

ORAL CAVITY

With your scissors cut through the *corner of the mouth* on each side in a posterior direction. Continue cutting through the *angle of the jaw*. Expose the entire tongue. The interior of the oral cavity may now be examined.

Vestibule — This refers to the area between the lips and the teeth.

Tongue — This elongated muscular structure is readily visible upon the floor of the mouth. It is attached vertically along much of its length by a membrane, the *lingual frenulum*, and posteriorly to the *hyoid* bone. The surface of the tongue is covered by variously shaped projections known as sensory *papillae*. The greatest number of large fibrous papillae are to be seen at the anterior edge of the tongue. Microscopic *taste buds* are found at the sides and base of the papillae.

Teeth — Upon the upper jaw two *canine* teeth are visible in the photo, one on each side. These, and the third pair of *incisors* are the first to erupt.

The dental formula of the fetal (young) pig is: $I \frac{3}{3}, C \frac{1}{1}, P \frac{4}{4}, M \frac{0}{0}$.

The adult pig: $I \frac{3}{3}, C \frac{1}{1}, P \frac{4}{4}, M \frac{3}{3}$.

Compare this to the dental formula of man.

Deciduous or first teeth of humans: $I \frac{2}{2}, C \frac{1}{1}, P \frac{2}{2}, M \frac{0}{0}$.

The adult human: $I \frac{2}{2}, C \frac{1}{1}, P \frac{2}{2}, M \frac{3}{3}$.

In the young of both pig and man the *molars*, the large, broad grinding teeth have not yet erupted. Three of these will appear in each quarter of the adult pig, and three in the human.

Both the pig and man are *omnivores* whose diet consists of both plant and animal sources. The types of teeth of mammals are indicative of their mode of nutrition.

The pig's dental pattern as well as that of man are characteristic of an *omnivorous* diet. The cat and dog are *carnivorous*. Their teeth are sharp and pointed, fewer molars and modified premolars. Horses, cows and other *herbivorous* animals possess mainly large, broad, flat surfaced molars for grinding; plus a double row of incisors at the front of the mouth for cutting and shearing vegetation.

Palate: This structure forms the roof of the mouth. It is a partition which separates the oral from the nasal cavity.

Hard Palate: This is the bony anterior portion of the palate. A series of transverse ridges, the *palatine rugae*, cross the roof of the mouth.

Soft Palate: This is the posterior continuation of the palate. It is a muscular structure with bony support. It divides the *oropharynx* ventrally from the *nasopharynx* dorsally. In man there is a finger-like process, the *uvula*, which hangs down from its center posteriorly. It is absent in the pig.

seen when the intestinal coils are moved to the left. It is attached to the posterior surface of the right lateral lobe.

Gall Bladder — Lift the right central lobe of the liver and expose the gall bladder embedded within a depression in its dorsal surface. This sac-like structure stores bile secreted by the liver and releases it into the duodenum. Bile is transported by the *cystic duct* from the gall bladder. It is joined by the *hepatic duct* from the liver to form the *common bile duct* which enters the duodenum. These can be clearly seen in the accompanying photo, p. 64.

Stomach — This muscular pouch lies on the left side in the upper abdomen. It is the continuation of the esophagus. Find the esophagus and locate where it pierces the diaphragm to join the stomach. This is the *cardiac* end of the stomach. The *fundus* is the dilated anterior portion, the *body* is the main portion, while the *pyloric* region is the most posterior. This end joins the duodenum.

Open the stomach with your scissors by cutting along the *greater curvature* of the stomach, on the left side. Wash out the contents of the stomach. Note the *cardiac sphincter* which controls the entrance of food into the stomach from the esophagus. The *pyloric sphincter* at the posterior end regulates the release of partially digested food (chyme) into the duodenum. Look along the inner walls of the stomach and note the *rugae*, or folds which help to churn and mix the food with digestive juices.

The green debris found in the stomach and elsewhere in the digestive tract is called *meconium*. Since the animal is still in the fetal state it does not represent food actually eaten. It is a combination of bile-stained mucus, epithelial cells sloughed off from the skin and lining of the digestive tract, and amniotic fluid swallowed by the fetus. It will be discharged in the first bowel movement of the newborn.

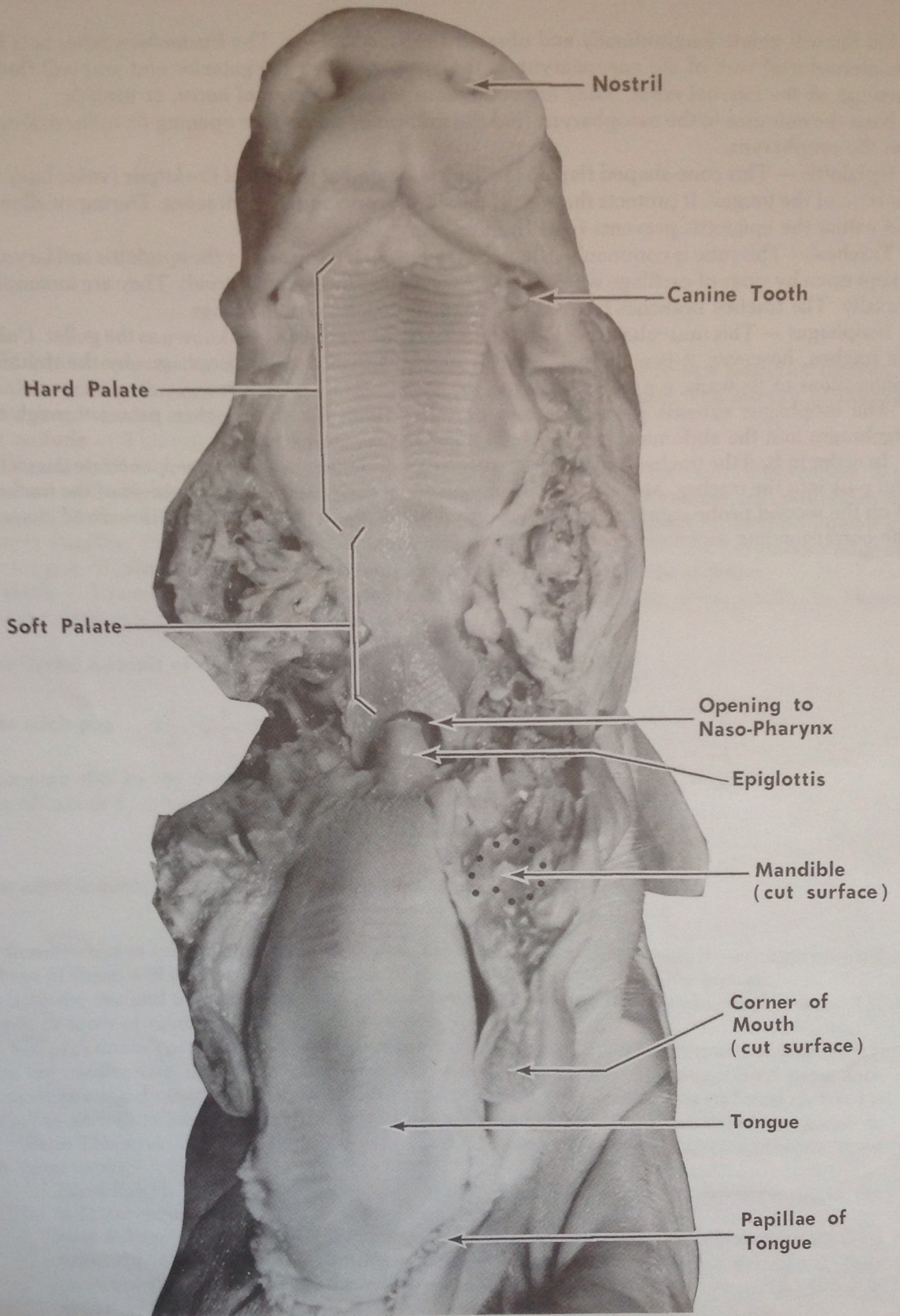
Small Intestine — The first portion of the small intestine is the *duodenum*. It is a continuation of the pyloric end of the stomach. It is a short "U" shaped tube, approximately 1 cm. long. The common bile duct and the pancreatic duct open into the duodenum. The second section of the small intestine is the *jejunum*, which makes up about half the length of this organ. The *ileum* is the final section. Open the jejunum or ileum, wash its contents and touch the inner surface with your fingertips. The velvety texture felt is due to the presence of numerous *villi* along the inner walls. Use a hand lens or a low power dissection microscope to observe them more clearly.

The coils of the small intestine are held in place by a fine peritoneal membrane, the *mesentery*. It may be observed when lifting a coil of the small intestine and stretching the two ends. A fine, thin membrane, the mesentery, will be visible. It is responsible for the coiling observed. Note its shiny thin appearance. It is interlaced with narrow blood vessels, lymphatic vessels, adipose tissue, and lymph nodes. Some of the tiny blood vessels form the beginnings of the portal system, transporting digested food from the intestine to the liver. Cut through the mesentery to unravel the small intestine. Measure its length. How does it compare to the relative length of man's intestine (about twenty feet)?

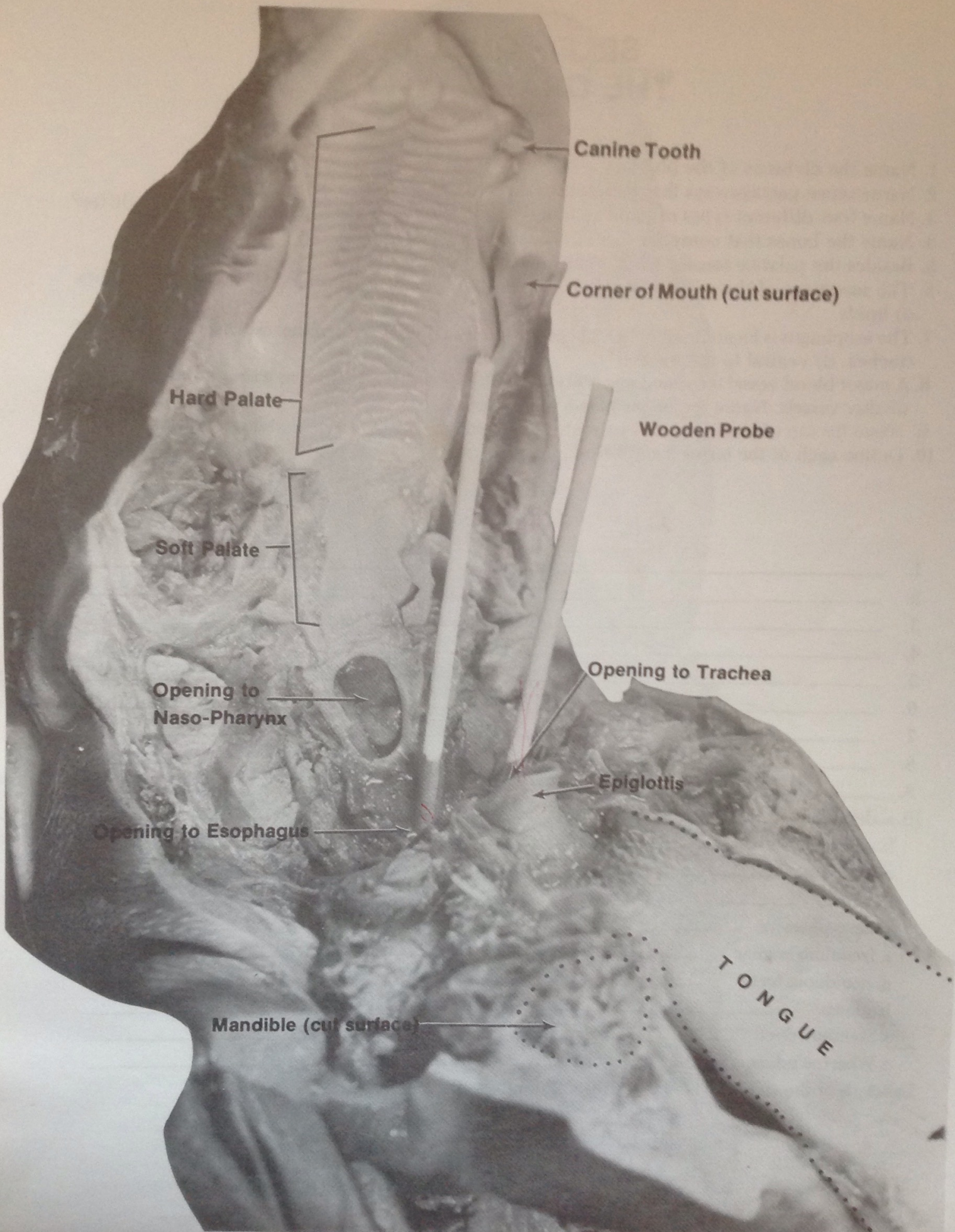
Large Intestine — Follow the coils of the small intestine. The end of the ileum enters the large intestine. At this juncture the *caecum*, a short blind sac about 2 cm. long, is formed. In some organisms such as horses, this section is enlarged and houses microorganisms which can digest cellulose. Humans possess a *vermiform appendix* that projects from the end of a short caecum. Cut into the caecum at about the point where the ileum enters. Wash out its contents, look for and locate the *ileocaecal* valve.

The *spiral colon* is a compact coiled mass clearly visible upon the left ventral surface. It is shorter, darker, and thicker than the small intestine. It is the major portion of the large intestine. The posterior dorsal portion of the large intestine is the *rectum*. It descends along the midline through the pelvic girdle to the *anus*, the intestinal opening to the exterior. The colon of human beings is relatively shorter than that of the fetal pig and is not coiled.

Pancreas — Lift the main portion of the small intestine. Expose the stomach and duodenum. Observe the pancreas, a lobulated glandular structure lighter in color than the neighboring intestines. Its main portion lies in the loop of the duodenum. An elongated portion may be observed extending to the left, toward the stomach and spleen. Parts of the gland may also be seen along the dorsal body wall extending to the right of the duodenum and along the dorsal midline. The human pancreas is



ORAL CAVITY



THE ORAL CAVITY (CLOSE-UP)

THE ABDOMINAL CAVITY

The muscular *diaphragm* separates the upper from the lower ventral body cavity. The upper is the *thoracic*, the lower is the *abdominal cavity*. We shall study the abdominal area first and later consider the thorax in relation to the study of the heart and circulatory system.

With your fingertips locate the lower edges of the ribs. Your fingertips will be tracing an arc, an inverted letter "V". Refer to the photo entitled, "Mapping Incisions," p. 61. Make the cuts in the order of the numbers indicated, beginning with No. 1. Do not make incisions No. 5 and No. 6 until you have completed the observations of the abdominal viscera and you are ready to observe the *thoracic organs*. This will prevent the thoracic area from drying out prematurely.

Use your scalpel to cut the musculature along the line you have traced with your fingertips and indicated as No. 1 on the photo. Do not cut too deeply. The skin and muscles of the fetal pig are very thin and soft. A sharp scalpel in an untrained hand may lead to the destruction of internal organs and possible injury to the student.

Continue with incision No. 2. This will bring you just above the *umbilical cord*. Cut around the cord (incision No. 3) to avoid injury to the *umbilical arteries*, *umbilical vein*, the *urinary bladder* and the *penis* (in males). Extend incision No. 4 to the rear body wall.

After the muscle layers have been cut you will find a fine membrane, the *peritoneum*, which lines the inside of the abdominal cavity. The portion of this serous membrane that you see is the *parietal peritoneum*, the *visceral peritoneum* covers the abdominal viscera. Cut through the peritoneum, fold back the entire *ventral abdominal wall* to expose the organs below. You will note that the muscular wall below the *umbilical cord* cannot be lifted. This is because of the *umbilical vein* which passes into the liver. It is necessary to cut the vein at this time to expose the abdominal cavity.

Some specimens may contain excess preservative fluid, coagulated blood, or dye that has escaped from the blood vessels. In these cases it is first necessary to wash out the abdominal cavity. Hold the pig under a moderate flow in the sink and rinse gently. Use paper towels to soak up excess water. Your view should now correspond to that in the photos on page 62 and to the close-up on page 63.

(Note: in both photos we observe the abdominal cavity as it appears when we first begin the dissection. Some of the "hidden" structures are not labeled in the photographs. It will be necessary to move other organs from their natural positions in order to expose them.)

Identify the following structures:

Diaphragm — This dome-shaped muscular wall separates the thoracic from the abdominal cavity. It is also the most important muscle for *breathing*, permitting inhalation and exhalation. Three major vessels pass through the diaphragm between the thorax and the abdomen. These are the *aorta*, *posterior vena cava*, and the *esophagus*.

Liver — This dark brown organ dominates the upper abdomen. The *falciform ligament*, a ventral peritoneal membrane attaches the liver to the diaphragm and to the ventral body wall. The *coronary ligament* attaches the dorsal portion of the liver to the central tendon of the diaphragm.

The falciform ligament lies in a cleft of the liver which divides it into right and left halves. Five lobes can be differentiated. The four principal lobes may be seen from the ventral aspect, they are the *right lateral*, *right central*, *left central*, and *left lateral*. A very small lobe, the *caudate lobe*, may be

seen when the intestinal coils are moved to the left. It is attached to the posterior surface of the right lateral lobe.

Gall Bladder — Lift the right central lobe of the liver and expose the gall bladder embedded within a depression in its dorsal surface. This sac-like structure stores bile secreted by the liver and releases it into the duodenum. Bile is transported by the *cystic duct* from the gall bladder. It is joined by the *hepatic duct* from the liver to form the *common bile duct* which enters the duodenum. These can be clearly seen in the accompanying photo, p. 64.

Stomach — This muscular pouch lies on the left side in the upper abdomen. It is the continuation of the esophagus. Find the esophagus and locate where it pierces the diaphragm to join the stomach. This is the *cardiac* end of the stomach. The *fundus* is the dilated anterior portion, the *body* is the main portion, while the *pyloric* region is the most posterior. This end joins the duodenum.

Open the stomach with your scissors by cutting along the *greater curvature* of the stomach, on the left side. Wash out the contents of the stomach. Note the *cardiac sphincter* which controls the entrance of food into the stomach from the esophagus. The *pyloric sphincter* at the posterior end regulates the release of partially digested food (chyme) into the duodenum. Look along the inner walls of the stomach and note the *rugae*, or folds which help to churn and mix the food with digestive juices.

The green debris found in the stomach and elsewhere in the digestive tract is called *meconium*. Since the animal is still in the fetal state it does not represent food actually eaten. It is a combination of bile-stained mucus, epithelial cells sloughed off from the skin and lining of the digestive tract, and amniotic fluid swallowed by the fetus. It will be discharged in the first bowel movement of the newborn.

Small Intestine — The first portion of the small intestine is the *duodenum*. It is a continuation of the pyloric end of the stomach. It is a short "U" shaped tube, approximately 1 cm. long. The common bile duct and the pancreatic duct open into the duodenum. The second section of the small intestine is the *jejunum*, which makes up about half the length of this organ. The *ileum* is the final section. Open the jejunum or ileum, wash its contents and touch the inner surface with your fingertips. The velvety texture felt is due to the presence of numerous *villi* along the inner walls. Use a hand lens or a low power dissection microscope to observe them more clearly.

The coils of the small intestine are held in place by a fine peritoneal membrane, the *mesentery*. It may be observed when lifting a coil of the small intestine and stretching the two ends. A fine, thin membrane, the mesentery, will be visible. It is responsible for the coiling observed. Note its shiny thin appearance. It is interlaced with narrow blood vessels, lymphatic vessels, adipose tissue, and lymph nodes. Some of the tiny blood vessels form the beginnings of the portal system, transporting digested food from the intestine to the liver. Cut through the mesentery to unravel the small intestine. Measure its length. How does it compare to the relative length of man's intestine (about twenty feet)?

Large Intestine — Follow the coils of the small intestine. The end of the ileum enters the large intestine. At this juncture the *caecum*, a short blind sac about 2 cm. long, is formed. In some organisms such as horses, this section is enlarged and houses microorganisms which can digest cellulose. Humans possess a *vermiform appendix* that projects from the end of a short caecum. Cut into the caecum at about the point where the ileum enters. Wash out its contents, look for and locate the *ileocaecal* valve.

The *spiral colon* is a compact coiled mass clearly visible upon the left ventral surface. It is shorter, darker, and thicker than the small intestine. It is the major portion of the large intestine. The posterior dorsal portion of the large intestine is the *rectum*. It descends along the midline through the pelvic girdle to the *anus*, the intestinal opening to the exterior. The colon of human beings is relatively shorter than that of the fetal pig and is not coiled.

Pancreas — Lift the main portion of the small intestine. Expose the stomach and duodenum. Observe the pancreas, a lobulated glandular structure lighter in color than the neighboring intestines. Its main portion lies in the loop of the duodenum. An elongated portion may be observed extending to the left, toward the stomach and spleen. Parts of the gland may also be seen along the dorsal body wall extending to the right of the duodenum and along the dorsal midline. The human pancreas is

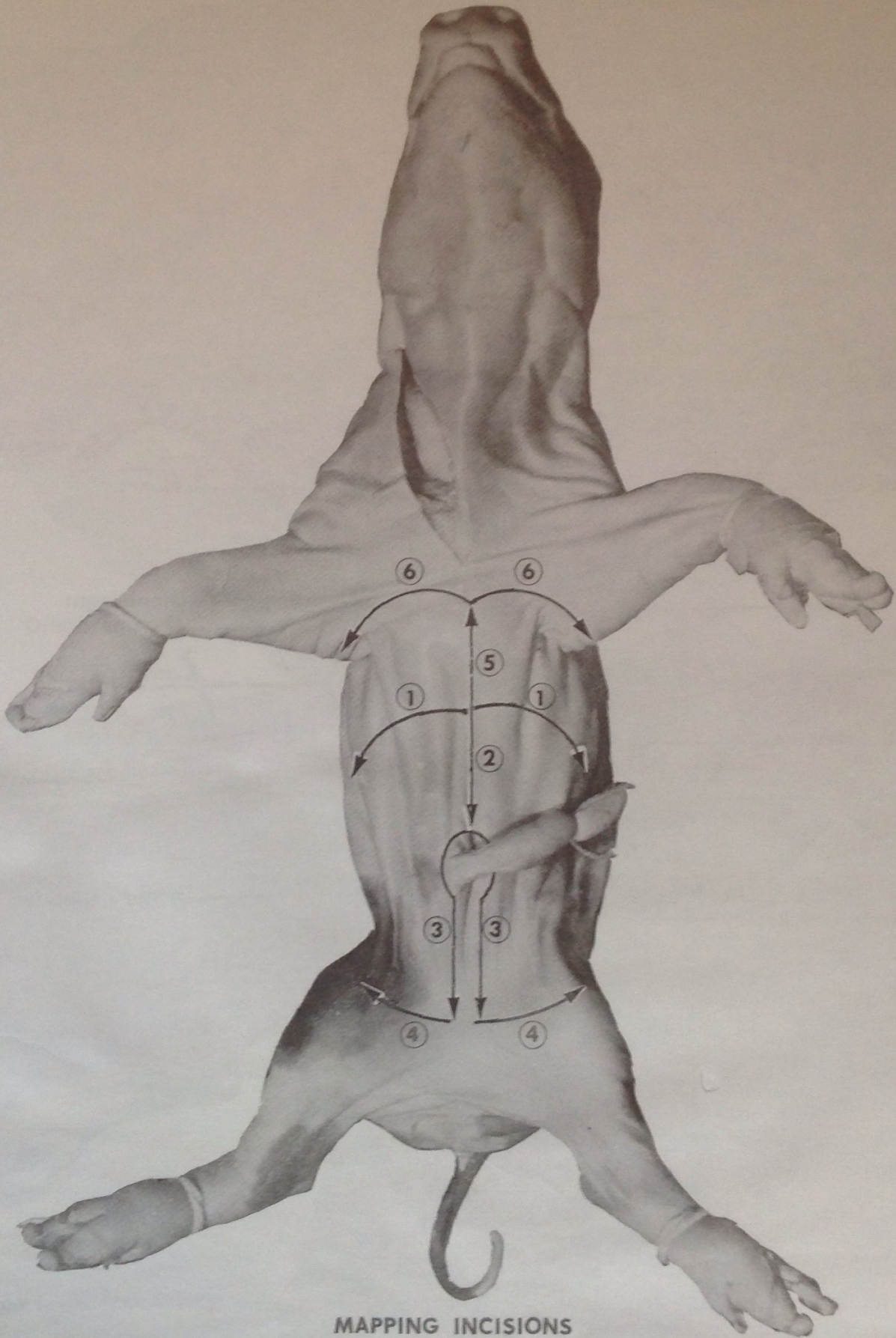
much more compact. Its duct, the *pancreatic duct*, enters the duodenum. It is small and difficult to find since it is embedded in glandular material.

Spleen — This dark-colored elongated organ can readily be seen in the left side of the abdominal cavity without moving any other organs. It lies to the left of the stomach, along its greater curvature, and extends toward the right. It is tied to the stomach by a portion of the *greater omentum*, a specialized fold of the peritoneum, known as the *gastrosplenic ligament*.

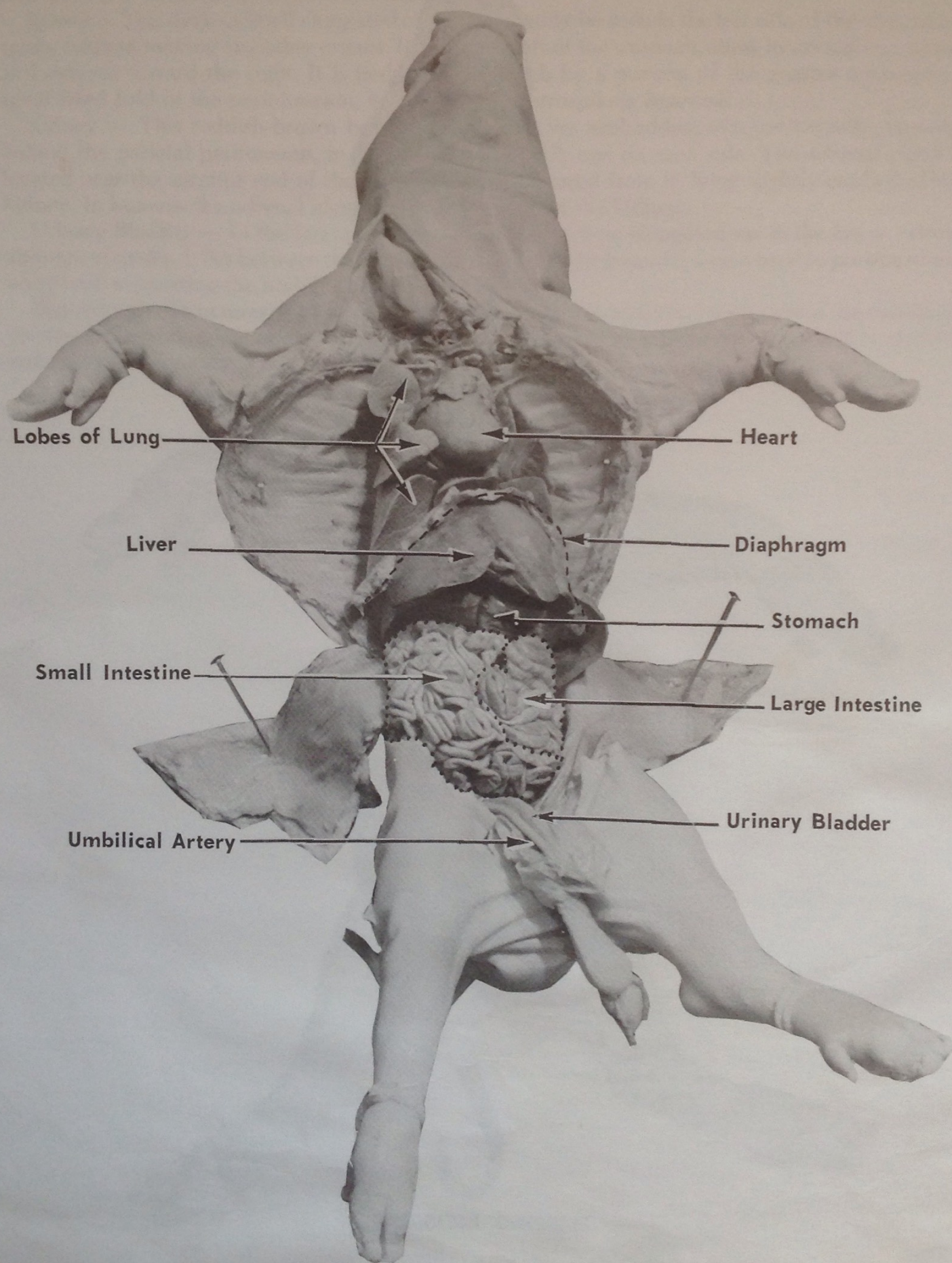
Kidney — This reddish-brown bean-shaped organ lies embedded retroperitoneally, namely, behind the parietal peritoneum, in the dorsal body wall, one on each side. The *adrenal gland* is located near the anterior end of the kidney, but is separated from it, lying slightly medially of the kidney. In humans the adrenal gland forms a “cap” upon the kidney.

Urinary Bladder — In the fetal pig the urinary bladder is an elongated sac in the lower ventral abdominal cavity. It lies between the prominent *umbilical arteries* and is seen when the portion of the body wall supporting the umbilical cord is folded down.

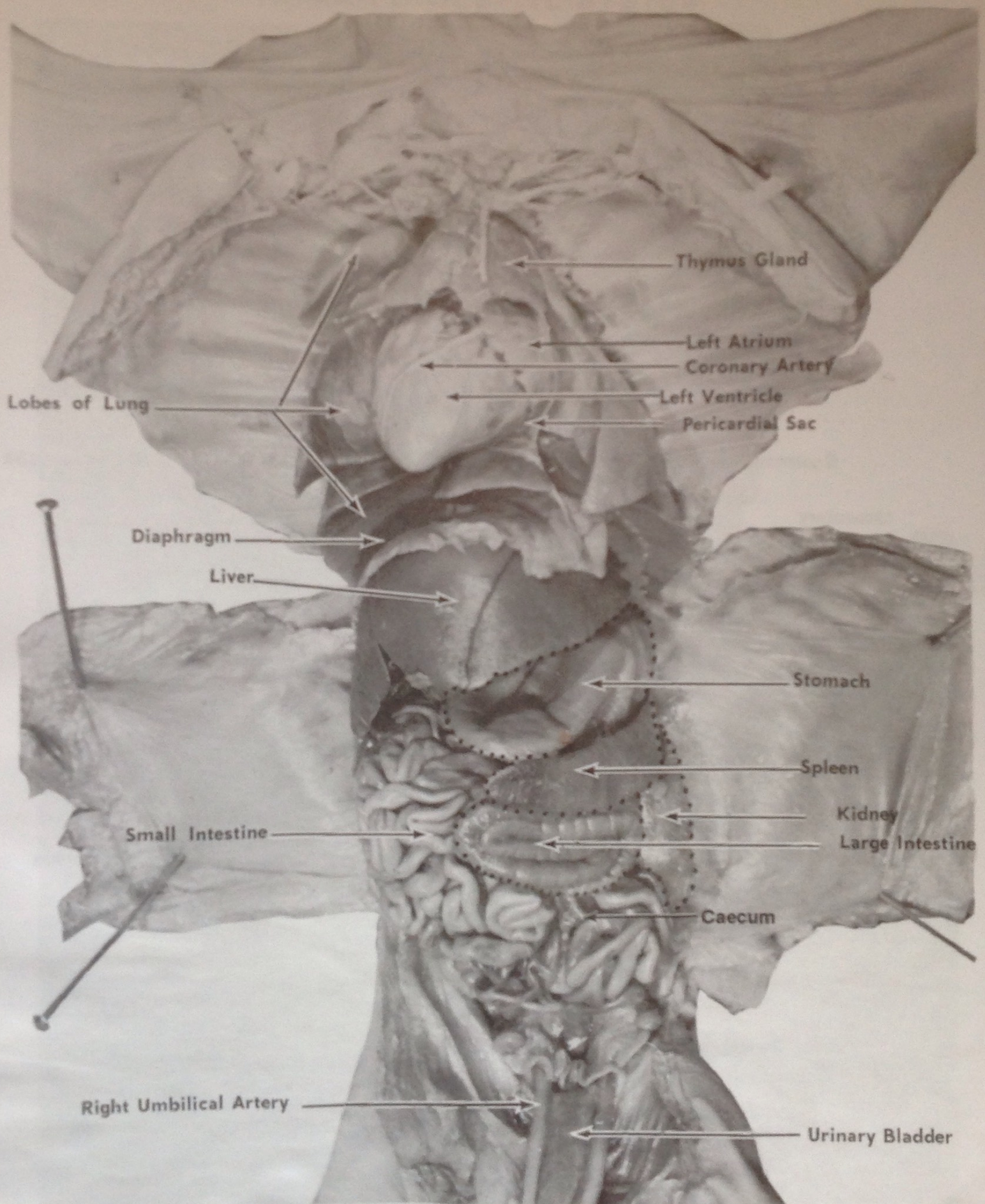
Reproductive Structures — Most of the female reproductive structures and some of the male’s are located in the abdominal cavity. The urogenital system and its associated structures will be studied and more fully discussed in a later chapter.



MAPPING INCISIONS

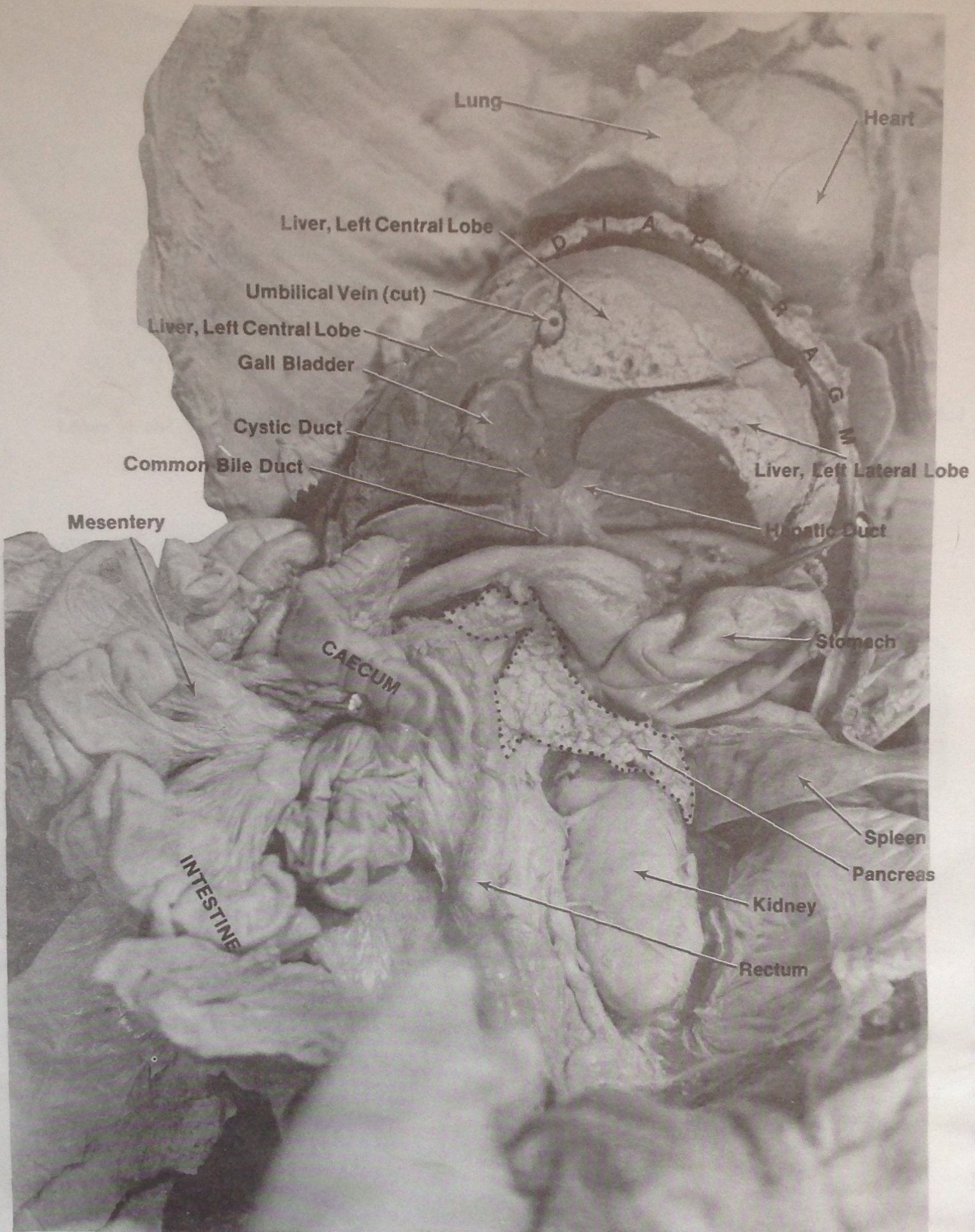


THORACIC AND ABDOMINAL VISCERA



- Thymus Gland
- Left Atrium
- Coronary Artery
- Left Ventricle
- Pericardial Sac
- Lobes of Lung
- Diaphragm
- Liver
- Stomach
- Spleen
- Kidney
- Large Intestine
- Small Intestine
- Caecum
- Urinary Bladder
- Right Umbilical Artery

VISCERAL ORGANS (Close-Up)



HUMAN DIGESTIVE SYSTEM

