The pericardium surrounds the heart. It is modified pleura, incorporating fibrous tissue as well as the normal pleural epithelial cells. It includes two layers rather than the usual single layer. It was named for Peri Como, a famous singer who in later years was lead singer for Pearl Jam, the Bangles and INXS.

The pleura is an organ that is primarily epithelial tissue. It covers the thoracic organs and lines the thoracic cavity. Functionally it is important because it secretes fluid that lubricates the surfaces it is associated with, helps reduce heat buildup, and is responsible for surface tension that holds the lungs against the thoracic wall.

The thoracic duct (quack) is part of the lymphatic system. It is often recognized because it looks like a string of beads. The constrictions in its walls are where the one way (semilunar) valves are. We find the thoracic duct dorsal to the descending aorta. It empties its contents into the brachiocephalic or subclavian vein on the left side of a human. Since there is no dedicated pump to create pressure gradients to move the lymphatic fluid, we rely on the skeletal muscle pump and the one way valves to direct the flow through the lymphatic channels.

Thymus Gland

The thymus gland is part of the lymphatic system. It is situated cranial and ventral to the heart. It also functions as an endocrine gland. It reaches maximum development at puberty and then becomes replaced by connective tissue. Functionally it is important because it preconditions T-lymphocytes. It was named for Don Thymus, famous for his radio program “Thymus in the Morning”.

The esophagus is an organ that is primarily smooth muscle tissue. It is essentially a tube that extends from the pharynx to the stomach. Functionally it is important because it directs food from the pharynx to the stomach during swallowing. It also provides for the opposite flow during regurgitation. Note that if you carefully examine the picture on the right you can see the dorsal vagus nerve. Both the ventral vagus nerve and the dorsal vagus nerve join the esophagus caudal to the heart and run with it to the diaphragm.

The diaphragm is primarily skeletal muscle. Functionally it is very important because it is responsible for most breathing at rest. It is dome shaped. In humans the origin of the diaphragm is along its outer margin to the deep surface of the bony thorax, costal cartilage of the ribs 7 to 12, sternum, and lumbar vertebrae 1 through 3. The insertion is at the central tendon. The phrenic nerve serves the diaphragm.
The **vagus nerve** is cranial nerve X. It is the only cranial nerve to pass into the body cavities below the neck. It is primarily *parasympathetic* in nature and is the major nerve affecting the heart and most of the gastrointestinal tract. It slows the heart down and speeds up the activity of the gastrointestinal tract. As the **left and right vagus nerves** approach the heart they run parallel to the respective phrenic nerves. After leaving the heart they reorganize as **ventral and dorsal vagus nerves** that run along the esophagus to and through the diaphragm. Spelling counts on this nerve, be sure to spell *vagus* correctly!

The **phrenic nerve** is formed from the union of branches of the anterior rami of cervical spinal nerves 3, 4, and 5. It serves the diaphragm. Note that on the right side it runs along the caudal vena cava as it passes to the diaphragm. When you remove the left lung, please be careful not to cut the phrenic nerve (no cat terrorism!). Remember the mnemonic ’C3, 4, 5 – stay alive – phrenic, phrenic, phrenic’!

The **sympathetic trunk** runs along each side of the vertebral column. It receives neurons from anterior rami of the spinal nerves via the sympathetic trunk ganglia. It serves many organs from the head to the pelvis. Because it receives nerves from the intervertebral foramina it is difficult to lift away from the body wall. Please be gentle with this nerve or it will break (no cat terrorism!). In a later lab we will see it in the neck where it runs with the vagus nerve (X) and that bundle is called the vagosympathetic trunk.

The trachea begins at the inferior end of the larynx (level of C6 body) and extends inferiorly to where it bifurcates into the left and right primary bronchi in humans. The inferior end is at the level of the sternal angle of humans in a supine position and to the body of T7 in the anatomical position. It is recognizable because of its 16 to 20 cartilaginous rings that normally prevent it from collapsing. It is about 1.5" in diameter and is lined with ciliated epithelial cells that sweep mucous out of the trachea and into the pharynx.
Aorta

The **aorta** is the great **artery** that carries blood away from the left ventricle to all the **systemic arteries** of the circulatory system. The blood in this **artery** is normally enriched with oxygen and deficient in carbon dioxide.

Caudal Vena Cava

Note that the **caudal vena cava** is medial to the right lung - therefore, it should not be confused with the **azygos vein** that is found dorsal to the right lung. The **azygos vein** drains the blood from the dorsal (posterior) thoracic wall into the **cranial (superior) vena cava**. It also can serve as an alternate path for the return of blood from caudal (inferior) to the diaphragm if the **caudal (inferior) vena cava** were to be blocked.

Internal Thoracic a.

The **internal thoracic (mammary) artery** is usually the first branch of the **subclavian artery** on both sides. It serves the ventral (anterior) thoracic wall. There is one on the left and one on the right. They normally run along both sides of the sternum.

Pulmonary Trunk

The **pulmonary trunk** is the great **artery** that carries oxygen deficient and carbon dioxide rich blood toward the lungs from the right ventricle. The **pulmonary trunk** bifurcates to form the **left** and **right pulmonary arteries**. It is typically blue in cats. Remember the blue color indicates low oxygen and high carbon dioxide levels. It is sometimes called the **pulmonary artery** or **pulmonary aorta**. Dr. J recommends the unique name **pulmonary trunk**.
There is only one **brachiocephalic artery**. It is the third branch off the **aorta**. It gets its name because it serves the arm and head. It gives rise to the **right subclavian artery** and the **right and left common carotid arteries** in most cats. In some cats it gives rise to the **bicarotid trunk** instead of the **left and right common carotid arteries**.

The **right subclavian artery** is a branch of the **brachiocephalic artery**. The **left subclavian artery** is the fourth branch of the **aorta**. They run through the thoracic outlet to become the **axillary arteries**. They have a number of branches that will be covered in this lab.

The **common carotid arteries** (**left and right**) are normally branches of the **brachiocephalic artery**, or less frequently branches of the **bicarotid trunk**. They have a number of branches, which will be the object of study in Laboratory 5.

The **bicarotid trunk** is not found in all cats. It occurs when the **brachiocephalic artery** bifurcates into a **right subclavian artery** and the **bicarotid trunk**. The **bicarotid trunk** later bifurcates to form the **left and right common carotid arteries**.
Costocervical a. The **costocervical artery** is usually the third branch off the **subclavian artery** on both sides. It usually passes medially while the **vertebral artery** passes toward the head. As the name implies, it serves the ribs and cervical region as well as the back. This is the "C" of the **VCT** mnemonic.

Thyrocerical a. The left and right **thyrocerical arteries** are usually the fourth branches of the **subclavian arteries**. One of its branches serves the thyroid gland. A second branch enters the shoulder region and becomes the **transverse scapular artery**. We will find the **transverse scapular artery** deep to the scapula, and again when it passes through the suprascapular notch and gives rise to the **suprascapular artery**. This is the "T" of the **VCT** mnemonic.

Vertebral a. The **vertebral artery** is usually the second branch of the **subclavian artery** on both sides. It usually passes toward the head while the **costocervical artery** passes more medially. The **vertebral arteries** run through the transverse foramina of the cervical vertebrae. They enter the cranium by passing through the foramen magnum. Functionally they are important because they are one of two pair of major vessels that carry blood to the brain on each side. The **vertebral artery** is the "V" of the mnemonic **VCT**.
Vertebrocostocervical Trunk

This vein is formed when the vertebral and costocervical veins join. In nearly all cats it joins the brachiocephalic vein on the left side. In the majority of cats it joins the brachiocephalic vein on the right, but in many cats it goes directly into the cranial vena cava between the brachiocephalic and azygos veins. Both configurations are shown above.

Brachiocephalic v.

There are two brachiocephalic veins. They get their name because they serve the arm and head. They are formed by the union of the external jugular vein and the subclavian vein on each side. This vessel also receives blood from the vertebrocostocervical trunk in more than 50% of the cats in lab.

Internal Thoracic v.

Normally, there is only one internal thoracic (mammary) vein. It drains the blood from the ventral (anterior) thoracic wall into the cranial (superior) vena cava.

Internal Jugal v.

Although the internal jugular vein is found in virtually all cats, it rarely takes the dye and it is relatively small. Because of this it is difficult to find. Typically, it is found in the carotid sheath, which includes the common carotid artery and the vagosympathetic trunk. It usually joins the external jugular vein before the junction with the subclavian vein.

Subclavian v.

The two subclavian veins join to help form the two brachiocephalic veins when they join the external jugular veins. They drain blood from the upper limb back toward the heart.
The lungs are the major respiratory organs of the body. They are responsible for the exchange of the respiratory gases, oxygen and carbon dioxide. In getting rid of carbon dioxide they function as a major excretory organ. To facilitate the gas exchange they have undergone miniaturization that effectively increases the surface area to volume ratio. The functional unit of the lung is the microscopic alveolus. There are three lobes in the left lung of the cat but only two lobes in the human left lung.

**Bronchi**

The bronchi are the large branches on both sides of the respiratory system. There are two primary bronchi that branch from the trachea. You will probably not see these. However, the above dissection is at the level of the primary bronchus and you can see in the right hand picture where it bifurcates as it passes into the lung. In that picture the probe is covering one of the openings of the secondary bronchi. Each primary bronchus branches to secondary bronchi, one to each of the lung lobes. Thus, there are 7 secondary bronchi in a cat, but only five in humans. The bronchi are recognizable because of the cartilaginous rings in their walls that help keep them from collapsing. The secondary bronchi also subdivide as they move through the lung.