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XXV.—Note on a new type of compound eye

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at each end, and those of *Petromyzon* are often (especially in very fresh specimens!) irregular in outline.

We thus find that the blood differs in almost every point in these two animals, viz. in the size and shape of the red corpuscles and in the character of their nuclei, and that *Petromyzon* in these respects stands alone, while *Myxine* resembles other fishes, and especially the Elasmobranchs and Dipnoi, whose corpuscles are much larger than those of Teleostei. But the two genera agree in the extraordinary number of the white corpuscles, which in most fishes are, if anything, exceptionally scanty.

I did not take the opportunity of estimating the number of the red corpuscles in either case; but they are certainly exceptionally few, especially in *Myxine*.

One very curious point still remains. Shipley, in his recent paper on the development of *Petromyzon* (Quart. Journ. Micr. Sci., Jan. 1887), states, without further remark, that the red corpuscles of the Ammocete (*P. fluviatilis*) are oval; and in writing to me he confirms the statement that the corpuscles of the Ammocete differ altogether in size and form from those of the adult *Petromyzon*. This observation is, I fancy, quite novel, and it recalls the similar but far less striking fact that the corpuscles of the young tadpole were long ago observed (by Gulliver) to differ somewhat in size and shape from those of the frog. But the noteworthy point now is that *Myxine* possesses red corpuscles similar to those not of the adult, but of the larval lamprey, which in many ways it resembles otherwise.

XXV.—Note on a new Type of Compound Eye.

By F. E. BEDDARD, M.A., F.Z.S.

THE minute structure of the eye in the Cymothoidæ has been treated of by Johannes Müller*, and more recently by J. F. Bullar†; the observations of the older author principally concern the cuticular lenses and the vitreous body, and are immaterial to the present note. Bullar has described and figured the eye of *Cymothoa* in some detail; his results on the whole show no great difference from the eye of *Porcellio*, which has been investigated by Grenacher and described in

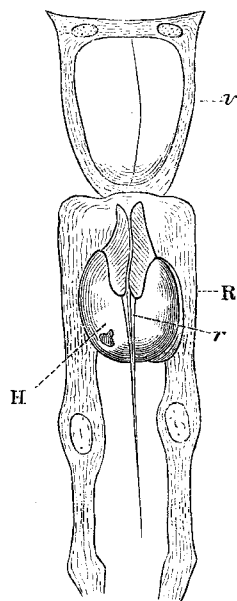
* Meckel's 'Archiv,' 1829.

† Phil. Trans. 1878.

his important memoir * on the Arthropod eye. The vitrella † in both types consists of two cells, which secrete a round or pear-shaped crystalline cone; this crystalline cone is evidently composed of two halves closely applied together, each half being formed from a single cell of the vitrella.

The retinula in both types is seven-celled; each cell secretes a chitinous refracting rod—the rhabdomere; these become fused into an axial structure—the rhabdom—in *Porcellio*; in *Cymothoa* each rhabdomere remains separate and within the retinula-cell of which it is a product.

I have recently studied the structure of the eye in several species of *Æga* and allied genera, and find some notable differences from the types already mentioned as well as from all other Isopods, excepting the genus *Serolis*. In *Serolis* ‡ the retinula differs from that of *Porcellio* &c. in being composed of only four cells; each cell secretes at its upper extremity a chitinous rhabdomere: the rhabdomeres are more or less completely fused together along their inner faces, but the rhabdom is not imbedded between the retinula-cells; on the contrary, each of these cells, owing to its peculiar shape, is only in contact with the upper part of the rhabdom; the lower portion is surrounded by two large spherical transparent cells, which fit in closely between the four retinula-cells (see woodcut). These cells are distinctly nucleated (H), the nucleus possessing a well-defined nucleolus. In sections it can be readily seen that the rhabdom, which at its inferior extremity becomes divided into four separate pieces (corresponding of course to the four rhabdomeres of which it is composed), is imbedded in, or at least is entirely surrounded by, the substance of these large clear cells.



Ommatidium of *Serolis Schythei*. v, vitrella-cells; R, retinula-cells; r, rhabdom; H, hyaline cells.

* 'Sehorgan der Arthropoden,' Göttingen, 1879.

† This term has been introduced by Profs. Lankester and Bourne (Quart. Journ. Micr. Sci. 1883, p. 177).

‡ "Report on the Isopoda collected during the Voyage of H.M.S. 'Challenger,'" Zool. Chall. Exp. pt. xxxiii.

In several species of *Cymothoidæ* I have been able to recognize the presence of these same hyaline cells both in sections and in teased preparations: I invariably found two present, and their relation to the retinula-cells and to the rhabdom was precisely as described above in *Serolis*. *Æga*, however, agrees with *Cymothoa* and other Isopods and differs from *Serolis* in the fact that there are seven cells to each retinula; but in the presence of these remarkable hyaline cells, as well as in their structure and position, *Æga* exhibits a striking resemblance to *Serolis*, and differs, so far as our knowledge goes, from all other Isopods. This structural resemblance between *Æga* and *Serolis* tends further to confirm the view, held by many carcinologists, of the close relationship between the Serolidæ and Cymothoidæ.

In one of my figures of the structure of the eye in *Serolis Schythei* (*loc. cit.* pl. ix. fig. 5) I have depicted the rhabdom as ending in a fine filament which passes through the hyaline cell as far back as the membrane which bounds the ommatidium posteriorly; I have also (figs. 3, 4) noted a similar prolongation of the rhabdom in *Serolis cornuta*.

On again referring to my preparations of both these species I find that those figures are not quite accurate. In *Serolis Schythei* the rhabdom has not the conical form which I have erroneously given to it in my drawing; it ends in four blunt points (*cf.* woodcut): just below the termination of the rhabdom is a bundle of delicate fibrils which unite into a single fibre (*r*); this passes through the substance of the hyaline cells and can be traced back as far as the ommateal membrane. In *S. cornuta* the arrangement is identical.

In some young examples of *S. Schythei*, taken from the brood-pouch of the mother, this bundle of delicate fibres, terminating in a single long fibre, was present, and appeared from its position to be a product of the four pigmented retinula-cells. At this stage the thickened masses which form the greater portion of the rhabdom in the adult eye were not developed. If it were not for this fact the bundle of fibrils (*r* in woodcut) in the adult eye would seem to have nothing to do with the rhabdom of the pigmented retinula-cells, but to be anteriorly formed by the hyaline cells. It is indeed quite possible that it is in part formed by these cells. If this be so, the retinula in Serolidæ and Cymothoidæ is composed of six cells, two transparent cells surrounded by four pigmented cells, all of which secrete chitinous rods. The central transparent cells, however, do not appear to end in nerve-fibres, unless the axial chitinous rod contains nerve-fibrils, which is of course a mere suggestion.

The structure of each retinula is therefore clearly very similar to that of the retinula of many mollusks as described by Patten, and, which is more important for purposes of comparison, to *Nereis* among Annelids if Patten's interpretation * of Carrière's figures be allowed. The two central clear cells are Patten's 'retinophoræ.' It will be observed, however, that apart from these two problematical hyaline cells the minute structure of the eyes of the Serolidæ and Cymothoidæ bear out Grenacher's conclusions rather than Patten's with regard to the morphology of the Crustacean eye. There can be no doubt that the crystalline cone is independent of the rhabdom and formed by different cells.

The specialization of the retinula-cells is, however, a new feature, and distinguishes the eye of these Isopods.

XXVI.—*Note on the Hapuku of New Zealand* (Polyprion prognathus). By Dr. A. GÜNTHER, F.R.S.

THE *Hapuku* of New Zealand, one of the most highly esteemed food-fishes of the southern hemisphere, and attaining to a weight of 100 pounds, has been known to naturalists since Cook's visits to that country, as has been shown by Mr. Hutton (Trans. N.-Z. Instit. v. p. 259). It was figured by Forster as well as by Parkinson, the former naming it *Perca prognathus*, a very appropriate term, to which I give preference before all others, although Schneider (Bl. Schn. p. 301) arbitrarily changed it into the less expressive *Epinephelus oxygeneios*. Forster's original description is published in 'Descript. animal. ed. Lichtenstein,' p. 309, and referred to by Cuvier (Cuv. & Val. Hist. Nat. Poiss. iii. p. 29), who, with his perfect knowledge of fishes, recognized its relation to *Polyprion*, not doubting that it was the same species as the Atlantic *P. cernium*.

The figure left by Parkinson bears the name *Sciæna gadoides*, probably in Broussonnet's handwriting; but this name seems to have remained always a MS. name.

The second period of the history of this fish begins with Owen, who, in the 'Osteological Catalogue of the College of Surgeons,' i. p. 51, described the skeleton of a New-Zealand Percoid under the name of *Centropristis gigas*. In the 'Catalogue of Fishes,' i. p. 251, I stated the reasons which

* Mitth. Zool. Stat. Neapel, 1886.