

Coniston Limestone, and indeed is intermediate in lithological character between that Limestone and the Trinucleus Shales of Sweden. Palæontologically it is connected with the latter by the occurrence within it of *Diplograptus* like *pristis*, *Dicellograptus anceps*, *Trinucleus seticornis*, *Didymene ornata*?, *Cybele Loveni*, and *Turrilepas*.

The Lower Coniston Flags have the fauna of the *Cyrtograptus* Shales, though *Cyrtograptus* has not yet been found in them. Our fossils are derived from near the base of this series, and that they occur in beds about the horizon of the lower part of the *Cyrtograptus* Shales is possibly indicated by the occurrence of *Monograptus cultellus*, of which, however, only one specimen has hitherto been found in the Settle District. A further examination of these Lower Coniston Flags, at points more remote from the base, will probably be rewarded by the discovery of other species of Graptolites.

That the Moughton Whetstones are really intermediate in position between these Lower Coniston Flags and the flags in the quarries of Arco Wood, Dryrigg, etc., seems proved by the occurrence in them of *Monograptus dubius*, *M. uncinatus*? and *M. Nilssoni*, all of which are found at the base of the *Cardiola* beds of Sweden, whilst the higher parts of the *Cardiola* beds contain fossils identical with those of Arco Wood, etc., including *Monograptus colonus*, and *M. bohemicus*. The zone with *M. dubius*, etc., has, so far as I am aware, been hitherto unrecorded in Britain, and the probable corresponding beds in the Lake District are not of a nature suitable for the preservation of Graptolites.

The Swedish affinities of these Settle rocks will probably be further proved, when more work has been carried on in the district, and from the simplicity of the sections, the area can confidently be recommended to the notice of any geologist who wishes, by patient work, to assist in establishing the zones of the Lower Palæozoic rocks of our country.

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## NOTICES OF MEMOIRS.

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PAPERS READ BEFORE SECTION C. (GEOLOGY) BRITISH ASSOCIATION MEETING,  
BIRMINGHAM, 1886.

I.—MANGANESE MINING IN MERIONETHSHIRE. By C. LE NEVE  
FOSTER, D.Sc., F.G.S.

**M**ANGANESE ore is now being worked in the Cambrian rocks at several places near Barmouth and Harlech. It occurs in the form of a bed varying from a few inches to three feet in thickness; the average thickness is one foot to one foot and a half. The undecomposed ore contains the manganese in the form of carbonate, with a small proportion of silicate; but at the outcrop it is changed into a hydrated black oxide. Some of the outcrops of the manganese bed are erroneously marked on the Geological Survey Maps as mineral veins, though Sir Andrew Ramsay was of opinion that the deposits were not true lodes. Recent workings show plainly that the deposits are truly stratified beds, or possibly various outcrops of one and the same bed, extending over a considerable area.

The ore contains from 20 to 35 per cent. of metallic manganese, and is despatched to Flintshire and Lancashire for the manufacture of ferromanganese. The new Merionethshire mines are the first instance of workings for carbonate of manganese in the British Isles.

II.—ON THE STRATIGRAPHICAL POSITION OF THE SALT MEASURES OF SOUTH DURHAM. By G. A. LEBOUR, M.A., F.G.S., Professor of Geology in the Durham College of Science, Newcastle-upon-Tyne.

THE beds above the main mass of the Magnesian Limestone in Durham are seldom exposed at the surface, as the south of the country is covered by a thick spread of drift. The presence of salt deposits having, however, been proved some years ago in the adjoining part of Yorkshire near Middlesbrough, several borings for working them in the form of brine were soon put down in the flat country between the Tees and the coast south of Seaton Carew. There are now altogether some fifteen or sixteen such borings, most of which have reached beds of salt at depths varying from 600 feet to over 1200 feet. These have thrown much light upon the rocks, hitherto scarcely known in this part of England, which lie between the Rhætic and the great Permian Magnesian Limestone of Durham. The author exhibited sections of these beds, and gave reasons for suggesting that much of the Salt Measures of this district is probably the representative of the Upper Permian or *Rauchwacke* of Germany.

The following table summarizes fairly the classification tentatively suggested by the author :—

<i>Avicula contorta</i> beds (proved in Eston shaft and boring) ...	Rhætic.
7. Red and green marls, with gypsum (known only south of Tees) ... ..	} Upper Trias.
6. Red sandstone ... ..	
<i>Unconformity</i> (?)	
5. Red sandstones and marls ... ..	(? Lower) Trias.
<i>Unconformity</i> (?)	
4. Red marly sandstones, marls, with lenticular beds of anhydrite, gypsum, and salt, and fœtid limestone in variable bands towards the base ... ..	} Upper Permian. ( <i>Rauchwacke</i> ).
3. Main Magnesian Limestone ... ..	
2. Marl slate with fish-bed ... ..	} Middle Permian.
1. Yellow sands ... ..	
<i>Unconformity</i> .	Lower Permian.

CARBONIFEROUS ROCKS.

III.—GEYSERS OF THE ROTORUA DISTRICT, NORTH ISLAND OF NEW ZEALAND. By E. W. BUCKE.

THE author of this paper has recently returned from the Lake district of New Zealand, where he spent eighteen months, and had exceptional opportunities for making observations upon the volcanic phenomena of the district. The largest geyser in New Zealand, that of the White Terrace of Rotomahana, is now destroyed; the three next in size are those of Pehutu, Waikiti, and Wairoa, all of which are situated close together at the back of the native village named Whakarewarewa, about three miles to the south of the Rotorua township, and these are particularly described in the present communication. The author was able to determine by soundings the depth of the tubes of several geysers of this district, and in the case of an extinct one, that of Te Waro, he was let down the tube. He found that this tube, at a depth of 13 feet from the surface, opened into a chamber 15 feet long, 8 feet broad, and 9 feet high, and that from one end of this chamber another tube led downwards to an undetermined depth.

Living entirely among the natives for many months, and speaking their language, the author was able to test the power claimed by the natives of being able to predict the outbursts of the geysers. He is convinced that by constant observations on the direction of the wind and the condition of the atmosphere, the natives have learnt to prognosticate the movements in all these hot springs with wonderful accuracy. He was also able to prove that during the whole time of his residence in the district certain of the geysers were only in eruption when the wind blew from a particular quarter.

IV.—ON AN ACCURATE AND RAPID METHOD OF ESTIMATING THE SILICA IN AN IGNEOUS ROCK. By J. H. PLAYER, F.G.S., F.C.S.

THIS paper describes a method of estimating the silica in igneous rocks by

1. Fusing the finely ground rock with a flux prepared by mixing carbonates of potash and soda and nitrate of potash.
2. Disintegrating the glass so obtained by the action of strong nitric acid.
3. Driving off nitric acid at a temperature just below 250°, thus rendering all silica insoluble.
4. Treating with hydrochloric acid, to leave the silica with some impurity, for weighing after calcination.
5. Separating the impurity by means of ammonium fluoride and weighing it.

REVIEWS.

OBSERVATIONS SUR LES GROUPES SÉDIMENTAIRES LES PLUS ANCIENS DU NORD-OUEST DE LA FRANCE. Par M. HÉBERT. (Extrait des Comptes rendus des Séances de l'Académie des Sciences, tom. ciii., Séance du 26 Juillet, 1886.)

IN this memoir, Professor Hébert submits to the Academy a view of the Geology of North-Western France which differs in some points from previous interpretations. Brittany and Western Normandy present difficulties such as have perplexed British geologists in many of the tracts occupied by the older rocks. French writers are agreed that in North-Western France there are (omitting the true crystalline schists) (1) a granite, (2) a great formation of phyllite, and (3) a series of purple conglomerates and (?) shales (*schistes*). The last-named group is overlain by the *Grès Armoricain*, and over this sandstone come shales and slates, with *Acidaspis Buchii*, and more than one species of *Placoparia*. These *Placoparia* beds, with the same *Acidaspis*, occur in our Salopian area, not far above the grits of the Stiper Stones; so that the *Grès Armoricain* may be safely regarded as Arenig. But below this horizon, the interpreters of Brittany geology find the materials for widely diverging opinions. The theory of M. Hébert may be thus summarized.

The oldest of the three rock-masses is the granite. It furnishes numerous rolled blocks to a conglomerate in the phyllite series, and it never penetrates the adjoining strata in veins. At its junction with the phyllite, the granite is in the state of sand, and the phyllite also is