black Marble, with the upper part of which he associated the Contemporaneous Volcanic Rocks of Scarlet. These divisions he substantiated by palaeontological lists, based on his extensive collection of the fossils,<ref>This collection is still contained in the Library of King William's College, Castletown, but unfortunately is now in poor condition (me p. 251).</ref> and so far as this branch of the subject is concerned there has not since been much advancement made upon his results.

In respect to the Drift deposits, his statement of their leading characters was full and particular, and he recognised, apparently for the first time, their Glacial origin.<ref>Quart. Journ. Geol. Soc. vol. ii. (1846), p. 340.</ref> Though, attributing more to the action of floating ice than would now be generally acknowledged, his theoretical conclusions in these matters were in advance of most of his contemporaries and of some of his successors. Thus he remarked (*op. cit.*, p. 341): "There appears no necessity for supposing any extraordinary rush of water or more powerful waves or currents than there are at present, but simply a difference of climate". He paid especial attention to the distribution of the boulders of the Foxdale Granite on South Barrule at higher levels than their source, being at first inclined to consider their transportation as evidence for "the agency of some great cataclysm",<ref>"Isle of Man", p. 178.</ref> but finally accepting the explanation offered by Charles Darwin,<ref>Journ. Geol. Jour. Soc., vol. iv., pp. 315–323.</ref> with whom he had been in communication on the subject, that they were lifted by the action of shore-ice on a sinking land.<ref>Stanford's Guide, p. 168.</ref>

In Cumming the study of Manx geology on modern lines had an adequate commencement, but for many years afterwards made made very little further progress. A few Manx Carboniferous fossils were described in the monographs of McCoy, Milne-Edwards and Haime, Davidson and others (see Appendix, pp. 589–91); some general sketches based on, and inferior to, Cumming's, were published in scattered guide-books and periodicals; and between 1862 and 1865 there was some discussion of certain markings in the Slates, supposed to be fossil foot-prints, but in reality the hollows left by decayed nodules (see p. 92). About this time the geology of the Island began to attract the attention of Lancashire geologists who spent vacations there, and published occasional papers on the subject in the Transactions of the scientific societies of Manchester and Liverpool. The earliest of these seems to have been a communication in 1864 to the Manchester Geological Society on the Slate Series,<ref>"The Cambrian Strata of the Isle of Man", by J. [E.] Taylor.—Trans. Manchester Geol. Soc., vol. iv., pp. 70–107.</ref> by J. [E.] Taylor, who claimed that these rocks were probably of Cambrian age.

In 1866 the Slate-rocks were investigated by Harkness and Nicholson,<ref>On the Lower Silurian Rocks of the Isle of Man", by Prof. R. Harkness and H. A. Nicholson.—Quart. Journ. Geol. Soc., vol. xxii., p. 420.</ref> who correlated them, on somewhat unsatisfactory grounds, with the Skiddaw Slates of the Lake District; and henceforward it has been customary to apply this appellation to the Manx Slates (see p. 115).

The next addition to the literature requiring our attention is a paper by Mr. J. Horne, published in 1874,<ref>"A Sketch of the Geology of the Isle of Man", by J. Horne, of the Geological Survey of Scotland.—Trans. Edinburgh Geol. Soc., vol. ii., pt. (1874), pp. 323–347.</ref> in which the Peel Sandstone and Langness Conglomerate were compared with the Calciferous Sandstone Series of Scotland, the Volcanic rocks of Scarlet and Poolvash were carefully described, and the Glacial Drifts were for the first time discussed on the land-ice hypothesis.

The renewed interest in Glacial subjects excited about this time by the works of J. Croll and James Geikie was also reflected in seculative papers on the Manx phenomena by J. A. Birds and (Sir) H. H. Howorth, and in a discussion arising therefrom in which J. Horne, G. H. Morton, and A. Strahan participated (see Appendix, p. 590).

In 1877 E. W. Binney described and figured certain obscure worm-markings from the Manx Slates.<ref>"A Notice of Some Organic Remains from the Schists of the Isle of Man", by E. W. Binney.—Proc. Lit. and Phil. Soc., Manchester, voL xvi., p. 8.</ref> Some valuable observations on the same rocks were published in 1880 by the Rev. J. Clifton Ward,<ref>"Notes on the Geology of the Isle of Man", by J. Clifton Ward.—Geol. Mag. (1880), dec. ii., vol. vii., pp. 1–9.</ref> who visited the Island for the purpose of comparing them with the Skiddaw Slates of the Lake District which he had recently surveyed. His examination disproved the supposition of Harkness and Nicholson that the Borrowdale Volcanic Ashes were represented among the flags of the eastern coast-line, but was on the whole favourable to the general correlation of the Manx Series with the Skiddaw Slates. In the same paper he gave an instructive account of the Carboniferous Volcanic Series, in which he recognised the effects of submarine volcanic action; and concluded with a general summary of the Drift phenomena.

A useful list of Manx Minerals by Sir Warington W. Smyth was issued by the Isle of Man Natural History and Antiquarian Society in 1888.

In the same year there appeared the first of a series of contributions to the literature by Prof. W. Boyd Dawkins.<ref>"On the clay-slates and phyllites of the South of the Isle of Man and a section of the Foxdale Mine", by Prof. W. Boyd Dawkins. — Trans. Manchester Geol. Soc., vol. xx. p. 53.</ref> In this paper stress was laid upon the mineral alteration and mechanical deformation which the slates had undergone; and the quartzites interbedded with them were recognised as the source of the pebbles in the Langness Conglomerate. A second paper of the series, published in the following year, gave the result of the detailed investigation of these Carboniferous Conglomerates.<ref>On the Geology of the Isle of Man. Pt. I. On the Conglomerates of the south of the Island. Vannin Lioar (Journ. I. of Man Nat. Hist. and Antiq. Soc., vol. i., pt. i., p. 16).</ref>

At this date commenced the periodical issue of the Journal of the Isle of Man Natural History and Antiquarian Society,<ref>Under the title of Vannin Lioar, afterwards altered to Yn Lioar Ntanninagh.</ref> in the pages of which, during ensuing years, many original geological observations concemuag the area have been recorded (*see* Appendix iv., pp. 591–595). The Manx Geological Society, established in 1888, though not issuing regular Proceedings has also from time to time added items of interest through the medium of the local newspapers.

In 1889 Messrs. Dickson and Holland published chemical 'analyses of some Manx igneous rocks (*see* Appendix ii., p. 575).

In 1891 Mr. B. Hobson, in furtherance of the investigations of Prof. Boyd Dawkins, contributed an important paper on the Carboniferous Volcanic and other igneous rocks of the south of the Island, in which for the first time the resources of modern petrography were brought to bear upon the subject.<ref>On the Igneous Rocks of the South of the Isle of Man, by B. Hobson. — Quart. Journ. Geol. Soc., vol. xlvii., p. 432–450 (Reprinted, with additions and corrections, in Yn Lioar Manninagh, vol. i., no. 10, pp. 337–348, April, 1892.)</ref>

Mr. H. Bolton who at the suggestion of Prof. Boyd Dawkins had made a careful search for fossils in the Slate-rocks, recorded<ref>On a Trilobite from the Skiddaw Slate of the Isle of Man, by H. Bolton. —Geol. Mag., dec. iii., vol. x. (1893), p. 29.</ref> in 1893 the finding of the cast of a trilobite in these strata near Ramsey, and afterwards added the further discovery of *Dietyanema* in an old quarry near Sulby.<ref>Observations on the Skiddaw Slates of the North of the Isle of Man, by H. Bolton .—Rep. British Assoc., Nottingham, 1893, p. 770.</ref> More recently Mr. Bolton has dealt with the

palaeontology of the Slates as a whole,<ref>The Palaeontology of the Manx Slates. — Manchester Memoirs, vol. xliii. (pp. 1–15, pl. 1.).</ref> and has brought together all the existing information on this difficult subiect. A considerable portion of this paper has been reprinted on la"ter pages of the present work (pp. 90 94).

The most noteworthy contribution to the Glacial literature of the Island since that of Cumming was made by Mr. P. F. Kendall in the pages of Yn Lioar Manninagh in 1894,<ref>On the Glacial Geology of the Isle of Man, by P. F. Kendall. — ye Lioar Manninagh, vol. i. pt. 12 (1894), p. 397.</ref> a brief outline of the author's results having been previously given before the British Association in 1890, and again in Wright's "Man and the Glacial Period "<ref>International Scientific Series.</ref> in 1892. Mr. Kendall made an exhaustive study of the palaeontology of the drifts, and the conclusions stated in the final page of his paper were that in spite of the presence of mariner shells in places, marine action played no part in the history of the Isle of Man during the Glacial Period, and that "the glaciation was effected by moving land-ice which overtopped its highest mountain". These results the work of the Survey has confirmed.

Discoveries of great consequence, not only to Manx Geology but to that of the whale of the northern part of the Irish Sea basin, were the outcome of deep borings in search of coal at the northern extremity of the Island begun in 1891 by Messrs. Craine Bros. of Liverpool.

The possibility of the extension of the Whitehaven Coalfield beneath the sea to this part of the Island had long before been discussed by Cumming and other writers (*see* p. 280); and a systematic attempt was now commenced to decide this question. At the time of writing this work is still in progress, and though the main object of the enterprise has not been attained, the presence of Triassic (including Saliferous Marls), Permian, and Lower Carboniferous strata has been demonstrated, the rock-floor being reached beneath the drifts at depths varying from 160 to about 400 feet below sea-level.

The results obtained from the three earlier of these borings were made public by Prof. W. Boyd Dawkins in 1894<ref>On the Geology of the Isle of Man. Pt. I. The Permian, Carboniferous, and Triassic Rocks, and the New Saltfield of the North, by Prof. W. Boyd Dawkins. — Trans. Manchester Geol. Soc., vol. xxii., pt. xxi., p. 590.</ref> and 1895,<ref>On the Geology of the Isle of Man. Part II. by Prof. W. Boyd Dawkins. — Trans. Manchester Geol. Soc., vol. xxiii., part vi. p. 147.</ref> and the details of a fourth were given by Mr. John Todd, the resident engineer, in a paper published in 1896<ref>On the Geology of the Isle of Man, by Prof. W. Boyd Dawkins — Rep. British Assoc. Liverpool, 1896, pp. 776–779.</ref>. An account of these and two later borings will be found in Chapter 7 of the present volume.

In the first of the above-mentioned papers Prof. Dawkins furthermore discussed the Peel Sandstones, attempting to show that instead of being either Upper Devonian or Lower Carboniferous as usually hitherto held, they were of Permian age. This view was again stated by the same author in a short general sketch of Manx geology published in 1896.[5]

In 1895 some curious effects of earth-movement upon the Slate Series, by which large tracts have been reduced to the condition of "Crush-conglomerate", were described by the present writer and Mr. (Prof.) W. W. Watts.<ref>The Crush-Conglomerates of the Isle of Man, by G. W. Lamplugh and W. W. Watts. — Quart. Journ. Geol. Soc., vol. xli. (1895), pp. 563–597.</ref> In the following year a brief "Outline of Manx Geology" was contributed by the writer to the Handbook for the Liverpool Meeting of the British Association.

At the above-mentioned meeting a monetary grant was made to enable a Committee, with local assistance, to examine the conditions under which remains of the Irish Elk are found in the Isle of Man", and excavations were undertaken under the superintendence of Mr. P. M. C. Kermode, which have yielded instructive evidence as to the succession of animal and plant life since the Glacial Period (*see* p. 384). The discovery of an almost perfect skeleton of the Elk in one of these excavations has been described by Mr. Kermode.<ref>The Irish Elk, Germs giganteus, in the Isle of Man, by P. M. C. Kermode. — Geol. Mag., dec. iv., vol. v. (1898), pp. 116–119; also in other Reports, etc., for which see Appendix, pp. 594–5.</ref>

In his "Ancient Volcanoes of Great Britain"<ref>London Macmillan & Co., 2 vols. (8vo.).</ref> published in 1897, Sir A. Geikie, at that time Director-General of the Survey, gave the result of his examination of the Carboniferous Volcanic Series of Scarlet. This account contains much new information respecting these rocks and their correlation with the

analogous formations of the mainland.

The "Annual Reports" of the Director-General for the years between 1892 and 1897 give the outlines of the more prominent results of the official Survey. A short paper on "Some effects of Earth-movement on the Carboniferous Volcanic rocks of the Isle of Man" was also communicated to the Geological Society in 1899 by the present writer.<ref>Quart.Journ. Geol. Soc., vol. lvi. (1900), pp. 11–25.</ref>