Northern Wyoming. From the Wind River Valley Mr. Wortman brought two specimens, and ten from the Big-Horn Basin." (*op. cit.* pp. 462-463).

NOTE.—We are indebted to the kindness of Prof. E. D. Cope for permission to reproduce the figure of *Phenacodus* given in our Pl. II.—EDIT. GEOL. MAG.

II.—AN ANSWER TO "OBSERVATIONS ON SOME IMPERFECTLY KNOWN MADREPORARIA FROM THE CRETACEOUS FORMATION OF ENGLAND, BY R. F. TOMES, ESQ., F.G.S."

By Prof. P. MARTIN DUNCAN, F.R.S.

I HEARD this communication read at the Geological Society in June last, and I made some remarks upon it which are noticed in the Proceedings of the Society. A considerable portion of the paper consisted of criticisms of some of my work which appeared in the British Fossil Corals (2 ser. Pal. Soc. part ii. Nos. 1 and 2, 1869-70). Some specimens were exhibited, in the author's absence, which were presumed to afford evidence of a satisfactory kind. But it was observed that the very imperfect and bad condition of the fossils did not substantiate the author's statements. Many specimens which ought to have been exhibited were not before the Society, and yet the classificatory position of some very rare corals could then and there have been settled. As this paper was not published by the Geological Society, as the author ignores the remarks I made on the paper, and as it appears in the GEOLOGICAL MAGAZINE for December, 1885, p. 541, I ask a small space for a reply.

In answer to Mr. Tomes, I assert that *Micrabacia Fittoni*, nobis (Pal. Soc. *loc. cit.* p. 37, pl. xiv. figs. 6, 7, 8, 9), is not a variety of *Cyclocyathus Fittoni*, Edw. and Haime (Pal. Soc. Brit. Foss. Corals, pt. i. p. 63, pl. xi. figs. 3, 3a, 3b, 1850). Neither is it that species. The species of *M. Fittoni* was founded upon a solitary yet good specimen, and the drawings of it were good and from nature. Some years after the description of the species, I investigated the morphology of *Micrabacia coronula*, and the results were published (Quart. Journ. Geol. Soc. vol. xl. 1884, p. 561).¹ I pointed out that there was reason to doubt whether *M. Fittoni* was a true *Micrabacia*; but that as the type was not accessible, I did not feel disposed to remove the form until I had an opportunity of investigating it anew. It was, however, not necessary to place the form out of the Fungida, to which section it belongs. I should have been glad to have seen another specimen, but Mr. Tomes did not give me the opportunity, and I am aware that he has not the type. So it is now necessary to compare the form I described with the species with which it is attempted to be associated, namely, *Cyclocyathus Fittoni*.

Amongst the structural details of *Cyclocyathus Fittoni*, Edw. and Haime, is a thin epitheca, and the costæ of the first and second cycles are more prominent than the others; these details are not seen in *M. Fittoni*. The upper or calicular surface is rather convex

¹ Omitted be to noted by Mr. Tomes.

externally and concave towards the centre, and the fossa is large and well marked, whilst the columella is fasciculate, broad, and papillose at the surface in *Cyclocyathus*; but in *Micrabacia* the corallum is *hemispherical* and there is no large fossa in the entirely convex calice, and the small columella has no papillæ. There are pali and no synapticulæ in *Cyclocyathus*, and there are no pali and many synapticulæ in *Micrabacia*.

The student of the Madreporaria who will turn to the figures of the types of the two forms in the Pal. Soc. *loc. cit.* will have no difficulty in recognizing their distinctness. *Cyclocyathus* is an aporose coral, and *Micrabacia* is a true Fungid. Mr. de Wilde drew *M. Fittoni*, nobis, from nature.

Smilotrochus insignis, nobis (Pal. Soc. *loc. cit.* p. 37, pl. xiv. fig. 18, 1870). This is stated by Mr. Tomes to be a *Ceratotrochus*. The morphology of *Smilotrochus* and *Ceratotrochus* was considered in my "Revision of the Genera and Families of the Madreporaria" (Linn. Soc. Journ. Zool. 1884), and it is noticed that *Ceratotrochus* is a *Smilotrochoid* with a columella. The columella of this genus is bundle-shaped and broad (fasciculate),¹ and processes arise from the inner edges of the larger septa and ascend into it and add to its bulk. The top of the columella is papillary and high up in the coral. The specimen with a so-called columella I had not the advantage of seeing, but there is a drawing of it in Mr. Tomes's paper (Geol. Mag. 1885, Pl. XIV. Fig. 6), and it is evidently a diagram. What is considered to be the columella is not a fasciculate structure gaining processes from the septa, nor is it a spongy columella, but a mass of matrix which always fills up the lower parts of these corals. The mass occupies the axis, and the rounded top is artificial. *Smilotrochus insignis*, nobis, is not a *Ceratotrochus*, and one of the reasons is that it has no columella.

Smilotrochus granulatus, nob. (*op. cit.* p. 36, pl. xiv. fig. 17). This is said by Mr. Tomes to be an immature *Trochocyathus Wiltshirei*, nobis. I should have been glad to have seen a specimen of the interesting *T. Wiltshirei*, and still more to have seen the proofs that a well-characterized *Smilotrochus* without columella and pali could become a form with those essential characters in the growth of one-tenth of an inch, and also increase from three to four cycles in the same space. The height of the type *T. Wiltshirei*, nob., is three-tenths of an inch, and that of the *Smilotrochus* is two-tenths of an inch. The cyclical arrangement and the nature of the costæ and of the calice distinguish the two forms perfectly. There is no evidence that one form could turn into another, and the species *Smilotrochus granulatus*, nobis, is not the same as *T. Wiltshirei*, nobis, for it has neither columella nor pali.

Podoseris mammiliformis, nobis, and *P. elongata*, nobis (Pal. Soc. *loc. cit.* p. 25, pl. ix. figs. 2-17). These species are stated to be species of *Rhizangia*, Ed. and H. To disprove this it would suffice to draw attention to the above-mentioned figures of the types and to the figures given of *Rhizangia* by Reuss (Denks. d. Wien. Akad. der

¹ Not spongy as Mr. Tomes states.

Wiss. t. vii. p. 120, pl. 7, fig. 7, 8, and fig. 9–11; also M. Ed. and Haime, Ann. des Sci. Nat. 3rd ser. t. x. pl. 7, fig. 7 and 8); but it is as well to call attention to the fact that perfect specimens of *Podoseris* have convex and more or less hemispherical upper surfaces, and that their bases are perforated, whilst there are synapticulæ between the septa. The form is not a social one, and never springs from stolons like *Rhizangia*, which has a wall, a flat upper surface with a shallow calice, and is seated upon a stoloniferous base which may extend beyond and give origin to others.

The figures given by Mr. Tomes (7 and 8) show that there are no stolons present. A stolon is a structure on which the bases of corallites grow, and it is not a growth from the edge of the base of a corallite. In the very numerous specimens of *Podoseris* from the Red Chalk which the Rev. Mr. Wiltshire placed at my disposal there were no traces of stolons. No union by stoloniferous growth existed in the specimens which were exhibited by Mr. Tomes at the Geol. Soc., and although he states that "three corallites are united by the stolon" (p. 552), it does not appear in the illustration (Fig. 7). I especially drew attention to the want of stolons and such union in the remarks I made on Mr. Tomes's paper at the Geological Society, and my remark was published in the Abstract of Proceedings. Nevertheless, Mr. Tomes persists in stating what he cannot substantiate.

I draw attention to Mr. Tomes's Fig. 10, which professes to represent synapticulæ. On Plate XIV. is printed "R. F. Tomes, del.," so that this is not a mistake of the artist. The figure proves that its author has views regarding the nature of synapticulæ which are not those of any other zoophytologist. Synapticulæ pass from one septum to another. In Fig. 9, synapticulæ are called dissepiments. Figure 11 of the Plate is acknowledged to be wrong, and should not have been printed, for it leads to a mistaken view of the structures it purports to represent. *Syzygophyllum*, Reuss, is not in the least like a *Podoseris*, and is synonymous with *Antillia*, nobis, a sub-genus of *Circophyllia*; it has no stolons. *Podoseris* is a well-defined natural genus and is one of the Fungidæ, and *Rhizangia* is one of the Aporosa.

Turbinoseris, nobis ("Revision of the Genera," p. 148). This genus is stated by Mr. Tomes to be synonymous with *Leptophyllia*, Reuss. They are distinct for morphological reasons. Pratz in his article (Palæontographica, 1882, p. 90) has shown that the septa of *Leptophyllia* are numerous, thin, often uniting and composed of vertical trabeculæ with vertical rows of perforations between them. It may be remarked that this lattice-work condition is not the result of fossilization or weathering, but that it is normal, and necessitates the species being placed with *Cyclolites* and other forms in a special family of the Fungidæ.

Turbinoseris has many species, and I have described them from the West Indies and from Sind, besides from the British Cretaceous. In all, the septa are solid, and that is sufficient to separate the two genera. *Turbinoseris* remains a member of the Lophoserine group

of the Fungidæ. *Turbinoseris de Fromenteli*, nobis, therefore retains its title, and Mr. Tomes cannot term it *Leptophyllia Anglica*, Tomes.

Mr. Tomes remarks (p. 545), “Some other compound corals have been collected at Haldon which, from their unsatisfactory condition, cannot be determined, though I believe them to be new. As the Haldon corals are only casts, they cannot be trusted when internal structure is important. The genus *Haldonia* is in my opinion a very doubtful one. Specimens in my own collection from Haldon differ in the important respect of sometimes having a styliform columella, and sometimes only a ring of pali, as in Prof. Duncan’s figures.” *Haldonia* was described and figured by me (Quart. Journ. Geol. Soc. 1879, vol. xxxv. p. 91), and like all the other forms I studied was not in the form of cast. *Haldonia Vicaryi*, nobis, was described from perfect specimens, and they had no columella. Corals of the same species, so far as my experience helps me, do not sometimes have a columella, and sometimes not and only pali. Probably the specimen seen by Mr. Tomes with a columella was the well-known *Actinacis* of Haldon.

I draw attention to the figures on the Plate (GEOL. MAG. 1885, Pl. XIV. Figs. 14–15), and protest against species being determined from such fragments.

Finally, on looking at Fig. 13, which is said to represent a *Pleurosmilia*, it will be noticed that the columella does not terminate by uniting with one of the principal septa which is more developed than the others. The form does not belong to that genus, but to *Placosmilia*, Ed. and H.

SUMMARY, ETC.

Smilotrochus insignis, nobis, non *Ceratotrochus insignis*.

———— *granulatus*, nobis, non *Trochocyathus Wiltshirei*.

Micrabacia Pittoni, nobis, non *Cyclocyathus Pittoni*, Ed. and H.

Podoseris mammiliformis, nobis, non *Rhizangia mammiliformis*.

———— *elongata*, nobis, non *Rhizangia elongata*.

Turbinoseris de Fromenteli, nobis, non *Leptophyllia Anglica*, Tomes.

Pleurosmilia neocomiensis, E. de From. fide Tomes, is *Placosmilia*.

Haldonia, nobis, has no columella.

Syzygophyllum, Reuss, non *Rhizangia*, Ed. and H.

III.—ON THE SO-CALLED “GAULT” OF WEST DEREHAM, IN NORFOLK.

By CLEMENT REID, F.G.S., and GEORGE SHARMAN.

(Published by permission of the Director-General of the Geological Survey.)

SINCE the publication of William Smith’s Map of Norfolk in 1819, the sections around West Dereham and Shouldham have been accepted as proving the occurrence of true Gault¹ in this part of West Norfolk. Messrs. Rose,² Fitton,³ and later writers, all

¹ The Kimmeridge Clay is also locally known as “Gault.”

² Phil. Mag., series 3, vol. vii. pp. 171–182.

³ Trans. Geol. Soc., series 2, vol. iv. p. 312.