(1) *Peripatus jamaicensis*, Gr. and Ckll.
(*a*) mut. *swainsonae*, Ckll.
(*b*) mut. *gossei*, Ckll.
(2) *Peripatus juliformis*, Guild., var. n. *gossei*, Bouvier.

Unfortunately, however, the type-specimen of mut. *swainsonae* had twenty-nine pairs of legs, and was *P. juliformis gossei*. This specimen M. Bouvier so identifies, but he overlooks the fact that it is the type of *swainsonae*, and must therefore bear that name. The dark variety of *P. jamaicensis*, which M. Bouvier calls mut. *swainsonae*, may be termed mut. *bouvieri*, and the proper classification will be as follows:—

(1) *Peripatus jamaicensis*, Gr. and Ckll.
(*a*) mut. *gossei*, Ckll.
(*b*) mut. *bouvieri*, Ckll. (*swainsonae*, Bouv.).
(2) *Peripatus juliformis*, Guild., var. *swainsonae*, Ckll. (*gossei*, Bouv.)

T. D. A. COCKERELL.

East Las Vegas, New Mexico, U.S.A., January 4.

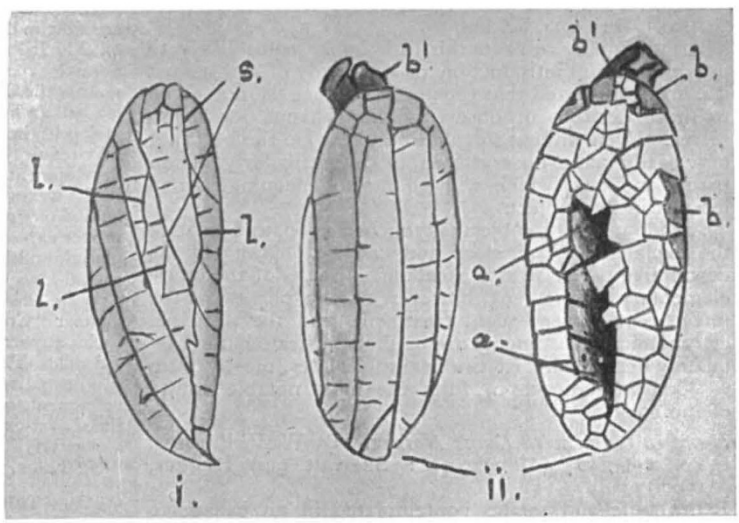
DASYPELTIS AND THE EGESTED EGG-SHELL.

A CHARMING FACT IN NATURAL HISTORY.

ANXIOUS that my pupils should see things about which they hear in the course of their class-work, I have recently lodged with the Zoological Society a standing order for an assortment of "quids," which, mostly of the nature of non-assimilable food, with occasionally a gizzard lining, are thrown out at the mouth by certain birds, snakes, and other creatures, in conformance with a habit extending to the anthropoid apes, since even the famous Chimpanzee "Sally" had acquired it (*P.Z.S.*, 1885, p. 674)—a habit most marked in certain whales, which will thus egest the whole skin of an animal devoured and flayed before being digested.

Among the first set of "castings" which I received were the two pigeons' egg-shells herein delineated, which were "thrown" by the egg-eating snake *Dasypeltis scabra* during the spring of 1900. This animal, confined to tropical Africa, shares with the Indian *Elachistodon* the unique feature of possessing vertebral "teeth," recently proved by Kathariner (*Zool. Jahrb.* Bd. xi. Anat. p. 501) to be, in the African species, true hypapophyses, toothlike but destitute of enamel, which mostly project towards or into the œsophageal lumen, through its median dorsal wall. The two snakes are members of distinct sub-families, and, in their isolation and independent occurrence, they furnish an ideal example of the principle of "convergence," by the process termed by St. Hiliare for Dasypeltis itself the "balancement" and now better known as the "substitution" of organs, as is proved for this snake by Kathariner's assertion that the reduction of its true teeth is effected during ontogeny. *Elachistodon* is unfortunately known only from two examples, and although it occurs in the Bengal area, it is unrepresented in our national collections.

Kathariner, in Dasypeltis, describes hypapophyses for each of the first thirty-four vertebræ, and of these the first twenty-six are much swollen basally, their minute pointed extremities lying each within a surrounding œsophageal lip, in such a manner as to suggest that they come into action only under pressure. The remaining eight are elongated, and with the exception of the last are converted into cutting organs, which perforate the œsophageal roof when at rest. The feeding habits of this animal have been described by Miss Durham in the *P.Z.S.*, 1896, p. 715, and she states that egestion of the shell occurs on the average one and three-quarter hours after the first seizure of the egg. No observations have hitherto been published on the egg-shell as disgorged, and unexpected interest attaches to this, from the fact that the two shells herein described differ to a marked extent in the evidence they furnish of the nature of the processes at work. Both agree only in the presence of a deep indentation (Fig. ii. *a*—*a*). As examined in the dried shell this gives the impression of a definite rent, through which the egg-contents would appear to have been discharged; but as its precise nature cannot be decided without maceration, which would lead to a sacrifice of one of the shells, I leave the settlement of this to the future. Whether it be a cut or a mere depression, it is beyond doubt due to the action of the perforating hypapophyses; for while it is limited to what would appear to be the area of apposition between these and the convex shell surface when in contact, its edges may be inrolled as under pressure from without; and the main reason I have for doubt is that in the larger egg (Fig. ii.) the shell-membrane (*b'*), ragged and torn, projects freely from the upper end, as though the discharge of its contents had been there effected. The shell-area surrounding the afore-named indentation (Fig. ii.) is in each case flattened and somewhat irregularly broken up, the whole presenting



Rough outline drawings of pigeon's egg-shells orally egested by the egg-eating snake, *Dasypeltis scabra*, to show fracture lines and limits of the incision for apparent discharge of the contents. *a*, incision; *b*, areas from which shell-fragments have been removed; *b'*, ruptured shell-membrane; *l*, longitudinal fracture lines; *s*, spiral fracture lines; *i*, non-flattened surface × 1½; *ii*, flattened and non-flattened surfaces of a second shell × 1½.

an appearance unquestionably due to pressure, but whether by contact with the anterior or posterior set of hypapophyses, it cannot at present be proved.

It is concerning the non-flattened shell-area that the conditions are most novel and interesting, for this, though brittle and subjected to a crushing action, is not, as would be imagined, irregularly broken up. The lines of fracture, in places irregular, are for the most part uniformly recurrent and equidistant. In the shell first examined they were found (*s*, Fig. i.) to be mostly longitudinally spiral and broken up in the intervening areas by cross-lines either transversely spiral or feebly transverse; and in consideration of the fact that the pigeon's egg is spirally rotated during its descent of the oviduct and as its shell is superadded, the conclusion suggests itself that the lines of fracture might be those

of a structural differentiation of the shell-substance, rendered pliable by a possible digestive action of the snake's œsophagus or buccal glands. This idea, however, is at variance with the fact that for the second shell (Fig. ii.) the chief lines are longitudinal, and the lesser, so far as they can be recognised, transverse. Of the whole series of lines, the longitudinal and longitudinally spiral are much the more marked, the lesser of the transverse series being much feebler and often incomplete—so much so that they mostly present the appearance of mere superficial scratches, visible only in certain lights, which, by thinning the shell, facilitate its distortion without breakage under pressure. Over the flattened area, however, they become actual "cracks," breaking clean through.

The question thus arises whether the main lines of fracture, if predetermined by shell-structure, may not involve the bird's oviducal wall, or whether the whole result may not be the work of the hypapophyses, under a co-ordinated muscular action of the snake's œsophagus, and it becomes necessary to inquire whether the rotation within both this and the pigeon's oviduct may not be a variable process, especially when it is found that in the shell of Fig. i., which is spirally fractured, there are three longitudinal lines recognisable (*l.*) though of variable extent.

The most conspicuous feature of the main fracture-lines is their regular recurrence and intersection at right angles—*i.e.* they are essentially cancellous. The regular recurrence of the hypapophyses suggest an obvious association with them, but this can only be determined on the death of the snake. If, as seems most likely, the distances between these and the fracture-lines will be found identical, there will remain no question as to how the latter arise. Spiral rotation of the egg beneath the anterior hypapophyses might well produce, under pressure, the spiral and transverse lines of both Figs. i. and ii. Kathariner's description of the condition of the parts, which gives us for each an elastic pad with a central stiletto, are just such as would be required to produce the result observed; and if this be due to the action of the anterior hypapophyses alone, the presence of the lines over the flattened area will be explained, by their being formed before the cutting "teeth" are brought into action.

The regularity of the fractures would seem to favour this view, and if it be correct, one can only marvel at the exquisite delicacy of the muscular apparatus concerned and its co-ordinate activity; but there still remains a difficulty in the case of the longitudinal lines, as it is hardly conceivable that the snake's œsophagus, distensible though it is, could accommodate so large an egg transversely placed.

The slight extent to which, where most fully fragmented, pieces of the shell may break away (as at *b*, Fig. ii.), is a striking feature, and it becomes the more interesting by Kathariner's discovery that the head of the intestine is so modified that it would oppose their passage should they reach it. Both the main longitudinal and spiral lines, as has been said, can be traced into the flattened shell-area, despite the fragmentation of that, and this would seem to justify the belief that the expulsion of the shell-contents must be a slow process, an inverted peristalsis, taking place during the egestive act.

The whole matter bristles with interest and suggestiveness. Thanks to Dr. P. L. Sclater, I am assured the shells which may yet be cast up by the snake now living in the Zoological Gardens, and the carcass of the animal when dead, for the further study of detail. I cannot, however, refrain from bringing to the notice of the scientific public a topic so fascinating as that herein dealt with, since it is one of those exquisite things which only organic nature reveals, and that but rarely.

G. B. HOWES.

THE LIVERPOOL MUSEUM AND PROGRESS.

OUR attention has been directed to a correspondence now taking place in the Liverpool press, *à propos* of a recent meeting of the Biological Society, at which questions were raised as to the disposal of space in the newly-erected extension of the city Museum and the rearrangement of the collections which must thereby ensue. The subject was introduced by Mr. Isaac Thompson, a past president, and continued at length by Prof. Herdman, in his capacity as the founder and leader of the Liverpool Biological School; and the undisguised theme was a protest against the non-communicativeness of the Museum Director and his committee of management, as to their intentions for the future development of their work. These gentlemen, it appears, who, with the sole exception of the Director himself, are in no way scientific, do not choose to consult Prof. Herdman and his co-workers, by whose long years of devoted labour the Liverpool School of Biologists have come to occupy a foremost position among the schools of the United Kingdom, more especially in matters pertaining to the fisheries and of economic importance. The claim which the local scientific men now raise is that their body shall be adequately represented on the Museum Board, and that immediate provision shall be made by this Board for the establishment of collections bearing on the nature and progress of oceanographic research and the fisheries, as more particularly representing the Liverpool area, regarded as a centre of local activity. And they also desire the display of objects of local interest, which shall in some measure reflect the latest advances in our knowledge of nature's operations.

The movement has been immediately taken up by the Liverpool geologists, who have also held a meeting of protest; and the general concern on the part of the combined Liverpool natural history societies is, as to whether the *régime* of the past, under which the Museum, controlled by persons mostly destitute of knowledge and experience of scientific affairs, shall remain a general emporium, having for its object the vain endeavour to fulfil the functions of a great central national museum, or whether it shall be made the centre of accumulation and display of all natural objects of local interest, supplemented only by such others as shall mark, in more especially its philosophic and educational aspects, the groundwork and recent progress in the natural history sciences. General collections from afar and costly *rarissimae* will be forthcoming so long as the exploring Liverpudlian and the enthusiastic amateur exist, while the Directorate cannot be denied the power of purchasing such things, within reason, when so minded. It is with the work-a-day aspect of the Museum, as a rate-supported institution, that advancement is now desired, and most assuredly the latter of the afore-mentioned courses is, for this, the right one, as it is that dictated by general progress in all that pertains to museum work throughout the country, and by common sense. And if this be so, the members of the Liverpool Biological Society, the older and more experienced of whom, under Prof. Herdman's guidance, have become universally recognised experts, having by their labours earned, as loyal citizens, a right of control, constitute a very suitable and competent body of men available for consultation, in itself the first necessary step for the proper strengthening of the Director's hands, if he is to be free and efficient as chief administrator.

Z. T. GRAMME.

M. ZÉNOBE THEOPHILE GRAMME, who died last week at the age of seventy-four, was one of the pioneers of electrical engineering. He was born in Belgium in 1826, and was brought up as a carpenter; a taste for mechanics led him to attend some scientific