by irregularities of the surface of the water. Such images are small black spots, orange or yellow bordered.

3. It was pointed out that in the male of *Eupomotis gibbosus* the colors are much brighter than in the female. The vermicular markings on the cheeks of the male are more brilliant than those of the female; the opercular ear-flap is larger and bordered with scarlet and blue; the ventrals of the male are black, while those of the female are yellow; the dorsal and caudal of the male are much more brilliantly blue than those of the female. In approaching the female, in order to induce her to enter his nest to spawn, the male elevates or puffs out the gill covers so as to display their brilliant markings. At the same time the opercular ear-flaps are erected and the black ventral fins spread out. When in this attitude the male faces the female and it is when seen from the front that his display of color is most brilliant. He assumes a similar attitude when threatening other males. He was never seen to assume this attitude except under the circumstances described, so that the display of color resulting from the attitude must be regarded as a means of expressing the emotions.

The Early History of the Lateral Line and Auditory Anlages in Amia: CORA J. BECKWITH. Presented by Jacob Reighard.

No common anlage of the auditory pit and lateral line system, such as has been described in Teleosts by Wilson, was found in *Amia*. The auditory pit was found to arise much earlier than the lateral line system and in the usual way. It is at first imbedded in an elongated mass of mesectoblast proliferated from the neural crest. This mass of mesectoblast, with enclosed auditory pit, bears a considerable resemblance to the common anlage of auditory pit and lateral line system referred to above. It subsequently extends into the adjacent gill arches, where its further history was not followed. The lateral line system makes its appearance at a later stage in the form of several independent ridge-like thickenings of the ectoblast which subsequently fuse. It is at no time connected with the anlage of the auditory pit.

The Vascular System of the Common Squid, Loligo pealii: L. W. WILLIAMS.

The knowledge of the histology of the vascular system of decapod mollusks is very incomplete, especially in reference to the extent of the capillary system. In addition to the capillaries, lacunæ have been believed to intervene between the arteries and veins. The extent of the capillary system was determined by injecting the vascular system with Berlin blue, and the lining of the vessels was studied by means of silver impregnations. Both the arterial and branchial hearts seem to lack an endothelium. The branchial heart consists of striated muscle and apparently secretory polygonal cells. The intrinsic muscle of the peristaltically contractile arteries resembles connective tissue. The arteries and veins are connected in all parts of the squid by capillaries. All the vessels are lined by an endothelium. The veins are connected with small end-sinuses which enclose the terminal branches of the arterioles and receive numerous capillaries, some of which arise from the perforating arteriole. The so-called lacunæ which partially enclose the pharynx and eyes are sinuses, since they have endothelial walls and since they intervene between veins, not between veins and arteries.

The wide distribution of the capillary vessels, the presence of an endothelium around every blood-containing cavity except possibly the heart, and the absence

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