of demonstrable lacunæ, all lead to the conclusion that the arterial and venous vessels of the squid are connected by capillaries which form a closed vascular system.

The Branchial Nerves of Amblystoma: G. E. Coghill.

1. There is, in larval *Amblystoma*, a complete series of pre-trematic rami of the ninth and tenth nerves. These rami are distributed wholly to the epithelium of the branchial arches and are therefore comparable to the pre-trematic nerves of fishes. Drüner finds the same series of nerves in *Triton* and *Salamandra*, and the first two of the series in *Proteus* and *Menobranchus*.

As in some fishes, there is an anastomosis in *Amblystoma* between the ramus post-trematicus IX. and the first ramus pre-trematicus X. In some individuals there is a similar anastomosis in the second and third branchial arches and in the hyoid arch between the facial and glossopharyngeus. The latter has been found by Drüner in *Triton*.

2. The ramus alveolaris VII. of *Amblystoma* is a pre-spiracular nerve and, as such, cannot be homologous to the ramus mandibularis internus of *Anura*. These two nerves innervate homologous areas and terminate in homologous centers in the brain. They differ, however, in the following important features: (*a*) The ramus alveolaris passes anteriorly of the derivative of the spiracular cleft, while the mandibularis internus passes caudally of that structure; (*b*) the alveolaris passes dorsally of the mylohyoid muscle, while the mandibularis internus passes ventrally of that muscle; (*c*) the alveolaris anastomoses with the trigeminus while the mandibularis does not.

These differences may be explained by reference to *Squalus acanthius*, in which both nerves are present. Here the areas innervated by the two nerves in part coincide and the terminal fibers of the two anastomose. Obliteration of a pre-spiracular nerve of the selachian type in *Anura*, and of a like post-spiracular nerve in *Amblystoma*, would give the two divergent amphibian types of distribution of the facialis.

The Anatomy of the Drumming Organ in some Marine Fishes: A. K. Krause.

The Cell-Lineage of the Mesoblast-Bands and Mesenchyme in Thalassema: John Cutler Torrey. (Read by title only.)

As in many other annelids and mollusks the middle germ-layer has, in *Thalassema*, a double origin. The mesoblast-bands (entomesoblast or cœlomesoblast) arise in the typical manner from D.4, the posterior member of the fourth quartet, which also contributes two small, but not rudimentary, cells to the posterior part of the gut. The 'larval mesenchyme' (ectomesoblast or pædomesoblast) arises, as in most other forms, from cells of the earlier or ectoblastic quartets; but whereas in the forms hitherto described it arises from only one quartet and only in certain quadrants, in *Thalassema* it arises from all of the three quartets and in all of the quadrants (though this latter statement does not apply to all of the quartets). At least twenty primary ectomesoblast cells are formed; but of these only ten are functional, while at least ten are rudimentary and disappear without becoming functional. Of the functional mesenchyme-cells, three are derived from the third quartet and seven from the first. These give rise not only to the larval muscles, but also in part to those of the adult. Of the rudimentary cells, six arise from the first quartet and one from each quadrant of the second quartet. These cells pass into the interior of the entoblast cells, are absorbed, and wholly disappear. They are probably to be regarded as vestigial cells which have been supplanted by other mesenchyme cells.

A Case of Compensatory Regeneration in Hydroides dianthus: C. ZELENY. (Read by title only.)

Primary Hexamerism in the Rugosa (Tetracoralla): J. E. DUERDEN. (Read by title only.)

Numerous serial sections of the rugose coral, *Lophophyllum proliferum* (McChesney), prepared for the author by the United States National Museum, enable him to confirm the observation of Pourtalès in 1871 that six primary septa occur at the tip of the corallum. Duncan and Kunth have independently found the Palæozoic *Heterophyllia,* and Frech the Devonian *Decaphyllum,* likewise to be primarily hexameral, while apparently no sections of any rugose types have been described revealing only the four primary septa which are usually assumed to be characteristic of the Tetracoralla. There is good reason for concluding that the Palæozoic corals were primarily hexameral, as is the case with modern corals and actinians (Ceriantheæ excepted).

The serial sections of *Lophophyllum* beyond the tip permit of the order of appearance of the later septa being established. These are found to arise in bilateral pairs within four of the primary interseptal chambers in conformity with Kunth's law. Instituting a comparison of this method of septal increase with what is known of the mesenterial and septal succession in modern Zoantharia, it is shown that the rugose corals are very closely related to the living Zoanthid polyps. In the latter new mesenteries appear at one region within only two primary exocœlic chambers, while in the Rugosa they must have appeared in the same manner within four primary chambers and rarely within six. The Zoanthids probably bore much the same relationship to the corals of Palæozoic times which the actinians of today bear to recent corals.

The Course of the Blood Flow in Lumbricus: SARAH WAUGH JOHNSON. (Reported by J. B. Johnston.)

The course of the blood flow in *Lumbricus terrestris* was studied by watching the pulsations, cutting the vessels, holding with forceps, and by various combined and indirect experiments. The main result is to show that the circulation in *Lumbricus* is not fundamentally a segmental one, upon which a partial systemic circulation has been superimposed, but is wholly systemic. The blood flows forward in the dorsal vessel to the extreme anterior end of the worm, downward in the hearts, and in both directions from the hearts in the ventral vessel. The flow is backward in the subneural vessel and upward from the subneural to the dorsal in the parietals. From the ventral vessel the blood goes to the intestine, body wall, and nephridia. From these organs it is gathered up by the dorso-intestinals, branches of the subneural, and parietals, and emptied into the dorsal. Thus the blood is carried backward by the longitudinal trunks on the ventral side of the body, upward through the body wall, intestine, nephridia, etc., to the dorsal, and forward in the dorsal to the hearts. Since the flow is upward in all the circular vessels, no complete circuit within a single segment is possible for any part of the blood. In the anterior end of the worm blood is carried forward by both the dorsal and ventral vessels, and backward by the subneural and lateral vessels. The latter have connections in several segments with the subneural, anastomose with the parietals of segments XII. and XIII., receive blood from the body wall, nephridia, and seminal vesicles, and empty