adult tissues in a state of functional survival rather than one of unlimited proliferation. It also renders it possible to study simultaneously both the effect of the medium on the cells and the effect of the cells on the medium. Thus, for example, the entire medium may be changed without removing the suspended fragments, or any part of it may be withdrawn at any time in order to test it for the presence of particular substances elaborated by the tissues.

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PULSATING BLOOD VESSELS IN THE OYSTER[1]

DESCRIPTION was recently published[2] of a pair of "accessory hearts" in the oyster. These structures are large, well-defined, thin-walled blood vessels in the mantle wall of the cloacal chamber and apparently pump blood from the excretory organs into the pallial arteries, which run around the borders of the mantle lobes. They pulsate independently of one another and at a rate considerably slower than that of the heart.

Further studies on *Ostrea lurida* have demonstrated that these organs are only the two most prominent of a great many pulsating peripheral blood vessels in the walls of the mantle. These vessels may be seen on the inner surface of each mantle lobe as radially arranged structures extending from the region of the adductor muscle and visceral mass to the tentacle-bearing periphery. They are of greater diameter toward their distal ends than centrally and are sometimes branched. Examination of sections shows that these vessels are directly associated with and partially surround the bundles of muscle fibers which function as retractors of the mantle.

A well-defined band of tissue, the cilia on which beat posteriorly, runs in each mantle lobe from a point adjacent to the labial palps to the postero-ventral border of the lobe. Underneath the ciliated epithelium of each of these bands, throughout at least a large part of its length, is a blood vessel which also pulsates rhythmically. At its posterior extremity each band with its underlying blood vessel becomes continuous with one of the radial blood vessels near the edge of the mantle, while along its course it crosses the radial vessels and appears to be directly continuous with many or all of them.

All these vessels (the accessory hearts, radial vessels and the horizontal bands) apparently open directly into the circumpallial vessel at the border of the mantle. These vessels are hardly more than indefinite blood spaces with such poorly defined walls that it is difficult to trace their origin, save in the case of the accessory hearts which originate in the blood spaces of the excretory organs. The pulsations of the radial vessels progress toward their distal ends as very distinct, relatively slow constrictions. The wave of pulsation of the vessel underlying the ciliated band begins anteriorly and as it crosses the radial vessels appears to be synchronous with pulsations of the latter.

Observation of the activity of these vessels is most difficult. When the oyster is removed from its shell the mantle becomes curled back and distorted because of contraction of the bands of muscle fibers. The structures were best observed by removing only one valve, leaving one mantle lobe still in contact with its shell. Also, small oysters, or spat 10 to 15 mm long, caught on glass plates were observed by transmitted light, making it possible to see both the waves of contraction and, in some cases, the direction of movement of blood corpuscles.

All pulsations proceed toward the periphery of the mantle, and during the contraction the blood cells go in the same direction. There appears, however, to be no effective valve action to maintain flow of blood in one direction, for as the vessels expand again the blood corpuscles reverse their direction of movement, though going more slowly.

The function of these pulsating vessels is as yet not entirely clear, though it may be to move the blood back and forth through the mantle to facilitate aeration. It is possible that the radial vessels, like the accessory hearts, receive their supply of blood from the excretory organs, though this has not been demonstrated. In the case of *O. lurida* it is doubtful that the marginal vessels of the mantle have a direct connection with the arterial system, as in *O. gigas*.

Blood in the marginal vessels (the pallial arteries or sinuses) may be observed to flow alternately back and forth, depending upon pulsations of the radial vessel as well as upon a pulsating activity of its own. Blood is collected in veins near the outer surface of the mantle and returned to the auricles.

A study of the anatomy of these contractile vessels is being made in order to establish what structures produce the pulsations. It appears probable that cells of the type of "Rouget cells," as investigated by Federighi[3] in *Nereis*, may be the agents responsible for the observed activity.

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[1] Published by permission of the Commissioner of Fisheries.

[2] A. E. Hopkins, *The Biological Bulletin*, Vol. 67: 3, 345–355, December, 1934; SCIENCE, 80: 2079, 411–412, November 2, 1934.

[3] Henry Federighi, *Jour. Exp. Zool.*, 50: 2, 257–294, February 5, 1928.