

NATURE STUDY OF ANIMALS.

H. E. PERRY.

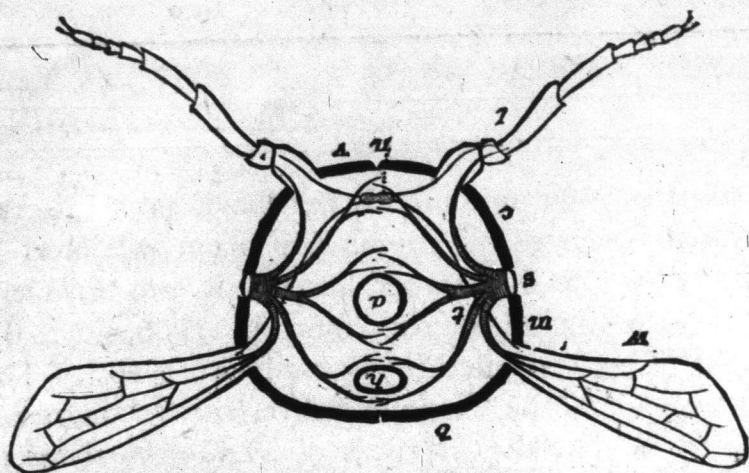


Fig 1. Ideal cross section through an insect: h, Heart; n, Nerve Cord; s, Spiracle. [breathing pore]; t, Tracheal Tubes; l, Legs; w, Wings.

The alimentary canal or digestive tube has already been described and pictured in these studies. See EDUCATIONAL REVIEW, August issue, page 35, Fig. 4.

The heart is a delicate tube extending along a median dorsal line immediately under the integument. In most adult insects it consists of a series of chambers, each of which permits the ingress of blood, but hinders its egress; while within the chambers are valvular folds, which allow the blood to move forward only. The blood enters the dorsal vessel through the lateral valves.

The pulsating portion of the dorsal vessel is confined for the most part to the abdomen. It is continued as a simple tube through the thorax, and into the head region, where it passes under the brain and divides into two branches. If the posterior or pulsating portion is called the heart, the anterior portion must be called the aorta. Compare this arrangement with the heart and aorta of higher animals. On the under or neutral side is another long blood tube, in which the blood flows backward. From these tubes the blood flows through spaces between muscles, tracheae, nerves, etc., bathing all the tissues.

The blood of insects is not red. It consists chiefly of a watery fluid or plasma, which contains corpuscles or leucocytes. Compare it with the blood of higher animals. What gives the red color to our own blood? If the red corpuscles were removed how would the residue compare with the blood of insects? How can insects get along without red corpuscles?

Note the position of the nerve cord. It is neutral, and is the chief central nervous system

of the animal, and extends along the median line of the body as a series of ganglia connected by nerve cords, a ganglion for each segment. In the head, however, we find a fusion of ganglia into two centres or masses; the foremost being dorsal to the oesophagus is called the brain or supracoesophageal ganglion, and the lower on the neutral side, the suboesophageal ganglion, and the two are connected by a girdle of nerve tissue around the oesophagus.

The brain gives rise to the optic nerves, and the nerves to the antennae. It is the seat of will, using the term "will" in a loose sense; and it directs the locomotor movements of the legs and wings.

The suboesophageal ganglion controls the mouth parts, co-ordinating their movements as well as some of the body movements.

The thoracic ganglia govern the appendages of their respective segments, and in common with the ganglia of the abdomen are to a great extent independent of brain control, each being an individual motor centre for its particular segment. This explains why decapitated insects are still able to breathe, walk or fly, and often retain for days some power of movement.

The respiratory system of insects consists of the spiracles and tracheal tubes. The tracheal tubes divide and sub-divide until they become extremely delicate tubules which penetrate even between the muscle fibres, and the other tissues of the body, and possibly even enter the cells, and thus convey air to the remotest tissues.

Fig. 1, shows the tracheal system in cross section in the region of the wings and legs. For the lateral distribution of the spiracles, see REVIEW, August issue, page 34, Fig. 1. Count them in the grasshopper, and compare with other insects. Winged insects never have more than ten pairs, although there are twelve segments in which they may appear—the three thoracic and the first nine abdominal segments.

The respiratory movements are entirely reflex and are independent of the brain, for they continue after decapitation, and even in the detached abdomen of a grasshopper or dragon fly, each neutral ganglion is an independent respiratory centre for its own segment.

The grasshoppers, locusts, crickets, cockroaches, etc., belong to a group or order of insects, called the straight-winged insects, technically known