

XXXVIII.—On the Reproduction of a lost part of an Operculum, and of its probable Restoration when entirely destroyed. By Dr. J. E. GRAY, F.R.S., V.P.Z.S. &c.

It is to be expected that an operculum of a Gasteropodous Mollusk might be sometimes broken or injured, but I have never been able to find any very distinct example of the kind, so as to study how the repair of the lost part would be effected. That such an occurrence would most probably be rare, is easily explained from its situation, as the operculum is protected by the last whorl of the spire of the shell when the animal is expanded, and by the mouth when it is contracted into the cavity of the shell.

I have lately met with a very distinct example in a specimen of *Fusus* in the British Museum collection.

In this specimen the apical half of the operculum has been broken off (see fig. 1), and the lost part has been renewed by an irregular roundish process, nearly of the size of the lost part, not quite as thick as the original portion, and formed of rather irregular horny plates; the smaller or first-formed portion being in the centre of the broken line, so that the restored part bears some similarity to the annular operculum of a *Paludina*. This restoration is exactly like that which would have taken place in a shell under similar circumstances, and is a further proof of the truth of the theory which I have long advocated, that the operculum is a rudimentary valve, and is homologous to the second valve of the Bivalve Mollusks.



In examining two specimens of *Pleurotoma babylonica*, preserved in spirits, with the opercula attached, I was much surprised to observe that the opercula of the two specimens were exceedingly different in structure and belonged to two distinct modifications of that valve, one (fig. 2) being subannular, with the nucleus apical, like the other species of the genus, and the other (fig. 3) annular, with the nucleus subcentral, somewhat like the operculum of *Paludina*.

Fig. 2.



Fig. 3.



The examination of the restoration of the lost half of the



operculum of the *Fusus* before referred to has solved the difficulty, and I have no doubt that one of these animals had by some accident lost its operculum, and that it had gradually restored it; commencing, as in the case of the restored part of the operculum of the *Fusus*, by a small nucleus in the centre of the opercular mantle, on the back of the foot, and gradually adding new layers round the edge of it, until it formed an annular operculum nearly of the size of the original, but differing from it in shape, being less acute in front and nearly similar in form at the two ends. A more minute examination has strengthened this theory, for the operculum of this specimen is less regularly developed than is usual in the annular operculum of the kind, and is much thinner than the normal operculum of the genus, as is the case in both these particulars with the restored part of the operculum of the *Fusus*.

This change in the formation of the operculum when it is reproduced, is just what one might have expected. The animal, when it has to form its operculum at its birth, begins its formation at the tip, and increases its size, as the animal requires a larger operculum for its protection, by the addition of new layers to the outer edge of its larger and last-formed end: but when it has to reproduce this organ, the opercular mantle having reached a certain size, it proceeds to cover its surface with a new protection in the most easy and rapid manner, and, commencing from a more or less central spot on the surface, enlarges the surface covered by adding new matter to the entire circumference of the first-formed part; it continues this process without waiting to make the operculum as thick and solid as the one which was lost, until it reaches the size of the original, moulding itself on the opercular mantle, and adapting its form to the form of the throat of the aperture of the shell which it has to close. The change of form in the front of the restored and mended operculum is caused by the parts being moulded on the existing opercular mantle—consequently they have not the narrow front part which is found in the normal form, caused by that part having been formed when the animal had this part of a small size; and as it increases in size the whole opercular mantle moves forward, leaving the small tip of the operculum free, and useless to the animal, and therefore not necessary to be reproduced when the operculum is re-formed in the adult age of the animal.

In the British Museum collection there is also a specimen of *Cominia maculata* with the operculum almost entirely reproduced, with the same alteration of the general form and position of the nucleus. These mended or reproduced opercula are always known from the normal operculum of the animal by being more or less irregularly formed and thinner in consistence.





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