NOTICES OF MEMOIRS, ETC.

I.—The Conditions under which Manganese Dioxide has been deposited in Sedimentary Rocks, as illustrated by the Elgin Sandstones. By William Mackie, M.A., M.D.[1]

MANGANESE dioxide has been observed to occur in the Elgin Sandstones under the following conditions:—(1) In ovoid or rounded spots, from $\frac{1}{2}$ inch to 6 inches in diameter, known to the quarrymen as 'vegetations,' at Newton Quarry, in U.O.R. rocks. From analyses MnO_2 varies from ·18 per cent. to ·262 per cent. (2) In small nodules, about $\frac{1}{4}$ inch in diameter, in Triassic rocks, south-east of Cuttishillock, $MnO_2 = 12{\cdot}87$ per cent. (3) In punctiform spots around decomposing felspars in sandstone of the Rosebrae division, U.O.R. sandstones = ·0715 per cent. of MnO_2. (4) In small spots or lining minute cavities, and evidently following carbonate of lime in Triassic rocks, at Spynie and Lossiemouth, $MnO_2 = {\cdot}035$ per cent. (5) In veins or lining joints, occasionally parallel to and some distance back from the joint-plane. An example from Bishopmill, U.O.R., gave MnO_2 1·27 per cent. + MnO ·27 per cent. (6) Along the upper surface, and occasionally irregularly diffused through the interbedded clayey bands of the Rosebrae division. (7) Uniformly diffused through the sandstone in the same way as the much more frequently occurring ferric hydroxide; seen at Newton, Millstone, and Cloves quarries in the U.O.R. (8) In some organic remains in the same formation; a scute of *Bothriolepis major* gave MnO 2·33 per cent., of *Psammosteus Taylori* ·83 per cent. (9) As a brown or blackish staining on the casts of organic remains. (10) As illustrative examples are cited fragments of cherty limestone in the local Boulder-clays, with their interstices filled with MnO_2, the carbonate of lime having been totally removed, and a specimen of 'black' sand from under Boulder-clay on the Banffshire coast, MnO_2 6·58 per cent. + MnO ·48 per cent.

Experiments made by allowing a dilute solution of manganese sulphate—thirty grains to the gallon—to drip slowly on various rocks and sandstones showed that common chalk and sandstone containing carbonate of lime were darkened in colour within twelve hours. Sandstones without carbonate of lime were not darkened. If the specimens were first moistened with dilute ammonia, caustic soda or potash, or the carbonated alkalies, darkening to a degree, took place very rapidly. Free ammonia was found to exist in every specimen of sandstone from the area examined, and to be particularly plentiful in Newton sandstone. An acid reaction was obtained in some of the 'black' spots at Newton, due, it was believed, to the oxidation of sulphur, which was also present. Others gave a marked alkaline reaction. The presence of ammonium chloride was also demonstrated in a number of the sandstone specimens. In the presence of ammonia and ammonium chloride, manganese is only precipitated after it is peroxidized, but peroxidization is rapidly effected in the presence of free ammonia or other free alkali.

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

Though the solution of ammonia and ammonium chloride in the sandstones is no doubt very dilute, it is probably, as compared with the solution of manganese in the infiltrating water, relatively strong.

Presuming the access of oxygen—which may be taken for granted in the case of porous rocks like sandstones—the explanation of the precipitation of manganese dioxide simply resolves itself into accounting for a preponderance of alkalinity at the special points of precipitation of that substance. Analyses show that the manganese areas contain excess of lime, magnesia, and alkalies, compared with what obtains in the surrounding sandstones. This may have been a cause of increased alkalinity, and hence of the precipitation of the manganese dioxide. On the other hand, it may simply be a concomitant of the precipitation, and due to the same cause. The alkalinity in some of the manifestations enumerated has undoubtedly been due to carbonate of lime, (1), (2), (4), (8), (9); to the ammonia arising from the decomposition of organic remains, (1), (8), (9); to the presence of carbonated alkalies, (3), (5), (6), (7); and to free ammonia of the sandstone water after the total precipitation of the ferric hydroxide in a higher zone of the sandstones, (7). The conditions that are necessary for the precipitation of manganese dioxide are the presence of alkali or alkaline substance in excess, soluble manganese compounds in transit, and facility for oxygenation.

There is nothing particularly unique in the precipitation of manganese dioxide. It is simply an extension or continuation of the same action as determines the precipitation of ferric hydroxide, and a general separation is effected between the two substances by the fact that the iron compounds fall out before the manganese as the infiltrating water containing them encounters further and further supplies of alkali. The general distribution of the two substances in the Elgin Sandstones illustrates this natural method of separation, the rocks impregnated with secondary infiltration of ferric hydroxide in a general way occurring in a zone overlying those impregnated with manganese dioxide.

In the author's opinion the manganese nodules of the deep-sea deposits owe their origin to the operation of the same or similar causes.

As a general summary it may be stated that the principles involved in Weldon's process for the recovery of manganese were long anticipated, and had long been in operation in Nature's processes before Weldon's day.

II.—The so-called 'Fossil' Water of Sedimentary Strata, as illustrated by the Sandstones of the Moray Firth Basin.

By William Mackie, M.A., M.D.[1]

A SERIES of determinations of the soluble chlorides and sulphates locked up in the interstices of the Elgin Sandstones, was made to test the thesis that from such an examination it is possible to determine the character, as to freshness or salinity, of the waters of the basin of deposit of a series of sedimentary rocks.

In the present case, though some interesting side issues were no

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doubt made manifest, the results as regards the main issue were found to be entirely negative. In all, 38 determinations were made: 7 in L.O.R. rocks, 17 in U.O.R., 6 in Triassic, 1 in Jurassic, and for the purposes of illustration 7 in recent deposits. The averages obtained were:—

	Cl, per cent.	SO_4, per cent.
L.O.R.	·0101 ...	·0180
U.O.R.	·0077 ...	·0064
Triassic	·0050 ...	·0051
Jurassic	·0037 ...	·0113
Recent	·0049 ...	·0042

Average over all: Cl, ·0063 per cent.; SO_4, ·009 per cent.

Some interest attaches to these averages in relation to the question of the saltness of the sea. They show at least that a fairly large proportion of that saltness may reasonably be referred to the washing out in past times of the chlorides and sulphates from sedimentary rocks.

The increase shown by these averages from the younger to the older formations—or, to put it otherwise, from the overlying to the underlying rocks—may be ascribed to the washing in of the soluble salts from the surface and concentration in the depths; but doubt may be expressed if that covers the whole case.

Remarkable variations were obtained in specimens from the same sandstone, even when collected in the same quarry. These variations were in some cases so extreme as to preclude any general conclusion as to the character of the waters of the basin of deposit. It was also found that the percolation of rain-water may reduce the chlorides to ·0005 per cent. or less, and the sulphates to a like quantity, or even to entire absence. Water passing down joints and fissures, it was also found, tends to wash back the soluble salts and concentrate them at some distance back from the fissures. Chlorides, and less frequently the sulphates, were found to increase in rocks secondarily stained with ferric hydroxide, and also in the manganese areas. It has been shown elsewhere that traces of the heavy metals are disseminated through the Elgin Sandstones generally, and also tend to increase in relative proportion in the manganese areas. Increases in lime, magnesia, and alkali have also been demonstrated as obtaining in the same areas. From the intimate relationship of all these substances it is inferred, with some degree of certainty, that they formed part of the same general infiltration. If so, it must also be inferred at the same time that the original 'fossil' water of these sandstones must have long ago been washed out, or at least seriously masked in the process. Generally it may be said that such washing out of the original 'fossil' water may have taken place anywhere, and that the result of subsequent infiltrations may have themselves been replaced again and again by other infiltrations, and so on. The inference, therefore, that the soluble salts of a series of deposits represent the salts of the original waters of the basin of deposit must in the majority of instances be a very uncertain one, if indeed any degree of certainty can be claimed for such an inference under any circumstances.

III.—Short Notices.

1.—A Backward Step in Palæobotany. By G. F. Matthew, LL.D. Trans. Roy. Soc. Canada, ser. II, vol. vii, sec. iv, p. 113.

Some years ago the late Sir Wm. J. Dawson described a fine collection of fossil plants from a locality near St. John, and on the evidence which he obtained from them stated their age to be Devonian.

Lately, other palæobotanists, Messrs. R. Kidston and David White, reviewing this evidence, have come to the conclusion that these plants must belong to the Coal-measures. The present article is written in support of the original view that these 'plant beds' and their flora are much older.

Evidence is deduced from the stratigraphy that several eroded terranes lie between the true Coal-measures and the 'plant beds,' and that these must be much older than the former.

The composition of the flora is also examined, and it is shown that this series contains a number of genera of plants not found in the Coal-measures proper, and that while a small percentage only of the species of the plant beds are identical with those of the Coal-measures of Pennsylvania, about half of these are found in the European Coal-measures. The connection of the plant beds with the Coal-measures, therefore, seems a distant one.

2. Royal Society's Catalogue of Scientific Papers.—The Royal Society has issued a circular appealing for funds to enable it to carry out the original scheme of cataloguing the papers contained in scientific periodicals up to and including 1900, of which twelve quarto volumes have already been issued, and the work brought down to 1883. The Society has already spent £14,790 5*s.* 5*d.* upon the matter, and now thinks that it might receive a little more financial assistance from others, especially as its expenditure has increased considerably of late years in other directions. They want £12,000, and it should not be difficult to raise the amount. The Society also proposes to issue a subject index for the whole period of 1800–1900, an index which, if properly done, should be of enormous value. It is pleasant to note that both these works are already in hand, and the completion of the author catalogue may be expected in about five years. Dr. Ludwig Mond, who previously gave £2,000, has headed the new list of subscriptions with the magnificent donation of £6,000, and Mr. Carnegie has contributed £1,000. We hope the delicate shade of meaning given to the letters F.R.S. by an eminent expert will be borne in mind by others who have found it an equally valuable asset.

3. North German Lower Cretaceous.—Dr. A. von Koenen has given a revised classification of the Albien in the Nachricht K. Gesell. Wiss. Göttingen (Math.-Phys.), 1901. This includes the Aptien, Barrêmien, Hauterivien, and Valanginien, each of which he divides into upper and lower. In the copy of his paper before us, a separate from the author, we note that he has corrected his

lower Barrêmian by placing the zone of *Crioceras elegans* above instead of below the zone of *Ancyloceras crassum* and *Crioceras fissicostatum*.

4. Chalk Foraminifera.—The foraminifera of the *Inoceramus*-beds of the district of Rzeszow and Debica have been figured and described by W. Friedberg in Bull. Intern. Acad. Sci. Cracovie (Dec. 1901). Out of 92 forms mentioned some 66 were previously found by Grzybowski in the *Inoceramus*-beds of Gorlice (ibid., April, 1901). The figures given by Friedberg are rather rough and unsatisfactory.

5. Patagonian Tertiary Mollusca.—H. von Ihering has an important though short paper on this subject in the Proc. American Phil. Soc., xli (April, 1902). He states that Borchert erroneously determined many of the forms, and thus was led to a wrong idea as to the age of the beds. Ihering regards the Parana formation as Miocene, and the Cape Fairweather beds as the representative of the Pliocene of Argentina in the south, while the same formation in the north is seen in the Tehuelche beds. The 'Pampeano superior' of Ameghino he regards as Pleistocene, and the *Pyrotherium*-beds as Eocene. Ihering says that there are neither existing nor Mesozoic species of mollusca in the *Pyrotherium*-beds.

6. Oligocene and Miocene Deposits of the Great Plains.—Hatcher, in the same Proceedings, discusses the origin of these beds, dealing with the character of the materials and the palæontological evidence. He arranges the White River formation thus: 1, *Titanotherium*-beds; 2, *Oreodon*-beds; 3, *Leptauchenia*-beds. The Loup Fork formation thus: 1, Gering Sandstone; 2, Ogalalla formation. The Arikaree formation thus: 1, Monroe Creek beds; 2, Harrison beds; 3, Nebraska beds of Scott. All from below upwards.

7. The Hull Museum.—Although this museum has been opened but a few months, Mr. Sheppard has already got into excellent shape the collections of Antiquities and Animals. He is now at work upon the geological material. Among this is the collection made by F. A. Bedwell (afterwards Judge) from the Chalk. Bedwell was the author of the paper on the Ammonite Zone of Thanet, which appeared in the Geologists' Association Proceedings, a paper the accuracy of which has been vouched for by Rowe. When Mr. Sheppard has cleaned and arranged this Chalk collection, which no doubt all came from the South of England, he will probably find some interesting specimens, and possibly some types.

8. Geology of Hertfordshire.—Mr. Hopkinson has issued in the Trans. Herts Nat. Hist. Soc., 1902, vol. xi (3), a list of works on the geology of the county from 1884 to 1900. This is in continuation of a previous list, and that again of Whitaker's list of 1875. We wish other county societies would see their way to publish similar lists regularly. A few have done so, but it is not general, and the matter might well engage the attention of the British Association Committee.

9. Pre-Rhætic Denudation of the Bristol Area.—Dr. Callaway deals with this subject in the Proc. Cotteswold Nat. Field Club, 1901, xiv (1). The paper gives a clear sketch of the country before and after Rhætic times, and is illustrated by two sections, one of the Avon section and the other of the Avon gorge.

10. Manchester Museum.—Mr. Hoyle's Annual Report for 1901–2 is highly satisfactory. The Rev. Arthur Dixon has given the museum a fine collection of fossils, rocks, and minerals. Other geological material acquired by gift or purchase is a series of rocks from Charnwood Forest, sections of coal plants selected to fill gaps in the collection, collection of magnesian concretions, of stalagmites and stalactites, Permian rocks from the Lakes and Isle of Man, and cores from borings in the Isle of Man.

REVIEWS.

I. — Geological Survey of England and Wales. Sheet 123 (Stoke-on-Trent). Solid and Drift Editions. Scale, 1 inch to a mile. (Price 1*s.* 6*d.*)

Memoirs of the Geological Survey of England and Wales. The Geology of the Country around Stoke-on-Trent (Explanation of Sheet 123). By Walcot Gibson, B.Sc., F.G.S., and C. B. Wedd, B.A., F.G.S.; with Notes by George Barrow, F.G.S. (1902. Price 1*s.* 6*d.*)

IT is necessary to discuss the Map and Memoir as separate items, because so much of the technicalities of the production of the map is new and important. It is incidentally stated in the preface to the Memoir that "Both maps are colour-printed, and they represent the first attempt to substitute colour-printing for hand-colouring in the issue of the 1 in. Survey maps." We must heartily congratulate those who originated the idea and those who have so ably carried it out, for the result is highly praiseworthy, and may be considered as a triumph of geological map printing. The map will be, at any rate, free from the personal errors of the colourist, and the colours will be both more permanent and will always agree with the colour index in the margin. This improvement, however, carries with it a great reduction in price, the sheet being issued at 1*s.* 6*d.* per copy instead of 3*s.*; and, by the way, the old quarter-sheet at 3*s.* only measured 13½ by 10 inches, while the new sheet is 18 by 12 inches. The new sheet covers a somewhat different area, taking in more ground to the west, and not including area to the east which appeared on the old sheet. We hope that the new issue of cheap, accurate lithographed geological maps will henceforth replace the hand-coloured editions.

The mapping is much more detailed. The four divisions of the Upper Coal-measures are shown by distinct colours, with, in addition, brighter colours for particular beds, such as limestones and a green grit. We quite agree with the wisdom of making no distinction between Middle and Lower Coal-measures, and rejoice to see that the