by a small fault—similar yellowish limestone is seen, and passes downwards into a shelly development. *Terebratula simplex* (but only the pedicle valves) is abundant. The shelly rock is best exposed in the west side of the southern or disused portion of the quarry, and contains *Terebratula simplex, Ter. plicata, Rhynchonella subangulata, Rhyn. oolitica, Zeilleria circularis, Pygaster semisulcatus* ?, *Diastopora, Spiropora straminea*, etc., and ossicles of *Pentacrinus.* About 2 feet of hard yellowish-white oolitic limestone is visible below the Pea-grit, which latter attains a thickness of about 14 feet. On the south side of the fault the shelly strata of the Pea-grit are inclined at a high angle and rest upon a massive deposit of yellowish-white oolitic limestone, thickly bedded in its upper portion but becoming flaggy below. This Lower Limestone is about 34½ feet thick. The whitish flaggy development is seen capping the promontory on the opposite side of the quarry, and passes downwards into brown arenaceous strata, very ferruginous in places, and becoming more compact towards the base. This arenaceous rock—also containing fragments of sea-urchins abundantly—is exposed for a thickness of 13 feet. To the floor of the quarry is about 7 feet, and to the water-retaining stratum from this point, as proved in an old well, is about 8 feet. Thus, from the top of the arenaceous strata to the water-retaining bed is about 28 feet.

From evidence obtained in an old pit about 200 yards north-west of Kemerton Castle the thickness of this deposit, which contains a few *Rhynchonella cynocephala, Ter. euides*, and Belemnites, was estimated at 33 feet. In many quarries on the hill it may be noticed that the thickness of the Lower Freestone is very considerable.

Summarized, our knowledge of the Inferior Oolite at this locality is as follows :—

(1) Lower Freestone. Whitish oolitic freestone.

(2) Pea-grit equivalent. Compact yellowish limestone containing fragments of Echinoderms and a few of the characteristic Brachiopoda. 14 feet.

(3) Lower Limestone. Massive bedded yellowish-white oolitic limestone. 34½ feet.

(4) *Scissi* beds. Brown ferruginous, sandy strata containing *Ter. euides, Rhyn. cynocephala*, and a few Belemnites. 33 feet.

NOTICES OF MEMOIRS, ETC.

I.—Earthquake Investigations.[1] By Professor John Milne, F.R.S., F.G.S. (Reporter).

At the present time this Committee enjoys the co-operation of 38 similarly equipped observing stations, which are distributed in a fairly even manner over the different continents. All large earthquakes are recorded at each of these stations. At Professor Milne's station in the Isle of Wight the number of records obtained during the year is about 150. A map accompanying the Report shows

[1] Report of Committee read before Section A (Mathematical and Physical Science), British Association, Belfast Meeting, September, 1902.

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the origins from which these world-shaking disturbances have originated. Nearly all of these, fortunately for humanity, are suboceanic and remote from thickly populated shores. From the sea-waves they sometimes create, the increase in oceanic depths found to have taken place after their occurrence, and the subsidences or upheavals of neighbouring shore-lines, the inference is that their cause is a caving in of some ill-supported portion of the earth's crust; a furrow on the face of the world has been deepened, whilst a bounding ridge may have been elevated. When these stupendous changes have taken place near to a volcano which has long been dormant, the violent shakings of its foundations have resulted in the imprisoned vapours suddenly bursting into activity. An activity of this description was apparently the immediate cause of the recent disasters in the West Indies; in fact, all the recorded eruptions in these islands have been preceded by sudden adjustments in neighbouring rocky folds.

Another section of the Report treats of the nature of the waves which so frequently pass through our earth and sweep its surface. Although this, like other sections, is of interest from a purely scientific standpoint, we observe that many of the investigations, as for example those bearing upon the choice of a site for an observatory, localizing districts where it would be unwise to lay a cable, have practical bearings of considerable importance.

With a desire to extend seismological investigations on the lines inaugurated by the British Association, we learn that the German Government had approached other nationalities inviting international co-operation. The Report before us indicates that co-operation of this nature is to a great extent *un fait accompli.*

II.—Note on the Occurrence of Bagshot Beds at Combe Pyne, near Lyme Regis.[1] By Horace B. Woodward, F.R.S.

In the Summary of Progress of the Geological Survey for 1900, p. 122, Mr. Clement Reid remarked, "It is probable that a chain of outliers of the Bagshot river-gravels will connect the Eocene of Dorset with that of Bovey Tracey in Devon."

The cuttings on the new railway between Axminster and Lyme Regis have since displayed, in the neighbourhood of Combe Pyne Hill, at an elevation of about 400 feet, beds of fine white sand, white pipeclay, and white, red, and mottled stony clays, with much rough flint and chert gravel. These beds have in places a marked inclination towards the east, due probably to original deposition, and in all respects they bear a close resemblance to the white and coloured clays and sands, and the coarse gravels, which border the Bovey basin at Wolborough and other places near Newton Abbot. They rest on a platform of Upper Greensand.

The beds at Wolborough I some years ago regarded as equivalent to the 'plateau drifts' of Haldon, but Mr. Reid has recently brought

[1] Abstract of a paper read at the British Association, Belfast, September, 1902, in Section C (Geology). Communicated by permission of the Director of the Geological Survey.

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forward evidence to show that both are for the most part of Bagshot age, with the exception only of the deposits that have been rearranged in later times. There is, therefore, good reason for referring to the Bagshot series the beds at Combe Pyne, which are evidently *in situ*, and which possess so many of the features characteristic of that formation.[1]

III.—The Geology of the Country in the Neighbourhood of Belfast.[2] By Professor Grenville A. J. Cole, F.G.S.

BELFAST stands between the lava-plateaux of Cainozoic age in Antrim and the undulating surface of Silurian rocks in county Down. The special interest of the district lies in the preservation of Mesozoic rocks, which elsewhere are scarcely represented in Ireland. Schists and gneisses in the north-east of county Antrim possibly represent Archæan masses refolded during the Caledonian earth-movements. The Caledonian folds gave us the crumpled country of Down, and admitted the granite of Newry and Castlewellan along an axis running north-east and south-west. Both Ordovician and 'Upper Silurian' (or Gotlandian) strata are represented in this area. The conglomerate of Cushendun is probably of Old Red Sandstone age; but the Carboniferous Limestone, which is so marked a feature of Ireland as a whole, plays only a small part in the north-eastern counties. The Carboniferous strata of Ballycastle, west of Fair Head, are mainly sandstones with intercalated coal-seams, on the same horizon as the Calciferous Sandstone of the South of Scotland.

A patch of marine Permian strata occurs east of Belfast, at Holywood; and the British type of Trias, red rocks with salt and gypsum, is well represented under the basalt capping that has preserved it. The Rhætic sea spread into this area, and terminated far west against the Londonderry highlands; the Lias also began to form, and is now finely exposed at Waterloo, close to Larne. It is questionable if higher Jurassic beds than those now left to us were ever laid down in this region; elevation and denudation certainly set in early, and the country remained dry land until the middle of Cretaceous times. Then, in the westernmost extension of the great Chalk sea, the sands, conglomerates, and white limestone of Antrim were deposited, representing the Upper Cretaceous of England in a thickness of about 100 feet. The cliffs of hardened chalk, between red basement-beds of Trias and the black basalt scarp above, form, in Glenariff and Murlough Bay, one of the most beautiful contrasts in our Islands. It is clear that in early Eocene times both the counties of Antrim and Down were covered with a rolling series of Chalk uplands, resembling on a less massive scale our present Salisbury Plain. This quiet and newly upheaved country was destined to be devastated by volcanic action, more continuous and extensive than had been seen in the British Isles since Old Red Sandstone times.

[1] Particulars of the sections are given in the Summary of Progress of the Geological Survey for 1901, pp. 53–59.

[2] Read before the British Association, Belfast, Sept. 1902, in Section C (Geology)

The ground was first broken by rifts running from south-east to north-west, and these were quickly filled by basic lavas. Flow after flow emerged across the country, filling up the hollows carved by denudation, and forming in time continuous plateaux. Although a few explosive vents were established here and there, fluid basalt was the great feature of these eruptions. A time of quiet followed, when the lake-deposits and iron-ores of Glenarm, Ballypalady, etc., were accumulated; and sporadic outbreaks of rhyolite appeared, the most prominent being that of Tardree Mountain. Then the basic eruptions were renewed, and the columnar basalts of the Causeway coast belong to this second epoch of activity.

Mr. Starkie Gardner has referred these volcanic masses of Northern Ireland to early Eocene times, from a study of the plant-remains in the associated lake-deposits. Hence we find the marine Cretaceous beds followed by a terrestrial and igneous Eocene; and possibly some of the latest vents were active in Oligocene times. Thenceforward we know nothing of Irish geological history until the Glacial Epoch, which has left such piles of Boulder-clay and gravel across the country. The latest feature of interest is the blue marine clay of Belfast and Magheramorne, full of exquisitely preserved post-Pliocene fossils. This lies unconformably on the glacial drift, and represents a comparatively recent submergence and re-elevation. The raised beach of Larne, with flint-chips in it prepared by man, indicates the modern date of the movements of elevation.

When we go south from the immediate neighbourhood of Belfast, the Mourne Mountains rise conspicuously, their summits being far more bold than those of the adjacent Caledonian granite ridge. They are also formed of granite, which cuts across basic masses; the latter are seen at Carlingford to be at any rate post-Carboniferous. In turn, a few basic dykes of still later date traverse the granite. By its relation to these two basaltic series, and its petrographic identity with the Cainozoic granites of Mull and Skye, we need not hesitate to regard the Mourne granite as of Eocene age. It forms, then, as Mr. McHenry has pointed out, an interesting deep-seated mass for comparison with the rhyolitic lavas of the inter-basaltic epoch in county Antrim.

From the above notes, which have no claim to originality, it will perhaps be seen how attractive the Belfast area is to geologists, by reason of its very contrast with the accepted types of Jurassic, Cretaceous, and Cainozoic deposits, as known to us in the London Basin. Those familiar, on the other hand, with the geology of the Scottish Isles, will find many interesting points of similarity.

IV.—The Post-Glacial Deposits of the Belfast District.

By R. Lloyd Praeger.[1]

THE silted-up head of Belfast Lough and other similar places in the district display a remarkably fine series of deposits extending from the close of the Glacial epoch to the present day, with a rich

[1] Abstract of a paper read before the British Association, Belfast, September, 1902, in Section C (Geology).

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fauna, from which much of the history of the intervening period may be gleaned. A typical section at Belfast shows the following sequence:—

		ft.	in.
Surface clays	...	6	6
Yellow sand	...	2	0
Blue clay	Upper ...	6	0
	Lower ...	6	0
Grey sand	...	2	0
Peat	...	1	6
Grey sand	...	2	0
Red sand	...	4	0
Boulder-clay (base not reached)	...	15	0
		45	0

The peat bed, which at Belfast is twenty feet below low-water level, reappears between tides at various other places in the district. It represents an old land-surface, and its fossils include the 'Irish Elk.' The blue clay is the most important bed of the series. Two divisions can be clearly distinguished in it, the lower clay being littoral, and characterised by such shells as *Scrobicularia piperata*, the upper yielding an abundant fauna pertaining to five to ten fathoms of water. *Thracia convexa* is a characteristic fossil. In both clays some of the bivalves occur in beds, each shell in its natural position, and many of the species attain remarkably large proportions. In places the *Scrobicularia* clay is overlaid by raised beaches. Thus, at Larne, twenty feet of stratified gravels, containing marine shells and neolithic implements throughout, replace the *Thracia* clay, and serve to date it. The fauna of the *Thracia* clay has a distinctly southern aspect when compared with the present fauna.

As regards oscillations of level, the peat proves a level higher than the present in certain places by at least thirty feet. Subsidence, irregular both as regards rate and area affected, superseded to the extent of fifty to eighty feet; the final elevation, which brought about the existing state of things, amounted to thirty or forty feet.

As regards climate, the northern fauna of the Glacial period appears to have passed away by the time the peat was formed. Southern species immigrated till the molluscan fauna acquired a distinctly southern character in the upper blue clay; then the seas became again colder, and the present local molluscan fauna has a distinctly northern aspect.

V.—On the Marine Fauna of the Boulder-Clay.

By Joseph Wright, F.G.S.[1]

The author has examined microscopically 112 samples of boulder-clay from various places in the British Isles and in Canada 47 of these were from Ireland, 27 from England and Wales, 22 from Scotland, 1 from the Isle of Man, and 14 from Canada. In 71 of the British and in 9 of the Canadian samples foraminifera were found; the specimens of the clays had been taken from various

[1] Abstract of a paper read before the British Association, Belfast, September, 1902 in Section C (Geology).

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altitudes, some few of them from localities over 1,000 feet above the sea. Almost all the forms found are referable to species which at present live at moderate depths off our coast, and most of them have the fresh appearance of these species. ***Nonionina depressula*** is often met with in great profusion, fully one half of the entire specimens found being referable to this species. One hundred and thirteen species have been found in the clays of Ireland, 72 in those of the Isle of Man, 65 in England and Wales, 40 in Scotland, and 15 in Canada.

In 31 of the gatherings no foraminifera were met with, whilst in some of the others they were very rare. The absence or the scarcity of specimens in some of the samples may be due, in part at least, to the circumstances that it was only the first floatings from the clays that were examined, and also that these minute organisms are liable at times to be overlooked when the material is being examined. To ascertain how far floatings could be relied on for giving conclusive results, 1 oz. troy of the boulder-clay from Woodburn, near Carrickfergus, was examined with the utmost care. The first floating was found to contain 1,400 specimens, the floating process being repeated 25 times before specimens ceased to come up; upwards of 600 additional specimens were thus obtained. What remained of the clay was then examined in detail with the microscope, and 67 more specimens were got from it.

In the boulder-clay at Knock Glen, near Belfast, 79 species were obtained, many of them being very rare forms, 6 being only known as recent British species from collections on the west coast of Ireland, 2 of these also occurring off the west coast of Scotland. The presence of these microzoa would lead us to infer that the clay at this place was probably deposited in deep water, when the land stood at a much lower level than at present, and when the marine conditions must have been somewhat similar to what now prevails off the west coast of Ireland.

VI.—The Fossil Flora of the Cumberland Coalfield.[1] By E. A. Newell Arber, M.A., F.G.S.

THE Cumberland Coalfield lies along the coastline to the west of the mountains of the Lake District. The towns of Whitehaven, Workington, and Maryport are three of the most important centres of the coal industry in Cumberland. In this district the Upper Carboniferous rocks consist of two series, of which the upper is the well-known 'Whitehaven Sandstone.' This is essentially an arenaceous deposit, and is often red or purple in colour. It is generally believed to lie unconformably on the 'Coal-measures' below, the latter consisting of argillaceous and carbonaceous material, and containing almost all the workable coals.

The horizons of both the 'Whitehaven Sandstone' and the 'Coal-measures' in the Carboniferous are disputed questions.

[1] Abstract of a paper read at the British Association, Belfast, September, 1902, in Section C (Geology).

Recently some attempt has been made to throw fresh light on the subject, from the evidence of the plant-remains which occur in both series, although not so abundantly as in some other coalfields. A full account of the floras, and the conclusions which have been attained, will, it is hoped, be published shortly elsewhere.

VII.—A Summary of the Principal Changes in South-East England during Pliocene and more Recent Times.[1] By Horace Woollaston Monckton, F.L.S., F.G.S.

(*a*) *Period of depression in South-East England.*

1. Deposition of the bed from which the Box Stones came.

2. The Lenham Beds. Sea 40 fathoms, extends to Guildford, shells not rolled, level 1,000 feet lower than now (Diestian).

(*b*) *Elevation in South-East England, but depression continues over estuary of Rhine.*

3. Gravel with large flints of Upper Hale, Aldershot, and the Pebble Gravel ('Westleton') of the Chilterns.

4. Coralline Crag, submarine banks in rather shallow water; climate that of South Europe.

5. Red Crag of Walton and Scaldisian of Belgium; sea-shore deposits, climate rather warmer than now.

The beds with *Corbula gibba* (Poederlian) complete Belgian series, and that country becomes dry land.

6. Red Crag of Bentley, Newbourn, Butley, sea-shore deposits. The Amstelian of Holland. Climate colder.

(*c*) *The depression of the estuary of the Rhine extends to South-East England.*

7. Norwich Crag deposited in sea-water of wide estuary. Chillesford Clay, shells not rolled or water-worn, level lower than now.

8. Weybourne Crag and Bure Valley Beds, depression extending and consequent introduction of *Tellina balthica.*

(*d*) *Period of great and extensive elevation.*

9. Cromer Forest Bed, level and climate as now.

10. *Leda myalis* Bed, marine with oyster-beds, shells in position of life. Slight local depression.

11. The Chobham Ridges Gravel and the Plateau Gravels around Reading over 300 feet O.D. come in here.

12. Arctic Fresh-water Bed, flood loam with *Succinea.*

The shells of Bridlington Shell Bed lived about this time.

13. The Cromer Till and Contorted Drift. First great ice-sheet. Lower Boulder-clay of many places, Bridlington Shell Bed, and Shell Bed of Moel Tryfaen, etc. Land higher than now.

(*e*) *Depression possibly only local in South-East England.*

14. The Middle Glacial Sand and Gravel, result from melting ice.

[1] Read before the British Association, Belfast, Sept. 1902, in Section C (Geology).

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(f) Period of renewed great elevation possibly continuous with period (d) in the far north.

15. The Great Chalky Boulder-clay. Ice-sheet extending over large area.

N.B.—At some time during Periods (*d*), (*e*), (*f*), the land in North Europe was raised to some 8,000 feet higher than now, and this is probable date of completion of excavation of Scottish lochs and Norwegian fjords.

(g) Period of depression.

16. *Corbicula fluminalis* Beds of Grays and Crayford. Mammiliferous beds of Sewerby and Hessle. Slight depression.

Marine Gravel of Holderness 100 feet O.D., Brighton, Goodwood, etc., Raised Beaches. Further depression.

(h) Period of elevation over large area. Last great ice-sheet.

17. Plateau Gravel of Norfolk in part, and much of the Thames Terrace-gravel. Purple and Hessle Clay of Yorks.

Shell-banks of Rockall, etc., show elevation of Iceland, Scotland, Norway, to some 600 feet higher than now.

18. Mundesley 'River Bed' near close of this period.

Probably the Raised Beach of Clacton, etc., belongs to a final period of depression (time of Yoldia Clay of Christiania), and in Norway there was a subsequent elevation during which the terraces in the fjords were formed.

VIII.—A British and a Finland Meteorite.

It is of extreme interest to record that a meteorite fell near Crumlin, county Antrim, on Saturday, September 13th, at 10.30 a.m. Although the British Association was holding its meetings ten miles away, no one thought it worth while to investigate what appeared to be a hoax, and it remained for Mr. L. Fletcher to go over about a week later and secure the stone for himself. We quote Mr. Fletcher's own account of this fall, which appeared in the *Globe* newspaper:—

"As for the stone itself, it weighs 9 lb. 5½ oz.; it is 7½ inches long, 6½ inches wide, and 3½ inches thick. Its form is irregular and distinctly fragmental; there are nine or ten faces, each of them slightly concave or convex; the edges are rounded. Five of the faces are similar to each other in character, and except for minute pittings and projecting points, are smooth; they show those large concavities which are common on meteoric stones, and have been likened in shape to 'thumb-marks'; the remaining faces are different in aspect, and have a low ridge-and-furrow development; they are doubtless due to fractures during the passage of the stone through the earth's atmosphere, possibly to the break-up at the moment of detonation. A crack going nearly half-way through the meteorite at a distance of an inch from an outer face was probably caused by impact on the larger stone met with in the soil. The meteorite is virtually completely covered with the characteristic crust which is formed during the passage of such bodies through the air; the crust is in parts black, in parts brown, perhaps owing to the influence of the soil. On the smoother faces already referred to, the crust is thicker than, and different in aspect from, that on the remaining faces. From this it is inferred that the meteorite broke up in the earth's atmosphere at an early part of its course, when the speed was still so enormous that the heat produced by compression of the air in front of the quickly moving stone was sufficient to scorch the newly broken surface, for a fresh fracture of the stone is quite light in colour. In one part the crust is iridescent in purple, blue, and pink colours. Here and there bright particles of a metallic alloy of iron and nickel interrupt the continuity of the dark crust. On one of the smaller surfaces of latest fracture there is visible a section of a large flat nodule of the bronze-coloured protosulphide of iron, troilite, which is a characteristic mineral constituent of meteorites, and is not found as a native terrestrial product. Owing to the presence of particles of nickel-iron dispersed through the stony matter, the meteorite affects the magnetic needle, though not to a great extent. A mould of the meteorite has been made from which models will be prepared; a detailed mineralogical and chemical examination of the material of the stone will be at once begun."

The Bjurböle Meteorite.—Wilhelm Ramsay and L. Borgström contribute to the Bulletin de la Commission géologique de Finlande (No. 12, 1902) a full account of this fall, which occurred on the 12th March, 1899. It smashed through the ice which covered the fjord, and bedded itself in the mud to the depth of six metres. The ice at the point was 40 cm. thick, and fortunately there was only 90 cm. of water, so its recovery was not difficult. It was recovered in several pieces, the total weight of the lot being 328 kilograms. Its chemical composition seems to be of especial interest, but we have not room for further detail, and must refer the reader to the original paper. Bjurböle is about 50 kilometres N.E. of Helsingfors.

IX.—Short Notices.

1. Pliocene Voles.—Dr. Forsyth Major has studied the Voles from the Upper Val d'Arno and the Norwich Crag, and his results are embodied in a valuable note in the Proceedings of the Zoological Society of London, just issued. According to Dr. Major, Mr. Newton's *Microtus intermedius* forms a well-defined group of these animals, not a species, and is raised to the rank of a genus, *Mimomys*. Three species are defined altogether, but the author wisely says, "I am, however, quite convinced that at least double this number of species ought to be recognised, and am only prevented from doing so at present because I do not wish to found species on isolated teeth," remarks which might well be taken to heart by describers of scraps and fragments of bone and other imperfect and indeterminable material.

2. Carboniferous Arachnids. — When studying the Arachnida from the Permian of Bohemia for my work "Fauna der Gaskohle" (says Professor Dr. Anton Fritsch), I came to the conclusion that no

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definite judgement was possible, before the Arachnida figured and described by Corda and Kusta from the Bohemian Carboniferous had been re-examined. Towards the conclusion of the work mentioned above, I took this in hand and prepared a work with many plates and restorations, which work will perhaps appear before the end of the year. I came to the following results, which are here noted since they interest a wide circle.

Cyclophthalmus senior, Corda, has no circle from the lateral to the large middle eyes, but there are merely angular granules on the median keel, as one sees in recent Buthidæ.

The restored figures of the eyes of *Cyclophthalmus*, which Corda gives on p. 37, as well as those of recent *Androctonus*, are fanciful and have no basis in fact.

Such position of the eyes as Corda figures for *Androctonus* exist in no known scorpion, and must have arisen from his mistaking the granules of the median keel for eyes.

Cyclophthalmus has merely two large median eyes, and, anteriorly on each edge, three lateral eyes, as in the recent *Buthus*. I have observed the latter in two species.

The Anthracomarta belong to the Trogulidæ, and it was necessary to settle which of the portions represented in the impressions belongs to the upper and which to the under sides. *Eophrynus* comes near to *Trogulus*, and has nothing to do with *Phrynus*.

The various genera of spiders which Kusta has described belong to the Arthrolycosidæ, which are the forerunners of the Mygalidæ.

The spider from Nyran (*Promygale*) shows by the possession of marginal plates a connecting link between the Trogulidæ and the Arthrolycosidæ.—*A. Fritsch*, Zool. Anzeiger, xxv, 16 June, 1902.

3. First Steps in Photo-micrography. By F. Martin Duncan, F.R.H.S. (the Amateur Photographer's Library, No. 25). Crown 8vo; pp. 104, with 16 text figures. (London: Hazell, Watson, & Viney, Ltd., 1902. Price 1s. nett.)

In this little work the author describes the methods and apparatus for use in low- and high-power photo-micrography; also development, printing, and lantern-slide making. The work is manifestly the result of the author's own practical experience, aud will be of great service to geologists who desire to produce their own photographs and to make lantern-slides of minute objects.

4. *Acrothyra* and *Hyolithes*: a Comparison. By G. F. Matthew, D.Sc. Trans. Roy. Soc. Canada, ser. ii, vol. vii, sec. iv, p. 93.

Having described a new genus of Brachiopods from the Basal Cambrian rocks of Cape Breton, Dr. Matthew proceeds to compare it with the genus *Hyolithes*, in which he finds analogous conditions of growth and musculation. *Acrothyra*, the new Brachiopod, is very like in form to the obtuse tubes of certain *Hyolithes*, and appears to have lived under somewhat similar conditions.

A close comparison of the muscular systems in these two forms shows some points of resemblance, and others of radical difference; the two forms, therefore, are not supposed to be very closely related, but to be independent types, separately developed from the Worms.

5. *Hyolithes gracilis* and Related Forms from the Lower Cambrian of the St. John Group. By G. F. Matthew, LL.D. Trans. Roy. Soc. Canada, ser. II, vol. vii, sec. iv, p. 109.

A very slender form of *Hyolithes*, a variety of *H. gracilis* of the *Paradoxides Œlandicus* (cf. *P. Tessini*) zone, from a somewhat lower horizon, is described in this paper. The form resembles *Orthotheca Hermelini*, Holm, from the base of the Cambrian in Sweden, but has a more projecting dorsal lip. Figures are given to show the forms of this species found in the St. John Group. The shell has several chambers in the apex, and so is of the subgenus *Camerotheca.* The operculum was not found.

REVIEWS.

Memoirs of the Geological Survey of England and Wales. (London, E. Stanford, and of all booksellers.)

1. The Geology of the Country around Southampton (Explanation of Sheet 315).[1] By Clement Reid, F.R.S.; with contributions by W. Whitaker, F.R.S. 8vo; pp. 70, with illustrations of Chalk and London Clay fossils, also Palæolithic implements and geological sections. (1902. Price 1*s.* 6*d.*)

THIS area comprises a part of the Hampshire Basin formed of Chalk and Tertiary strata, and modified by some minor undulations in the strata. Thus the Portsdown anticline, which occurs to the east, has been shown to affect the area from the occurrence of several new inliers of London Clay (pp. 10 and 41).

Special attention is directed to the fossils of the London Clay and Bracklesham Beds; and to the flint implements of the plateau and valley deposits, which are illustrated. So many and varied fossils occur in the Bracklesham Beds of the New Forest at Brook, Bramshaw, Huntingbridge, and Southampton, as shown by the lists given pp. 27–34 and p. 40, that a more liberal number and better quality of illustrations might well be expected. Indeed, the area is so extremely prolific in fossil remains that it deserves and will no doubt obtain a more extended memoir at no distant date.

Records are given by Mr. Whitaker of numerous well-sections.

2. The Geology of the Country around Exeter (Explanation of Sheet 25). By W. A. E. Ussher, F.G.S.; with Notes on the Petrology of the Igneous Rocks by J. J. H. Teall, M.A., F.R.S. 8vo; pp. 122, with 20 Illustrations in the text. (1902. Price 2*s.*)

IN this work there is an account of the unproductive Culm-measures, and full particulars of the subdivisions of the New Red Sandstone series which occupy a large portion of the country around Exeter.

Much interest attaches to the volcanic rocks which occur in the lower part of the New Red Sandstone, and a petrological description of these is contributed by the Director of the Geological Survey. There are notes also on the superficial deposits, water-supply, etc.

[1] This memoir has already been referred to in the Geological Magazine for October, p. 478.