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ORIGINAL ARTICLES.

I. DESCRIPTION OF A GREAT PART OF A JAW WITH THE TEETH OF  
*STROPHODUS MEDIUS*, OW., FROM THE OOLITE OF CAEN IN  
NORMANDY.

By Professor OWEN, F.R.S.

(PLATE VII.)

I HAVE not hitherto seen any specimen so satisfactorily and finely illustrative of the affinity of *Strophodus* to *Cestracion* as that figured in Plate VII. and which is now in the British Museum. It consists of the major part of the dental covering of a jaw, including the posterior part of the symphysis, and shows that the principal or largest crushing teeth are in two rows, in each ramus, the hinder one the largest, as in *Cestracion*. These are followed by two rows (at least) of smaller crushing teeth, and are preceded by rows of teeth both smaller and more produced at the middle of their working surface, and in the same degree changing from the crushing molar to the conical prehensile type. This dental coating or armature is imbedded in a block of the fine Oolitic building-stone from Caen, which has taken the place of the dissolved cartilaginous support of the teeth, so as to maintain and exhibit the curve of the arch (Fig. 1a) by which the teeth obliquely overspanned the jaw to which they were originally attached.

Of the principal row of teeth (*a*), six are preserved entire on one side, and the basis of seven on the opposite side of the jaw: the hinder half of this series has been broken off; the fracture of the supporting matrix there demonstrating the curve of the convexity of the jaw to which they were originally attached. Seven (Fig. 1a, 1-7) is thus shown to be the normal number of these large crushing teeth, which succeed each other from within, outward, and forward: it is the shell of the innermost and last formed which is wanting on the left side of this jaw.

The second tooth, counting from behind, on this side (*a*2), with a grinding surface 0.035 m. m. in length, 0.013 m. m. in breadth, has that surface moderately convex transversely, with the convexity highest toward the fore end, in the longitudinal direction: the outer and inner borders straight and parallel; the fore and hinder borders curved, but so as to indicate a low angle, fitting the interspace of the correspondingly shaped ends of the two teeth of the contiguous row. The main part of the crown is sculptured by an extremely fine network of thin ganoin, the meshes simulating pores; but toward the hinder slope the threads run together to form fine sub-

parallel ridges which descend to the margin of the crown. There is a like disposition along the fore part of the tooth, but the parallel ridges are formed much nearer the margin, and are much shorter than those behind. The third, fourth, and fifth teeth, *a* 3-5, closely resemble the second; the sixth tooth shows the effects of mastication, the threads are worn down to the bottom of the meshes on the most prominent part of the grinding surface, and the meshes are shallower over a greater extent of that surface. In the anterior (seventh, *7 a*) tooth abrasion has rendered a still greater proportion of the surface smooth, demonstrating how the ganoin closes the summits of the medullary or vascular canals.<sup>1</sup> The unworn meshes of the reticulate ganoin are so minute and deep as to look like pores. The marginal parallel ridges, out of the field of work, of course remain. The six teeth in place preserve the form and dimensions of the innermost: each in succession is moved forward, or toward the symphysis, about 0.004 m. m. in advance of the inner tooth.

The teeth of the row, *b*, next in advance are seven in number, and are preserved on both sides of the jaw: they do not show so close a resemblance to each other in size and shape as those of the row behind; in comparison with which they are smaller, more convex in the direction of the length of the grinding surface, and the highest part of the convexity is at the middle of the surface: the anterior end of the tooth is narrower than the posterior end, and in a greater degree in the innermost tooth than in the rest; this character, with the greater longitudinal convexity, gives the appearance of the tooth being bent obliquely lengthwise with the smaller anterior end inclining to the outer side of the jaw. The resemblance of the tooth, especially of the posterior ones, both in shape and superficies, to a contracted medicinal leech, is close, and accounts for the name given by the quarrymen to the detached fossils. The length of the working surface of the third tooth, *b* 3, in a straight line is 0.031 m. m.; the breadth of the hind border is 0.013 m. m.; that of the front border is 0.010 m. m. The posterior parallel linear disposition of the ganoin is proportionally greater as compared with its minutely reticulate disposition than in the larger teeth of the row behind. In the sixth tooth the summit of the convexity is worn smooth. In the seventh tooth, part of the crown has been broken away, on both sides of the jaw.

Eight teeth of the row, *c*, next in advance are preserved on the left side of the jaw: they diminish in greater degree, in size, than do those of the row *b* compared with *a*; they rise higher and more abruptly at the middle of the crown; the anterior end is more contracted; the inferiority of size of the innermost as compared with the rest is greater. A low ridge is continued from the summit of the crown to the ends of the tooth, that to the fore end being more marked than the one behind, and the anterior ridges are more prominent in the outer teeth of the row, *c*, 5, 6, 7, than in the inner teeth, 1-4. The length of the working surface of the fourth tooth, *c*, 4, is 0.028 m. m.; the breadth is 0.011 m. m.

<sup>1</sup> As shown, in section, magnified, in plate xx. of my 'Odontography.'

Eight teeth of the foremost or symphyseal row of teeth, *d*, are preserved on the left side. The exposed parts of the working surface augment from 0.008 m. m.—the longitudinal diameter of the innermost, *d*, to 0.020 m. m. that of the sixth tooth in advance. The degree of convexity of the grinding surface increases from the innermost to the fourth; in advance of this, the ganoin coating has been more or less broken away; in the fifth and sixth teeth, the ridge continued from the convexity to the ends of the teeth becomes marked, and more strongly as the tooth advances in position. The right and left teeth of this foremost series are alternate, and loosely interlock at the mid-line of the symphysis.

The parallel ridged disposition of the ganoin occupies the greatest proportion of the crown in the teeth of the anterior row; the reticulate disposition, rather coarser than in the large posterior teeth, is confined to the obtuse summit of the crown.

Returning to the hind part of the dental series, the largest row first described is succeeded by one, *e*, of very small teeth, with a uniformly convex grinding surface of an oblong elliptical form, of which the long diameter, in the direction from within outwards, exceeds that from before backwards. The long diameter is 0.011 m. m.; the short diameter is 0.008 m. m. The reticulate pattern prevails over their surface; it is coarser or with larger meshes than in the teeth in advance. Of only one tooth in this series is the ganoin of the crown preserved; parts of five other teeth of this row, however, remain *in situ*. The indications of a succeeding hinder row, *f*, of similar, but rather smaller teeth, are obvious; and the base of one tooth of a third, and probably hindmost row, *g*, is preserved.

In comparing the dentition of *Strophodus* with that of *Cestracion*, the chief difference is seen in the smaller number of rows anterior to the principal or largest: three rows, in each ramus, occupy the interval between such principal row and the mid-line of the symphysis; in *Cestracion* seven rows occupy that space in the upper jaw, and nine rows in the lower jaw; in this jaw, moreover, a medial azygous row occupies the mid-line of the symphysis, which is not the case in the upper jaw. (See Figure, inserted at page 236.)

According to this analogy, the teeth in the present specimen agree in arrangement with those of the upper jaw of *Cestracion*; but in the more gradual diminution of size, as they approach the symphysis, the teeth agree more with those of the lower jaw in *Cestracion*; the decrease being much more abrupt in the series next but one in advance of the principal series in the upper jaw of *Cestracion*. It is unlikely, from the minor number of rows and the larger relative size of the anterior teeth in *Strophodus*, that an azygous mesial row should be interposed at the symphysis of the lower jaw. But the elements for absolutely determining whether the present specimen be from the upper or lower jaw are wanting. I have assumed the latter for facility of description, partly from the gradual decrease forward in the size of the teeth, partly because a detached fossil jaw is so much more commonly a lower than an upper one.

But what is of more interest and importance is, that, in this long

deferred acquisition of a specimen so much desired by Agassiz in 1836,<sup>1</sup> the main prevision so sagaciously deduced from fragmentary groups of the fossil teeth by the founder and chief builder of the fair edifice of Palichthyology is confirmed, viz. :—that “the genus *Strophodus* had a less considerable number of teeth in the jaw than the genus *Cestracion* :”<sup>2</sup> and the only emendation which this fossil suggests is, that “it does not appear, with regard to the rows in *Cestracion* homologous with those present in *Strophodus*, that there are fewer teeth in such rows in the fossil genus.”<sup>3</sup> Of the teeth of *Strophodus* figured by Agassiz, those in Tab. 18, Vol. 3, op. cit., figs. 5 and 6, ascribed to *Str. subreticulatus*, and those figs. 12, 13, ascribed to *Str. magnus*, resemble teeth in rows *a* and *b* of the present specimen so closely as to indicate specific identity; perhaps the term *Strophodus medius* may conveniently indicate the species of the Caen Oolite, which includes more than one of the species originally proposed for detached teeth.

## DESCRIPTION OF PLATE VII.

Fig. 1. Jaw of *Strophodus* from the Oolite of Caen (drawn of the natural size).

The arrow indicates the line of symphysis and fore part of the jaw.

Fig. 1a. View of the section across the principal row of teeth, *a*, showing the curve of their attached bases. The figures and letters indicate the corresponding rows in the two rami of the jaw.

[A figure of the Jaw of recent *Cestracion* is given at page 236 of this Number.—EDIT.]

## II.—ON THE SUPPOSED INFLUX OF WATER TO THE INTERIOR OF THE GLOBE, AS THE CAUSE OF VOLCANIC ERUPTIONS.

By G. POULETT SCROPE, Esq., F.R.S., F.G.S.

IT is now generally recognised that the power which forces up lava from a depth of miles through narrow and crooked fissures broken across the solid crust of the globe, is no other than steam, developed in the interior of the lava by vaporisation of water intimately disseminated throughout its substance. I am not aware that this view of the volcanic phenomena was put forward by any writer previously to the publication of my volume on Volcanos in 1825. But I had derived a conviction of its truth from observation of the great Vesuvian eruption of 1822, and a study of Etna and Stromboli in the years 1819-21. This was subsequently confirmed by the discoveries of Sorby, Scheerer, and others, of the existence of water in intimate molecular combination with the crystalline or granular minerals that compose the granitic rocks from the fusion of which lava is supposed to proceed. I had expressed my belief that the aqueous particles so confined, whether in a liquid or a solid state, would, upon the occurrence of increased heat, or diminished pressure, exert an elastic separating force upon the solid

<sup>1</sup> “Alors il m’importait essentiellement de connaître leur disposition et leurs formes diverses.”—Recherches sur les Poissons Fossiles, iii. p. 118.

<sup>2</sup> “Le genre *Strophodus* avait à ses mâchoires un nombre de rangées moins considérable que le genre *Cestracion*.”—Tome. cit. p. 120.

<sup>3</sup> “Il me paraît également probable que chaque rangée contenait aussi moins de dents placées les unes derrière les autres, de dehors en dedans.”—Tome. cit. p. 122.