NOTICES OF MEMOIRS

I.—British Association for the Advancement of Science. Forty-first Meeting. Edinburgh, 1871. Papers Read or sent in to be Read in Section C. (Geology.)

President.—Professor Archibald Geikie, F.R.S., F.G.S.

Address by President:—Sketch of the Geology of Edinburgh and Neighbourhood.

J. Thomson, F.G.S.—On the Age of the Stratified Rocks of Isla.

Dr. J. Bryce, F.R.S.E., F.G.S.—Third Report of the Committee on Earthquakes in Scotland.

H. Woodward, F.G.S.—Report on Fossil Crustacea.

Prof. W. C. Williamson, F.R.S.—On the Structure of Dictyoxylon.

G. J. Grieve—On the Position of Organic Remains near Burntisland.

W. Carruthers, F.R.S.—On the Vegetable Contents of Masses of Limestone occurring in Trappean Rocks in Fifeshire, and the conditions under which they are preserved.

W. Pengelly, F.R.S.—Seventh Report on Kent's Cavern Explorations.

Rev. W. S. Symonds, F.G.S.—On the Contents of a Hyæna's Den on the Great Doward, Whitchurch, Ross, Herefordshire.

L. C. Miall—Further Experiments and Remarks on Contortion of Rocks.

Prof. Ed. Hull, F.R.S., and *W. A. Traill*—On the Relative Ages of the Granitic, Plutonic, and Volcanic Rocks of the Mourne Mountains, Down, Ireland.

R. Daintree—On the General Geology of Queensland.

Rev. Dr. Hume—On the Coal-beds of Panama, in reference mainly to their Economic Importance.

T. Moffat, M.D.—On Geological Systems and Endemic Diseases.

Rev. J. F. Blake, M.A., F.G.S.—On the Yorkshire Lias and the Distribution of its Ammonites.

H. Woodward, F.G.S.—Relics of the Carboniferous and other Old Land Surfaces.

James Thomson, F.G.S.—Report on Sections of Fossil Corals.

Sir Richard Griffith, Bart., F.R.S.—On the Boulder Drift and Esker Hills of Ireland; and likewise on the Position and Composition of Erratic Blocks in that Country.

Dr. J. Murie, F.G.S.—On the Systematic Position of *Sivatherium giganteum.*

W. Boyd Dawkins, F.R.S.—On the Relation of the Quaternary Mammalia to the Glacial Period.

Prof. Williamson, F.R.S.—On the Structure of Diploxylon, a Plant of the Carboniferous Rocks.

C. Lapworth and *J. Wilson*—On the Silurian Rocks of Selkirk and Roxburgh.

C. Lapworth—On the Graptolites of Gala Group.

D. J. Brown—On the Silurian Rocks of the South of Scotland.

D. J. Brown—On the Upper Silurian Rocks of the Pentland Hills and Lesmahago.

John Henderson—On the Age of the Felstones, Conglomerates, and Sandstones of the Pentland Hills.

Prof. Dr. P. M. Duncan, F.R.S., F.G.S.—Report on the British Fossil Corals.

Prof. Archibald Geikie, F.R.S., F.G.S.—On the Progress of the Geological Survey of Scotland.

John Miller, F.G.S.—On the so-called Hyoid Plate of the Asterolepis.

P. W. Stuart Menteath—On the Origin of Volcanoes.

Prof. Harkness, F.R.S.—To exhibit one of the earliest forms of Trilobites.

H. Woodward, F.G.S.—On a new Arachnid from the Coal-measures of the Dudley Coal-field.

Dr. Bryce, F.R.S.E.—Note on certain Fossils from the Durine Limestone, N.-W. Sutherland.

Rev. W. S. Symonds, F.G.S.—To exhibit a new Onchus Spine from the Lower Old Red Sandstone of Hay, Breconshire.

Professor Traquair—Additions to the Fossil Vertebrate Fauna of Burdiehouse, near Edinburgh.

C. W. Peach.—Additions to the List of Fossils and Localities of the Carboniferous Formation in and around Edinburgh.

D. Grieve—Fossiliferous Strata at Lochend, near Edinburgh.

W. Milne Home—Notice of a Scheme for the Conservation of Remarkable Boulders in Scotland, and for the Indication of their Position on Maps.

Rev. J. Gunn, F.G.S.—On the Agency of the Alternate Elevation and Subsidence of the Land in the formation of Boulder-clay and Glaciers, and the Excavation of Valleys and Bays.

J. E. Taylor—On the Later Crag Deposits of Norfolk and Suffolk.

L'Abbé Richard—On Hydrogeology (in French).

W. S. Mitchell, M.A., F.G.S.—Leaf-beds of the Lower Bagshot Series.

R. H. Scott, M.A., F.R.S.—Mesozoic Deposits of Ombiak, North Greenland.

Robert Brown, Ph.D.—On the Geology of the Noursoak Peninsula and Disco Island in North Greenland.

W. S. Mitchell, M.A., F.G.S.—Some further remarks on the Denudation of the Bath Oolite.

J. Curry—On the general condition of the Glacial Epoch, with suggestions on the Formation of Lake Basins.

G. Busk, F.R.S.—Report on the Fossil Elephants of Malta.

*** The following Papers were announced, but not read in Section C.:

D. J. Brown—Notice of a small Glacial Moraine in the Pentland Hills.

G. A. Lebour, F.G.S.—On the value of Palæontological evidence in correlating distant (so-called) Contemporaneous Deposits.

G. Maw, F.G.S.—On the Geological Structure of the Atlas Mountains.

H. P. King—Remarks on Silver Islet, Lake Superior.

G. A. Lebour, F.G.S.—On the Age of the Coal-bearing Rocks of Chili.

T. L. Phipson—On the Gold Ore of Nova Scotia.

II.—On the Relative Ages of the Granitic, Plutonic, and Volcanic Rocks of the Mourne Mountains and Slieve Croob, Co. Down, Ireland.[1]

By Professor Edward Hull, F.R.S.; and William A. Traill, B.A., of the Geological Survey of Ireland.

After remarking on the bold and interesting physical features of the district, which in some respects resemble those of Arran, and which had already been objects of investigation by Griffith, Berger, and Bryce, the authors observed that there were, as in Arran itself, two varieties of granite. These had been shown by the Rev. Professor Haughton to differ both in composition and origin; the soda granite of Slieve Croob (consisting of quartz, orthoclase, and mica) being of metamorphic origin, and the potash granite of Mourne (consisting of quartz, orthoclase, albite, and mica) being irruptive. The relative and (as far as possible) the actual ages of these granites remained to be determined; and, in the absence of stratified deposits newer than the Lower Silurian in immediate contact with the granite, the authors considered they had approximately determined these points by considerations connected with the basaltic and felstone-porphyry dykes by which the district had, on several occasions, been invaded; the conclusions thus derived being that the granite of Mourne was newer than that of Slieve Croob by a long interval of geological time, and that while the former was probably of Mesozoic, the latter was of Palæozoic age.

This distinction might be otherwise expressed thus: that the metamorphic granite of Slieve Croob was formed out of the Lower Silurian Grits and Slates with which it is associated, while the granite of Mourne was forcibly irrupted amongst the Silurian rocks, which now inclose and surmount it in several places. These differences in manner of formation were clearly shown by the effects of the two granites on the surrounding stratified rocks.

The granite of Mourne at its margin in some places passes into quartziferous porphyry, and sends offshoots of this rock in the form of dykes into the surrounding Silurian strata, as may be very clearly determined by several examples in the vicinity of Newcastle. Hence the authors inferred that the dykes of quartz-porphyry and felstone which traverse the older granite of Slieve Croob might be referred to the age of the newer granite of Mourne.

Trap Dykes.—The trap rocks of the district were classed mineralogically as follows:—

(*a*) Quartz-porphyries and highly silicated felstones; (*b*) Diorites; (*c*) Basalts or Dolerites of two ages.

Considered with reference to relative ages of formation, the following was the order of succession:—

(1.) *Older Basalts and Dolerite Dykes.*—These form by far the most numerous of all the trap rocks of the district, occurring in great numbers along the coast south of Newcastle, and amongst the in-

[1] Communicated to Section C., British Association, Edinburgh, with the sanction of the Director-General of the Geological Survey.

terior of the Mourne mountains, as at Slieve Muck and Pigeon Rock Mountain and others.

Their age with reference to the granite of Mourne was placed beyond question by a large number of examples in which these dykes, after traversing the Silurian rocks, are abruptly terminated at the margin of the granite, evincing a higher antiquity than the granite itself.[1]

These older basalts were found to traverse the Silurian rocks in well-formed dykes within vertical (or nearly vertical) walls, and are generally undistinguishable from those of newer Tertiary age. Sliced specimens showed under the microscope the composition to be augite, triclinic felspar, and titano-ferrite.

(2.) The next in order of age are the quartz porphyries and felstones, which (as already stated) branch off from the main mass of the Mourne granite, and are unquestionably of the same age as the granite itself, and often strongly resemble it in its more compact form.

Dykes of these rocks are also found traversing the older granite of Slieve Croob. They consist of a felspathic base, with crystals of felspar grains and crystals of quartz, and sometimes mica or hornblende as accessories in small quantities.

(3.) The diorite dykes are few in number: the finest example occurring at Rostrevor, where a large dyke traverses the older basalt dykes contained in the Silurian beds. It consists of a crystalline granular aggregate of reddish felspar and hornblende well developed.

(4.) Besides the older basaltic dykes, which are cut off by the granite, there are a few which traverse both the Silurian rocks and the granite of Mourne itself. These are, therefore, newer than those previously described.

In general aspect there is no decided difference between the older and newer basaltic dykes; they have all the external appearance of the Tertiary dykes which abound along the margin of the basaltic plateau of Antrim, and in the west of Scotland; and had it not been for their different relations to the Mourne granite, they might have all been included in the same category.

It might have been supposed that microscopical examination would show some distinction in the basalts of these geological ages, but recent investigations by Zirkel, D. Forbes, Allport, and others, tend to show that there is no criterion of age amongst the constituents of basalt, dolerite, or melaphyre; and the presence of olivine—once supposed to be distinctive of Tertiary basalts—has been detected amongst those even of Carboniferous age.[2] Nor can the bearing of these dykes form any basis of distinction, as in the Mourne district the older basaltic dykes run in all directions; the easterly and westerly dykes, however, appear to cut those bearing North and South.

Age of the older basalts.—The geological age of these older

[1] Sir Richard Griffith has informed one of the authors that he was already aware of this fact, but had not published his observations.

[2] Mr. S. Allport, GEOLOGICAL MAGAZINE, Vol. VI., pp. 115 and 159.

basalts can only be approximately determined. They are newer than the Carboniferous Limestone which they are seen to traverse at Cranfield Point, Carlingford, and elsewhere. Recollecting the abundant evidences of contemporaneous volcanic action which the Carboniferous rocks of Scotland and the North of England and Staffordshire present, the authors are disposed to refer these older basalts to the Carboniferous period; and, having regard to the prodigious number of these dykes traversing the rocks at intervals along the coast from Dundalk Bay to Dundrum Bay, they suggest the former existence of one or more volcanic vents in their vicinity during later Carboniferous times, such as has been inferred to have existed in the vicinity of Carlingford by Dr. Haughton.[1]

Sequence of Granitic, Plutonic, and Volcanic Rocks in the Mourne District.—The following may be regarded as the order of succession of these rocks, with their approximate ages, in the district north of Carlingford Bay, all being more recent than the age of the Caradoc beds of the Silurian epoch; commencing with the oldest we have—

(*a*) Metamorphic Granite of Slieve Croob, Castlewellan and Newry; *Pre-Carboniferous: Post Silurian.*
(*b*) Older Basaltic dykes of Mourne and Carlingford; *Upper Carboniferous.*
(*c*) Diorite dykes; later than the *Carboniferous.*
(*d*) 1. Granite of Mourne, 2. Felstone and Porphyry dykes penetrating the Granite of Slieve Croob and the older Basaltic dykes; *Post Carboniferous.*
(*e*) Newer Basalts of *Miocene Tertiary Age.*

Judging by the comparative scarceness of the newer Tertiary dykes in the district of Mourne, the authors draw the conclusion—that it may be considered as the southern limit of the region affected by the volcanic outburst of the Miocene Period, which have left such grand monuments of active force over the districts of the north-east of Ireland and extending into the Inner Hebrides; while, on the other hand, it was the seat of active volcanic energy during an earlier period, which, in all probability, was identical with the later Carboniferous.

III.—On the Silurian Rocks of the Pentland Hills and Lesmahago.

By D. J. Brown.

THE author showed that in the Pentland Hills both the Wenlock and Ludlow divisions of the Silurian Rocks are represented, and that the Lower Old Red Sandstone formed no part of these beds. Also, that these Pentland beds are not the equivalent of the Lesmahago, but that these latter are a higher portion of the Ludlow series than any found in the Pentland Hills.

IV.—On the Silurian Rocks of the South of Scotland.

By D. J. Brown.

IN this paper the author endeavoured to show that the Silurian rocks of the South of Scotland, as developed in Dumfriesshire

[1] Quart. Journ. Geol. Soc. vol. xii., p. 193.

and Peebleshire, do not all belong to one geological epoch, as has been hitherto supposed, but belong to two different epochs, a lower one represented by the Moffat rocks, well known by their beds of Anthracite shales, and Graptolites, and an upper series of later age, which lies unconformably on the Moffat rocks. These beds have been long known at Wrae and Glencotho, and more recently at Galashiels, through the exertions of Messrs. Lapworth and Wilson.

V.—On the age of the Felstones, Conglomerates, and Sandstones of the Pentland Hills.

By John Henderson.

THE author described two sections through these hills, and showed that the Pentland Felstones cut through, indurate, and inclose angular fragments of rocks belonging to the upper portion of the Lower Carboniferous formation, and that the so-called Old Red Conglomerates contain limestone pebbles inclosing Carboniferous fossils.

REVIEWS.

I.—Introductory Text-book of Meteorology. By Alexander Buchan, M.A., F.R.S.E., etc. 8vo. pp. 212. (Edinburgh and London: Blackwood and Sons.)

THE science of the weather has naturally occupied attention from the earliest times, and in the form of proverbs the leading facts and inferences of Meteorology have, longer than those of any other science, been familiar to the people. But not until the invention of meteorological instruments in the seventeenth century could it be said to rank as a science, since which it has made such rapid advances that it has tended as much as any other science to the benefit of mankind. That its study has been much neglected, and does not form a subject of general education, may in some measure be due to the want of a concise hand-book, wherein the facts and principles of Meteorology are stated in a simple and connected form. If this be so, the little volume before us will, we think, remove the impediment; it furnishes an excellent class-book to the student, while at the same time the general reader will find in it as much information as he would desire, and this in an attractive style. The author describes the various meteorological instruments, and points out the methods of using them. The work is illustrated with numerous woodcuts, and with eight charts, showing the mean pressure of the atmosphere, the prevailing winds, the mean temperature of the earth at different periods, etc.

A study of Meteorology is of great importance to the geologist, in the explanations it gives of the climates of different regions, for the causes which originate changes in them, and the influence they would have in modifying the different forms of life, are questions of the highest interest.