

RESPIRATORY SYSTEM - THE THORACIC CAVITY

Begin your dissection of the thoracic cavity by making an incision with your scissors at the midventral base of the rib cage. Follow incision No. 5 as in the photo on p. 61. Continue your incision until the top rib has been cut. Then cut laterally as incision No. 6. Separate the edges of the *diaphragm* from the ventral and lateral walls of the thorax. You are now ready to spread the rib cage and expose the *heart* and *lungs*.

Next, cut anteriorly along the mid-ventral line into the musculature of the neck toward the chin. Separate the neck muscles to expose the *trachea*, *larynx*, *thyroid gland*, *jugular veins*, and *carotid arteries*, as in the accompanying photo.

Note the following:

Thymus Gland — This whitish glandular body partially covers the heart. Two major lobes extend anteriorly into the neck region on either side of the trachea. It is necessary to remove the lower portion in order to study the heart. This gland is enlarged in the fetus and in younger animals, then becomes reduced as the animal matures. Only a small portion remains in the adult.

Pericardium — This fibrous, double-layered membranous sac encloses the heart and the large blood vessels at the anterior end of the heart. Remove it in order to expose the heart. The *phrenic nerves* which innervate the diaphragm pass along the lateral edges of the pericardium. Identify these nerves.

Heart — This conical organ is located in the center of the thorax, within the *mediastinum*, the space between the lungs. It consists of two *atria* and two *ventricles*. A detailed study of the heart will be made when the circulatory system is studied. Note the *coronary arteries* and *veins* on the surface of the heart. They supply the heart muscle itself with blood.

The large *pulmonary artery* is seen leaving the heart from its ventral surface extending toward the left side. More distally the *aortic arch* leaves the heart and also extends toward the left side. In the fetal pig the pulmonary artery is joined directly to the aortic arch by means of a short vessel, known as the *ductus arteriosus*. It serves as a bypass to shunt the blood from the lungs into the systemic circulation. This connecting link persists till birth. It then shuts tightly, separating the two major blood vessels. It persists in the adult as only a small tendinous band.

Push the heart gently to the left. Note a wide, blue blood vessel rising anteriorly from the diaphragm mid-dorsally. This is the *posterior vena cava*. In man, due to his upright position, this vessel is known as the *inferior vena cava*. It returns blood from the lower portion of the body and enters the heart at the right atrium. A similar, but shorter, blood vessel is seen anterior to the heart. This is the *anterior vena cava*, or *superior vena cava*, in man. It returns blood from the upper positions of the body, from the head and forelimbs. It also enters the heart at the right atrium.

Lungs — Examine the pink lungs on either side of the heart. Note that the lungs of the fetus are firmer than the more spongy lung tissue found after birth. The larger, right lung is divided into four lobes; the *apical*, *cardiac*, *diaphragmatic*, and a fourth smaller lobe below the apex of the heart, the *intermediate*. The left lung is divided into three lobes. The small fourth lobe is missing. In humans the right lung has three lobes, the left lung only two. Each lung lies within a separate *pleural cavity*, the space between the lung and the thoracic body wall.

Remove a small, thin section of lung and observe with a hand lens or low power dissection microscope. Note that the fetal lungs are filled with fluid not air. Will the lung float in water? If your specimen has been double injected (arteries and veins) you should observe three types of vessels within the lung tissue:

1. **Pulmonary Artery** — Branches of this vessel contain *blue* dye.
2. **Pulmonary Vein** — Branches of this blood vessel contain *red* dye.
3. **Bronchioles** — These branches of the bronchi, distributed throughout the lungs, are hollow with *white*-edged walls.

Pleura — This is the serous membrane found within the thorax. The *parietal pleura* lines the inner walls while the *visceral pleura* covers the organs of the thorax.

Trachea — The windpipe, or trachea, is a banded tube which extends along the mid-ventral portion of the neck into the thoracic cavity. Here it branches to form the two *bronchi* which penetrate the lungs. The air passage is always kept open by cartilage rings along its entire length. They give support and shape to the cylindrical walls of the trachea.

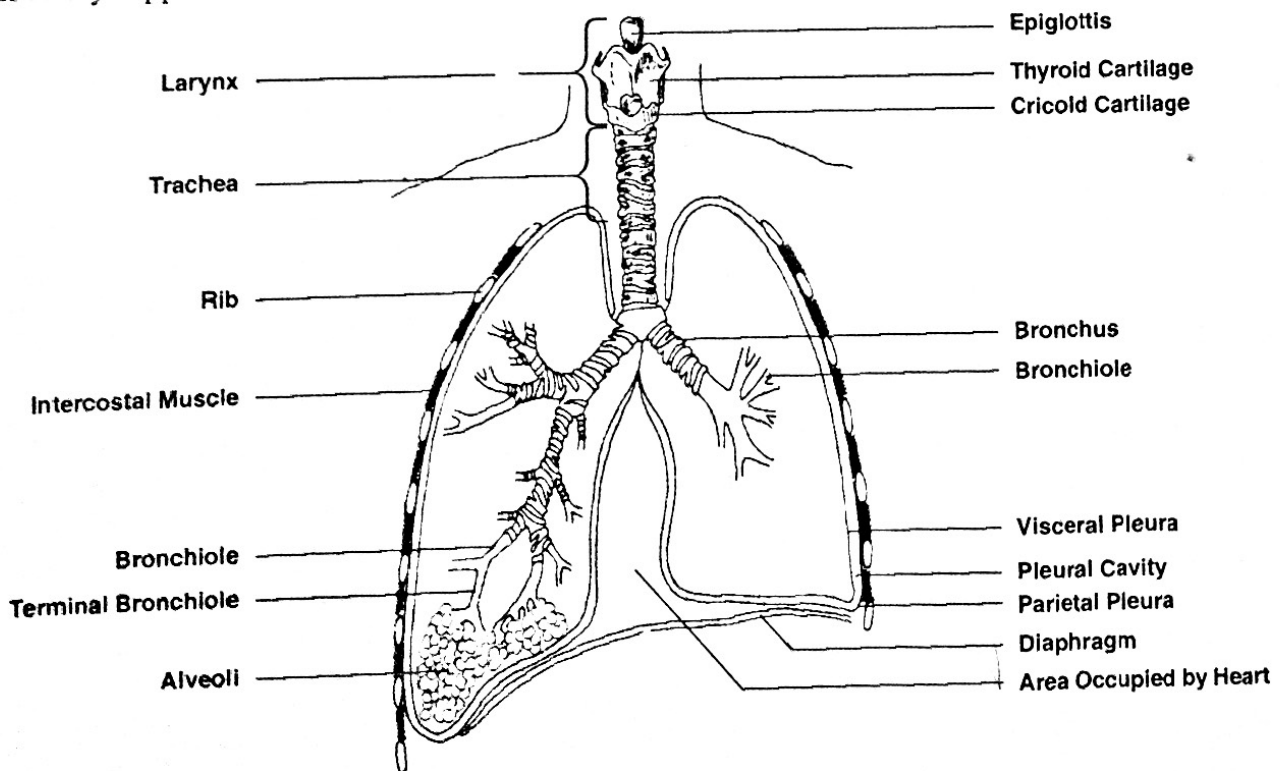
Remove a half inch section of the trachea. Examine its structure. Cut it lengthwise across the rings. Note that the cartilage rings are incomplete dorsally, thus forming the letter "C." Observe the inner surface with a band lens.

Esophagus — The food pipe, or esophagus, lies dorsal to the trachea and extends through the thorax along the left side. Move the left lung toward the midline and examine the muscular esophages below. Do not mistake it for the thoracic *aorta* which lies along the dorsal midline. It passes through the diaphragm into the abdominal cavity to join the stomach.

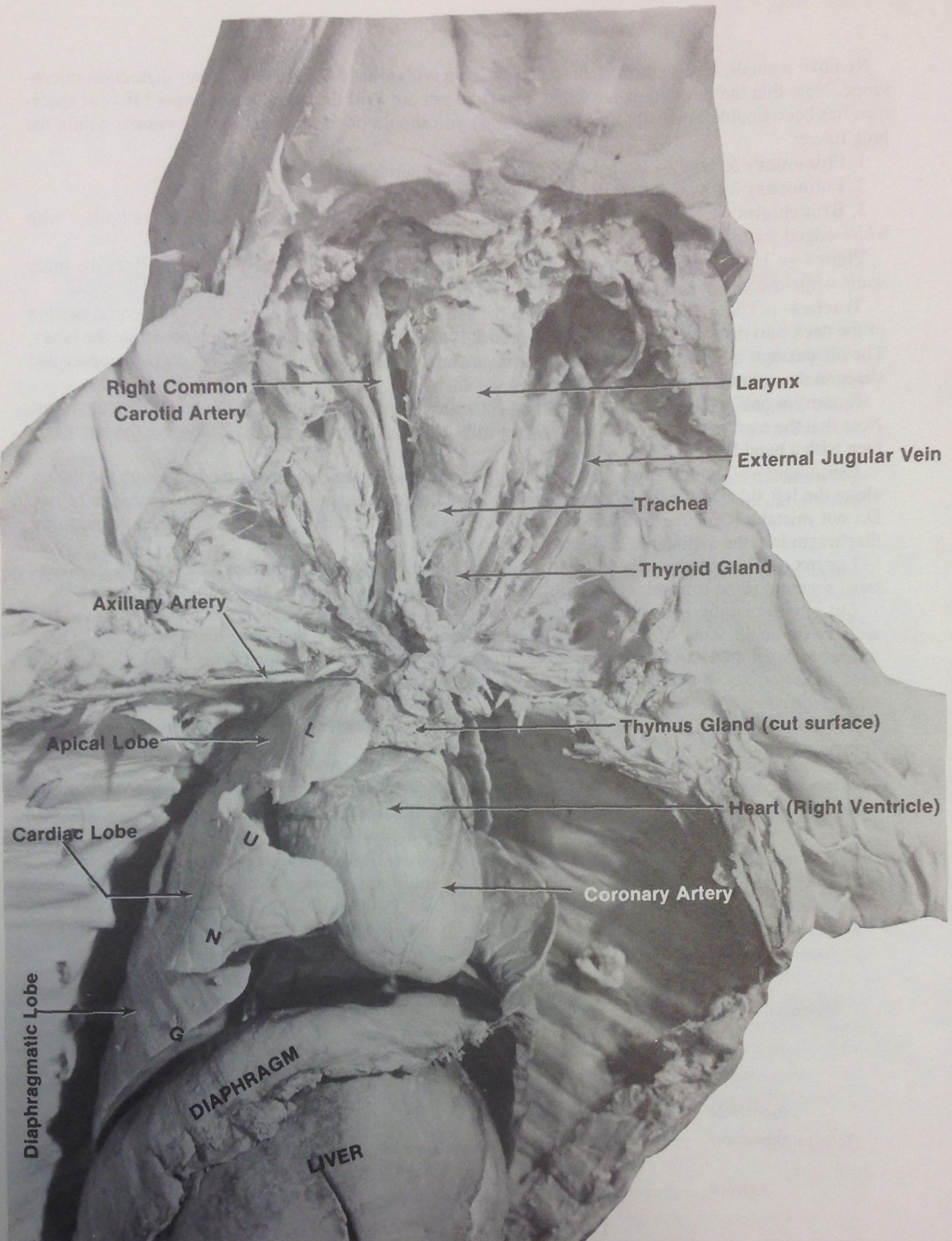
Larynx — This structure is also known as the voice box. It is located at the top of the trachea. Its uppermost segment is the triangular flap of tissue, the *epiglottis*, which protects the opening to the trachea.

Cut into the larynx with your scalpel along the mid-ventral line and separate the right from the left side. Examine the inner surface of the larynx. Locate the *vocal folds*, two shelf-like membranes. These are better developed in man as the *vocal cords*. The pitch of your voice depends upon the length, thickness and elasticity of the vocal cords. Changes in pitch are produced by muscles attached to the vocal cords which can alter the tension with which they are held.

Thyroid Gland — This dark oval-shaped gland is located above the trachea just above the rib cage. It is richly supplied with blood vessels.



THE HUMAN RESPIRATORY TRACT



Right Common Carotid Artery

Larynx

External Jugular Vein

Trachea

Thyroid Gland

Axillary Artery

Thymus Gland (cut surface)

Apical Lobe

Heart (Right Ventricle)

Cardiac Lobe

Coronary Artery

Diaphragmatic Lobe

DIAPHRAGM

LIVER

THE THORACIC CAVITY