late been drawn to the Trias by a committee of the British Association, this preliminary sketch of the results already obtained may be of some service.

My thanks are due to many friends, but especially to the quarry owners for very active help, to Mr. Arber for the identification of Triassic plants of which very little is known in this country, and to Dr. Smith Woodward for examining the vertebrate remains.

IX.—NOTES ON SOME RECENT WORK ON THE BOKKEVELD FOSSILS.

By F. R. COWPER REED, M.A., F.G.S.

IN a recent important article in the "Records of the Albany Museum, South Africa," vol. i, No. vi (1906), pp. 347–404, pls. vi–x, Professor Schwarz describes some interesting fresh material from the Bokkeveld Beds, and is able to add several new species to the steadily growing list. Incidentally he is led to criticise some previous work done by me on the Brachiopoda and Mollusca from the same beds. Whilst I welcome the new light he is able to throw on several of the obscure fossils with which I had to deal, I must demur to some of his conclusions, especially in the case of the Brachiopoda; and accordingly, as my opinion on his paper has been specially asked by other workers on this fauna, a few remarks appear to be requisite. It must not be forgotten that the specimens in all cases are poor and unsatisfactory, but Professor Schwarz has had the advantage over me of more abundant material.

1. With regard to his new species *Rensseleria relicta* (op. cit., p. 364, pl. vii, fig. 7), it is considered by Professor Schwarz to be perhaps identical with my *Rensseleria* sp. a (Ann. S. Afr. Mus., vol. iv, pt. 3, p. 176, pl. xxi, fig. 8). Without seeing his type it is naturally impossible for me to form a definite opinion, but his view seems to possess much probability, though my doubts as to the generic position of this shell have been recently expressed in my description of *Scaphiocalia* (?) *africana* (GEOL. MAG., Dec. V, Vol. III (1906), p. 308). Better material will probably remove the existing uncertainty as to its specific and generic relations.

2. The ribbing in *Rensseleria hottentot*, Schwarz (op. cit., p. 365, pl. vii, fig. 8), as described and figured, does not suggest the genus *Rensseleria*, but rather the genus *Rhynchospira*, and the same remark applies to his *Trigleria simplex* (pl. vii, fig. 9), which I cannot agree is probably identical with my *Trigleria* aff. *Gaudryi*; the central grooved narrow fold or wide rib on the brachial valve, represented in Professor Schwarz's figures and mentioned in his descriptions, seems to forbid their reference to *Rensseleria* or *Trigleria*; and, as he remarks, *T. simplex* may rather be compared with Hartt's *Retzia jamesiana*. In placing the latter in the genus *Rhynchospira* I am merely adopting Clarke's view in the case of the Para examples, for the species has also been referred to *Notothyris* and *Centronella*.

3. Professor Schwarz arrives at somewhat different conclusions with regard to the specific separation of the members of the genus *Spirifer*, but he acknowledges the difficulties with which one has to

contend owing to the fossils occurring only as casts or impressions, and frequently in an imperfect condition. In the first place it cannot be denied that all the species described from these beds are closely allied, and that many intermediate forms occur which might be referred to one or other of the species with equal justice. Only the most marked forms at the extremity of each series of variations are in reality capable of precise definition, and it is by them that the specific characters have been established. Therefore the reference of many of the positional examples and debatable specimens depends largely on the personal equation. In my case it should be remembered that I had the advantage over Professor Schwarz of examining the type-specimens in London. Professor Schwarz would restrict the name *Sp. Orbignyi*, Morris & Sharpe, to those forms possessing a more semicircular shape and a less incurved beak and more backward sloping hinge-area on the pedicle valve than *Sp. antarcticus*, Morris & Sharpe. To the transversely fusiform shells with nearly a vertical hinge-area and rather strongly incurved beak in the pedicle valve, which I included under the name *Sp. Orbignyi*, Professor Schwarz applies the name *antarcticus*, Morris & Sharpe. In spite of the differences pointed out, and in view of further specimens which I have seen, I am reluctant to adopt his view, for the characters on which he relies do not seem to be constant.

My *Sp. cf. pedroanus* Professor Schwarz would include in his *Sp. antarcticus* (= *Sp. Orbignyi*, mihi), but with this view I cannot completely concur, for there appear to be special features in the number, character, and relative size of the ribs which I have previously mentioned (Ann. S. Afr. Mus., loc. cit., p. 183, pl. xxii, fig. 5). Professor Schwarz also misunderstands my description by thinking that I took *Sp. pedroanus* to have only 10–16 ribs in all, but the fact that I largely rely for the comparison on the number of the ribs (20–22) in the South African form should have been sufficient to indicate that I had clearly in my mind Hartt's statement that there were 10–16 ribs on each side of the fold and sinus. I am, however, ready to admit that my *Sp. cf. pedroanus* may not be identical with the South American species bearing this name, and may be only an extreme variety of the *Sp. antarcticus* of Professor Schwarz.

In the case of *Sp. Ceres*, mihi, Professor Schwarz believes that one of the specimens figured by me (pl. xxii, fig. 6) is an overgrown example of *Sp. Orbignyi* or *Sp. antarcticus*, though his very reasons for adopting this view considerably weaken his arguments in favour of the separation of *Sp. Orbignyi* from *Sp. antarcticus*. Likewise his inclination to identify *Sp. Ceres* with *Sp. Hawkinsi* (for which I cannot see sufficient evidence) proves that he allows much latitude of variation in his specific interpretations.

It is always a misfortune to have to multiply specific names, particularly in connection with poorly preserved fossils, and one would be glad to reduce the number of species of *Spirifer* recorded from the Bokkeveld Beds. But when local varieties or zonal mutations may be suspected it is wise not to neglect minor differences observable in specimens from other localities and rocks than the type; and particularly does this seem to be

a necessary warning in the case of the Bokkeveld Beds with their diverse lithological development, and in view of the absence of minute zonal work or zonal collecting from the beds included in this stratigraphical series.

4. In the case of the Mollusca Professor Schwarz is able to record several new species. Perhaps with regard to the specimen identified as *Cypricardella Pohli*, Clarke, the figure leaves something to be desired, as, comparing it with the one given by Clarke of this species, there does not seem to be much resemblance. However, without seeing the specimen a fair criticism cannot be passed.

5. With regard to the trilobites and the points of difference between Professor Schwarz and Mr. Lake in their identification, it is not for me to pass any opinion. A small collection recently presented by the South African Museum to Cambridge includes a good example of the new species *Homalonotus hippocampus*, Schwarz, which, as the author states, is sharply separable from *H. Herscheli*. I notice the subgeneric name *Cryphaeus* still used by Prof. Schwarz in connection with *Phacops*, though it has been shown to be preoccupied (GEOL. MAG., Dec. V, Vol. II, 1905, p. 173), and it is doubtful if any of the South African forms referred to this subgeneric group, *Asteropyge*, can be rightly retained in it without undue extension of its meaning.

In a subsequent article a review of the whole fauna will be given.

NOTICES OF MEMOIRS.

I.—A CONTRIBUTION TO OUR KNOWLEDGE OF THE LIMESTONE KNOLLS OF CRAVEN. By A. WILMORE, F.G.S.¹

THE Craven Lowlands district, between the great faults on the north-east and the grit hills of the Pendle Range on the south, is characterised by a well-known series of limestone knolls which have been the subject of much discussion.² Having worked in the district for some years I venture to make the following suggestions.

I. The words 'knoll' and 'reef-knoll' seem to be differently understood by different workers. It seems to me desirable to drop the term 'reef-knoll.' This term was applied by Mr. Tiddeman to certain extreme members of a series: there is every possible gradation between these and ordinary rounded knolls to which the term would never be applied. Further, the hills so named by Mr. Tiddeman have not all originated in the same way.

¹ Paper read in Section C (Geology) at British Association Meeting, York, 1906.

² Tiddeman: Brit. Assoc. Rep., 1899; Brit. Assoc. Handbook for Leeds and Airedale, 1890; Brit. Assoc. Rep., 1900; GEOL. MAG., January, 1901. Marr: Q.J.G.S., vol. lv, pt. 3 (August, 1899); also Dakyns in same number. W. Hind & Howe, "On the Pendleside Group at Pendle Hill, etc.": Q.J.G.S., vol. lvii, pt. 3 (August, 1901). Sir A. Geikie: "Text Book," vol. ii (1903), p. 1041.