NOTICES OF MEMOIRS, ETC.

1. — British Association for the Advancement of Science. Seventy-Fourth Annual Meeting, held at Cambridge, August 18–24th, 1904.

List of Papers read in Section C, Geology.

Aubrey Strahan, F.R.S., President.

President's Address. (See p. 449.)

Dr. J. E. Marr, F.R.S.—The Geology of Cambridgeshire. (See p. 508.)

F. W. Harmer.—The Great Eastern Glacier. (See p. 509.)

W. Whitaker, F.R.S.—On a Great Depth of Drift in the Valley of the Stour, Suffolk. (See p. 511.)

W. Whitaker, F.R.S.—Some Cambridgeshire Wells. (See p. 511.)

H. B. Woodward, F.R.S.—Note on a small Anticline in the Great Oolite Series, north of Bedford. (See p. 439.)

J. Spiller.—Recent Coast Erosion in Suffolk: Dunwich to Covehithe. (See p. 502.)

J. W. Stather.—Report of the Committee on the Drift Deposits at Kirmington, Lincolnshire. (See p. 512.)

Professor W. J. Sollas, F.R.S.—On the Structure of the Silurian Ophiurid *Lapworthura Miltoni.*

Dr. B. N. Peach, F.R.S., and *Dr. J. Horne, F.R.S.*—The Base-line of the Carboniferous System round Edinburgh.

Dr. R. H. Traquair, F.R.S.—Note on the Fish-remains recently collected by the Geological Survey of Scotland at Salisbury Crags, Craigmillar, Clubbiedean Reservoir, and Torduff Reservoir, in the Edinburgh District.

Dr. R. H. Traquair, F.R.S.—On the Fauna of the Upper Old Red Sandstone of the Moray Firth Area.

G. W. Lamplugh.—Note on Lower Cretaceous Phosphatic Beds and their Fauna.

G. W. Lamplugh.—Marine Fossils from Ironstone of Shotover Hill.

E. A. Newell Arber.—On the Fossil Plants of the Upper Culm Measures of Devon.

E. A. Newell Arber.—On derived Plant-petrifactions from Devonshire.

Professor H. G. Seeley, F.R.S.—On Fossil Footprints of Reptiles from the Stormberg Beds of the Karroo of Cape Colony.

Dr. J. E. Marr, F.R.S.—Report of the Committee on Life-Zones in the Carboniferous Rocks.

J. Lomas.—Report of the Committee on the Fauna and Flora of the Trias.

Discussion on the Nature and Origin of Earth Movements, opened by the President, Dr. J. Horne, F.R.S., Professor W. J. Sollas, F.R.S., and Mr. J. J. H. Teall, F.R.S.

Professor P. F. Kendall.—Evidence in the Secondary Rocks of persistent movement in the Charnian Range.

Rev. W. Lower Carter.—River Capture in the Don System.

E. Greenly.—The Glaciation of Holyhead Mountain. (See p. 504.)

Rev. O. Fisher.—On the Elephant-trench at Dewlish, Dorset.

Professor P. F. Kendall.—Report of the Committee on Erratic Blocks.
Professor H. Bäckström.—On the Origin of the Great Iron Ore Deposits of Lappland.
A. Harker, F.R.S.—Exhibition of specimens of Tertiary Plutonic Rocks (including Gneisses) from the Isle of Rum.
E. Greenly.—The Lava-domes of the Eifel.
Professor W. W. Watts, F.R.S.—Report of the Committee on Geological Photographs.
Professor H. A. Miers, F.R.S. — Concretions as the Result of Crystallisation.
R. H. Rastall.—Basic Patches in Mount Sorrel Granite. (See p. 501.)
L. J. Spencer.—On the different modifications of Zircon.
R. H. Solly.—A preliminary description of three new Minerals and some curious Crystals of Blende from the Lengenbach Quarry, Binnenthal.
Professor K. Busz.—On the Granite from Gready, near Luxullian in Cornwall, and on some Contact Rocks.
A. W. Dwerryhouse.—Report of the Committee on Underground Waters of North-West Yorkshire.
Professor P. F. Kendall.—Exhibition of a Model of the Cleveland Area, showing Glacier-lakes.
Rev. W. Lower Carter.—On the Glaciation of the Don and Dearne Valleys.
H. N. Davies.—On the Discovery of Human Remains under Stalagmite in Gough's Cave, Cheddar, Somerset.
Dr. Scharff and *G. W. Lamplugh.*—Report of the Committee to Explore Irish Caves.
J. Parkinson.—The Geology of the Oban Hills, Southern Nigeria.
A. W. Gibb.—On the occurrence of Pebbles of White Chalk in Aberdeenshire Clay.
W. G. Fearnsides and *R. H. Rastall.*—On Boulders from the Cambridge District collected by the Sedgwick Club.
Rev. Dr. Irving.—On Stratified High-level Gravels and their Relation to the Boulder-clay. (See p. 497.)
J. N. Shoolbred.—Tidal Action in the Mersey in Recent Years.
Rev. O. Fisher.—The Cause of Compression of the Earth's Crust. (See p. 495.)

Papers bearing on Geology read in other Sections :—

SECTION D.—ZOOLOGY.

Professor W. B. Scott (Princeton, U.S.A.).—The Hoofed Animals of the Santa Cruz Beds of Patagonia.
Dr. C. W. Andrews. — Egyptian Eocene Vertebrates and their Relationships, particularly with regard to the Geographical Distribution of Allied Forms.
Professor H. F. Osborn (Columbia University, New York).—The Evolution of the Horse.

SECTION E.—GEOGRAPHY.

President's Address (D.W. Freshfield).—On Mountains and Mankind.
Moritz von Déchy.—The Glaciers of the Caucasus.

R. T. Günther.—Changes of Level on the Italian Coasts.
R. H. Yapp.—Vegetation features of the Fen District.
H. Y. Oldham.—Changes in the Fen District.
Dr. Vaughan Cornish.—Report of Committee on Terrestrial Surface Waves.
Dr. Tempest Anderson.—The Lipari Islands and their Volcanoes.
A. W. Andrews.—A Geographical Object-lesson: Passes of the Alps.

SUB-SECTION OF ANTHROPOGRAPHY.

Professor A. MACALISTER, F.R.S., Vice-President, in the Chair.

Dr. Valdemar Schmidt. — The Latest Discoveries in Prehistoric Science in Denmark.
Miss Nina F. Layard.—Further Excavations on a Palæolithic site at Ipswich.
Report.—The Lake-Village at Glastonbury.

SECTION K.—BOTANY.

FRANCIS DARWIN, M.A., M.B., F.R.S., President.

Dr. D. H. Scott, F.R.S.—A New Type of Sphenophyllaceous Cone from the Lower Coal-measures.
Dr. D. H. Scott, F.R.S., and *E. A. Newell Arber.*—On some New Lagenostomas.
E. A. Newell Arber.—A new feature in the Morphology of the Fern-like fossil *Glossopteris*.
Francis J. Lewis.—Interglacial and Post-Glacial Plant Remains from the Peat of England and Scotland.
Dr. D. H. Scott, F.R.S.—Semi-popular Address on a New Aspect of the Carboniferous Flora.

II. — THE GEOLOGY OF CAMBRIDGESHIRE. By J. E. MARR, Sc.D., F.R.S., Pres. Geol. Soc.[1]

THE main physical features of the county are the Chalk uplands of the south-eastern and southern part, the curious plateau on the west, the Cam Valley between them, and the fenland of the north.

Of Jurassic rocks, the Oxford Clay is not well exposed save near Whittlesea. The Corallian rocks are of considerable interest. Two types occur—the Ampthill Clay facies of the western outcrop and the Calcareous facies of the Upware Inlier. The Elsworth rock forms the base of the deposits of each of these types, and its relationship to the members of the Calcareous facies is a subject still under discussion. The Upper and Lower Kimeridge Clay are found at Ely and in the neighbourhood of that city.

Of Cretaceous rocks the Lower Greensand is well seen near Gamlingay. The old phosphate workings of Wicken are now closed. The Gault is seen in many exposures. Most of the sections exhibit Lower Gault, but Mr. Fearnsides has recently detected the Upper Gault in the Barnwell brick-pit. The basal member of the Chalk,

[1] Abstract of paper read before the British Association, Cambridge, Section C (Geology), August, 1904.

he well-known Cambridge Greensand phosphatic seam, lies unconformably upon the Gault. It is succeeded by various divisions of the Chalk up to the zone of *Micraster*.

The glacial deposits consist chiefly of the Chalky Boulder-clay; the great boulder at Ely is also of interest.

The Pleistocene gravels include the plateau gravels on the Chalk hills and the well-known mammaliferous gravels forming terraces on the valley-sides. The March marine gravels are usually correlated with the gravels of one of these terraces.

Alluvium is found on the valley-bottoms, and in the fenland peat occurs with intercalated patches of *Scrobicularia* clay. The peat contains the fauna of Neolithic and later times.

III.—The Great Eastern Glacier. By F. W. Harmer, F.G.S.[1]

THIS name is proposed for the great ice-stream the moraine of which, the Chalky Boulder-clay, covers an area of more than 5,000 square miles in the east of England, frequently attaining a thickness of more than 100 feet.

As far back as 1858, Trimmer, a pioneer in glacial investigation, pointed out that the county of Norfolk had been twice invaded by ice, first from the North Sea and then from the west, the resulting detritus in the one case being characterised by igneous blocks, some of them of Scandinavian origin; and in the other by a predominance of Jurassic material. The first invasion is represented by the Cromer Till and the Contorted Drift of the Norfolk coast; the second, by the Chalky Boulder-clay, the subject of the present paper, which does not occur in north-east Norfolk.

The region covered by the latter deposit, which extends over a great part of the eastern counties of England, has a palmate outline, its lobes, which radiate from the great depression of the Lincolnshire and Cambridgeshire Fens, being of unequal length. The latter region was not only the centre whence the Chalky Boulder-clay of the southern part of the area was distributed, but also the quarry out of which was excavated most of the enormous mass of Jurassic material of which the matrix of this deposit is so largely composed.

The present physiographical features of the east of England resemble, more or less, those which obtained in Glacial times, the Drift deposits not only covering the plateaux between the valleys in which the rivers of the district now run, but descending into them, sometimes to below sea-level. Hence by the study of the existing contours, aided by that of well-borings, it is possible to obtain a general idea of the pre-Glacial topography by which the movements of the ice must have been determined or influenced.

Although the erratics of the Chalky Boulder-clay are more or less of a similar character over a wide area, indicating that it was distributed from a common centre, the predominant character of its

[1] Abstract of paper read before the British Association, Cambridge, Section C (Geology), August, 1904.

detritus varies in different districts, in accordance with that of the strata over which the ice had moved. The matrix of the Boulder-clay of South Norfolk and North Suffolk, for example, has been largely derived from the Kimmeridge Clay. Over this region, which formed in Glacial times a shallow trough running east and west, corresponding with the present depression of the basins of the Little Ouse and the Waveney, as well as with the gap in the Chalk escarpment between Swaffham and Newmarket, the ice evidently poured in great volume, planing down the surface of the Chalk and carrying its Kimmeridgian material fifty miles to the east from its original source in the Fen basin. On the other hand, although the Fen ice was sufficiently thick to enable it to overflow the Chalk hills between Newmarket and Royston, it only travelled thence to the south-east for about half that distance. In this region the Boulder-clay is chalky near the escarpment, while beyond the outcrop of the London Clay it is mainly composed of detritus from that formation.

Along the basin of the Ouse, where its matrix is largely Oxfordian, the ice to which it was due advanced much further, to Buckingham and beyond, as it also did along that of the Nene, in the direction of Northampton, where Liassic débris is common. On the contrary, the high land near the head waters of the Welland obstructed the ice-flow, so that but little Boulder-clay seems to have found its way into the area comprised in Sheet 53 of the Ordnance map. The greater part of Sheet 63, however, is covered by it, and it there reaches an elevation of 730 feet above the sea-level. Much of the Boulder-clay of this region, in the author's opinion, was due to the ice-stream of the Trent Valley, having been piled up upon the high land to the east of Leicester by the pressure of ice descending from the Pennines.

It seems probable that the whole of the low-lying region between the Lincolnshire Wolds and the Pennines was filled with ice during the period of maximum glaciation. It is not physically possible that any considerable thickness of ice could have existed on one side only of the Lincolnshire ridge, which does not often exceed an elevation of about 200 feet above the lower ground adjoining it.

The author hopes to make the ultimate source of the Chalky Boulder-clay ice the subject of a future paper. The prevalence of Carboniferous débris in the East Anglian region seems to indicate, however, that a part of it at least was of Pennine origin; another part may have been due to an overflow from the North Sea across the lower part of the Chalk Wolds, and the ice may also have been reinforced by the abundant precipitation to which this district was subject during the Glacial period; the moisture-bearing cyclonic disturbances from the Atlantic, to which the enormous accumulation of ice in the Baltic region was due, must have passed near the eastern counties of England. There is no evidence to show that any considerable amount of ice entered East Anglia through the Wash gap during the Chalky Boulder-clay period, all the facts known to the author appearing to point in an opposite direction.

IV.—On a Great Depth of Drift in the Valley of the Stour. By W. Whitaker, F.R.S.[1]

SEVERAL cases of great irregularities in the thickness of the Drift have been shown by borings in Suffolk, and the existence of deep channels filled with Drift has been practically proved, as also in the neighbouring counties of Essex and Norfolk. In some cases these channels cannot be shown on the map, the Glacial Drift being hidden by deposits of later age, and this is markedly the case in the upper part of the valley of the Cam, where at one place (Newport) the Drift has been pierced to the depth of 340 feet without reaching the bottom.

In Suffolk the greatest amount of Drift recorded is at Brettenham Park, where apparently a thickness of 312 feet has been found. But this and all other records in East Anglia are now put into the shade by the result of a boring near Glemsford railway station. This is at a low level in the valley of the Stour, in the tract formed by the sand and gravel that crop out from beneath the Boulder-clay of the higher ground. Here one would have expected, perhaps, some 50 feet of Drift, but certainly not more than 100. No less than 477 feet have been passed through before reaching the Chalk.

The gravel and sand that form the surface reached to a depth of 51 feet, as might have been expected; but then the unexpected occurred, no less than 228 feet of Boulder-clay (partly sandy) having been found, with a mass of sand and clayey sand beneath.

We seem here, then, again to have evidence of a very deep Drift-filled channel. A well in the village, at a higher level, has reached Chalk after passing through 120 feet of Drift; so the channel does not reach far northward, nor does it reach to Foxearth, in Essex, about a mile to the south, where there is a still less thickness of Drift. As to its direction or extent, however, we can say little as yet.

One may add that a boring (? unfinished) in Euston Park has proved over 150 feet of Drift, at a spot where no Drift is shown on the map. This may be simply a huge pipe.

V.—Some Cambridgeshire Wells. By W. Whitaker, F.R.S.[1]

SINCE the publication of the latest Geological Survey memoir dealing with the county further records of nineteen additional well-sections at sixteen places have been obtained.

These vary in depth from 40 to 284 feet, and pass through various formations from Drift to Lower Greensand. None have any special interest; but the whole forms a useful addition to our knowledge of the geology and water-supply of the county.

[1] Abstract of paper read before the British Association, Cambridge, Section C (Geology), August, 1904.

VI.—Report of the Committee to investigate the Fossiliferous Deposits at Kirmington, Lincolnshire, and at various localities in the East Riding of Yorkshire. Chairman, Mr. G. W. Lamplugh; Secretary, Mr. J. W. Stather.[1]

IT has only been found possible during the present year to complete the investigation of the deposits at Kirmington and Great Limber, but it is hoped in the future to extend operations to Bielbecks and several other sections that require further elucidation.

Kirmington Section.

The work on this important section, which was begun last year, has now been carried to a successful conclusion; and the results show that in some respects this section has no known parallel in English drift sections. It will be remembered that, as described in last year's report, a brickyard is worked at this place in a mass of warp or clay containing estuarine shells, with a fresh-water bed at its base, and that this deposit is overlain by a bed of coarse flinty shingle, above which in one part of the pit there is found a few feet of red stony clay believed to be a boulder-clay. The boring last year proved the presence of a glacial clay at some depth beneath the warp. The chief object of our investigation has been to discover the relationship of the fossiliferous warp to the Glacial Series, and to carry the boring through the superficial deposits to the chalk, which was not reached last year.

During June of the present year a new boring was carried out under the personal supervision of the Chairman and Secretary, with the assistance of Mr. G. W. B. Macturk. Mr. Villiers, well engineer, of Beverley, undertook to put down the boring, and the Committee desire to express their indebtedness to him for the ready manner in which, at considerable personal inconvenience, he met their wishes as to the time and conditions of the work.

In order to secure a section in another part of the pit, the site of the new boring was fixed at a point 80 yards north-east of last year's boring. Although at the spot chosen the warp used for brickmaking had been excavated to a depth of 5 feet below the level of its base at the former site, this material was passed through in the new boring to a further depth of 3 feet, so that its base is here 8 feet below its position in the former boring. The total depth attained by the new boring, combined with the height of the open section, was 96 feet, or 41 feet lower than was reached last year. The surface of the chalk lay much deeper than was anticipated, and the borings seem to prove that the surface features of the locality are not due to the presence of chalk, as hitherto supposed, but that the rising ground has been formed by the erosion of a thick and complex mass of drift.

[1] Abstract of paper read before the British Association, Cambridge, Section C (Geology), August, 1904.

The diameter of the second boring was at first 4 inches, narrowing to 3 inches at a depth of 15 feet. It was found necessary to line the boring with the tubes throughout.

The section seen in the brickyard and proved in the borehole was as follows :—

	ft.	in.
Surface soil (at 95 feet above O.D.)	1	0
Clay with foreign stones (see NOTE A)	4	0
Well-worn shingle, principally of battered flints	8	0
Laminated warp with estuarine shells, and at its base a thin seam of peat associated with a sandy warp containing fresh-water shells in one part of the pit (see NOTE B)	18	6
Clean yellow sand, with pebbles of chalk and flint	4	9
Red clay passing downwards into tough reddish-brown clay ...	7	6
Purple clay, streaked with silt and loam, passing downwards into tough purple clay with small stones, including some erratics (see NOTE C)	10	6
Stoneless purple clay	5	0
Stoneless yellow clay	6	0
Flinty gravel	4	6
Yellow clay and loam with small drift pebbles	5	0
Yellow sand, full of well-rounded quartz grains and specks of chalk	8	0
Yellow sand and laminated clay	4	0
Tough compact bluish-grey or lead-coloured clay, with a few small foreign pebbles (see NOTE D)	5	3
Tough yellow clay streaked with chalk	1	0
Solid chalk and flint	3	0
Total	96	0

NOTE A.—Among the erratic stones which this clay contains the following were identified: basalt, porphyrites, rhomb-porphyry, grits, etc.

NOTE B.—Mr. Clement Reid records from this bed *Scrobicularia piperata*, *Rissoa ulvæ*, *Tellina balthica*, *Cardium edule*, *Mactra subtruncata*, *Mytilus edulis*, and abundant Foraminifera (see Mem. Geol. Survey, Holderness, p. 58).

NOTE C.—In general appearance this clay resembles the Purple Clay of Holderness. Among the pebbles washed out of 30 lb. of the clay brought up by the augre, chalk and flint greatly predominate, but the following rocks were also represented: red chalk, black flint, Spilsby sandstone, ferruginous pebbles, quartz, basalt, and porphyrites, besides many undeterminable small pebbles.

NOTE D.—This clay is hard and tough, and very different from A and C both in texture and colour. It resembles in colour the Basement Clay of Holderness. The pebbles are smaller in size than in C, and there is a still higher proportion of chalk and flint. Among the erratic pebbles the following are recognizable: basalt, porphyrite, sandstone, black flint, grit, quartz, etc.

Mr. Reid has examined the plant remains obtained by the Committee from the band at the base of the warp, and reports as follows :—"The plant remains obtained by Mr. Stather from the peaty warp belong to the following species :—

Ranunculus sceleratus, Linn.
Eupatorium cannabinum, Linn.
Aster Tripolium, Linn.
Lapsana communis, Linn.
Mentha aquatica, Linn.
Labiate (much crushed)
Atriplex ?
Zannichellia pedunculata, Reichb.
Scirpus setaceus, Linn.
,, *maritimus*, Linn.
,, sp.
Carex incurva, Lightf.

"The list is a small one, but it indicates estuarine conditions, and suggests a sub-arctic climate. With one exception the plants are still to be found in the neighbourhood of the Humber; but one of

them, *Carex incurva*, is a sea-coast sedge not now ranging south of Holy Isle.

"A striking peculiarity of the deposit is the abundant remains of the estuarine sedge, *Scirpus maritimus*, a plant which, growing out of a few inches of water, tends to form a thick belt through which few drifted seeds would find their way. In view of the abundance of this sedge in the bed now examined and of the like-growing reed, *Phragmites communis*, in the deposit which I searched some years ago, the small number of other plants yet detected is not surprising. Land plants are only represented by two fruits of *Lapsana*, perhaps brought by birds. These fruits of *Lapsana*, as well as those of the sea-aster, are considerably smaller than my recent specimens, but I have not yet had an opportunity of comparing them with fruits of the same species near their northern limit."

From the fresh-water shell-bed associated with the peat, Mr. E. T. Newton has determined *Planorbis spirorbis*, *Bithynia tentaculata*, with probably *Candona* (an Entomostracan).

Great Limber Section.

A boring was also put down under the supervision of Mr. G. W. B. Macturk, who kindly undertook to aid the Committee in this manner, at the Great Limber brickyard, three miles south-east of Kirmington, where there is a further development of warp and sand, believed by Mr. C. Reid to be of the same age as the Kirmington deposit, though no fossils have been found in it. The section seen in the brickyard and proved in the boring was as follows :—

	ft.	in.
Surface soil and clay with stones (at 110 feet above O.D.)	4	0
Loamy sand contorted and mixed with warp	4	0
Laminated blue warp with sandy streaks	10	0
Pan	1	3
Current-bedded sand	4	9
Sharp sand	8	0
Flint, sand, and rounded chalk pebbles	5	0
Solid chalk with flints	1	0
Total	38	0

In comparing this section with the one at Kirmington it should be noted, (1) that no shells have been found in the laminated warp at Limber; (2) that the warp does not rest on glacial clays; and (3) that the base of the Limber warp is 92 feet above O.D., or 28 feet higher than that of Kirmington.

It would be premature to discuss the problems raised by these interesting sections until the work of the Committee has been carried further. For the present, therefore, we desire only to record the data thus far obtained.

The thanks of the Committee are due to Mr. W. H. Crofts and Mr. G. W. B. Macturk for practical help in many ways; also to the Earl of Yarborough (landlord), E. P. Hankey, Esq. (agent), and the occupiers of the brickyards—Mr. Hervey and Mr. John Housan—for permission to put down the borings.

VII.—Geology and Agriculture. By F. J. Bennett, F.G.S.

[Abridged from article contributed to the *Land Agents' Record* (August 20th, 1904) on the uses to which Ordnance Maps might be put for Estate Records.]

MUCH valuable information is lost, both to the landowner and farmer, to say nothing of the geologist, for want of recording it at the time. How often is land drained and no record made of the soil turned out, and the courses of the drains not laid down on the estate maps? Post-holes and excavations of all kinds are made and no record kept at the time. And yet how easy to put all these down on the map itself, a record for all future time, and constantly under the eye of the owner and occupier. The map itself, the back as well as the front, is most obviously the proper place for these notes. Yet how very few persons use these maps in this way.

Scotch farmers seem to succeed in England where our farmers cannot, and why is this? One great reason is that they are far more systematic than ours are, and they record the results of each field year by year.

Let us take the case of a person purchasing an estate. To a large extent he would, in a usual way, be very much in the dark as to the real nature of the property he had purchased. He would, of course, have all the information the seller could afford him, and that would vary very much according to the way in which the estate had been managed. He might be able to obtain 1 in. or even 6 in. maps of the Geological Survey, both Solid and Drift, with, in many cases, the accompanying memoirs; and, according as he was able to understand them, they would give him much or little information. Yet to most this would be of a superficial or vague nature on many points, and perhaps could not give the details most useful to him. But if he had followed the plan adopted, I believe, in the best estate offices, the 25 in. Ordnance maps would have been used, and on these maps all the divisions of the fields would have been marked at the time the survey was made, and the estate maps would, no doubt, have been brought up to date by marking on them any alteration subsequently made. There would, no doubt, be a schedule of the amount of arable and pasture and woodland, with the kind of trees, water, and roads, and there might be a rough division of the soil into heavy and light.

Soil.—Now, let us suppose that the late owner had made these maps in the way this paper suggests. Say, that on each field division be noted the nature of the soil and subsoil, whether clay, sand, loam, gravel, chalk, etc., and the qualifying character of these. Of course difficulties would arise as to how this information could be obtained. Here, then, I would suggest that a visit should be paid to the Geological Survey Office to ascertain what information was available. As a very useful preliminary to this visit, trial holes, or trenches preferably, could be dug, especially in the pasture lands, so that the subsoil could be exposed. In this way a kind of soil map could be made and recorded on the map or schedule accompanying

it. Field names should also be noted, with their oldest and latest ways of spelling these, with the dates.

Wells.—These should be all marked on the map, whether in use or not, and all measured, and their total depth given, and that of the water and the variation of this, and, where possible, a record of the soils and subsoils met with when this well was sunk and the name of the sinker.

Springs.—All these should be marked, and their variations and highest point in any special year, going as far back as possible.

Quarries.—All these should be noted, and characters recorded on the map.

Pits.—Where old pits exist, often, of course, grown over, it will be found of the utmost importance, where all record has been lost, that they should be cleared and their true character ascertained.

Drains.—Now, perhaps, the most important detail has been left to the last. I am informed that, in most cases, where land has been drained the courses of the drains have not been laid down on the estate maps, so that very often much of the money thus expended has, for practical purposes in after years, been lost, and where the drains have ceased to work much time and expense have been incurred, sometimes to no purpose, in seeking the outlets, etc. All this would have been avoided had their courses been laid down on the maps. To record the nature of the soil dug out, when drains are being made, is of the utmost importance to the agriculturist and geologist, and this should be especially noted on the map. As the Government indirectly lends large sums of money for land drainage I would suggest that the Government stipulate in the future that the courses of all land drains should be laid down on the estate maps, and the nature of the soil recorded, and that a copy and tracing of the drains be deposited with the Government Department.

I would here suggest a further use of these 25 in. maps for the recording on them by farmers of certain agricultural notes relating to crops, etc.

On each of the field divisions year by year, and in one line if possible (so that the records of several successive years might be placed on the same division for reference, especially if contractions were used), should be noted the amount of seed sown, the kind and quantity of manure used, and the weather at the time; also the result of the crop, such as weight of grain, length of straw, etc., and the same with other crops. If the results of seven years were thus recorded they could be taken in at a glance and the reason often seen for success in one year and failure in another, and the varying results where different manures had been used could also be noted in a field-book. The different kinds of trees and their growth in relation to the soil should be noted both by farmers and landowners. Many farmers, no doubt, would object to all this as an additional and useless labour on their part; but I would suggest that such information would be of the utmost value to the incoming farmer, and would, of course, be the private property of the late occupier. The incoming tenant should be very glad to

pay a very substantial sum for this accumulated information, as, without this, he might have to spend years and lose much valuable time and money in finding it out. Thus the late occupier would find that he had not only been getting together much valuable information for himself, but information of such a nature that the incoming tenant would be glad to buy it.

VIII.—Brief Notices.

1. The Yorkshire Philosophical Society.—The Annual Report of this Society for 1903 is a trifle more bulky than usual, separate copies of Dr. Anderson's paper on the West Indian Eruption, which was published by the Royal Geographical Society, together with the 12 plates and map which accompanied the original paper, being inserted.

2. Cambrian of Portugal. — A fine series of fossils from the calcareous schists of Alemtejo is described by J. F. Nery Delgado (see Comm. Serv. Geol. Portugal, 1904, 6 pls.). Delgado considers the fauna nearly allied to that of *Olenellus*, and that it is more ancient than the Cambrian fauna of Spain, which certainly belongs to the zone of *Paradoxides*. The fauna contains *Paradoxides*, *Olenopsis*, *Hicksia*, *Microdiscus*, *Metadoxides*, and *Olenellus* among the Trilobites, *Lingulella*, *Obolella*, *Acrothele*, *Hyolithes*, and many Lamellibranchs. The plates contain photographic figures and are excellently produced.

3. Reclassification of the Reptilia. — Professor Osborn has printed in the *American Naturalist* for February, 1904, his paper on the reclassification of the Reptilia, read before the Society of Vertebrate Palæontologists at Philadelphia in December, 1903. He arrives at the following conclusions:—

The birds probably originated from a group of Diaptosauria identical with or closely related to that which gave rise to the Dinosauria. It is not true that birds have descended from Dinosaurs, but there is very strong evidence that birds and Dinosaurs are descended from a common stock.

There is no question that the mammals are affiliated with the subclass Synapsida rather than with the Diapsida; both in skull and shoulder-girdle structure and in the phalangeal formula they are Synapsidan. As to their nearer relationships they appear to be rather with the superorder Anomodontia and with the order Cynodontia or Theriodontia. The divergence of the mammal stem from these typical reptiles will probably be found to have occurred in the Permian or Trias of South Africa.

4. Geology of Tunis.—Under the title "Etude géologique de la Tunisie centrale," Dr. L. Pervinquière has written a detailed monograph around a really magnificent map of the country, geologically coloured. The formations dealt with range from the Pleistocene to the Trias, the fossils themselves being referable to the Lias, Oxfordian, Portlandian, Neocomian, Aptian, Arbian, Cenomanian,

Turonian, Senonian, Eocene, Oligocene, Miocene, and Pliocene. The country seems remarkable for the isolated Triassic hills which stand up boldly from the surrounding country. A list of previous works on Tunis is given, and M. Pervinquière deserves our thanks for a valuable addition to African geology. The book is issued from Paris (Direction Générale des Travaux Publics), 1903. Price 15 frs.

5. *Merycodus*.—A fine and perfect skeleton of the hypsodont group of ruminants has been described and figured by W. D. Matthew (in the Bull. Amer. Mus. N.H., xx, 1904). This is *Merycodus osborni*, a form related to the antelopes, but with branching, deciduous antlers like those of the deer. The specimen came from the Middle Miocene (Pawnee Creek Beds) of north-eastern Colorado, and was found by Mr. Barnum Brown, of the American Museum Expedition of 1901. The paper sketches the other known species of the genus as well as species of the genera *Blastomeryx*, *Lapromeryx*, and *Palæomeryx*.

6. The Mines of Hualgayoc, Peru.—Situated in a volcanic region, in which the sedimentary rocks seem to be of Cretaceous age from their fossil contents, the mines of Hualgayoc yield an abundance of minerals. Those chiefly worked are lead and copper, and this paper (published in the Bol. Cuerpo Ingen. Minas Peru, No. 6, 1904), by F. Malaga Santolalla, is mainly devoted to them. Hualgayoc is a province of Peru, and the author prefaces his description of the mines with a sketch of the geography, history, and geology of the area. The paper is well illustrated and has a topographical map.

7. Tertiary Fauna of Florida.—Dr. W. H. Dall has recently published in the Transactions of the Wagner Free Institute of Science the concluding part of his "Contributions to the Tertiary Fauna of Florida." This consists of the molluscan fauna of the Silex beds of Tampa and the Pliocene beds of the Caloosahatchie river, and includes in many cases a complete revision of the generic groups treated of and their American Tertiary species. This part vi runs from p. 1219 to p. 1654, pls. xlviii–lx, and with an index brings a laborious and valuable work to a successful conclusion.

8. North Polar Expedition, 1893–96.—Messrs. Longmans & Co. have published vol. iv of the scientific results of this expedition, edited by Dr. Fridtjof Nansen. The volume before us contains Dr. Johan Kieer's paper in the Lower Silurian at Khabarora. The age of the beds appears to be of the Scandinavian Esthonian type, and praise is due to Dr. Kieer and Dr. Brögger for successfully dealing with such unpromising material. Dr. Nansen contributes to this volume his "Bathymetrical features of the North Polar seas, with a discussion of the continental shelves and previous oscillations of the shore-line," illustrated by maps and plates.[1]

9. Relief Map of North America.—Although dated as long ago as 1901, it may be worth while to call attention to a publication of the Geological Survey of Canada entitled "Altitudes in the Dominion

[1] See Professor Hall's Review in our August Number, p. 422.—Ed. Geol. Mag.

of Canada, with a Relief Map of North America." This is on a scale of 200 miles to an inch, and shows elevations at 100, 1000, 5000, 10,000, and above 10,000 feet, and does not seem to be generally known.

10. Primitive Fossil Fishes.—M. Ad. Kemna contributes to the Bull. Soc. Belge Géol., xvii, 1903 (1904), a general review of recent discoveries in fossil fishes of the earliest period. The writer bases his review on the papers of Dr. Traquair and Dr. Smith Woodward, and after pointing out the importance of the more ancient fishes, refers to their zoological position, and sketches in some detail the families Heterostracidæ, Osteostracidæ, and Anaspidæ.

11. Excursions in Belgium.—M. Rutot has provided a full report of the excursion of the Belgian Society of Geology, Palæontology, and Hydrology to Hainaut and the environs of Brussels in 1902. It is published in the Bulletin, xvii (5), 1904. The district traversed was from Erguelinnes to Leval-Trahegnies, Mons, Vaulx lez-Tournai, Blaton and Hautrage, Brussels and environs; and the jaded British geologist might do worse than spend his four days over this ground. The geology covers the Landenian, Bruxellian, Ypresian, and Montian, and fossils are abundant.

12. Oligocene of Poland.—M. K. Wójcik has found in a small valley in Kruhel Maly, near Przemysl, on the northern border of the Middle Carpathians, a dark clay or sandy clay-bed with Mollusca and Foraminifera. Of the forms found 46 out of 60 belong to the Lower Oligocene of North Germany, as described by Von Koenen, and 8 of the 14 remaining species are found in the Vicentinian beds described by Fuchs and Oppenheim. The whole fauna is comparable to that of the *Clavulina szaboi* beds of Von Hantken. Accompanying the paper, which appears in the Bull. intern. Ac. Sci. Cracovie, 1893, No. 10, are two plates of shells and Foraminifera.

13. Minerals of Colombia. — A new journal has reached us from the Republic of Colombia, "Trabajos de la Oficina de Historia Natural," Bogata, 1904. This tract of 27 pages contains an account of the alkaline and earthy minerals of Colombia, by Ricardo Lleras Codazzi, chief of the section of Mineralogy and Geology.

14. Cinnabar from Peru.—Augusto F. Umlauff publishes in the seventh "Boletin del Cuerpo Ingenieros de Minas del Peru" a long account of the Huan Cavelica mercury deposits, with map and sections. The ore seems to occur indiscriminately throughout the mass, as at Santa Barbara it is described and figured as occurring in Andesites, Amphibolites, Basalts, Sandstones, Limestones with Cretaceous mollusca, and Conglomerates. No description of the fossils is given; it being merely stated "molluscs and others very abundant."

15. 'Exotic Blocks' of the Himalayas.—In the Comptes Rendus of the Ninth Congress of Geologists held at Vienna in 1903, just published, we find Dr. C. L. Griesbach's note on the 'exotic blocks' of the Himalayas. These are masses of limestones of Nummulitic

age, often converted into marble, which rest, and in some cases are enclosed in, igneous rocks. They occur in the Tibetan area. These blocks would appear to be the result of the action of huge igneous flows, which, passing through the dislocated rocks, tore off and bore to the surface masses of rudimentary rock, together with other loose masses, the result of the dislocating and faulting itself. Dr. Griesbach thinks that all this was part of the general Himalayan upheaval, which falls into the period after the deposition of the Upper Cretaceous system and prior to the deposition of the younger Tertiaries, and fits into the period during which the great flows of Dekkan Trap took place in India.

16. Bradford Glacial Lakes.—The Bradford Scientific Association have started a new quarterly called the *Bradford Scientific Journal* (No. 1, July 1904), and the opening paper deals with "The Glacial Lakes of the Bradford District," by J. E. Wilson. The author gives a map, and states that a note of his conclusions appeared in the Report of the British Association for 1900.

17. Persimmon Creek Meteorite.—This iron came from North Carolina in 1893, and is now in the U.S. National Museum. It is described in the Proc. U.S. Nat. Mus., xxvii (1904), by Wirt Tassin, as "a more or less continuous matrix of iron containing troilite, schreibersite, and carbon." Its present weight is 9 lb. 6 oz., but a fragment weighing about 1 lb. 13 oz. has been broken off.

18. Museums.—It may be well to call attention to the Vorberichte für die xii Konferenz (Centralstelle für Arbeiter-Wohlfahrtseinrichtungen), 1903, in Mannheim, which contains Gill Parker's account of the Ruskin Museum and Lehmann's account of the Altona Museum, among other papers.

19. Fresh Fossil Egg.—Messrs. W. C. Morgan and M. C. Tallman described in Bull. Geol. Univ. Calif. Publications (iii, 1904) an egg from a pebble in a placer deposit on the Gila river in Arizona. The egg formed the centre of a rounded mass of hard calcareous rock, which was removed so as to allow of an examination of a fresh surface of the shell. The authors say that the egg corresponds fairly well to the type of egg laid by a cormorant, and with that and some photographic illustrations we must content ourselves.

20. Erratic Blocks.—Special attention should be called to the Eighth Report of the Committee on the Erratic Blocks of the British Isles (Rep. Brit. Assoc. for 1903, 1904), as in it the Secretary, Professor Percy F. Kendall, has drawn up a summary of the records accumulated during the past thirty-two years from England, Wales, the Isle of Man, and Scotland.

21. The "Records of the Geological Survey of India," established in 1868, published hitherto in yearly volumes until 1897, when it was amalgamated with the "Memoirs." With a view to the rapid publication of short papers and notes on Indian geology, it is now being continued again as before. Private workers are invited to contribute. The current number (vol. xxxi, pt. 1, 1904) contains

papers of economic importance; on an occurrence of copper ore in the Darjiling district, and on coal deposits in Punjab and Assam. Various mineralogical notes and technical assays are appended.

22. *Stylonurus* in the Baltic Silurian.—The genus *Stylonurus* has not hitherto been recorded from the Baltic region, but Dr. F. Schmidt, in examining a specimen collected from the uppermost Silurian of Rotziküll on the Island of Oesel, has come to the conclusion that it represents a fragment of this Merostomatous Arthropod. He bases this conclusion on the general form of the body, which tapers somewhat rapidly backwards, the shape of the four-jointed limb fragment with terminal spines, and the ornament of the body-segments. At the same time the species, which he names *Stylonurus* (?) *Simonsoni*, after the collector, may belong to some hitherto undescribed genus. The specimen presents some interesting features, especially two grooves on the dorsal side of the carapace, giving it a somewhat trilobed appearance. Portions of the underside of the head-shield are preserved, including a complete metastoma, a structure hitherto unknown in *Stylonurus*; it is distinguished by its pyriform outline. Dr. Schmidt's paper, which appeared in the *Bulletin* of the Imperial Academy of Sciences of St. Petersburg for March, 1904, is illustrated by a plate.

23. A large *Prestwichia*.—Among the papers of the late Professor C. E. Beecher was found a manuscript which has been printed in the Amer. Journ. Sci., July, 1904. This manuscript describes (and figures) a cephalothorax of *Prestwichia signata*, sp.n., from the Fort Riley Limestone of the Lower Permian, three miles west of Stockdale, Kansas. The specimen has a length of 45 mm., and is of especial interest as coming from a higher horizon than any other American species yet known.

REVIEWS.

The History of the Collections contained in the Natural History Departments of the British Museum. Vol. 1: The Libraries—The Department of Botany—The Department of Geology—The Department of Minerals. 8vo; pp. xviii and 442. (London: printed by order of the Trustees of the British Museum. Sold by Dulau & Co., 37, Soho Square, W., and others. 1904. Price 15*s*.)

THIS volume contains the history of the libraries and of the collections in the Departments of Botany, Geology, and Minerals. A second volume (not yet issued) will contain the history of the collections in the Department of Zoology.

"The possibility of producing such a history as the present is," says the Director in his Preface, "a remarkable evidence of the care and efficiency with which the records of the Museum have been kept during the past century. The value of the book to workers in the various branches of Natural History will be very