You will supplement your measurements of circulatory function this week with dissection and examination of the fetal pig circulatory system and some associated structures. The following dissection guide gives you both the general procedures to follow at each step and the structures to look for.

**Glands and Respiratory Structures of the Neck and Thoracic Cavity**
*Wear Disposable gloves when dissecting preserved animals*

**Procedure**
Open the pig's thoracic cavity by making an incision with scissors. Make this shallow at first and gradually go deep to get into the thoracic cavity. You will need to cut through the ribcage to get into the thoracic cavity. To do so, avoid the sternum by going to either side of it where you find softer cartilage to cut through. Cut through the rib cage and upwards until you are through the skin and into the lower jaw area.

Work your way through the muscle in the neck region (a probe or closed scissors are good for this). Find the **thymus gland** overlying the heart here. This gland is quite large in young mammals and serves an important immune function. A second location where thymus can be found is as two longish masses flanking the thyroid gland more anteriorly in your pig. The **thyroid gland** is a small reddish structure lying over the trachea more anteriorly in your pig. The thyroid gland is the source of thyroid hormones (thyroxin and triiodothyronine) and is a key endocrine gland regulating metabolism among other things. Note the **trachea** underneath the thyroid gland and extending posteriorly towards the lungs and anteriorly towards the larynx. What type of tissue gives the trachea its necessary rigidity?

**The Arterial and Venous Systems**

The figures on the next two pages are schematics of the arterial and venous systems respectively. The major vessels in each system are labeled, but there are also smaller vessels that are not shown. Use these diagrams in combination with the photos below to identify these structures. The major veins on your pigs should have blue latex in them while the major arteries should have red/pink latex in them to facilitate identification.
Major Thoracic and Abdominal Arteries of the Fetal Pig

- Common Cartotid arteries
- Left subclavian artery
- Subscapular artery (to shoulder muscles)
- Axillary artery
- Aortic Arch
- Pulmonary Artery
- Coronary artery
- Dorsal Aorta
- Diaphragm Muscle
  - Intercostal arteries (to muscles between ribs)
  - ADRENOLUMBAR PHRENIC - to diaphragm
  - ADRENAL - to adrenal gland
  - ADRENAL GLAND KIDNEY
  - LUMBAR (7 pairs) - to dorsal abdominal wall
  - SPERMATIC (♂) or OVARIAN (♀) - to gonads
  - POSTERIOR MESENTERIC - to colon and rectum
- Coeliac artery
  - Cranial Mesenteric artery (serves pancreas and intestines)
  - Renal arteries (serve kidneys)
  - Lumbar (7 pairs) - to dorsal abdominal wall
  - Spermatic (♂) or ovarian (♀) - to gonads
  - Posterior mesenteric - to colon and rectum
- External iliac arteries
  - Femoral artery (serves hindleg)
  - Internal iliac - to pelvic viscera and muscles
  - Deep femoral - to thigh muscles
  - Epigastric - to ventral abdominal wall and
- Umbilical arteries
Major Thoracic and Abdominal Veins of the Fetal Pig
The Heart and Pulmonary Blood Circuit

The heart lies inside a tough connective tissue membrane - the pericardium. The pericardium actually consists of two parts, the visceral pericardium covering the heart itself and the parietal pericardium, which forms the sac enclosing the heart. The space between these two membranes is termed the pericardial cavity. Open the parietal pericardium to expose the heart covered by the visceral pericardium.

You should be able to identify the four chambers of the pig's heart externally: the right and left atria (singular: atrium) and right and left ventricles. The right and left atria are the smaller dark structures at the top of the heart that receive blood from the vena cava and pulmonary veins respectively (see below). The division between the right and left ventricles can be seen externally by the location of a prominent groove termed the coronary sulcus that is also the path the coronary artery and vein take across the heart (the coronary artery is the first branch off the aorta).

Next, locate the key large blood vessels near the heart. Recall that there are two separate circuits in adulthood: the heart pumps blood into and receives blood from the pulmonary circuit serving the lungs and the systemic circuit serving the rest of the body (these are not completely separate during fetal life - Why not? Answer this question for yourself in both the functional and morphological senses). You should be able to find the pulmonary trunk leaving the right ventricle. This vessel soon splits into three branches: pulmonary arteries headed towards the right and left lungs and the ductus arteriosus (What is the function of the ductus arteriosus and what other fetal adaptation serves a similar function?).
Thoracic and neck vessels of the Systemic Circuit

Move anterior to the heart now to locate the major veins of the thoracic and neck regions. You should be able to see that blood returning from the anterior part of the body is collected into the **cranial vena cava** (also called the superior vena cava) before entering the heart at the right atrium. The cranial vena cava splits anteriorly to form two **brachiocephalic veins**, which themselves split almost immediately into three veins on each side: a **subclavian** and the **internal and external jugular veins**. The subclavian veins split to give rise to the subscapular and axillary veins (draining the shoulders and forelimbs respectively). You may also find the cephalic vein entering the external jugular near its base.

We will focus now on the arteries of the thoracic cavity and neck region. Move the pulmonary trunk down and back to observe the **aortic arch**. As shown on the diagram above, this structure exits the left ventricle and
immediately curves downward while giving off branches that run anteriorly primarily. The first major branch is the **brachiocephalic trunk**, which soon gives rise to three branches: the right **subclavian artery** and the two **common carotid arteries**. The next major branch off the aortic arch is the left subclavian artery. This artery gives rise to two prominent branches: the left **subscapular artery** running deep into the shoulder and the left **axillary artery** serving the forelimb.

By moving the pig's lungs aside, you should also be able to see where the aortic arch gives rise to the **dorsal aorta** and its connection to the pulmonary trunk via the ductus arteriosus.

**Arteries and Veins of the Abdominal Cavity**

The first major branch of the dorsal aorta going posteriorly is the **coeliac artery**, which is found at approximately the level of the aorta and serves the stomach and spleen. You may have to detach parts of the diaphragm muscle to see it. Moving more posteriorly, look for the **cranial mesenteric artery** that serves the small intestine. Continuing caudally, find the pair of **renal arteries** going to the kidneys and the closely associated renal veins. The dorsal aorta continues caudally until it divides to form the umbilical arteries and external iliac arteries. If you follow an external iliac artery and probe through the muscles of the leg, you should be able to find the femoral artery (the lateral branch) and the deep femoral artery (the more medial branch).

Now examine the venous system in the abdominal cavity. First, find the **caudal vena cava** (also known as the inferior vena cava), the vein which collects blood from the lower portion of the body for return to the heart. Since this vessel actually lies under the parietal peritoneum, you will be able to see it better if you peel this epithelium back. The vena cava splits posteriorly to form two common iliac veins, which then split to form external and internal iliac veins. As with the external iliac artery discussed above, the external iliac veins split to give rise to the femoral veins and the deep femoral veins.