

posit in another, the conditions having become unfavourable to the perpetuity of their development in the latter deposit over the original region whence they had migrated."

There is now only one other part of our summary of fossils which seems to claim attention, and that is the Echinodermata. Of these at least six out of eight are common to the Inferior Oolite, namely—

- | | |
|------------------------|---------------------------------|
| Nucleolites = Clypeus. | Holctypus = Galerites. |
| 1. — sinuatus. | 4. — depressus. |
| 2. — clunicularis. | 5. Acrosolenia hemiscidaroides. |
| 3. — orbicularis. | 6. Diadema depressum. |

Of these the *Nucleolites sinuatus* and *Holctypus depressus* are highly characteristic of the Inferior Oolite.

In concluding these remarks, it should be understood that they refer only to a limited district. Were our observations extended over the whole range of the Cornbrash, as it occurs in this country, we should doubtless arrive at additional facts, both as regards the structure and agricultural capabilities and also its fossil contents: we may indeed expect the list of the latter to be greatly augmented, and in all probability other species common to the Inferior Oolite will have to be noted in addition to those in our present list.

XXXII.—On the Teeth of the *Pneumonobranchiate Mollusca*.

By J. E. GRAY, Ph.D., F.R.S., V.P.Z.S. &c.

THE teeth of the *Pneumonobranchiate Mollusca* are exceedingly uniform, when this group is confined to those which have a closed pulmonary cavity, which, in my former arrangement, I called *Adelopneumona*; I now think that the genera which form the other suborder, being unisexual, and having many characters, as well as the structure of the tongue, like those of the *Tæni-glossa*, should be arranged with them, near to the *Littorinidæ*, which often pass the greater part of their lives out of water, and have very imperfectly developed gills on the inside of the mantle.

All the genera of the order so restricted have very numerous, nearly similar ctenoglossal teeth, placed in many cross lines on a more or less elongated lingual band.

In some genera the line is straight, in others angularly diverging from the central lines, and in some the series are angularly bent on each side of the central line.

Professor Troschel, who has figured the teeth of some European

and exotic genera, Dr. Wyman the American genera, and Mr. Thompson, who has described the teeth of many of the English genera and species of this order, have shown these peculiarities, and the alterations which occur in the form of the teeth in different parts of the same cross series.

I have examined the teeth of several of the other exotic genera, and find them quite conformable to those of the European kinds. In general the teeth have a broad, expanded, more or less four-sided, oblong base, with a reflexed tip; the bases of the teeth in the same series and of the neighbouring series being close together on the lingual band, so as to form a close-set rasp.

This is the case with the genera *Arion*, *Nanina*, *Parmacella*, *Clypeidella* (*Dussumieri*) of ARIONIDÆ; *Philomycus*, *Limax*, *Geomalacus*, *Vitrina*, *Helix*, *Acavus*, *Arianta*, *Vallonia*, *Iberus*, *Polygyra*, *Theba*, *Helicella*, *Succinea*, *Bulimus*, *Partula*, *Zua*, *Pupa*, *Clausilia*, *Balea*, and *Achatina* of LIMACIDÆ; *Veronicella* of VERONICELLIDÆ; *Onchidium* of ONCHIDIADÆ; *Auricula*, *Melampus*, *Alexia*, *Scarabus* of AURICULIDÆ; *Lymnea*, *Amphipeplea*, *Bulimus*, *Physa*, *Coretus*, *Segmentina*, *Ancylus* of LYMNEADÆ; *Siphonaria* of SIPHONARIADÆ; and *Amphibola* of AMPHIBOLIDÆ.

The only exceptions I have observed are in the genera *Testacellus* and *Peronia*, and the teeth of these animals are exactly similar. They consist of numerous cross series, each series consisting of many teeth, like the other families of the order, but the teeth are far apart, slender, curved, with a blunt, rounded upper and a pointed lower end like a pin, and only attached to the lingual band by a slight process on the inner side of the middle of the tooth.

This difference in the teeth and the peculiar habit of the genus, living as it does on worms, which it swallows whole, induce me to propose to separate the genus *Testacellus* from the *Helicidæ*, and form it into a peculiar family *Testacellidæ*, to which *Plectrophorus* will probably belong, as it has the same sunken lines on the side of its body from the tentacles to the middle of the back; and in the same manner I would separate the genus *Peronia*, which lives on the sea-coast, from the *Onchidia*, which have the normal teeth of the order.

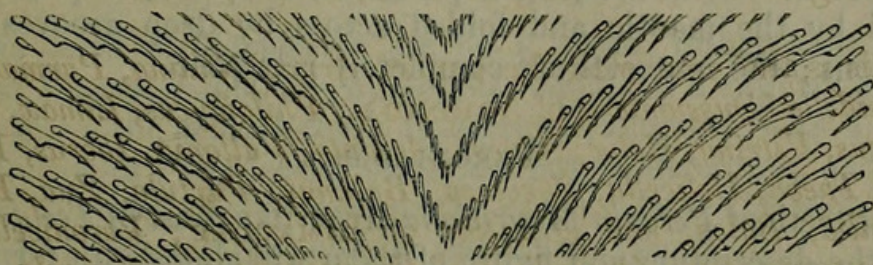
The genus *Parmacella* in *Arionidæ*, and some species of *Helicella* (= *Zonites*) and *Oleacina* in *Helicidæ*, have a much narrower and more elevated recurved apex with a narrow base, and are more distinct from each other in the tongue-membrane, making a kind of transition between the normal teeth of the order and the teeth of the genera *Testacellus* and *Peronia*.

ARIONIDÆ.

The *Nanina Albinensis*, *N. Otaheitana*, and *N. Panayensis* all have very numerous nearly uniform teeth, close together on a very broad lingual band.

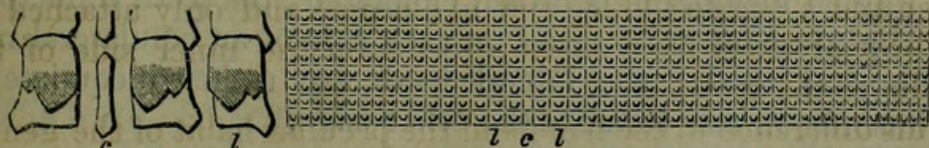
Parmacella (Olivieri). The teeth numerous in very close cross lines, with a compressed elevated central ridge with a flat edge ending in two teeth.

TESTACELLIDÆ.

Fig. 1. *Testacellus*.

Lingual membrane broad; teeth numerous in diverging cross series, those of the first six or seven lines yellow, the first darkest, the rest transparent, without any in the central series; the teeth pinshaped, slightly curved, with a roundish head and an acute tip, only attached to the thin lingual membrane by a small central process (see fig. 1).

HELICIDÆ.

Fig. 2. *Achatina fulica*.

In this and the following figures, *c* represents the central, *l* the lateral, and *u* the exterior lateral teeth.

The teeth of all the exotic species I have examined are like those described in the European kinds. I figure the teeth of *Achatina fulica* (fig. 2), as the teeth of that genus have not before been described; they are numerous in each cross series, those of the two central series are small; they are all small, four-sided, rather broader than long, with a blunt rather large central tip.

The teeth of *Partula (faba)* are like those of *Bulimus*; they are placed on a broad pale yellowish lingual membrane in numerous straight transverse lines on each side of the central line, and are equal and uniform.

VERONICELLIDÆ.

The teeth of *Veronicella* are very like those of *Bulimus*. The

lingual membrane is broad; the teeth numerous, similar, uniform, in numerous straight cross series on each side of a narrow central equilateral tooth; the lateral teeth are very nearly equilateral, with a broad, flat, subcentral, subequilateral tip.

ONCHIDIADÆ.

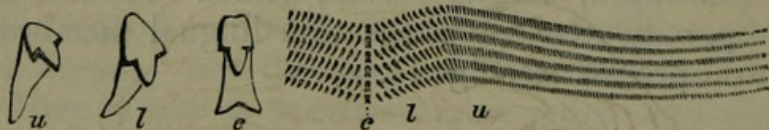
The teeth of a new species of *Onchidium*, very like *O. Celticum*, from the coast of West Africa, are very similar to those of *Helix*, with a short and narrow central tooth in each cross series: the foot of this animal, when preserved in spirits, is quite margined by the mantle and folded across by deep grooves into divisions; the tentacles are completely retractile.

PERONIADÆ.

The teeth of *Peronia Mauritiana* are so like those of *Testacellus*, that the description and figure of them will almost suit for these (see fig. 1).

AURICULIDÆ.

Fig. 3. *Auricula*.



The teeth of *Auricula* (fig. 3) are very like those of *Bulimus*. The lingual membrane is broad, elongated; the teeth numerous, in a slightly bent cross series on each side of an equilateral narrow central tooth; the lateral teeth are rather inequilateral, diminishing in size towards the other edge.

LYMNEADÆ.

The teeth of *Lymnea*, *Planorbis*, *Physa* and *Ancylus* are extremely similar, and have been well described by Dr. Troschel and Mr. Thompson.

AMPHIBOLIDÆ.

Fig. 4. *Amphibola*.



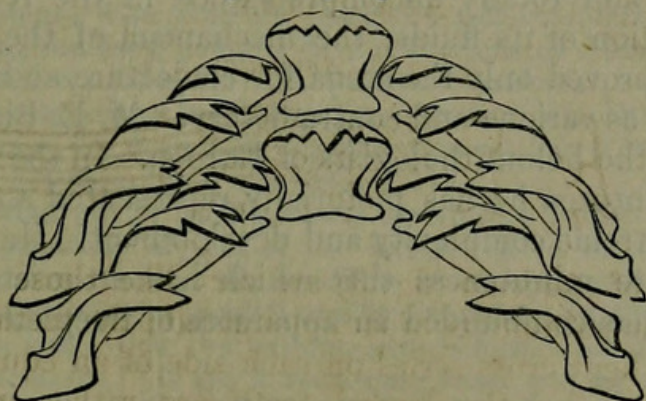
The teeth of *Amphibola nux avellana* (fig. 4) are very similar to those of *Lymnea*. The lingual membrane is large, very broad, expanded and long, with a central space or line scarcely defined; the teeth are numerous, equal, similar, four-sided, rather longer

than broad, in straight cross lines, with a broad rounded lobe, rather more sinuous on the inner than on the outer side of its front edge.

SIPHONARIADÆ.

Fig. 5. *Siphonaria*.

The teeth of *Siphonaria* are on a broad, rather long, dark brown lingual band, are numerous, equal, in a slightly arched cross line; the central tooth is narrow, elongated, with a small rhombic apex; the lateral teeth are larger, diverging, and gradually diminish in size towards the outer side of the series, and furnished with a rather oblique curved tip (see fig. 5).

Fig. 6. *Cyclophorus*.

The teeth of *Cyclophorus Inca* (fig. 6) are similar to those of *Natica* and the other marine genera belonging to the group of *Ptenoglossa*.

XXXIII.—*On the Mechanism of Aquatic Respiration and on the Structure of the Organs of Breathing in Invertebrate Animals.*
By THOMAS WILLIAMS, M.D. Lond., Licentiate of the Royal College of Physicians, formerly Demonstrator on Structural Anatomy at Guy's Hospital, and now of Swansea.

[With a Plate.]

[Continued from p. 261.]

Rotifera.—It is the undivided belief of all recent observers that a blood-proper system does not exist in the Rotifera. These animalcules are provided with a rudimentary water vascular system,



Gray, John Edward. 1853. "XXXII.—On the teeth of the Pneumonobranchiate Mollusca." *The Annals and magazine of natural history; zoology, botany, and geology* 12, 329–333. <https://doi.org/10.1080/03745485709495051>.

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