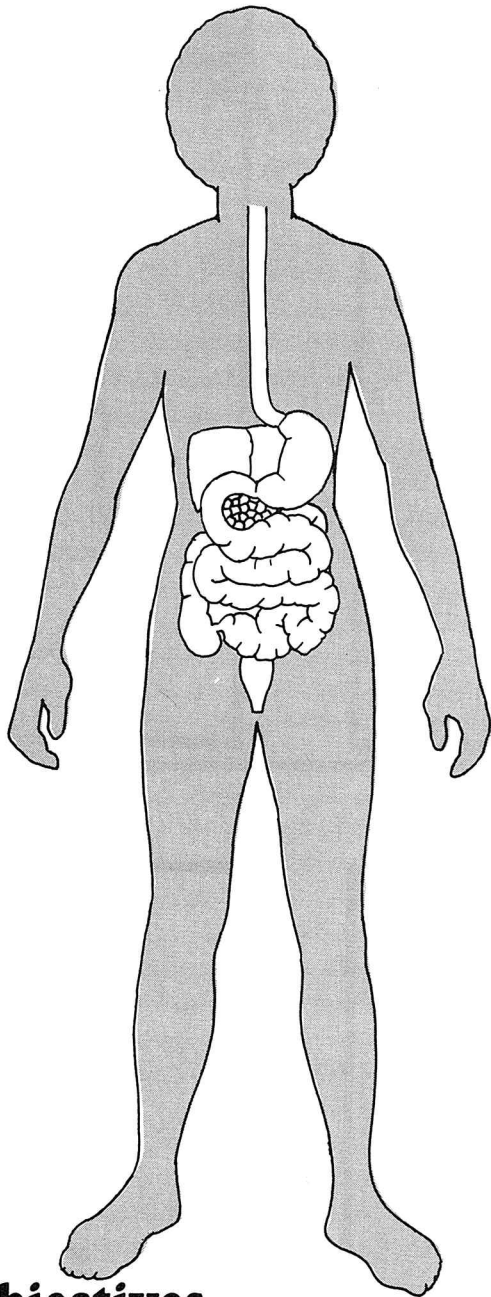


The Digestive System



Objectives

Students will:

- learn the parts of the digestive system
- understand how the parts work together to digest food
- find out why they need to eat a balanced diet.

Materials

- crackers
- plastic straws

Building Understanding

1. Ask students to brainstorm all the parts of their body involved in taking in and digesting food. List their responses on the board. Ask students where they think the process of digestion begins.

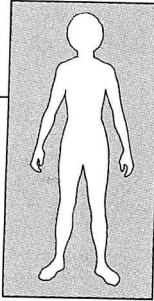
Explain that digestion is the process in which foods are broken down into simple forms that the body can use.

2. Teach students that there are six groups of nutrients: protein, fats, carbohydrates, vitamins, minerals, and water.

The body uses different nutrients for energy; as building blocks for growth; to work properly; to stay healthy; and to repair damaged cells.

Divide the class into six groups and assign a nutrient group to each. Ask each group to find out from textbooks, encyclopedias, magazines, food labels, or the school nutritionist which foods contain that nutrient and then create a chart that lists those foods or is illustrated with pictures of those foods. Somewhere on the chart students should list what their nutrient does or how the body uses it. For example: Carbohydrates—sugars and starches—provide the main energy source for cells. Be sure to make students aware that no one food provides all the nutrients the body needs every day. Stress that eating a balanced diet

The Digestive System



made up of a variety of foods supplies the body with the right amount of each nutrient it needs.

3. Hand out a cracker to each student. Ask students to chew the cracker for a minute before swallowing, noting what happens to the cracker in their mouth. Compare student responses. Students should notice that the cracker is broken into small pieces; moistened and softened by saliva; and that the taste becomes sweeter. Impress upon students that during digestion food is broken apart mechanically, such as by chewing, and chemically, such as occurs when an enzyme in saliva changes the starch in the cracker into sugar.

Making The Model

1. NOTE: This model is best put together on top of the skeleton as part of "Building The Body." To do this, alter the instructions below by asking students to fold the tab at the top of the part labeled **INSIDE THE FACE** behind the skull on the skeleton and paste in back.

Students can draw hair around **THE FACE**, cut **THE FACE** out, and tape the **FACE TAB** over the **INSIDE OF THE FACE** or draw a face on **INSIDE OF THE FACE**. Cut the tab off the top of the part labeled **FOOD TUBE** (esophagus) and tape the top under the face so the face can be lifted to see the skull.

Complete the model as below, fitting the last part of the **LARGE INTESTINE**, the rectum, behind the pelvis bone.

2. Reproduce a set of pages 93—98 for each student.

3. Ask students to cut out the parts

labeled **INSIDE THE FACE** on page 93 and the **FOOD TUBE** (esophagus), on page 94 and glue the tab at the top of the **FOOD TUBE** behind the throat at the bottom of the face.

4. Reproduce a set of page 94. Cut out the parts labeled **STOMACH** and the **STOMACH WALL** box. Then cut along the solid line inside the stomach to form a flap that opens when folded on the dotted line. Turn the stomach over and tape the tabs on the **STOMACH WALL** box so that the piece fits behind the flap in the **STOMACH**. Be sure the drawing can be seen when the stomach is turned over and the flap opened.

5. Turn the **STOMACH** back over and paste the tab at the end of the **FOOD TUBE** behind number 1 on the stomach.

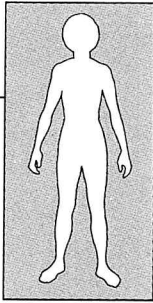
6. On page 94, cut out the part labeled **SMALL INTESTINE** and then cut along the solid lines inside the piece to form a flap. Next cut out the **VILLI** box. Turn the small intestine over, and glue the tabs of the **VILLI** box so the box fits over the flap and the drawing on the **SMALL INTESTINE** can be seen from the other side.

7. Turn the small intestine back over and paste the **TAPE BEHIND 2** on the **STOMACH**.

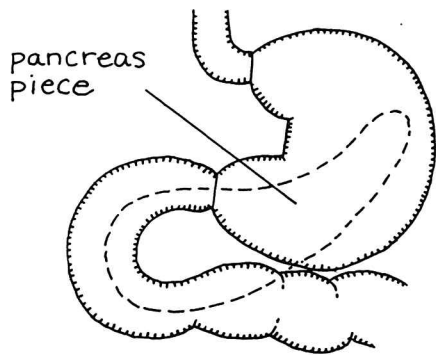
8. On page 95 cut out the **LARGE INTESTINE** and tape the **TAPE BEHIND 3 TAB** on the **SMALL INTESTINE** behind number 3 on the **LARGE INTESTINE**.

9. Cut out the **PANCREAS** and paste the pointed end behind the **STOMACH** and the curved end behind the **SMALL**

The Digestive System



INTESTINE as shown:



10. Cut out the LIVER on page 95 and set it aside until it is brought up in the lesson (otherwise it will block the food tube, stomach, and small intestine). Then ask students to place the pointed end of the LIVER on top of the STOMACH and glue the curved end behind the curved end of the PANCREAS as shown above.

Using The Model

1. Have students follow along on their model as you explain that:

a. Digestion begins in the mouth where teeth chew food, breaking it into smaller and smaller pieces and where saliva, flowing out of salivary glands, softens and moistens chewed food. Point out the 6 salivary glands. Remind students about the cracker they chewed showing how saliva also changes some starches in food into sugar.

b. The tongue pushes small balls of food to the back of the mouth into the throat. Throat muscles direct the food balls into the FOOD TUBE, or esophagus, where muscles keep it moving to the stomach.

c. The muscular, elastic STOMACH (refer to the model of the stomach below) mashes and churns food. Ask students to lift the flap, and explain that the STOMACH WALL releases

digestive juices containing enzymes that start to break apart proteins. The wall also releases acids that help the enzymes work while killing germs at the same time. As the stomach churns, food turns into a thick paste called *chyme*.

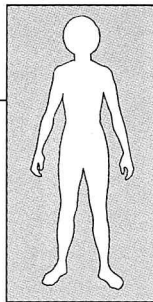
d. Chyme leaves the lower part of the stomach and enters the SMALL INTESTINE, which is about 6.3 meters (21 feet) long in adults. The wall in the first part of the small intestine gives off different digestive juices, but there are not enough to complete digestion. The GALL BLADDER in the LIVER produces bile that flows through a duct to the first part of the small intestine to break fats apart.

The PANCREAS produces enzyme-rich juices that flow through a duct to further break down proteins, fats, and carbohydrates in the small intestine. Using the illustration above as a guide, you can show students where to draw the ducts from the liver and the pancreas on their model.

e. All of the enzymes and bile complete digestion by breaking food into simple forms the body can use. These simple forms are picked up by millions of tiny fingerlike VILLI that line the small intestine and can be seen by students when they lift the flap. The simple forms are absorbed into blood by passing through the villi.

f. Parts of food the body cannot use are moved along by muscles in the SMALL INTESTINE wall into the LARGE INTESTINE. The large intestine is about 1.5 meters (5–6 feet) long in adults. Most of the water and minerals left in the unusable food parts pass through the walls of the large intestine and into the blood. The rest solidifies and is stored in the rectum until it is released from the anus, the opening at the end of the large intestine.

The Digestive System



2. Ask students to look at their model and identify the parts of the digestive system that form one long tube from end to end: mouth, throat, esophagus (food tube), stomach, small intestine, large intestine.

3. You may wish to mention the following to older students:

a. Saliva is produced in six glands, three on each side of the head. It empties into the mouth through ducts.

b. It can take from 10 to 20 hours for food to pass from one end of the digestive system to the other.

c. The LIVER is the largest organ inside the human body. It stores vitamins and minerals, makes essential proteins, and destroys worn-out blood cells.

d. The appendix is the fingerlike projection in the bend in the first part of the large intestine. No one knows what the appendix does, if anything. Should the appendix enlarge and become infected, it must be removed.

e. Living in the large intestine are helpful bacteria that produce some vitamins people need.

More To Do And Learn

1. Color The Model

Invite students to color the digestive system.

2. Peri What?

Hand out a plastic straw to each student or divide students into groups and hand out a straw to each group. Ask students to roll a ball of paper that fits into the straw without falling through. Ask students to push the ball into one end of the straw and then to keep squeezing the straw behind the ball to make the ball move along the

straw until it comes out the other end.

Explain that the straw represents the esophagus, or small intestine, or large intestine, and the

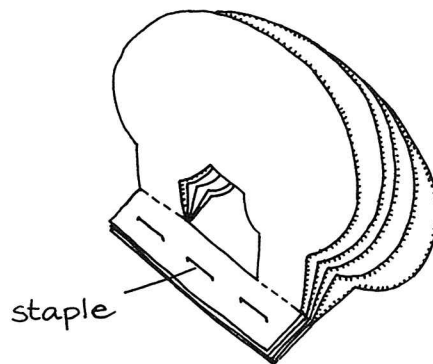
squeezing represents the contraction of muscles in the walls of those organs. This muscle contraction moves food along in wavelike motions called **peristalsis**.

Ask students what they think happens when peristalsis reverses between the stomach and the mouth (vomiting).

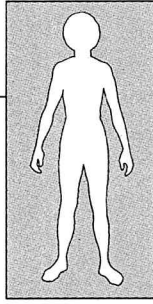
3. All About The Stomach

Reproduce a set of pages 96—98 for each student. Ask students to cut out the part labeled STOMACH WALL and then cut along the black lines inside the piece to form a flap. Cut out the STOMACH GLAND box with its tabs, turn over the stomach wall, and paste the tabs so the gland fits over the flap on the stomach wall and can be seen when the piece is right side up.

Turn the stomach wall over, cut out the point labeled SLANTED MUSCLES, and fit it on top of the stomach wall. In order, cut out the pieces labeled CIRCULAR MUSCLES, LONG MUSCLES, and OUTER COVERING and add them to the stack, one on top of the other. Staple or clip the five pieces together at the left to form a stomach “book.”



The Digestive System



Have students follow along as you explain that the stomach is an elastic bag-like organ that can stretch to hold the food a person eats. Its three layers of muscles—long (page 2 of the book), circular (page 3), and slanted (page 4)—contract in different directions enabling the stomach to churn food as it mixes inside with stomach juices. Ask students if they can control these muscles just by thinking about them. (No, the muscles are involuntary.) Ask students to turn to the last page of their stomach book, the rough, folded stomach wall. By opening the flap students can see one of the millions of tiny glands that produce digestive juices and acid. Cells in the stomach wall also produce mucus. By coating the stomach wall, mucus prevents the acid and juices from harming the stomach itself. Mention that muscles keep the openings into and out of the stomach closed except when food is swallowed and chyme is ready to enter the small intestine.

4. Why Fiber?

Ask students if they have heard commercials or read about eating foods rich in fiber. Explain that fiber is the substance cellulose found in cells of plants, including vegetables, fruits, and whole grains. While some animals such as cows and rabbits can digest fiber, people cannot. However, fiber is important in the diet because it helps the muscles in the intestines work at their best, preventing constipation. Fiber may also reduce the risk of cancer of the large intestine.

Making Connections

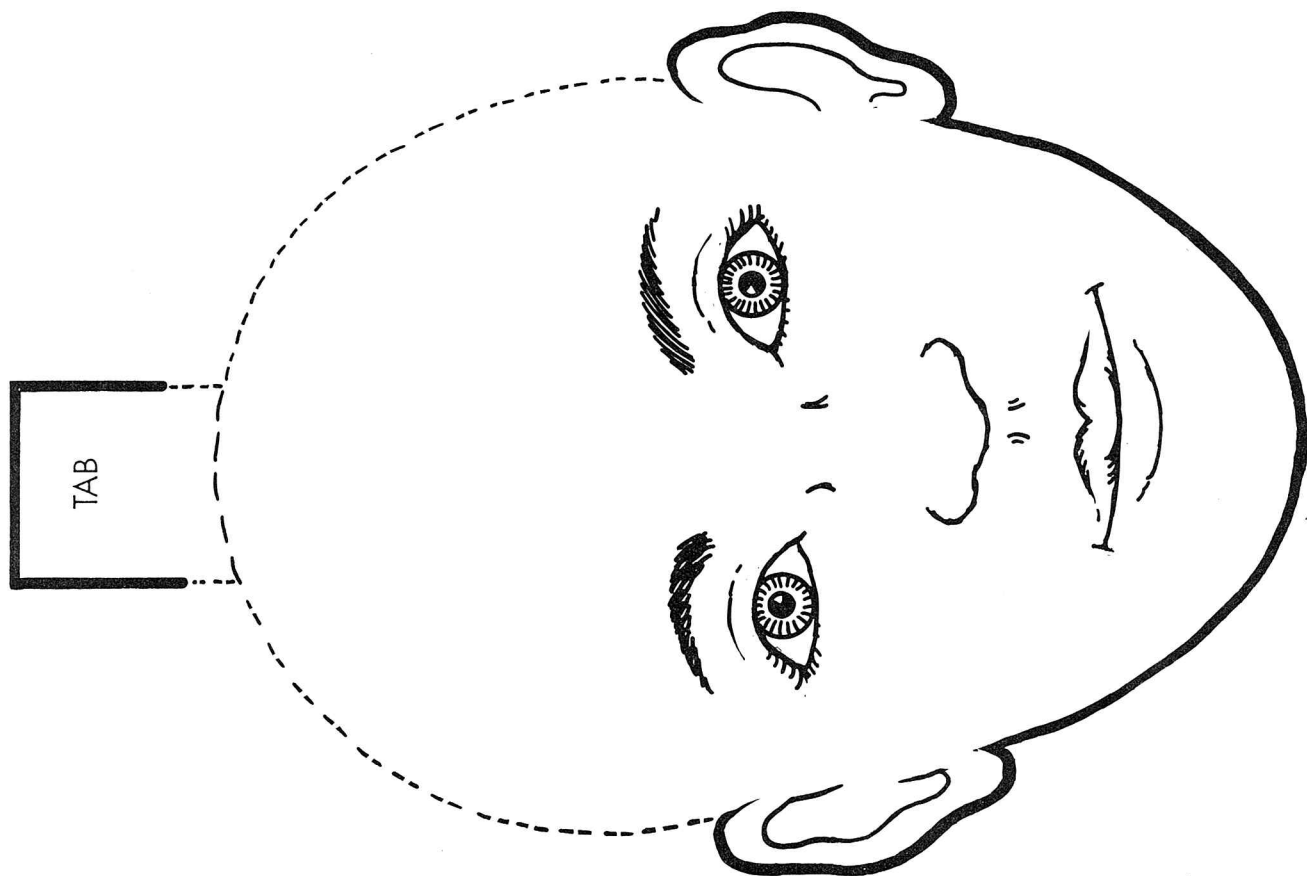
1. Divide students into groups and ask them to prepare the following to

present to the class:

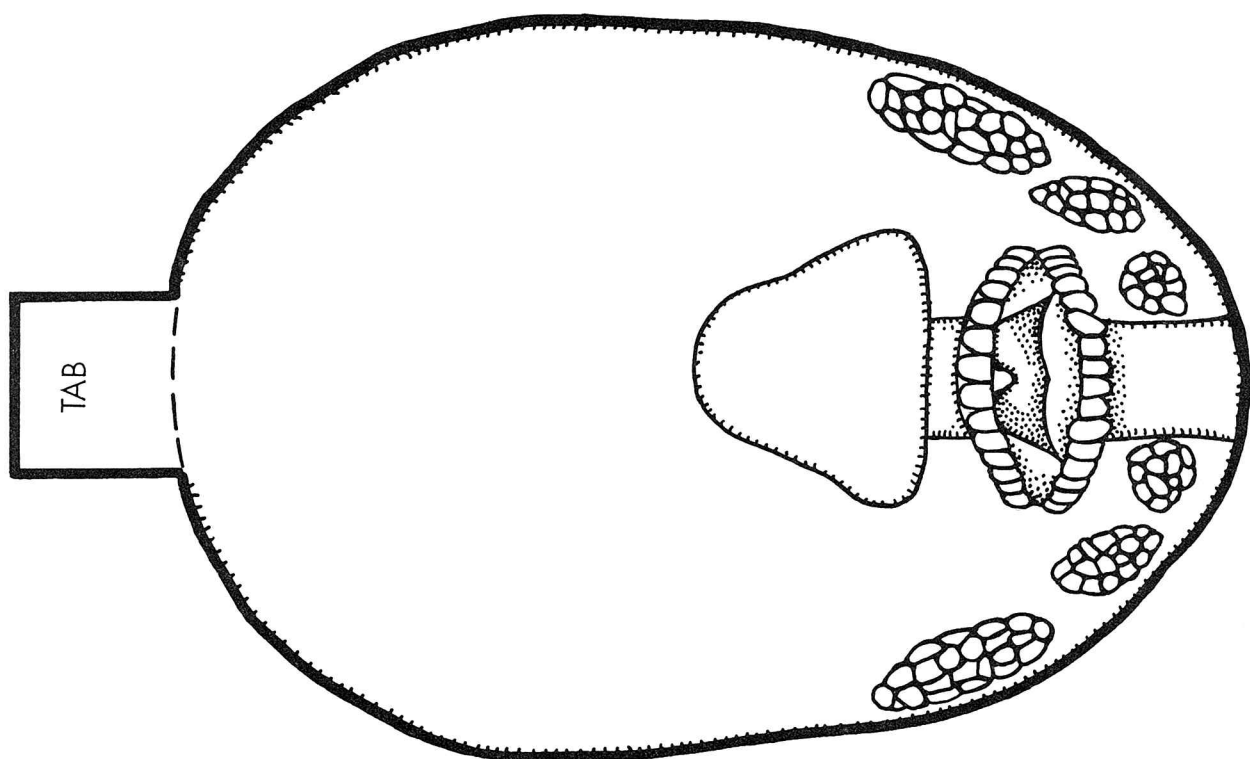
- a. A skit in which one member is food and the other members are parts of the digestive system. The food describes what is happening to it while each part explains what its job is. Two groups may have to perform this skit.
- b. A report on what ulcers are.
- c. A report on how many stomachs a cow has and why.
- d. A report on what lives inside a termite's stomach and why.

Healthy Choices

Teach students that side effects of many medicines include nausea, vomiting, stomach cramps, constipation, or diarrhea. Too much caffeine or nicotine can cause the stomach to overproduce acid, leading to ulcers. Too much alcohol can permanently damage the liver.



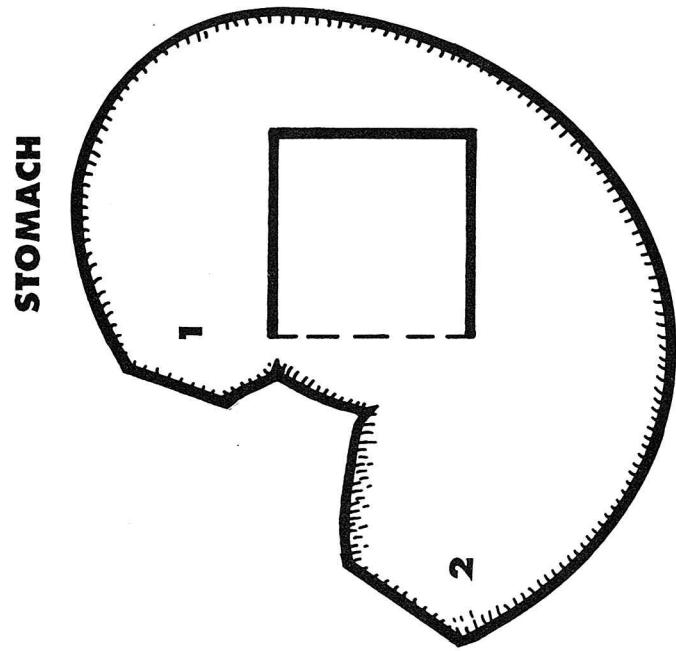
THE FACE



INSIDE THE FACE

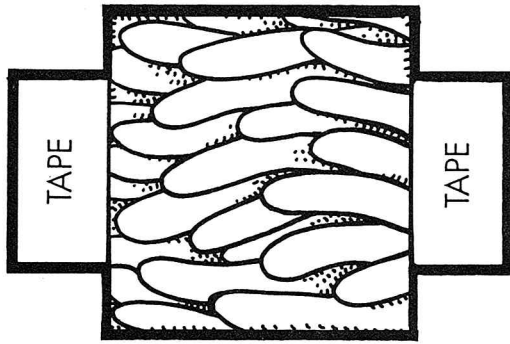
FOOD TUBE

UPPER
TAB

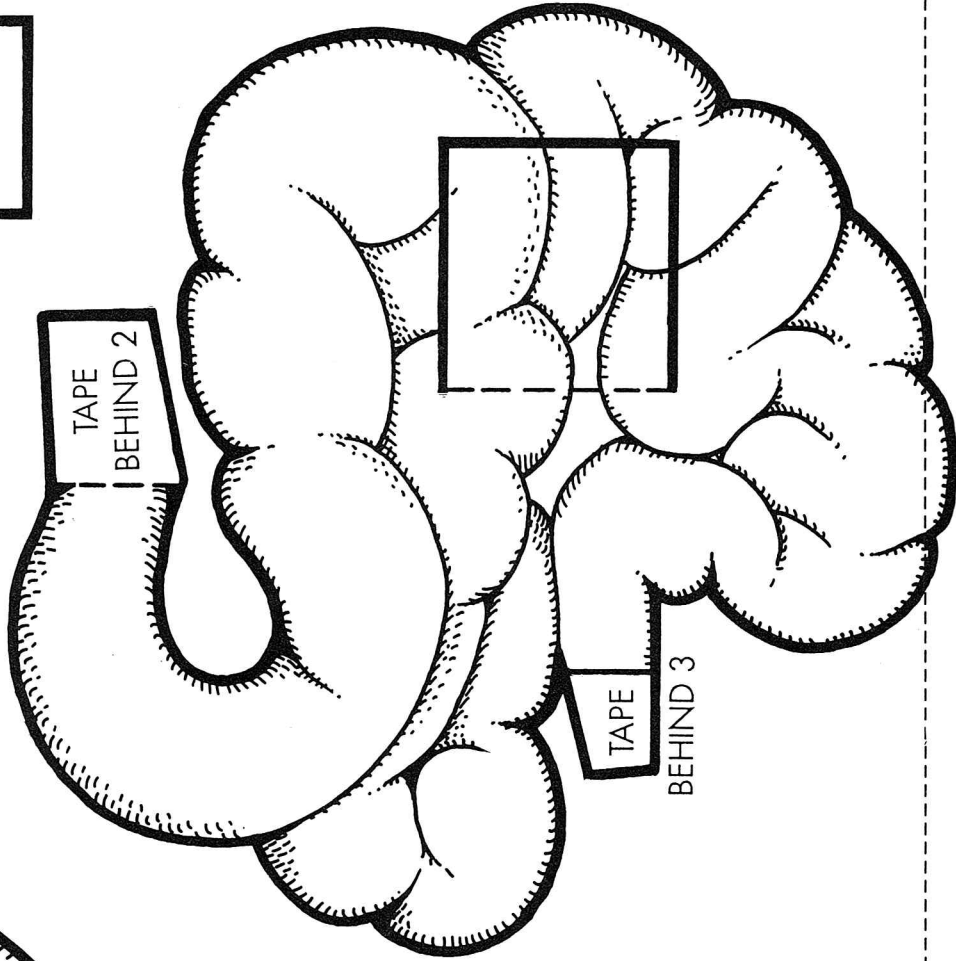


STOMACH

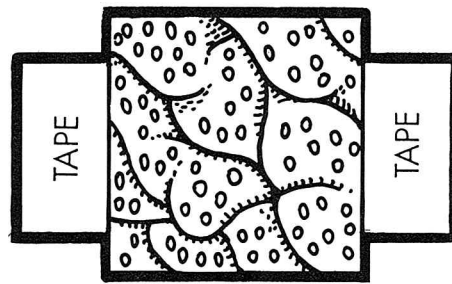
VILLI



SMALL INTESTINE

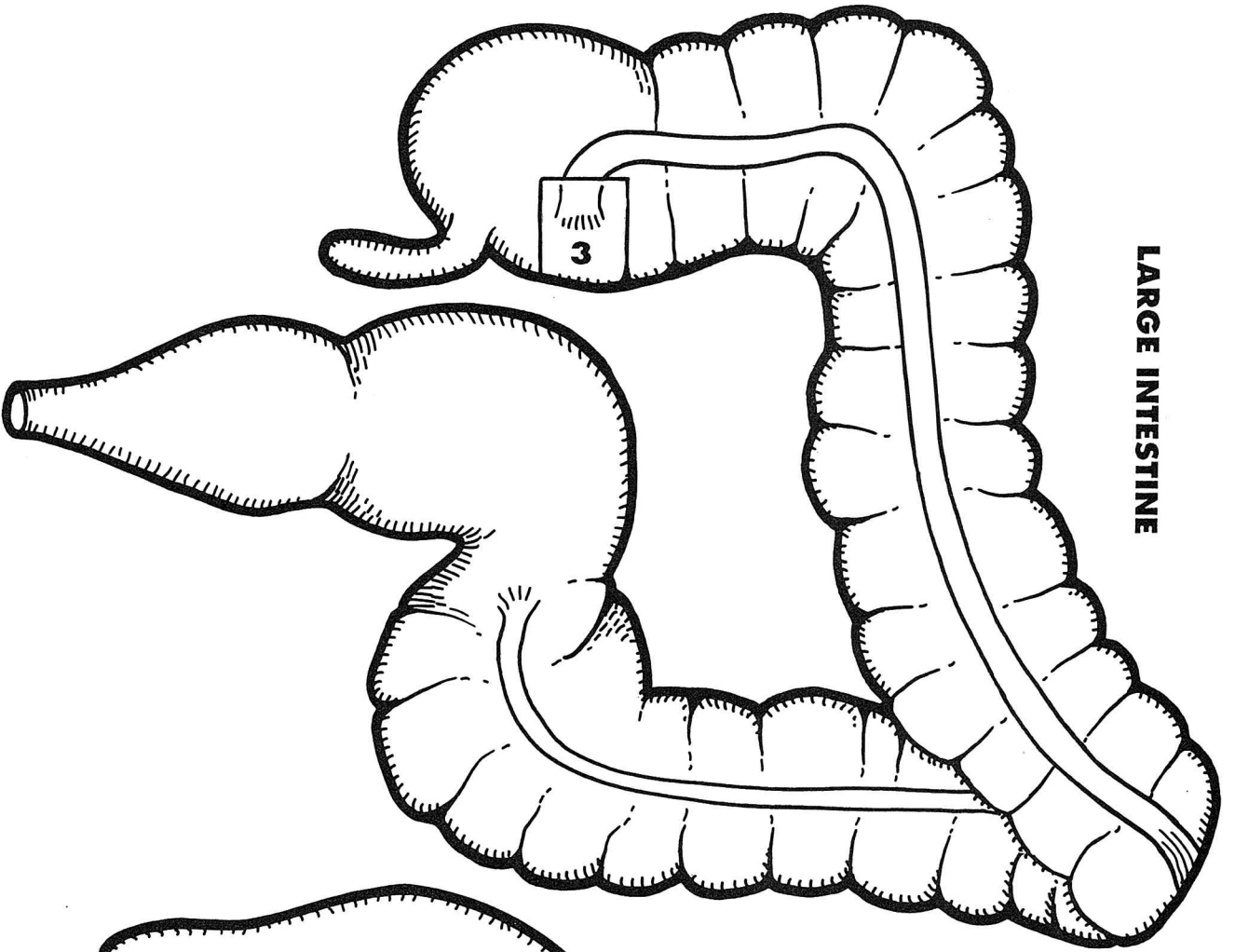


STOMACH WALL

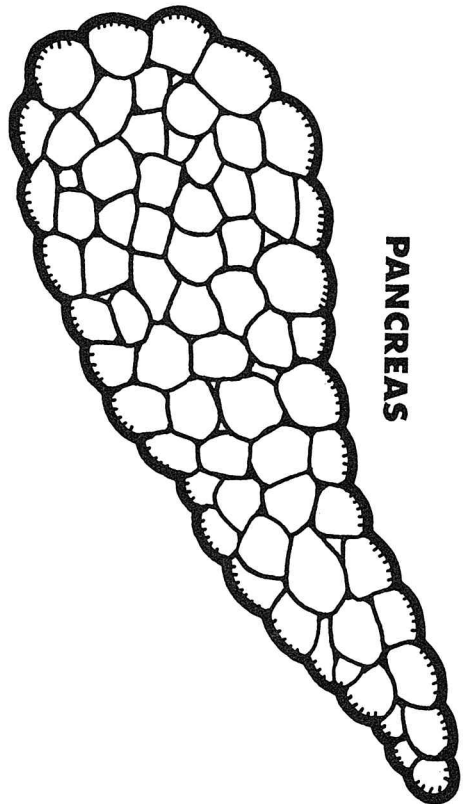


LOWER
TAB

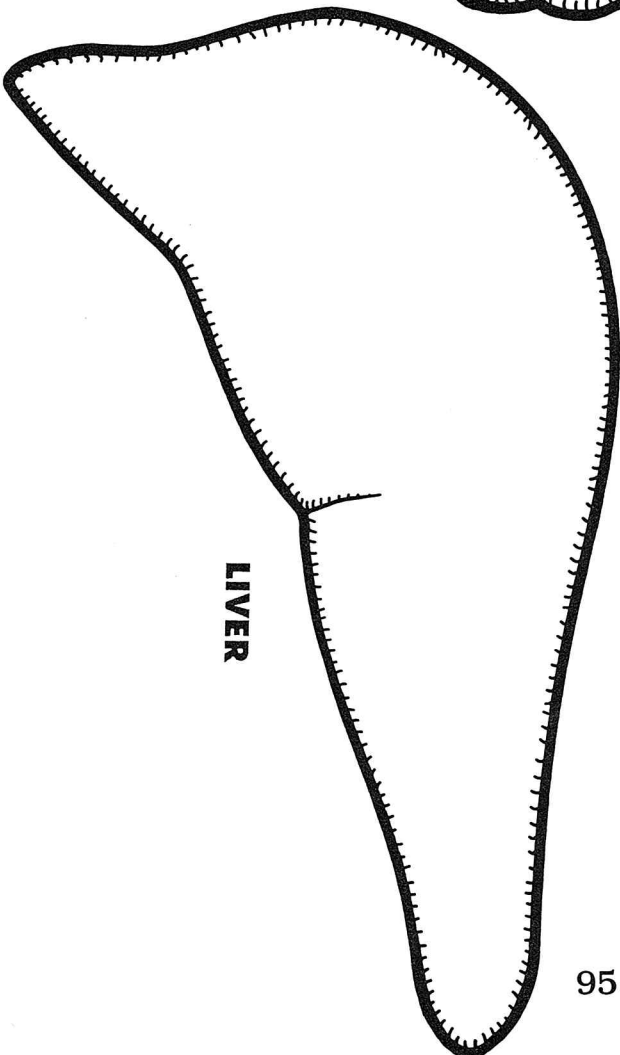
LARGE INTESTINE

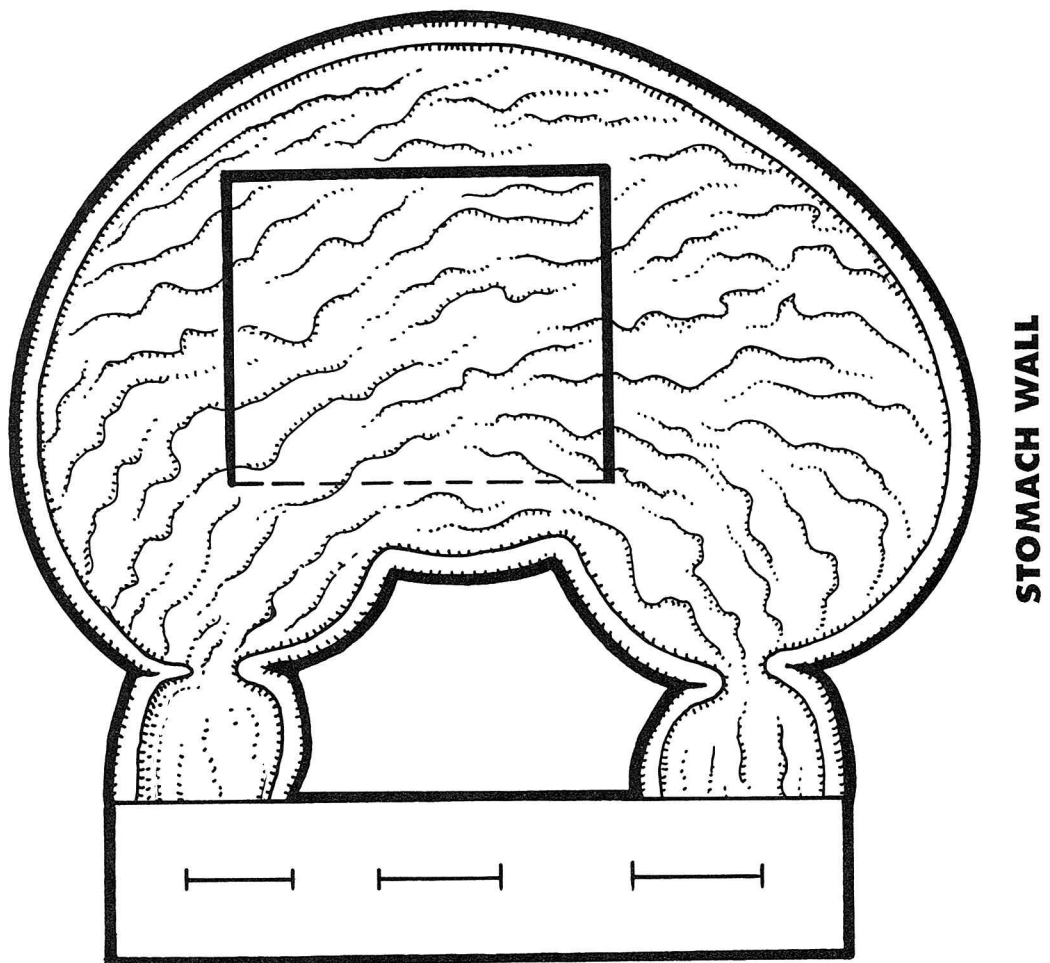
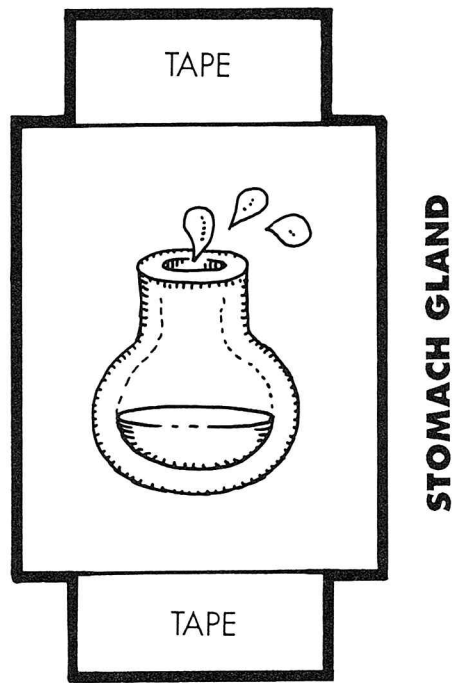


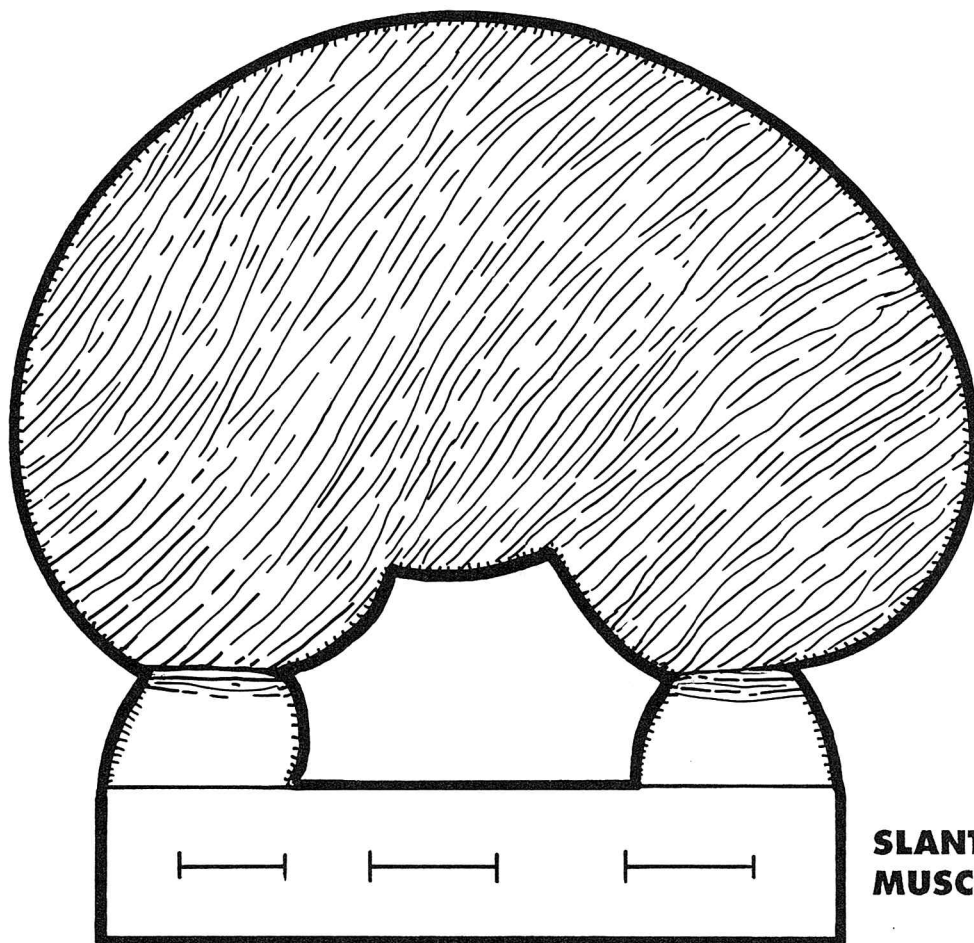
PANCREAS



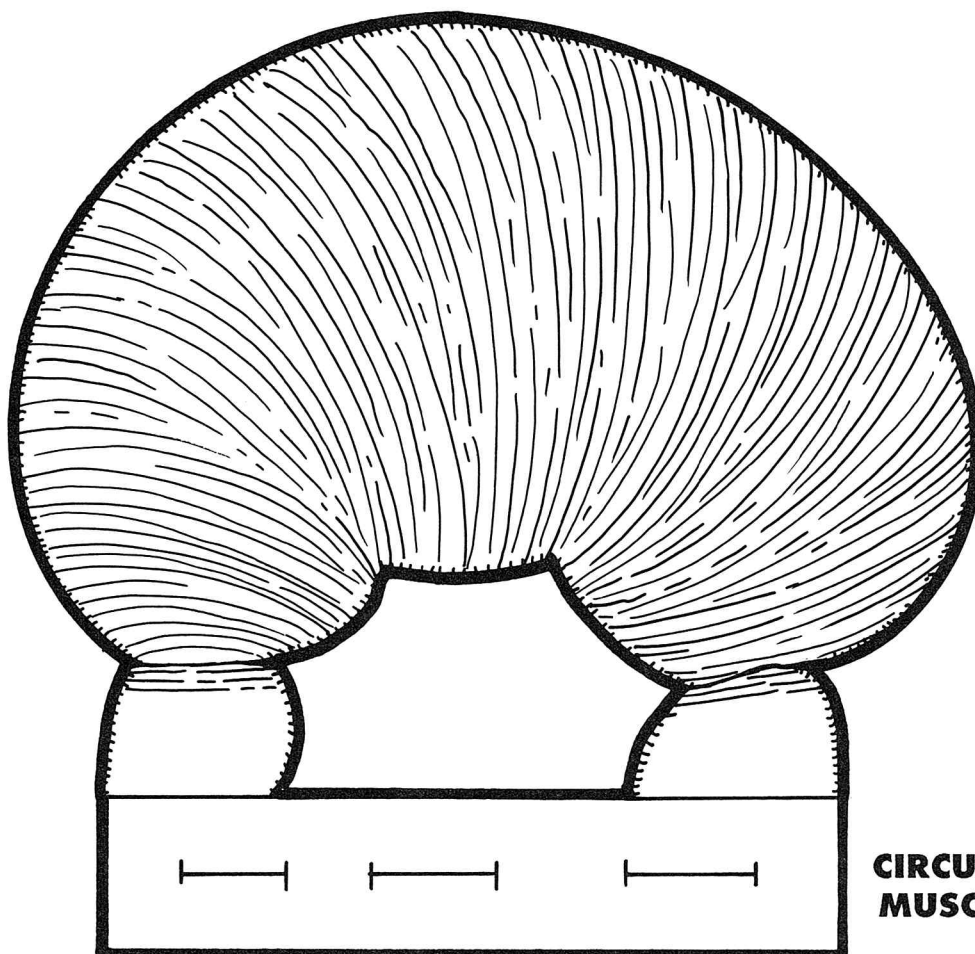
LIVER



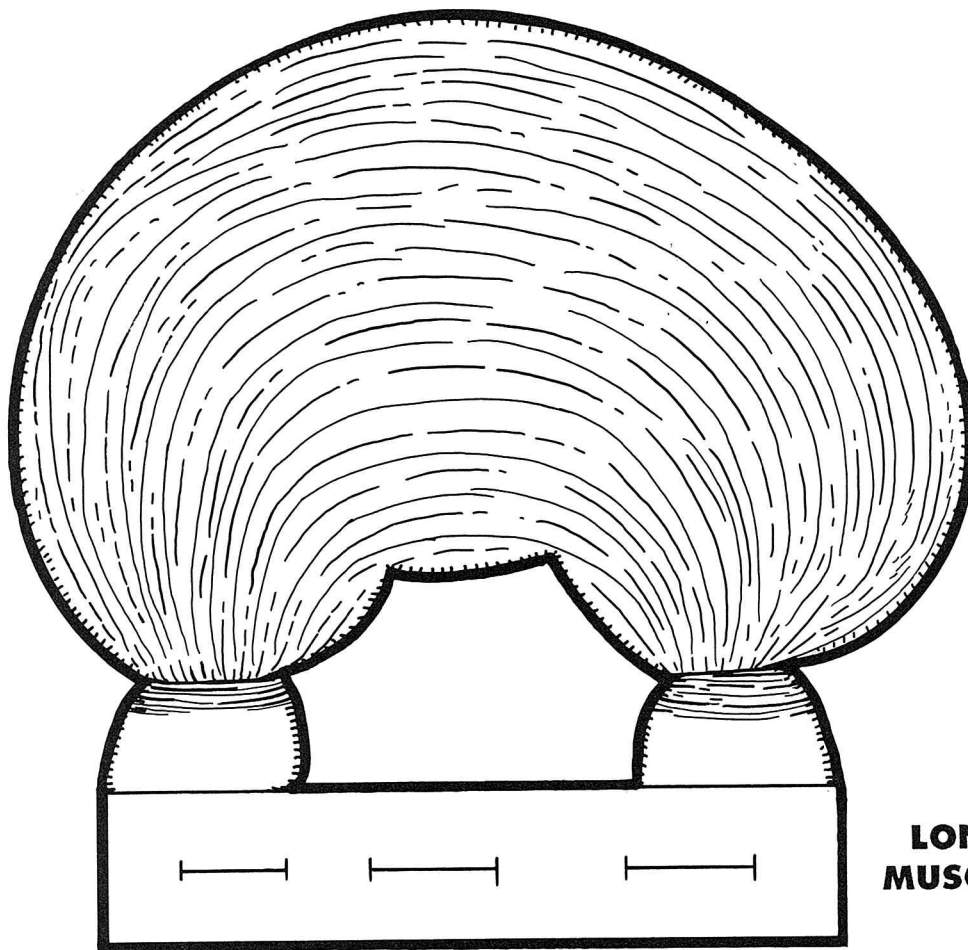




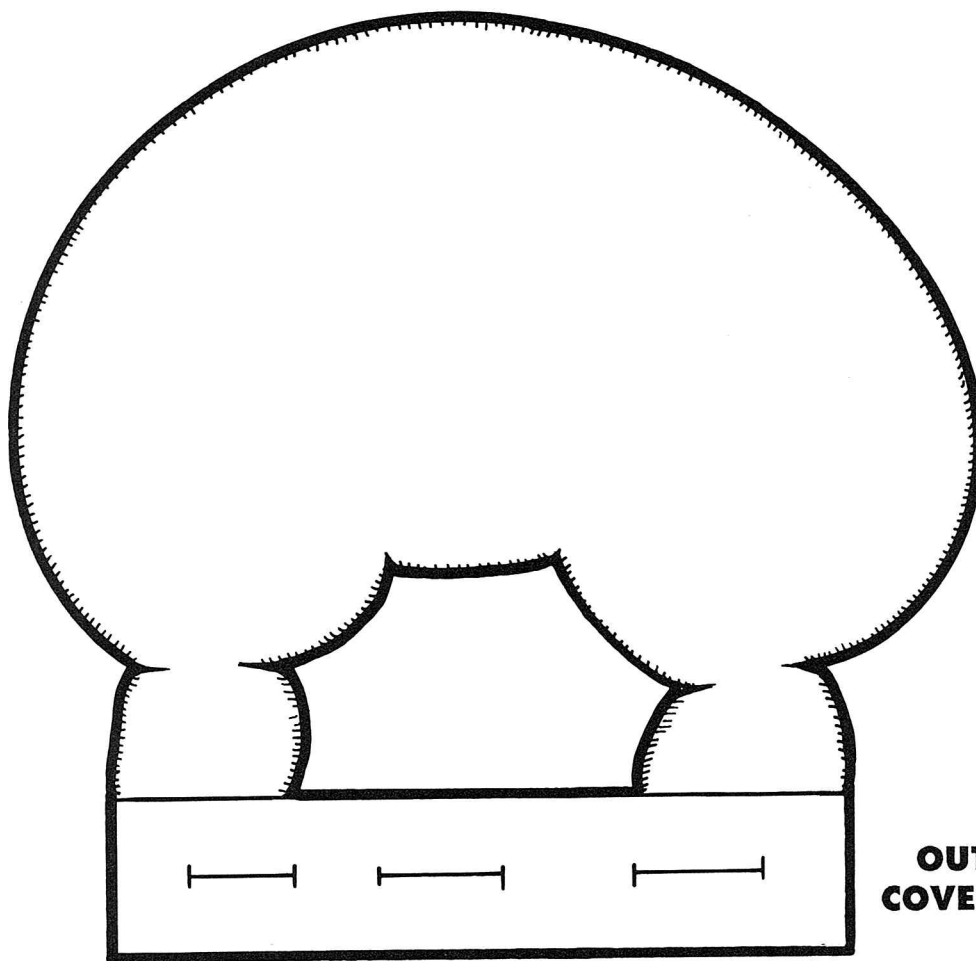
**SLANTED
MUSCLES**



**CIRCULAR
MUSCLES**



**LONG
MUSCLES**



**OUTER
COVERING**