

The discovery of the circulation in insects, and of its varying energy at different periods of growth, has elucidated many obscure points in the physiology of this important

*tal.* The dorsal portion, which is the one in which a pulsation is chiefly observable, is furnished with distinct valves, is attached along the dorsal part of the body by lateral muscles, and has vessels which enter it laterally, pouring into it the circulating fluid, which is returning from the sides and inferior portions of the body. In the caterpillar, this portion of the dorsal vessel extends from the twelfth to the anterior part of the fifth segment. It is furnished with eight double valves, which are formed, as Mr. Bowerbank has correctly described them in the *Ephemera marginata*—namely, the upper valve “by a reflecting inwards and upwards of the inner coat, or coats of the artery,” (by which he means the dorsal vessel) “and the under one by a contraction or projection of the like parts of a portion of the artery beneath, so as to come within the grasp of the lower part of the valve above it.” The whole vessel is made up of three coats, the two innermost of which, the lining, or serous, and the muscular, or principal portion of the vessel, constitute the reflected portions, or valves; while the third, or outermost coat, which is exceedingly thin and delicate, is continued over the vessel nearly in a straight line, and does not appear at all to follow the reflexions of the other two. In the caterpillar, this portion of the vessel has eight pairs of small suspensory muscles, seen along the upper side of Fig. 339, which arise from the middle of the upper surface of each valve, and are continued back to be attached over the middle of the next valve: they seem to have considerable influence over the contractions of the valves. The Aortal, or anterior portion of the vessel, extends from the hinder part of the fourth segment to its termination and division into vessels, to be distributed to the head, which division takes place after it has passed the œsophagus, and at a point immediately beneath the supra-œsophageal ganglion, or brain of the insect. This portion of the vessel is much narrower than the dorsal, has no distinct valves or muscles; nor do any vessels enter it laterally; but it is very delicate and transparent, and gradually diminishes in size from its commencement to its anterior termination. Its course, in the caterpillar, is immediately beneath the integument, along the fourth and third segments, till it arrives at the hinder parts of the second segment; when it gradually descends upon the œsophagus, and immediately behind the cerebral ganglion, gives off a pair of exceedingly minute vessels. It then passes beneath the ganglion, and, in the front part of the head, is divided into several branches, as noticed by Mr. Newport in the anatomical description he has given of the nerves of this species of *Sphinx*: (Phil. Trans. 1832, p. 385.) These branches are best observed in the chrysalis (Fig. 340:) in all the stages they may be divided into three sets; the first is given off immediately after the vessel has passed beneath the ganglion; and consists of two lateral trunks, the united capacity of