

ON THE REGULATION OF THE SUPPLY OF BLOOD TO THE VENOUS SINUSES OF
THE HEAD OF REPTILES, WITH DESCRIPTION OF A NEW SPHINCTER
MUSCLE ON THE JUGULAR VEIN. BY H. L. BRUNER.

[Abstract.]

The remarkable development of blood sinuses in the reptilian head has received no explanation at the hands of earlier investigators. The work of the writer shows that the origin of these sinuses is due to periodical constriction of the jugular vein by a ring-like muscle, whose contractions thus lead to an increased blood pressure in the region drained by the vein.

In *Phrynosoma* this ring-muscle, which is composed of striated fibres, is attached to the lateral end of the ex-occipital bone, beneath which the jugular receives the posterior cerebral vein. Immediately behind the mouth of the latter vein, the ring-muscle embraces the jugular. The muscle occurs also in turtles (*Emys*) and snakes (*Tropidonotus*).

According to the observations of the writer on lizards, the distention of the extra-cranial blood sinuses is of great importance at the time of moulting, when the removal of the old epidermis is greatly facilitated by it, particularly in the region of the eyes and nasal openings. Under ordinary circumstances, such distention probably serves to express emotion of various kinds.

The above-mentioned facts furnish a basis for an explanation of the habit of ejecting blood from the eye (orbital sinus), for which *Phrynosoma* is noted.

For additional details, the writer refers to the paper itself, which will be published in full elsewhere.

NOTE ON THE ABERRANT FOLLICLES IN THE OVARY OF CYMATOGASTER.*

BY GEORGE L. MITCHELL.

The thickness of the ovarian follicle varies in different vertebrates inversely with the size of the egg. In species containing large eggs the thickness of the follicle *decreases* relatively with the growth of the egg. In the bird and frog it is only in the smaller eggs that the single layer of follicle cells may be distinguished in sections. The rapid growth of the egg soon stretches this layer of cells so that it becomes finally indistin-

*Contributions from the Zoölogical Laboratory of the Indiana University, No. 25.

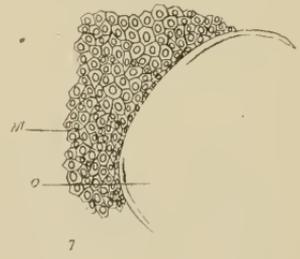
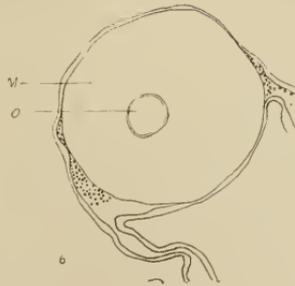
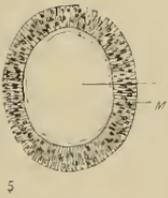
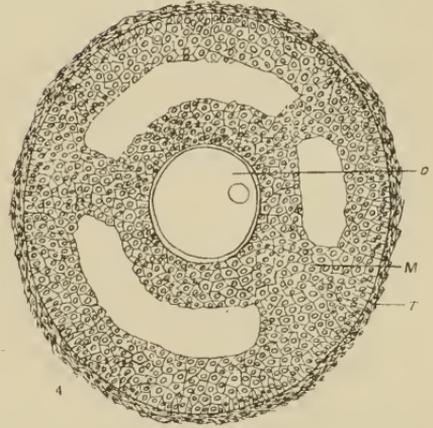
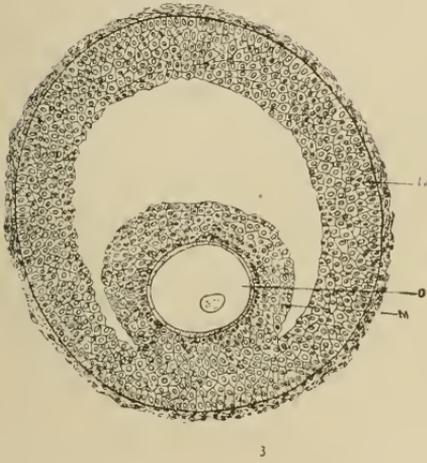
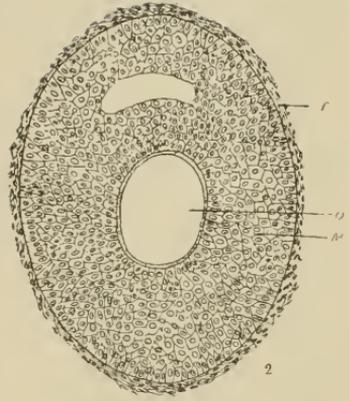
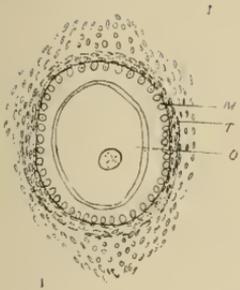
guishable. In species containing relatively small eggs the thickness of the follicle *increases* with the growth of the egg. Examples of this are found in fishes, but the extreme is found in the Graafian follicle of mammals.

The Graafian follicle, whose structure is well known, offers some peculiar features which may be explained in connection with the reduction of the size of the ovum in the mammalian phylum. Suggestions as to how any why the many layered follicle of higher mammalia has arisen from the single layered follicles of monotremata are furnished by the viviparous fish *Cymatogaster*. The egg in this species is much below the average in size. It has in fact lost nearly all of its yolk. It is significant, therefore, that among many individuals with normal follicles there are occasionally found individuals containing a small number of many layered follicles. It is to call attention to these and to compare them with the mammalian structures that the present article is prepared.

In order to fully appreciate the conditions, follicles of various mammals and various stages in the same mammal may be briefly mentioned. Poulton has found that in monotremata the follicular epithelium remains a single row of cells.

The follicles of the cat, after moving from the surface toward the deeper parts of the ovary, begin to thicken from the single layered stage to the many layered stage. Fig. 1 represents the single layered stage. Fig. 2 represents the many layered stage in which the follicular cavity is beginning to be formed. The egg in the many layered stage is usually imbedded in the portion of the granulosa nearest the surface of the ovary. The first traces of the follicular cavity are seen in the thicker part of the granulosa. As the egg grows the follicle cells still multiply and the liquor folliculi filling the cavity distends the latter. Fig. 3 shows the follicle with its now nearly ripe egg imbedded in the discus proligerus. This figure represents the typical Graafian follicle.

The follicle of the rabbit differs from that of the cat (Fig. 4). Columns of granulosa cells connect the outer mass of cells with that surrounding the egg. In such follicles as many as four stalks are found in a single section. On examining other sections of the same follicle other stalks may be found so that a single follicle may contain as many as seven of these. In both the cat and rabbit the thickness of the follicular wall is not reduced with the growth of the egg, but rather increases proportionally with the growth. In the opossum both types of follicles of Figs.



3 and 4 were found. The two varieties were about evenly divided. Of the stalked variety there seemed to be few follicles with more than two or three pronounced cavities.

The normal follicle of *Cymatogaster* presents no novelties. As the egg ripens the granulosa cells become very high and narrow columnar, but remain in a single series.

As before stated, occasionally there are found, in this species, follicles in which the granulosa is made up of a great many layers of flattened and polyhedral cells. Such a one is represented in Fig. 6. Those cells immediately surrounding the ovum and those next the follicular wall are noticed to be somewhat flattened, while those intermediate are more rounded and polyhedral. The ovaries, which contain such follicles, are comparatively few, but where one such follicle is found, usually two or three more may be found. No indication of follicular cavities has been observed, but the similarity of such follicles to certain stages of the mammalian follicle is at once evident. Compare Fig. 6 with Fig. 2.

If, now, follicular cavities should be formed and filled by an accumulation of follicular fluid we should have conditions similar to those of Figs. 2 and 3.

In oviparous fishes, in batrachians, in birds, in monotremes and in the early stages of mammals, we find the follicles one layered. In the adult stages of marsupials and higher mammals, where the eggs are very small, we find the many layered condition.

The occasional multilayered follicle in the ovary of *Cymatogaster*, whose egg is but .2-.3 mm. in diameter, seems to bridge the condition found in normally large yolked eggs and the minute eggs of the higher mammals.

The material examined was collected by Dr. C. H. Eigenmann on the coast of California.

EXPLANATION OF FIGURES.

Fig. 1-3. Three stages in the development of the follicle of the cat.

Fig. 4. Follicle of the rabbit.

Fig. 5. Normal mature follicle of *Cymatogaster*.

Fig. 6. Abnormal follicle of *Cymatogaster* showing the small egg in the center of a many layered granulosa.

Fig. 7. Part of the granulosa layer of Fig. 6, enlarged.