

XXIV. *On the Ova of the Echidna Hystrix.**By Professor OWEN, C.B., F.R.S., &c.*

Received April 26,—Read May 13, 1880.

[PLATE 39.]

TOWARDS a knowledge of the generative economy of the Spiny Monotreme (*Echidna Hystrix*, CUV.) the recorded steps are the following:—

The fact of its possessing mammary but teat-less glands, as in the *Ornithorhynchus*;* that these glands acquired large and functional development concomitant with ovarian indications of recent gestation;† that the lacteal areola became lodged in a tegumentary depression or *quasi* pouch, capable of receiving the head and fore limbs of the young,‡ at least when this was not more than 1 inch 10 lines in total length.

The female *Echidna* and her young, the subjects of the paper of 1865, were taken in Lolac Forest, Victoria, Australia, on the 12th August, 1864. Guided thereby, I noted, in correspondence with friends in localities frequented by the *Echidnæ*, the period when females in the impregnated state might be obtained, with instructions as to the parts to be preserved and transmitted, in alcohol, for examination; noting, also, the chief facts which remained to be determined§ in reference to the subject of the present communication. Among such friendly correspondents I have the good fortune to include GEORGE FREDERIC BENNETT, Esq., Corresponding Member of the Zoological Society of London, resident at a locality, Toowoomba, in Queensland, where individuals of the *Echidna Hystrix* were to be had. In a letter of September 23rd, 1878, Mr. BENNETT writes:—"You will have received, ere this reaches you, specimens of probably impregnated *Echidna* got on various dates—July 18th, 27th, and August 9th."

The correspondent's father, my friend Dr. BENNETT, F.L.S., being in London when these specimens had arrived, I dissected them in his presence, but found not any ovum in either uterus.|| The ovaria showed one or more enlarged ovisacs.

As the season of generation might vary within certain limits in different localities, I urged the prosecution of the quest through the months of August and September.

* Phil. Trans., 1832, p. 537, Plate 17, figs. 2 and 3.

† *Op. cit.*, 1865, p. 674, Plate 40, figs. 1–5.

‡ *Ibid.*, p. 675.

§ *Ibid.*, p. 677, Plate 40, figs. 6–10. *Ibid.*, pp. 672, 682.

|| See the figure of the female generative organs of *Echidna Hystrix*, in Phil. Trans., 1865, Plate 41, fig. 1.

In a letter from Mr. G. F. BENNETT, dated Toowoomba, January 14th, 1879, he writes:—"I was not able to get any more specimens this last season, but I hope to begin where I left off last year, and continue to the time advised in the letter of my father's—that is, to the middle of September; and then I hope I shall be able to give you material to decide this important question."

In February last I was favoured by receiving from Dr. BENNETT, who had returned to Sydney, New South Wales, a letter of the date December 26th, 1879, in which I had the pleasure to read:—"I have now sent you a case containing a tin of preparations in spirit of the uteri of *Echidna*. I selected those I thought would interest you, but I fear none of them yet solve the problem. One (not sent) I have ventured to open—distended uterus of one captured in August—and it contained a small semi-opaque ovum. Those sent were captured from August 30th to October 10th. One, taken September 24th, was not impregnated, but a young one was found in the pouch, and another on the 29th September."

I welcomed this satisfactory confirmation of the marsupial structure described in the paper of March 2nd, 1865,* and was gratified shortly after by receiving the "tin" of specimens notified as despatched by my friendly correspondent.

The specimens, four in number, of the hinder half of the trunk and hind limbs, with the generative organs entire and *in situ*, were in a good state of preservation; and my first leisure was devoted to their examination. In two of these the uteri were unimpregnated. In a third specimen, from a female killed August 30th, 1879, three ova were lodged in the deep folds of the thick and soft inner membrane or tissue of the left uterus (Plate 39, fig. 1, *c'*). There was no ovum in the right uterus (*ibid.*, fig. 1, *d, c*).

The ova were of a spherical form, and of different sizes; the smallest had a diameter of $2\frac{1}{2}$ millims., the next in size of 4 millims., the largest of 6 millims.

The smallest ovum was situated nearest the vaginal end of the uterus, the next in size was nearer the Fallopian end, the largest held an intermediate position. Each was lodged in a smooth depression of the soft and thick inner uterine coat, and some threads of mucus extended over the larger ovum. These were shown by microscopical investigation not to be vessels, but filamentary portions of uterine secretion (fig. 2, *a a*), coagulated probably by the preserving fluid. A magnified view of the ovum, as seen undisturbed in its nidus, *c'*, is given in fig. 2.

In the fourth specimen, from a female killed on the 14th September, 1879, there was no ovum in the left uterus (*ibid.*, fig. 3, *c', d'*); but in the right uterus (*ibid.*, fig. 3, *c, d*) was an ovum of the size of the largest of the three in that of the date August 30th. It is shown *in situ*, with half of the smooth cell from which it was dislodged in reflecting the portion of the uterine wall, *c*, including the ovum with the other half of the cell. This was situated near the Fallopian end of the uterus. The parts being dissected while under colourless dilute alcohol, a slight touch of a camel's

* Phil. Trans., 1865, p. 671, Plate 39.

hair pencil rolled the ovum out of its cell; there was no organic adhesion between them.

In Plate 39, fig. 4, the ovum is shown, moderately magnified. The outer membrane (hyalinion or "zona pellucida") closely resembled that of the similar-sized ovum of the *Ornithorhynchus paradoxus*.^{*} Under a magnifying power of 120, hyaline corpuscles with interspaces, as shown in fig. 6, pervaded the homogeneous part of the tunic. The space separating it from the embryonal or vitelline mass is shown at the rent of the hyalinion, at *h*, fig. 4. No trace of spermatozoa could be detected in the fluid occupying the interspace.

The yolk or germ-mass has a delicate smooth covering closely attached to the subjacent mass. On picking off with a fine needle-point part of this investment (fig. 5, *v*), the granular yolk-substance adhered to its inner surface. The chief and interesting feature of this yolk-mass was the linear fissure, *g*, extending along about one-third of the periphery, and penetrating a short way into the vitelline or germinal substance. This fissure may be interpreted as the commencement of the primary fission of the mass, and as indicative of a stage in development prior or preparatory to the complete fission observed by BARRY[†] and BISCHOFF[‡] in the smaller uterine ovum of the rabbit.

Not any trace of embryonal structure was discernible in or near this fissure, or in any other part of the germ-mass. One portion of this mass presented a darker tint than the rest, but the structure was uniformly and minutely granular; the coagulating influence of the alcoholic menstruum had given increased firmness to the mass.

The results of the foregoing investigations may be summed up as demonstrating the close resemblance in *Echidna* to *Ornithorhynchus* of the uterine ovum in structure, as in augmentation of size prior to embryonal development; the latter character being exemplified in a greater degree in the present (*Echidna*) series by the smaller size of the ovum, the least of the three, in the left uterus (Plate 39, fig. 1). Concomitantly with the more equal development of the right and left female organs in *Echidna*, as compared with *Ornithorhynchus*,[§] is the evidence of an ovipont by the right ovarium shown by the reception of the impregnated ovum in the uterus of that side (*ib.*, fig. 3).

Finally, the additional evidence of the viviparity of the Monotremes in the commencement of the fission of the germ-mass (fig. 5, *y*).

^{*} This "membrane (Plate 25, fig. 6, *a*) offered a moderate degree of resistance when torn open, and yielded equally in every direction when separated from the yolk, the rent margins curling inward like the coat of an hydatid; it was of a dull greyish colour, slightly transparent."—Phil. Trans., 1834, p. 561.

[†] Phil. Trans., 1839, pp. 320–332.

[‡] 'Entwicklungsgeschichte der Kaninchen-Eies,' 4to., 1842.

[§] Phil. Trans., 1834, Plate 25, fig. 2; Phil. Trans., 1865, Plate 41, fig. 1.

DESCRIPTION OF THE PLATE.

- Fig. 1. Female organs of *Echidna Hystrix*; both uteri laid open, and three ova exposed *in situ* in the left uterus. Natural size.
- Fig. 2. The largest of the three ova in the cell of the lining uterine substance, with filamentary portions of secreted matter passing across the ovum. Magnified.
- Fig. 3. Female organs of *Echidna Hystrix*; both uteri laid open, and one ovum shown in the right uterus. Natural size.
- Fig. 4. The ovum removed, with the hyalinion, *h*, partially torn to expose the yolk or germ-mass and the interspace between it and the outer tunic. Magnified.
- Fig. 5. The germ-mass of the same ovum, showing the fissure *y*; the hyalinion, *h*, being reflected. Magnified.
- Fig. 6. A portion of the hyalinion. Highly magnified.

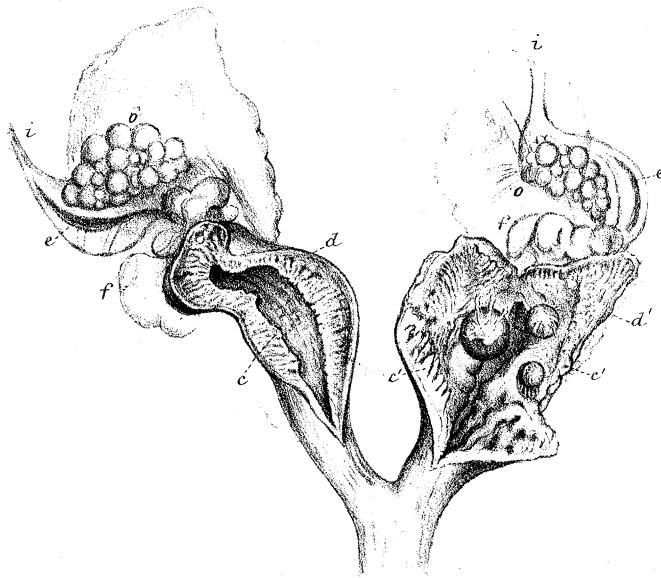


Fig. 1.

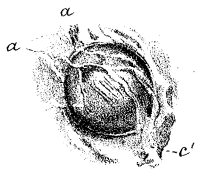


Fig. 2.



Fig. 4.

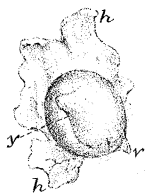


Fig. 5.

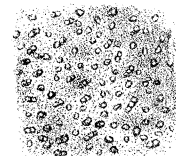


Fig. 6.

Fig. 3.

