

## 2. The external opening of the »Brick-red« Gland in *Limulus polyphemus*.

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From the first description of the »Brick-red« Glands by Packard in 1874 to the present time, many have studied these organs and considered their importance as affecting the position of *Limulus* among the Arthropods. Some importance too has been placed on a supposed function of these glands as well as on the fact that no efferent ducts or external openings have been found in the adult.

Each gland consists of a basal portion, lying on either side of the mid-ventral line and extending from the second thoracic appendage to the fifth. From this basal portion and at right angles to it, there arise four large lobes which project one into each of the proximal portions of the second, third, fourth and fifth thoracic appendages.

Packard<sup>1</sup>, writing in 1875, was the first to mention and describe the anatomy of these organs, which had entirely escaped the notice of the earlier writers, Van der Hoeven, Owen and Milne Edwards. He »could not by injection of the gland make out any general opening into the cavity of the body or any connection with the hepatic or great collective vein; any 'attempt to inject the gland from the veins failing«.

Writing again in 1880 Packard<sup>2</sup> says that the glands have no outlet, though he finds large active cells which cause him to believe that they are excretory in function.

E. Ray Lankaster<sup>3</sup> in 1884 writes »the minute structure of the glands leave little room for doubt that we have in the coxal glands an active secretory apparatus. . . . But it must be admitted that no abundant or peculiar looking secretion can be detected in this lumen, and further, it seems that there is no outlet for this secretion«.

Kingsley<sup>4</sup>, writing later, has likewise been unable in the adult to find any communication between the gland and the exterior; and

McMurrich<sup>5</sup> in 1894 states that »they have no communication with the exterior in the adult, but in the early stages of development open upon the basal joint of the fifth appendage«.

If the basal portion of the gland is followed posteriorly beyond the junction with the lobe from the fifth appendage, it is found to

<sup>1</sup> American Naturalist. Vol. IX. 1875. p. 511—514.

<sup>2</sup> Anniv. Mem. of Boston Soc. Nat. Hist. 1880. p. 16—18.

<sup>3</sup> Quart. Journal of Micr. Science. Vol. XXIV (new series). p. 84 & 161.

<sup>4</sup> Quart. Journal of Micr. Science. Oct. 1885.

<sup>5</sup> Invertebrate Morphology. p. 432.

attach itself to the posterior inter-articular membrane of the fifth coxal joint where it opens to the exterior, at the apex of a definite well-formed papilla. This papilla is somewhat hidden by the folds of the inter-articular membrane. It is first noticed however as a small light area surrounded by a darker gray ring lying close to the basal portion of the fifth appendage. The papilla, in large adults, is easily distinguished without the aid of a lens, and a bristle-probe is easily passed through it into the duct and gland.

In younger specimens the papilla itself is not so easily recognized, though its position is readily determined by the light color. In still younger forms, where the shell is more or less transparent, neither the papilla nor the characteristic area is recognized except by careful examination, and in very young forms a strong lens is necessary.

As a matter of fact I have not been able to find a single specimen, even among the smallest, in which the opening is closed. It seems to increase in size with the increased growth and function of the gland, and the gland itself appears equally functional in adults and in young.

I have many times noticed a white transparent fluid oozing to the exterior, through the external openings. Chemical analyses which are now being carried on indicate that the glands are of an active excretory nature, without doubt of renal character.

### 3. Berichtigung zu Bergh's Vorlesungen über allgemeine Embryologie.

Von Dr. F. Braem in Breslau.

eingeg. 23. August 1895.

Auf p. 97 u. ff. der genannten Schrift (Wiesbaden 1895) wird die Angabe gemacht, daß Pflüger die aus seinen Druckexperimenten gewonnenen Ergebnisse, »sowie die Thatsachen der normalen Furchung des Froscheies . . . durch sein ,Princip des gleichen Widerstandes' und ,Princip des kleinsten Widerstandes' zu erklären versucht« habe. »Wenn die Kernspindeln bei den ersten Theilungen des Froscheies sich unter normalen Verhältnissen horizontal stellen, so sollte das eine Folge davon sein, daß der Kern, wenn er sich zur Spindel streckt, nur in dieser Richtung den gleichen Widerstand findet; daß die Kernspindeln sich bei der dritten Furchung vertical stellen, wäre dagegen eine Folge des Principes des kleinsten Widerstandes, indem der Druck von den Nachbarzellen jetzt der Streckung der Kernspindel den größten Widerstand entgegensetzt.« Später, heißt es dann, hat Braem diese Grundsätze in ausgedehnter Weise anzuwenden gesucht.

Diese Darstellung beruht auf einem Irrthum, den ich im Einver-

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