plexus and the ulnar limb at the marginal vein. This channel receives blood directly from the (temporary) a. mediana and from the a. ulnaris from the time at which those arteries become recognizable. Having thus become incorporated in the arterial side of the vascular system, the arch is drained through its digital branches into the distal part of the marginal vein, and is thus drained in the adult.

THE ORIGIN OF THE PRIMITIVE DUCT

By H. V. NEAL, *Tufts College*

The origin of the primitive (pronephric) duct remains a persistent problem of Vertebrate Morphology. Early speculations as to its origin were biassed by the assumption that Vertebrates were derived from annelid-like ancestors and that their kidney tubules were comparable with nephrida. When, however, it was demonstrated that nephridia are ectodermal while kidney tubules are mesodermal, the assumption of their homology became untenable. Consequently, if annelids possess organs comparable with kidney tubules, the mesodermal structures which Goodrich has called coelomoducts appear to be the only ones.

Even after the mesodermal origin of the kidney tubules had been demonstrated the ectodermal origin of the primitive duct was assumed. The duct was supposed to have been formed by the closure of the edges of a longitudinal groove into which the segmental tubules (coelomoducts) poured their secretions through separate apertures. This description of the origin of the primitive duct remained as the orthodox hypothesis until agreement was reached that the primitive duct is a derivative of the pronephros and is therefore mesodermal. Consequently, morphologists assumed that the primitive duct had been formed by the union of successive pronephric tubules. Such an effect would follow from a backward shifting of the external orifices of anterior coelomoducts. In this way an increasing number of tubules would share a common duct to the origin of which each made a contribution and the external opening of which shifted posteriorly until it reached the cloaca. The intimate connection of the primitive duct with the ectoderm in ontogenesis thus receives a reasonable interpretation.

Doubt as to the adequacy of this hypothesis to explain the facts of ontogenesis has recently been expressed by Burlend ('31), who denies that the facts have been correctly stated by embryologists. According to Burlend, the pronephic duct is not ontogenetically formed by the coalescence of pronephric tubules. The supposition that tubules unite to form the primitive duct in Elasmobranchs is in his opinion an error due to misinterpretation of sections. Burlend correctly states that the pronephric anlage which in Elasmobranchs forms the primitive duct arises as an elongated cellular mass proliferated from the lateral wall of the splanchnocoelic mesoderm and not as a series of outgrowths, from the nephrotomes. Burlend believes that the clue to the origin of the primitive duct in Vertebrates is found in the observations of

Price on *Bdellostoma* embryos. From this evidence and his own observations upon Elasmobranch embryos, Burlend assumes that the primitive duct had its origin in a longtiudinal groove of the splanchocoelic mesoderm. By the closure of this groove to form a tube the primitive duct arose. The segmental (pronephric) tubules developed in connection with this duct as it became separated from the coelomic epithelium. The openings of the tubules into the coelom are the places where the original groove remained open when the primitive duct was formed.

The foundations of this hypothesis seem insecure. Price's description of the development of the primitive duct needs confirmation. Granting that Price has correctly described the development of the primitive duct it is surprising that its ontogenesis, if it really is primitive, differs so radically in other Vertebrates. Even in Elasmobranchs the pronephros does not arise as a groove or outpocketing, but as a solid cellular proliferation. If Burlend's hypothesis were the correct one, we should expect the splanchnocoelic epithelium in the region of the mesonephros to make some contribution to the primitive duct. But, as Bates ('14) has stated, the mesoderm posterior to the pronephros makes no contribution whatever to the elongation of the primitive duct. Moreover, the hypothesis affords no clue to the intimate connection of the primitive duct with the skin (ectoderm).

The contrast between the ontogenesis of the pronephros, and of the mesonephros remain unexplained by the hypothesis. Annelids such as *Allolobophora* (Rosa '06) have acquired a collecting duct with relations strikingly similar to those of the primitive duct of Vertebrates, but there is no evidence that this was developed from a longitudinal groove of the mesoderm. Until these difficulties and objections are removed, morphologists will maintain a skeptical attitude towards Burlend's hypothesis.

REPORT OF WORK ON ROTIFERA ON MOUNT DESERT ISLAND—1931

By FRANK J. MYERS, *American Museum of Natural History*

During the season of 1931 I spent the time in collecting and preserving rotifer material in bulk for the purpose of filling up certain gaps in the study collections of the American Museum of Natural History, and of the National Museum; in checking up on certain living rotifers, found only on Mount Desert Island thus far, for a paper on "New Species of Rotifers from Mount Desert Island"; and in working on the rotifer section of Pratt's Manual of the North American Invertebrates now in the course of revision.

(*Editor's note:* See paper by Mr. Myers in *American Museum Novitates*, No. 494, September 28, 1931, on "The Distribution of Rotifera on Mount Desert Island."