obliquely from the front, dividing it into several (4) lobes. Cirrhi and setæ unknown.

The particular characters of the species are the proportions of the body and feet, and the shape of the latter. It is distinguished from *M. McLeayi* by its larger size and broader axis, and by its broad oval feet.

Locality and Formation.—Morben, near Machynlleth; in the Metalliferous Slate Series.

Orthoceras, sp. Pl. XI. Fig. 18.

I have not been able to determine the species of this *Orthoceras*, for the shell itself is unknown, only internal casts being found. The more mature part of the shell is similar to *O. vagans* in its distant septa, but it tapers more rapidly. In the younger shell, on the other hand, the septa are closer set, and the shape is more cylindrical. Other cylindrical and slender *Orthoceratites* with distant septa also occur, and if all these belong to one species it must be very variable in form.

Measurements.—Length, 3 inches; breadth of broad end, 10 mm.; breadth of small end, $2\frac{1}{2}$ mm.; breadth midway, $4\frac{1}{2}$ mm.; distance between septa midway, 3 mm.; distance between septa near apex, 1 mm.

Localities.—Corys; Taren y Gesail; Melin Newydd Valley; Eglwys Fach; Cefn Hendre; and Steddfa Gurig.

EXPLANATION OF PLATE XI.

Fossils from the Cardiganshire Group (Llandoveryes).

- FIG. 1. *Buthotrephis major*, Kpng., river side near Tal y bont.
 ,, 2. ,, ,, var. *Llyn Fron Goch*, Llantrisant.
 ,, 3. ,, *minor*, Kpng., Pont Erwyd.
 ,, 4. Algae from Mynydd bach.
 ,, 5. *Palæochorda tardifurcata*, n. sp. Aberystwyth.
 ,, 6. *Retiofucus extensus*, n. sp. Cefn Coch, Aberystwyth.
 ,, 7. ,, ,, young form, Allt wen, Aberystwyth.
 ,, 8-11. *Nematolites Edwardsii*, n. sp. Aberystwyth.
 ,, 12a. *Nematolites dendroideum*, n. sp. near Llantrisant.
 ,, 12b. A part of same enlarged.
 ,, 13a. *Dentalina*.
 ,, 13b. The same magnified, Cwm Symlog.
 ,, 14. *Textularia*, magnified, Cwm Symlog.
 ,, 15. *Rotalia*? magnified, Cwm Symlog.
 ,, 16, 17. *Myriantites Lapworthii*, n. sp. Morben, Machynlleth.
 ,, 18. *Orthoceras*, sp. Taren y Gerail, S. of Cader Idris.

III.—NOTES ON THE PERMIAN AND TRIAS.

By PROFESSOR EDWARD HULL, M.A., LL.D., F.R.S.,
 Director of the Geological Survey of Ireland.

I WISH to make one or two observations on the Rev. A. Irving's paper on "The Permian and Trias," which has appeared in the GEOLOGICAL MAGAZINE, and of which he has been so good as to send me a separate copy.

My first observation refers to the geological age of the Sandstone of the vale of the Eden, in which he quotes my name as a supporter

of the view that it is of Permian age. Now, I wish to state, that personally I have never given an opinion to this effect, nor have I had any, but a very limited, opportunity of forming one. When it was announced some years ago by Sir R. I. Murchison and Professor Harkness, that the Upper Sandstones of the valley of the Eden, previously supposed to be Triassic, were in reality of Permian, age, I accepted their views with the reliance due to statements proceeding from such high sources. But as the evidence was rather of an inferential and indirect nature, I am quite prepared to fall back on Professor Sedgwick's views as soon as the officers of the Geological Survey shall have definitely pronounced in their favour.

I must, however, take some exception to the manner in which Mr. Irving has represented the respective positions of Sir R. I. Murchison and Professor Harkness in reference to this question. It is scarcely correct to say, that the former "manipulates the observations" and "overrides the previous judgment of the latter" as regards the age of the Upper Sandstones. As a matter of fact, Murchison and Harkness are equally responsible for the views expressed in their joint paper.¹ Murchison writes the "Introduction"—but all through the statements are made in the plural number, and are the result of their joint observations. Of this any one may satisfy himself by reference to the paper, and I think Mr. Irving was hardly justified in his way of representing the course taken by my former chief.

My next point is in reference to Mr. Irving's statements regarding the "Upper Permian" beds of South Lancashire. I very much regret that it betrays a hastiness of inference not to be expected of one who undertakes to review the whole question of the relations of British Permian and Trias. Starting with the statement that Mr. Strahan has "recently shown" that a certain duplex series of marls and sandstones which had been observed by Mr. Binney and myself to "crop out in one place"—and were supposed by them to be Permian—are really the base of the Triassic series in that district, he goes on to question the existence of Upper Permian beds in South Lancashire altogether. Now, in the first place, I beg to say that Mr. Strahan has shown nothing of the kind; and even if he had done so as regards the St. Helen's section, it would not have affected the general question of the existence of Permian beds in South Lancashire. The locality in question is at the extreme western limit of the district, and isolated from the main tract which ranges from Winwick to Manchester. Mr. Strahan's visit to South Lancashire must have been a flying one, in which he gathered up the most recent information from new sinkings, and if he had contented himself with giving the information thus acquired, without the generalizations in which he indulges, I would have had no objection to offer. But I must protest against such *ex parte* publication of views by an officer of the Survey made under such circumstances, in the face of those first arrived at by such a careful observer as the late Mr. Binney, who spent a lifetime in collecting evidence and formulating his conclusions thereon; and secondly, of myself, who spent several years in

¹ Quart. Journ. Geol. Soc. vol. xx. p. 144.

mapping this district officially, and had opportunities for observation and deduction which Mr. Strahan could not have obtained.

As a matter of fact, I have visited all the sinkings which he describes, and another which he does not describe, viz., one at Abram near Winwick, in which beds of calcareous marl with limestone bands are passed through below the New Red Sandstone, and from which I myself collected numerous small shells of Permian age of a kind which are to be found in these beds wherever they occur along the border of the Coal-field, such as *Schizodus*, *Turbo*, *Azinus*, etc., fossils which prove beyond question that these beds (as I have shown in one of my papers) are the representatives of the Magnesian Limestone of the North-east of England. These fossiliferous beds I regard as the equivalents of those referred to by Mr. Strahan, and nowhere do they occur in the New Red Sandstone.

I would ask Mr. Irving whether he has consulted the Survey Memoirs of the South Lancashire Coal-field, those of Prescott, Wigan, Bolton, Oldham, and Manchester, and of Stockport, and if so, whether he deliberately rejects the evidence therein detailed regarding the existence of these Upper Permian beds.¹

Mr. Binney, who first determined the age of these beds, and had with admirable industry collected the details of every available section from Stockport on the east to Liverpool on the west, placed the question of their age beyond doubt, both by evidence of unconformity to the Trias above, and to the Carboniferous beds below, as well as by palæontological evidence.² On the question of the unconformity to the New Red Sandstone, the sections along the valley of the Mersey, depending partially on borings, and partly on visible evidence, first made out by Mr. Binney, and afterwards verified by myself,³ is conclusive, even if it stood by itself. They show the Permian Marls with bands of limestone 129 feet thick at Heaton Mersey, the same at Hope Hill, only 25 feet, and at Stockport nearly absent, as the Pebble Beds of the Bunter rest almost directly on the Lower Permian Sandstone.⁴ This overlap is from west to east, and shows that the Upper Permian Marls become thicker towards the Cheshire Plain, along the eastern side of the Coal-field, though the converse is the case on the Liverpool side.

As regards the general question dealt with by Mr. Irving, I am almost inclined to concur that there is but little evidence to support the view of a threefold division of the Permian beds. That there is a two-fold division I no less strongly hold; and if he will do me

¹ Mr. Irving mentions the name of Mr. De Rance as a supporter of his views. This I can scarcely credit. At any rate he must excuse my accepting his unsupported statement.

² Contained in several papers but chiefly in the following, "On the Permian Beds of the North-west of England," Mem. Lit. and Phil. Soc. Manchester, vol. xii. A list of the fossils, and the general succession of the formations in S. Lancashire, will be found in the "Coal-fields of Great Britain," 4th ed., p. 198.

³ "Geology of the Country around Stockport, Macclesfield, etc.," Mem. Geol. Survey, pp. 34-5

⁴ Such thick beds of marl as those here stated nowhere occur in the Bunter Sandstone. I do not recollect throughout the whole of Lancashire and Cheshire even seeing a marly band more than about six or eight feet in thickness.

the favour to consult my paper "On the Evidence of a Ridge of Lower Carboniferous rocks under the Plain of Cheshire,"¹ he will see how I explain the differences in the mineral characters of the lower division as it occurs in the Midland Counties, and in the Northern.

DUBLIN, 18th Sept. 1882.

IV.—NOTES ON THE POST-CARBONIFEROUS (DYASSIC) AND TRIASSIC DEPOSITS OF THE ALPS.

By the REV. A. IRVING, B.A., B.Sc., F.G.S.;
of Wellington College.

THE purpose of this communication is to supplement the author's paper on the "Classification of the European Rocks known as Permian and Trias," which has appeared in recent numbers of this MAGAZINE. It is based on a short communication made to Section C. of the British Association at the recent meeting at Southampton, and has been expanded into the present paper at the request of the President of the Section, R. Etheridge, Esq., F.R.S.

Reasons were given in the former paper for not considering the names 'Dyas' and 'Permian' as altogether suitable as general terms applicable to the European area as a whole, since they severally connote the respective facies of the rocks of this age in particular areas. It is with geological history as with an imperfectly known country, one feels the desirability of great and distinctive landmarks; and such a land-mark is furnished for later Palæozoic times by the great Carboniferous system. The name 'Post-Carboniferous' was therefore proposed as a general term, and this name is here retained, until a better one is proposed, upon the high authority (among others) of Prof. Gümbel of Vienna as well as of that of Credner. It has been urged against the use of this term, that it applies to any and all of the formations which are later in time than the Carboniferous period. Such an objection is to my mind a feeble one; one might almost as well say that a 'postscript' to a letter includes all that the writer of the letter has since written. This, like so many other questions of nomenclature, cannot be settled by mere reference to a Latin dictionary: if it could be, a boy in a grammar school might perhaps decide it for us. One feels, and every one who has read Latin at all must feel, that in composition the prepositions acquire a flexibility which they do not possess to the same extent in their unagglutinated use. Surely 'post-' does sometimes mean 'coming after in importance' as well as in sequence of time; the term in question therefore implies that the series to which it refers, though having a sufficiently pronounced facies of its own to be entitled to be regarded as a system distinct from, is yet in some sense subordinated to, the Carboniferous system. Further, in considering the propriety of the use of the term now under discussion, it should be borne in mind that the strata, to which the name 'Post-Carboniferous' is here applied, are recognized as falling into the

¹ Quart. Journ. Geol. Soc. vol. xxv. p. 171.