

pa, 10a, *pa*, 10b, *pa*) aortæ and the pulmonary artery (fig. 10, 10a, 10b, h^1 , h^2). Our investigations in regard to the relations of the heart to the different vessels which pass to and from it are quite defective, and, like other points in the development of the organs, must be left for future research.

The Bloodvessels. All the principal bloodvessels originate, like the heart, as channels, hollowed in the superior thickness of the subsidiary layer. We have already (p. 545 and 594; Pl. 9d, fig. 1, h , j^2 ; Pl. 9c, fig. 5, j^2) pointed to the fact, that the subsidiary layer becomes more or less separated from the layers above it; but, with the exception of the tracks along which vessels are formed, this gap is afterwards filled up again. After the initiatory steps are taken to form the heart, the anterior pair of the branchial aortæ (Pl. 12, fig. 7, j') are developed: they appear as channels running obliquely forward and upward, one on each side of the head, from a common point of origin, the heart, (h) toward the dorsal region (p. 547). At the same time, the branches (fig. 7, i , i) of the afferent vessel, the omphalo-meseraic vein, commence as nearly transverse channels opening into the posterior end of the heart (h). These transverse channels (i , i) are exactly in that bend of the subsidiary layer which forms the anterior edge of the abdominal cavity. Exterior to the body, the omphalo-meseraic vessel first appears as a broad and thick band, (i^1 , i^1) which subsequently becomes hollow, and constitutes the vena terminalis.

At the time the branchial fissures (Pl. 12, fig. 8, m , fig. 9, m) are formed, the three other branchial aortæ (Pl. 18a, fig. 11, h^2 , and note 2, p. 551) are developed between, and run parallel with them. A little later, the branchial aortæ empty into the two branches of the dorsal artery (Pl. 18a, fig. 11, j^2 , also fig. 7, j). Beyond this we have nothing more to say in regard to the branchial aortæ themselves besides what has already been stated in the section on the general development of the embryo.

The aorta dorsalis, or descendens, originates as a forked vessel, one limb of the fork running along the right side, (Pl. 18a, fig. 11, j , j^2) and one along the left, (Pl. 18, fig. 7,) of the dorsal region, just behind the head, and uniting into one median channel (Pl. 9c, fig. 7, j^2 ; Pl. 18, fig. 7) at a short distance behind the heart. From this point it runs singly along the axis of the body to its posterior extremity; and finally, when the tail is developed, to the end of that organ (Pl. 13, fig. 2, w-c. 1, j^2 , p. 553). The anterior ends of the two branches of the fork of this vessel run forward into the head, (Pl. 18a, fig. 11, j ;) and eventually branch there very extensively (Pl. 13, fig. 2). Soon after the forming of the aorta, lateral branches (Pl. 18, fig. 5, 7) run out from its right and left sides and pass into the vascular area, and its posterior end forks, and joins the two lateral abdominal veins. Presently the allantoidian arteries (Pl. 13,