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LIII.—Observations on M. Favre's paper on a new classification of Ammonites

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clouded; abdomen variegated with white and yellow. Head scarcely as wide as the thorax, and both covered with silky white pile; the palpi pale testaceous. The posterior margin of the prothorax arcuate; the metathorax longitudinally depressed; the wings fusco-hyaline, a darker cloud occupying the marginal and second and third submarginal cells; the anterior legs in front and their tarsi ferruginous. Abdomen subsessile, having a fine silky pile; the apical margins of the first and second segments, and the following segments entirely, reddish yellow; a large pale yellowish-white macula on each side of the second segment.

Hab. Para.

Agenia cursor.

Male. Length $5\frac{1}{4}$ lines. Black, with a fine silky pile; legs elongate, the posterior pair longer than the insect; anterior wings dark fuscous, and having a clear hyaline space that occupies the three discoidal as well as the first apical cell. Head transverse, as wide as the thorax; the face below the insertion of the antennæ and the clypeus covered with silky pile. Thorax: the sides, beneath, and the apex of the metathorax silvery; the anterior tibiæ beneath and the tarsi obscure ferruginous. Abdomen: the first segment forming a petiole which is longer than the metathorax; the other segments have a blue tinge.

Hab. Para.

[To be continued.]

LIII.—*Observations on M. Favre's Paper on a New Classification of Ammonites.* By Dr. J. E. GRAY, F.R.S. &c.

As to M. Keferstein's theory that the *Aptychus* is "a protecting organ of the nidamentary glands of the female Ammonite," which M. Favre considers certain—and he further goes on to say, "the soft tissue of this gland has a great resemblance in its various parts to the structure of the different types of *Aptychus*, and the form of the *Aptychus* corresponds very well with that of the outer part of this gland" (p. 366)—I do not offer any decided opinion on this extraordinary theory, as I have never studied the question; at the same time I may observe that it is not supported by any thing I have observed in the structure or habits of recent Mollusca, and is, indeed, entirely opposite to all my experience as a student in the structure and development of shells.

A protecting organ of a gland, or a gland itself, becoming shelly would be an entirely new fact in malacology; and the notion should not be entertained without very strong reasons, of which M. Favre gives none.

All true shells are secreted by the mantle of the mollusk, and not by any other part of the animal. The operculum of Univalves, which is the analogue of the second valve in the Bivalves, has a peculiar mantle on the foot of the animal for its secretion; and when the operculum is formed of several layers (that is to say, when its inner and outer surfaces are covered with an additional calcareous coat) the outer coat is secreted by a peculiar lobe of the mantle, as the outer coat of the cowrie, *Marginella*, &c. is secreted; and I have no doubt that the outer coat of *Aptychus* is secreted by a lobe of the pedal mantle, like the outer coat of the operculum of Gasteropods.

The only instance that has occurred to me of a body secreted by a mollusk having the slightest resemblance to a shell, and yet not being secreted by the mantle of the animal, is that of the three shelly plates that encase the gizzard of *Bulla lignaria* and *B. aperta*. These plates are only the hardening of the cartilaginous tubercles that are found in the stomach of *Aplysia* and other allied genera, and have not the structure or texture of true shells; they certainly bear no resemblance to the shells of *Aptychus*, which, as M. Favre describes them, have the regular texture of shells.

The structure of the *Aptychi* that I have examined, as well as the account of it given by M. Favre (p. 365), is quite the same as that observed in many opercula of Univalve shells.

It certainly is against all my experience of fossil shells (which has been extensive) if the *Aptychus* is a fossil nidamentary gland, or that a soft glandular part should be fossilized so as to produce a body formed of three layers, each with a peculiar structure, and that the structure which they produce by becoming fossilized should be similar to the structure observed in opercula, which are often formed of three layers, as M. Favre describes them. The reasons which he gives that they cannot be opercula show M. Favre's slight acquaintance with the structure and economy of living Mollusca; for otherwise he would have known that the majority of opercula, although found in the aperture and protecting the animal, evidently "could not have served to close the aperture of the shell."

M. Favre observes:—"The shell of *Nautilus* is composed of two layers—an external layer formed of an aggregate of cells of different sizes, and the largest of which are those

nearest the outside (it forms the most important part of the shell properly so called, and M. Suess has named it *ostracum*), and an internal nacreous layer formed of very small cells, which constitutes the septa and lines the inner surface of the *ostracum*. The former is secreted by the mantle; the latter by the body of the animal."

Thirdly, he states, "The whole animal (of the *Nautilus*), the posterior part excepted, is therefore united to the shell, and the chamber is hermetically closed;" and goes on to say, "the mantle extends in front of this attaching ring (*Haft-ring*); it is composed of two parts—one, which is very short, corresponding to the antisiphonal region of the animal; the other, which is much longer, corresponds to the siphonal region, and secretes the shell, with which it is connected by its outer margin."

These observations come within my study; and I may observe that they are directly at variance with all my experience in the structure and growth of the shells or opercula of Mollusca, and appear to me only to be compared to the Swiss author, living in the centre of Europe, who described ships being built of brick.

The *Nautilus*-shell is composed of two layers, the outer chalky and opaque, the inner pearly: the outer is first formed, and forms the edge of the shell; the inner pearly layer is deposited on the inside of the outer as it is enlarged, the two going on *pari passu*; and both are deposited by the mantle of the animal, as all shells are deposited, and as may be seen both in the univalve *Turbo* and the bivalve *Uniones* or *Avicula*, which exactly agree with *Nautilus* in structure; and I should like to know how the body of the bivalve got out of the large mantle to deposit the pearly layer of the inner surface of the shell, which is quite out of its reach and influence. It is quite a new fact to me that the whole animal of a mollusk should be united to the shell, and so hermetically close it; if true, it would require an entire change in the definition of Mollusca, which are always entirely free from the shell, and only attached to it by peculiar muscles; and I can vouch for this being the case in the *Nautilus* from the examination of several specimens preserved in spirit; and, further, I can assure M. Favre that the edge of the mantle in these animals is quite free from the edge of the shell, and that the chambers of these shells are formed in the same way as the septa in other shells—as, for example, the septa across the vertex of *Bulimus decurtatus* and other decurtated shells.

I am willing to allow that there are things to be explained in regard to the formation of the septa and the siphons and

the use of the *Aptychus* to the Ammonite; but this is not to be settled by the wild theories of persons who are evidently deficient in elementary knowledge of the structure and economy of living Mollusca. This is one of the evils of the palæontologists (as they call themselves) considering palæontology a separate science, and confining their study to fossil bones, shells, &c., and not paying sufficient attention to the study of recent animals, instead of studying them as parts of the same subject, the former only to be explained by the latter—as Cuvier demonstrated in his ‘*Ossements Fossiles*,’ by a careful study of the existing animals and their parts before he attempted to determine the fossils he then knew: instead of this we find the palæontologists describing and forming genera on mere fragments, and putting forth the wildest and most erroneous theories. If the recent and fossil species were studied together by the same person all this would be got rid of; and we cannot expect that any reliable information as to the determination, structure, or distribution of fossils will be obtained until this course is adopted. One can have no confidence in palæontologists who describe numerous species and genera from fragments, when they fail in describing or determining the osteology or conchology of recent species.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

March 20, 1873.—Mr. George Busk, Vice-President, in the Chair.

“On the Temperature at which *Bacteria*, *Vibriones*, and their Supposed Germs are killed when immersed in Fluids or exposed to Heat in a moist state.” By H. CHARLTON BASTIAN, M.A., M.D., F.R.S., Professor of Pathological Anatomy in University College, London.

For more reasons than one we may, perhaps, now look back with advantage upon the friendly controversy carried on rather more than a century ago between the learned and generous Abbé Spallanzani and our no less distinguished countryman Turberville Needham. Writing concerning his own relation to Needham, the Abbé said*, “I wish to deserve his esteem whilst combating his opinion;” and, in accordance with this sentiment, we find him treating his adversary’s views with great respect, and at the same time repudiating much of the empty and idle criticism in which so many of Needham’s contemporaries indulged with regard

* *Nouvelles Recherches sur les Découvertes Microscopiques et la Génération des Corps Organisés, &c.* London and Paris, 1769, vol. i. p. 69.