NOTICES OF MEMOIRS.

I.—British Association for the Advancement of Science, Seventy-ninth Annual Meeting, held at Winnipeg, August 26–31, 1909. List of Titles of Papers read in Section C (Geology) and in other Sections bearing upon Geology.

Address by the President (*Dr. Arthur Smith Woodward, F.R.S., F.G.S.*).—The Evolution of Vertebrate Animals as shown by Fossils (see Geol. Mag., September, p. 413).

J. B. Tyrrell.—The Geology of Western Canada.

Professor A. P. Coleman, Ph.D.—The Extent of the Ice Sheets in the Great Plains.

Warren Upham, D.Sc.—The Glacial Lake Agassiz. (See p. 475.)

Professor E. F. Chandler.—The Rainfall Run-off Ratio in the Prairies of Central North America.

Professor A. P. Coleman, Ph.D.—The Bearing of Pre-Cambrian Geology on Uniformitarianism.

Professor W. G. Miller.—The Pre-Cambrian Rocks of Canada.

A. R. Dwerryhouse, D.Sc.—An Outline of the Glacial Geology of Britain, illustrative of the Work of the Committee on Erratic Blocks.

Dr. Aubrey Strahan, M.A., D.Sc., F.R.S.—The Glacial Geology of South Wales.

David Woolacott, D.Sc.—On the Classification of the Permian of the North of England.

Herbert Bolton.—New Faunal Horizons in the Bristol Coalfield.

Professor S. H. Reynolds, M.A.—Description of the Avon Section, Bristol, in illustration of Dr. A. Vaughan's work on the English Carboniferous Limestone.

Professor S. H. Reynolds, M.A.—Lithology of the Carboniferous Limestone of Burrington Combe, Somerset.

Ernest Dixon, B.Sc.—On some Structures in Limestone Formations.

Professor W. G. Miller.—Gold and Silver Ore-deposits of Canada.

Professor A. P. Coleman, Ph.D.—Copper and Nickel Deposits of Canada.

Professor W. G. Miller.—Iron Ore-deposits of Canada.

J. B. Tyrrell, M.A.—Placer Mining in Canada.

Professor T. L. Walker, Ph.D.—Rare Metals found in Canada.

Professor J. W. Gregory, D.Sc., F.R.S.—Report of the Committee on South African Strata.

Charles F. Juritz, M.A., D.Sc.—Topographical and Geological Terms in South Africa.

Report of the Committee on Topographical and Geological Terms in South Africa.

Tempest Anderson, M.D.—The Volcano of Metavanu.

Professor J. W. Gregory, D.Sc., F.R.S.—Exhibition of the Material described as Geyserite from the Mount Morgan Mine, Queensland.

A. Smith Woodward, LL.D., F.R.S.—Discovery of Dinosaurs in the Cretaceous of Australia.

A. Smith Woodward, LL.D., F.R.S.—Discovery of a Dinosaurian Tooth in the Trias of Brazil.

Professor S. H. Reynolds, M.A.—Certain Aspects of British Scenery as illustrating the work of the Geological Photographs Committee.
Henry C. Beasley.—Report on Footprints found in the Trias of Great Britain.
Professor S. H. Reynolds, M.A.—Report of the Committee on the Geology of Glensaul, co. Galway.
E. S. Cobbold.—On some Further Excavations among the Cambrian Rocks of Comley, Shropshire, 1908.
Report of the Committee on the Drift Deposits of Kirmington, Lincolnshire, and the East Riding of Yorkshire.
Report on the Crystalline Rocks of Anglesey.
Report on the Chemical Composition of Charnwood Rocks.
Report on the Salt Lakes of Biskra, Algeria.

List of Titles of papers read in other Sections bearing upon Geology:—

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

F. Napier Denison.—Effects of Atmospheric Pressure on the Earth's Surface.
Professor A. E. H. Love, F.R.S.—Discussion of "Earth Tides".

SECTION D.—ZOOLOGY.

E. S. Goodrich, F.R.S. (Oxford).—The Origin of Vertebrates.
Professor A. B. Macallum, F.R.S. (Toronto).—Palæobiology and the Age of the Earth.
J. Stanley Gardiner, F.R.S. (Cambridge).—Coral Reefs.

SECTION E.—GEOGRAPHY.

A. O. Wheeler.—Some Characteristics of the Canadian Rockies.
J. Stanley Gardiner, F.R.S.—The Seychelles.
Professor Hobbs (Michigan).—Cycle of Alpine Glaciation.
Miss L. A. Owen.—Floods in the Great Interior Valley of America.
Professor A. P. Coleman.—The Yellowhead Pass and Mount Robson.
Professor Dodge.—The Formation of Arroyos in Adobe-filled Valleys in the South-Western United States.
Professor D. W. Johnson.—The Development of Nantasket Beach near Boston.
M. Allorge.—The Eastern (Tunisian) Atlas Mountains; their Main Structural and Morphological Features.

SECTION G.—ENGINEERING.

J. B. Porter.—An Outline of an Investigation now being conducted for the Dominion Government on the Coals of Canada.

SECTION H.—ANTHROPOLOGY.

Report of the Committee to investigate the Lake Villages at Glastonbury.
Report of the Committee to conduct explorations with the object of ascertaining the age of Stone Circles.
Report of the Committee to investigate Neolithic Sites in Northern Greece.

Report of the Committee to conduct Archæological Investigations in British East Africa.

Professor E. Guthrie Perry.—On a Recent Find of Copper Implements in Manitoba.

C. Hill-Tout.—Report on the Ethnology of the Okanagan.

Dr. G. B. Gordon.—Ethnological Researches in Alaska.

Professor H. Montgomery.—Archæology of Ontario and Manitoba.

SECTION K.—BOTANY.

J. Parkin.—The Evolution of Inflorescence.

Dr. Kidston, F.R.S., & Professor D. T. Gwynne-Vaughan.—The Ancestry of the Osmundaceæ.

II.—THE GLACIAL LAKE AGASSIZ.[1]

By WARREN UPHAM, A.M., D.Sc., St. Paul, Minn.

DURING the final melting of the North American ice-sheet a glacial lake, held by its barrier in the basin of the Red River and Lake Winnipeg, extended from Lake Traverse, on the west side of Minnesota, northward to the Saskatchewan and Nelson Rivers, and eastward on the international boundary to and somewhat beyond Rainy Lake. It attained thus an area of about 110,000 square miles, exceeding the combined areas of the five great lakes tributary to the St. Lawrence River. This glacial lake, named in 1879 Lake Agassiz, had a southwardly flowing outlet, called the Glacial River Warren, which took the course of the present Minnesota River, joining the Mississippi at Fort Snelling.

Beach ridges of sand and gravel, a few feet high, traced by levelling along about 800 miles of the highest shore of Lake Agassiz, mark its stage of greatest extent, and other similar beaches, at many successive lower levels, record later stages of the lake, reduced in height by erosion of a deep channel along the course of the outflowing river. After the recession of the ice-sheet permitted drainage from the glacial lake north-eastward into Hudson Bay, still lower beaches were formed, until the complete uncovering of the area crossed by the Nelson River reduced Lake Agassiz finally to its present representative, Lake Winnipeg.

In its earliest and highest stage, Lake Agassiz was nearly 200 feet deep above Moorhead and Fargo; a little more than 300 feet deep above Grand Forks and Crookston; about 450 feet above Pembia, St. Vincent, and Emerson; more than 500 feet above the site of the city of Winnipeg; and about 500 and 600 feet respectively above Lakes Manitoba and Winnipeg. The length of Lake Agassiz is estimated to have been nearly 700 miles, and its greatest width more than 200 miles.

Reports on the explorations of this ancient lake have been published by the Geological Surveys of Minnesota, the United States, and Canada. In the present paper the latest explanations are reviewed to account for the northward ascent of its beaches.

[1] Paper read before British Association, Section C (Geology), Winnipeg, 1909.

The highest and earliest beach or shore-line has an ascent of about a foot per mile toward the north-north-east; the lower and later shores ascend less; and the lowest shore, marked by beaches only 60 to 70 feet above Lake Winnipeg, are almost perfectly horizontal. It is thus known that the land was being uplifted differentially while Lake Agassiz existed, and that the uplift was nearly completed before the ice-sheet was wholly melted away.

The chief cause of the uplift is thought to be the unburdening of the land by the removal of the vast weight of the ice-sheet, this part of the earth-crust being restored to equilibrium or isostasy by an inflow of the plastic magma at a great depth within the earth, which took place during the time of departure of the ice.

Measures of the shore erosion and beach accumulation indicate that the duration of Lake Agassiz was only about 1000 years; and from the rate of recession of the Falls of St. Anthony, forming the gorge of the Mississippi River between Fort Snelling and Minneapolis, the length of the Post-Glacial period is estimated to be between 6000 and 10,000 years.

REVIEWS.

I.—An Egyptian Oasis: an account of the Oasis of Kharga in the Libyan Desert, with special reference to its History, Physical Geography, and Water-Supply. By H. J. Llewellyn Beadnell, F.G.S., etc. 8vo; pp. xiv, 248, with 28 pictorial plates and 4 maps and sections. London: John Murray, 1909. Price 10*s.* 6*d.* net.

A VERY interesting account of the "Flowing Wells and Sub-Surface Water in Kharga Oasis", accompanied by map, section, and view of one of the wells, was contributed by Mr. Beadnell to the Geological Magazine for February and March of last year. The author has now published in full his researches on the history and physical features of this extensive and remarkable oasis.

The oases of the Libyan Desert appear to have been inhabited from early prehistoric times, as flint implements of Palæolithic type occur on the margins of the plateaus that border the oases, and also within the depressions. Although at Kharga no natural outflow of water now occurs on the floor of the oasis, the author considers it probable that in those early times there may have been some natural springs, which escaped through fissures and attracted attention. Many ancient wells 120 metres in depth continue to flow now, though for the most part the yield has diminished. It is not known when the flowing wells were first made, but it has been ascertained that during their occupation of the country the Romans largely developed the water-supply, cutting underground tunnels of great length in solid rock with numerous air-shafts in the 'surface-water sandstone'.

As the author dealt with the geological structure of the region in the article before mentioned, we need not further refer to this part of the subject. With regard to the origin of the oasis, he finds no evidence of fluviatile erosion, nor of local subsidence. Tectonic