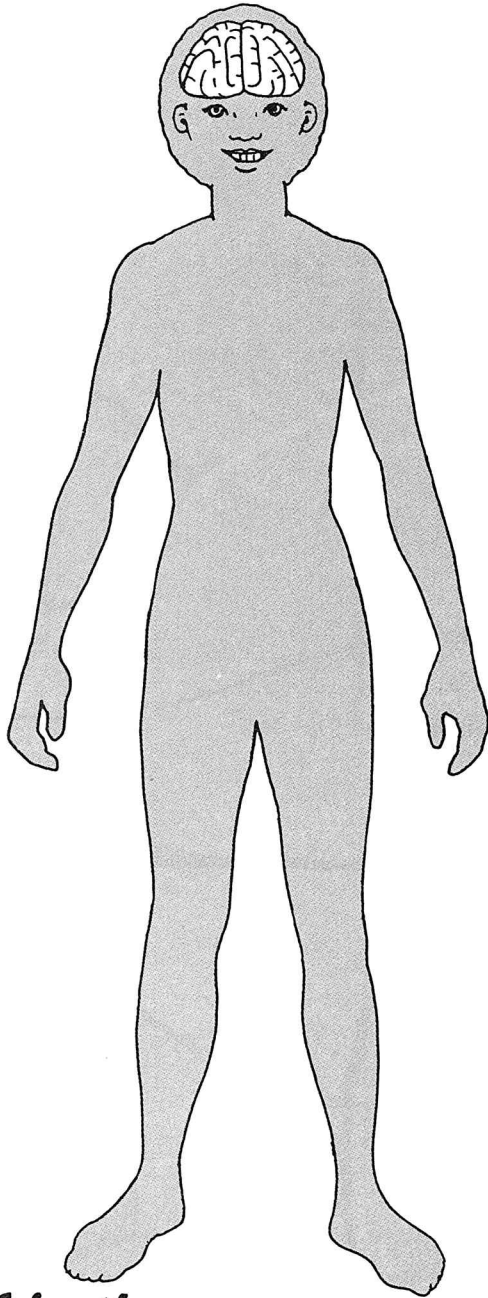


The Eye



Objectives

Students will:

- identify the parts of the eye
- discover how the parts work together
- learn that light entering the eye is bent to focus an image on the retina
- understand why some people need corrective lenses.

Materials

- scissors
- glue
- a piece of clear plastic or plastic wrap

Building Understanding

1. Ask students:

- Which sense organ does the job of seeing?
- How do you depend upon your eyes every day?

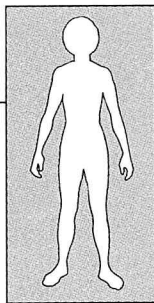
2. Have students close their eyes. Ask students:

- What wouldn't you be able to do if you could not see?
- Which of your other senses would you depend upon to help you find your way and learn about the world around you?

Mention that most of what students learn during their lives reaches their brain through their eyes.

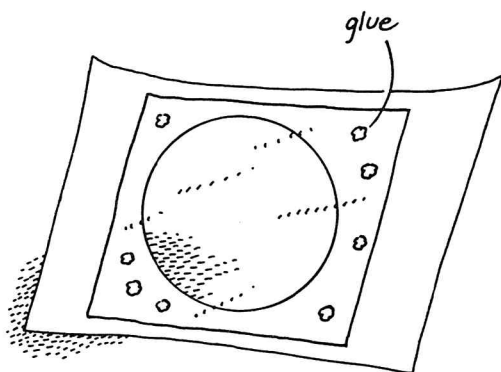
3. Divide students into pairs. Ask each pair to look into each other's eyes and list what they can tell about the eye just from looking. (Answers may include: the eyes are in the head; each eye has a white part, a colored ring, and a black circle; each eye has an eyelid that opens and closes; each eye has eyelashes and an eyebrow; eyes look shiny; there are small red lines in the white part of the eye.) Ask each pair to relate their findings to the class. List responses on the chalkboard.

The Eye



Making The Model

1. Reproduce a set of pages 25—30 for each student.
2. Have each student find page 25. Point out that the name of the eye part on page 25, the OPTIC NERVE, is printed on the page and that the name of each additional eye part will also be printed on each page.
3. Have students find page 26 and along the cut line cut out the circle labeled BLOOD VESSELS with its TAPE DOWN TAB. Using glue, paste the tab on box 1 on page 25.
4. On page 27 cut out the RETINA circle along with its tab and paste the tab on box 2 on page 25.
5. Point out page 28 has the LENS and the IRIS AND PUPIL. Ask students to first cut out the part labeled LENS and then fasten TAPE 3 on the LENS to TAPE 3 on page 25 by folding the tape to form a hinge as shown:
6. Cut out the IRIS, then cut out the PUPIL in the center. Fasten TAPE 4 on the IRIS to TAPE 4 on page 25 with a folded hinge.
7. Cut out the center of page 29, the part labeled CORNEA. Turn page 29 over and paste a piece of clear plastic or plastic wrap over the cut center as shown:



If neither is available leave the center open. Fasten both TAPE 5 boxes to the TAPE 5 boxes on page 25 by folding tape to form hinges.

8. Cut out the part labeled OUTER EYE on page 30. Fasten both TAPE 6 boxes to the TAPE 6 boxes on page 25.

Using The Model

1. Have students shut their eyes. Ask students:

- What can you see of the classroom?
- Why do you think you cannot see anything?

- What do you think has to enter your eyes in order for you to see? (light)

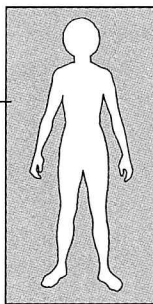
Explain that the sun and light bulbs give off their own light, but nearly all other objects do not. Instead, light from the sun or a bulb bounces off objects, and it is this reflected light that enters our eyes and allows us to see the objects.

2. Ask students to follow along on their model as you explain how the eye works. Students can write a key phrase on each eye part to help them remember what the part does. For example, students could write *bends light* on the LENS.

Explain that when the eyelids are open light can enter the eye. As light passes through the CORNEA it is bent slightly. Then it passes through the PUPIL, the opening in the colored IRIS. Behind the pupil is the clear LENS, which bends light so that it focuses on the RETINA.

The lens bends light so that the image of the object we are looking at focuses upside down on the retina. Have students draw a picture of an animal,

The Eye



such as a cat, and hold it in front of their model. Ask them to draw the same image upside down and much smaller on the retina.

Explain that cells in the retina change light energy into electrical signals that travel along nerves to the back of the eye. The nerves pass through a layer of **BLOOD VESSELS** that deliver to eye cells nutrients and oxygen in the blood and carry away wastes. All of the nerves join at the back of the eye to form the **OPTIC**, or seeing **NERVE**. The optic nerve from each eye carries the electrical signals to the seeing center of the brain (refer to **BRAIN** model). The brain translates the signals so we see the object right side up. It tells us what we see—a cat, for instance—and decides if we should do anything, such as feed the animal.

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

a. The **CORNEA** is part of the outermost layer of the eye—the white sclera—students saw when they looked into each other's eyes. It protects the eye.

b. The **IRIS**, the colored part of the eye, is made up of smooth muscle and is attached to the middle eye layer, the choroid. The iris changes the size of the pupil because it is a muscle that can contract or expand to change the opening of the pupil.

c. Ask students:

- Which part of the eye is the black circle you saw in each other's eyes? (the pupil)
 - Why do you think it is black? (No light is coming out of it.)
- Explain that the **PUPIL** can get bigger or smaller to let more or less light enter the eye (see below).

d. The **LENS** is made up of clear living cells and is held in place by two bands of tissue called **ligaments**. By changing shape the lens focuses light from near and distant objects on the retina so we can see all things in focus. Light bends when it passes from one transparent substance into another, such as from air into water or from air into eye cells in the cornea and lens.

e. The **RETINA** is made up of rod cells that help us see in dim light and distinguish white, black, and gray and of cone cells that help us see in bright light and in color.

More To Do And Learn

1. Color the Model

Suggest that students color the facial skin around the eye and also color the iris.

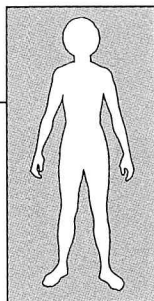
2. Cut and Paste Parts

Students can draw in or paste on eyelashes. Ask students what they think eyelids, eyebrows, and eyelashes do (help keep dust and dirt out of the eyes).

3. All About Tears

Ask students where they think tears come from and what they think tears do. Explain that above the outside corner of each eye there are tiny tubes, or ducts, carrying tears from tear glands. Every time we blink our eyelids spread tears over each eye. Tears wash away dirt, kill germs, and keep the cornea moist. Students may wonder where tears go when we aren't crying—most evaporate but some drain into tubes that empty into the nasal cavity. Students can draw in a tear or slide a sheet of paper in and out behind the eye opening to mimic an eyelid opening

The Eye



and closing to spread tears. Pair students and ask them to count how many times their partner blinks in a minute.

4. What the Doctor Sees

Older students can cut out part of the center of the lens and paste clear wrap over it to emphasize that the lens is clear. By looking into their model with a clear lens they can see what the doctor sees during a checkup—the retina and blood vessels.

5. Pupil Experiment

Set up the following experiment: Pair students and turn off the lights. After a minute or two turn on the lights and have each student look at the pupils on his or her partner. Ask students:

- What happens to the pupils? (They get smaller.)
- Why do you think the size of the pupils changes?

Explain that the iris controls how much light enters the eye by making the pupil wider or narrower. In bright light the pupil narrows so that too much light cannot enter the eye and harm eye cells. In dim light the pupil widens to let in as much light as possible.

Students can make the pupil in the model smaller by drawing a black ring that fits inside the pupil on another piece of paper and sliding it behind the pupil. Do this on your model and ask students if the light is dim or bright if the pupil is wide open (dim). If the pupil is narrow? (bright)

Remind students *never* to look directly into the sun. Such intense light can harm their eyes.

6. Facts On Fluids

Mention to students that there is a clear fluid (aqueous humor) between

the cornea and the lens and a clear jellylike fluid (vitreous humor) between the lens and retina. Both fluids help nourish the lens and give the eye its shape.

7. Work Those Muscles

Mention that there are 6 muscles that are attached to each eye that move the eye up and down, from side to side, and in any direction in between. Ask students to move their eyes in different directions.

8. Corrective Lenses

By changing shape the lens focuses light so we see both near and distant objects clearly. Some people see nearby objects clearly but distant objects look fuzzy. The lens in these

NEARSIGHTED people focuses light from distant objects in front of the retina instead of on it. Eyeglasses or contact lenses with concave lenses (thicker at the edges than at the center) correct nearsightedness by focusing light from distant objects on the retina.

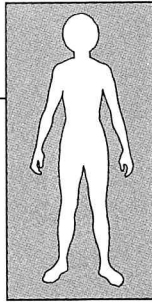
FARSIGHTED people see distant objects clearly, but nearby objects are out of focus. Their lens focuses light from nearby objects behind the retina instead of on it. Eyeglasses or contact lenses with convex lenses (thicker in the center than at the edges) correct farsightedness by focusing light from nearby objects on the retina.

Invite students to draw the frame of a pair of eyeglasses or cut one out of another sheet of paper and place it on their model.

Making Connections

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

The Eye



present to the class:

- a.** A skit in which one member of the group is light bouncing off himself or herself and the other members are the parts of the eye seeing him or her.
- b.** A report on how the eye and a camera are alike and different.
- c.** A report on how an insect's eye works after students first find out which is more similar to a human eye—the eye of an insect or the eye of an octopus.
- d.** A report on optical illusions.

Healthy Choices

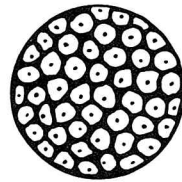
- 1.** Teach students that many medicines can cause blurry vision as can abuse of alcohol and hard drugs. Alcohol abuse causes people to see double; hard drugs cause pupils to stay wide open or constricted no matter what the light, make people see things not really there, and slow down nerve messages to the brain.
- 2.** Ask students why they think it is dangerous to be in a car driven by someone who has abused drugs and whose vision is impaired as a result.

TAPE 6

TAPE 3

TAPE 6

TAPE 1



OPTIC NERVE

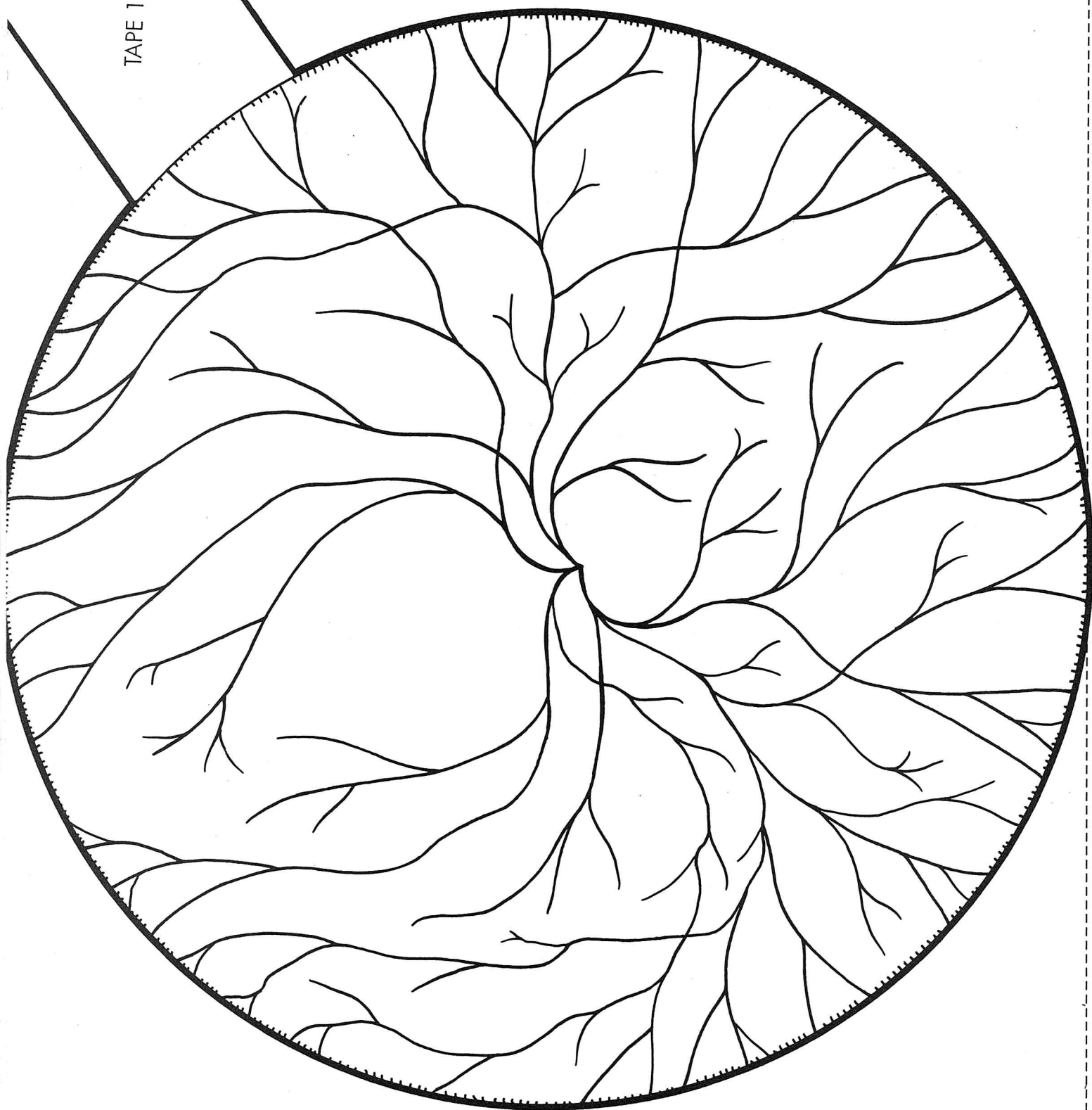
TAPE 2

TAPE 5

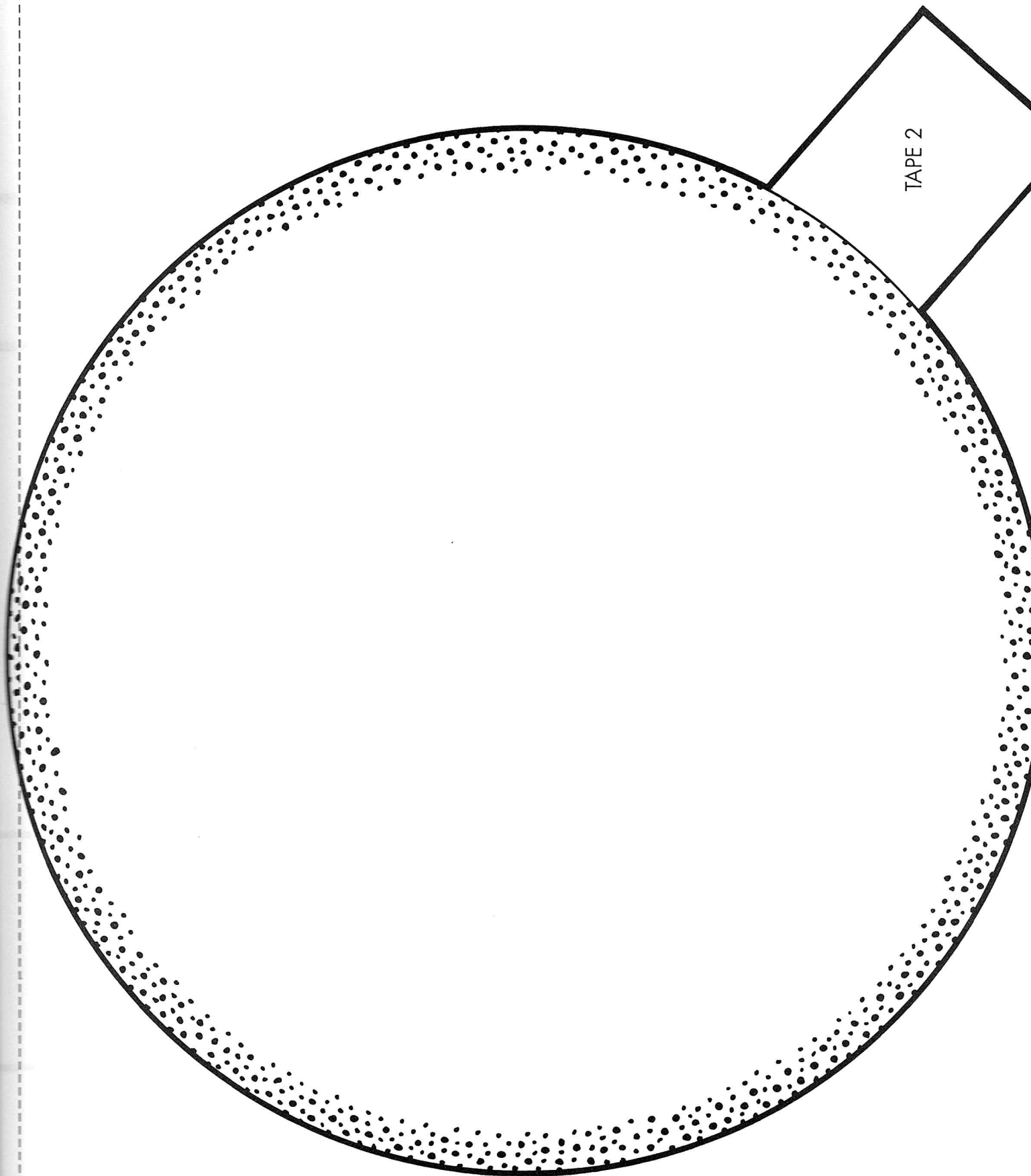
TAPE 4

TAPE 5

TAPE 1

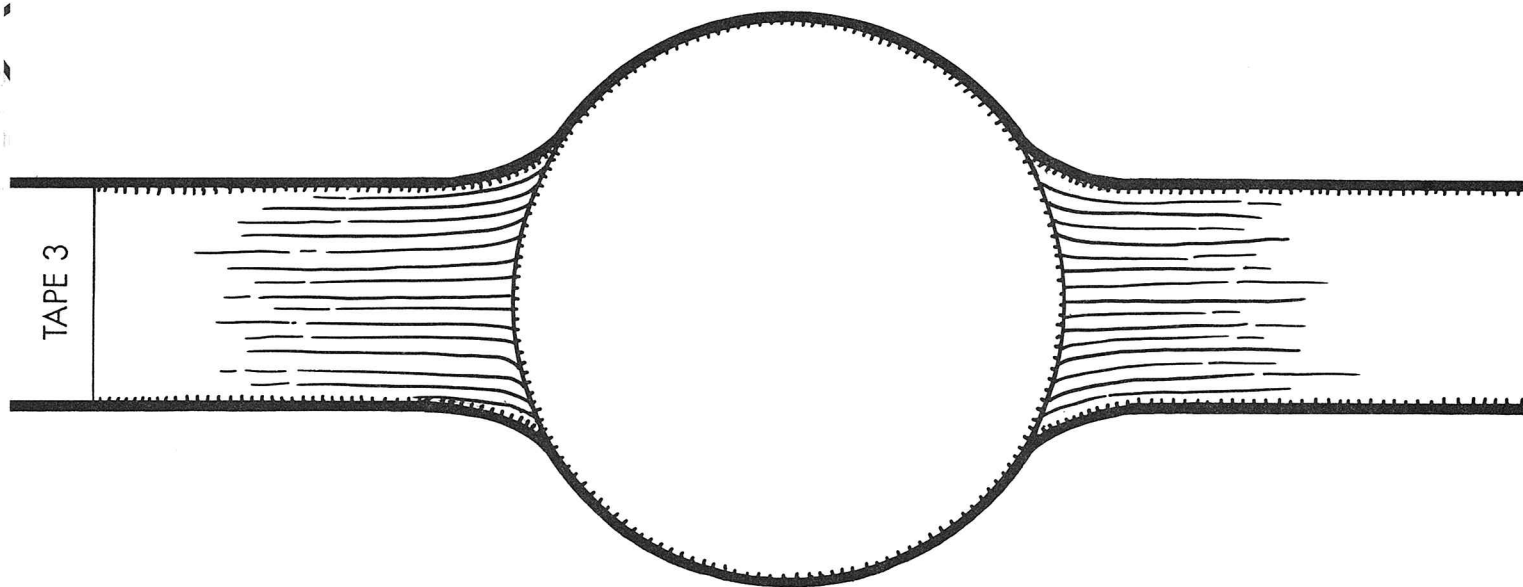


BLOOD VESSELS

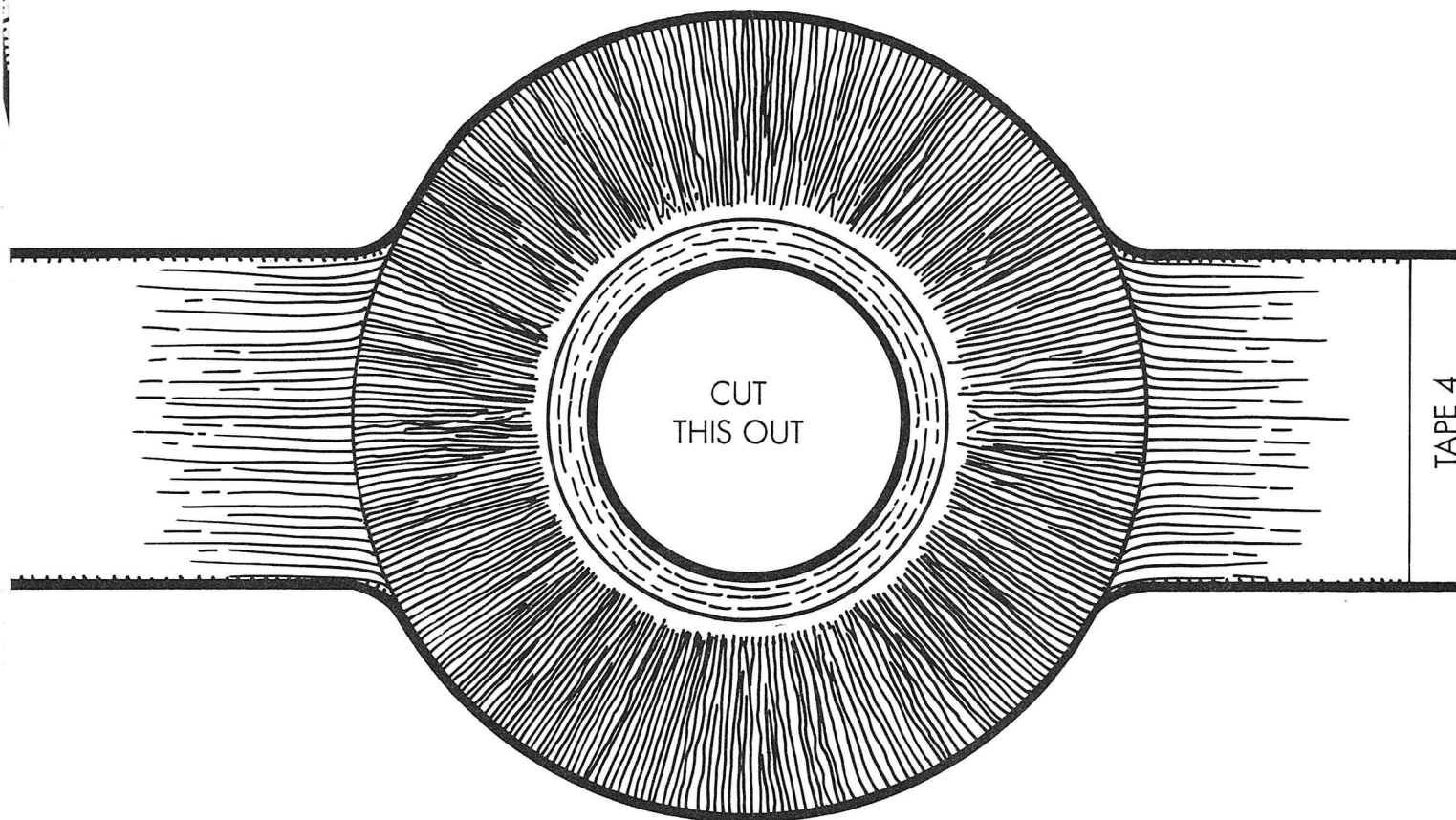


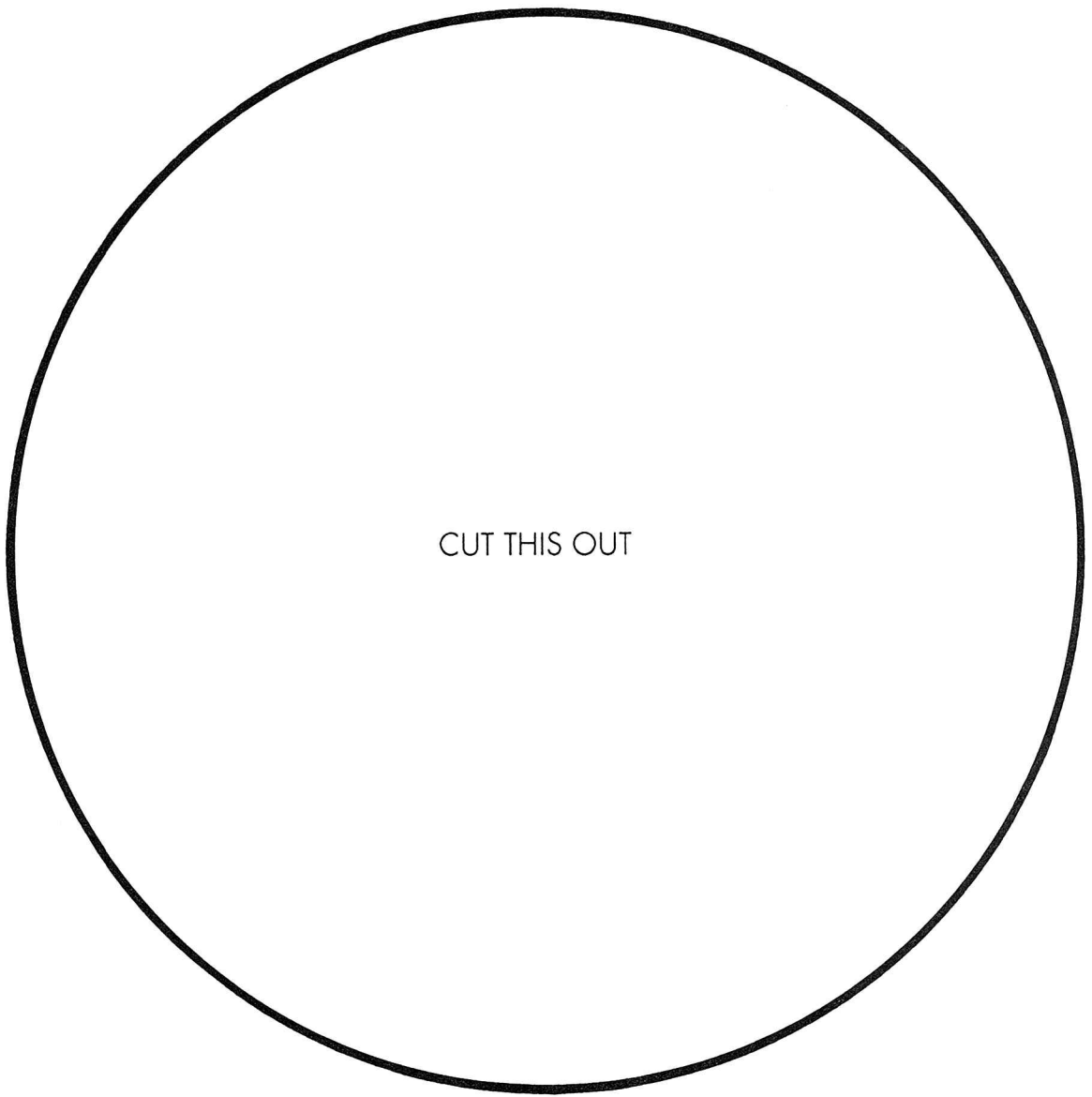
RETINA

LENS



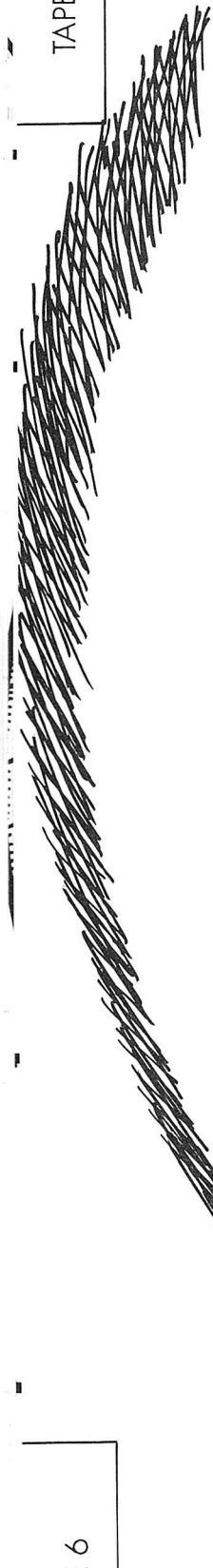
IRIS AND PUPIL





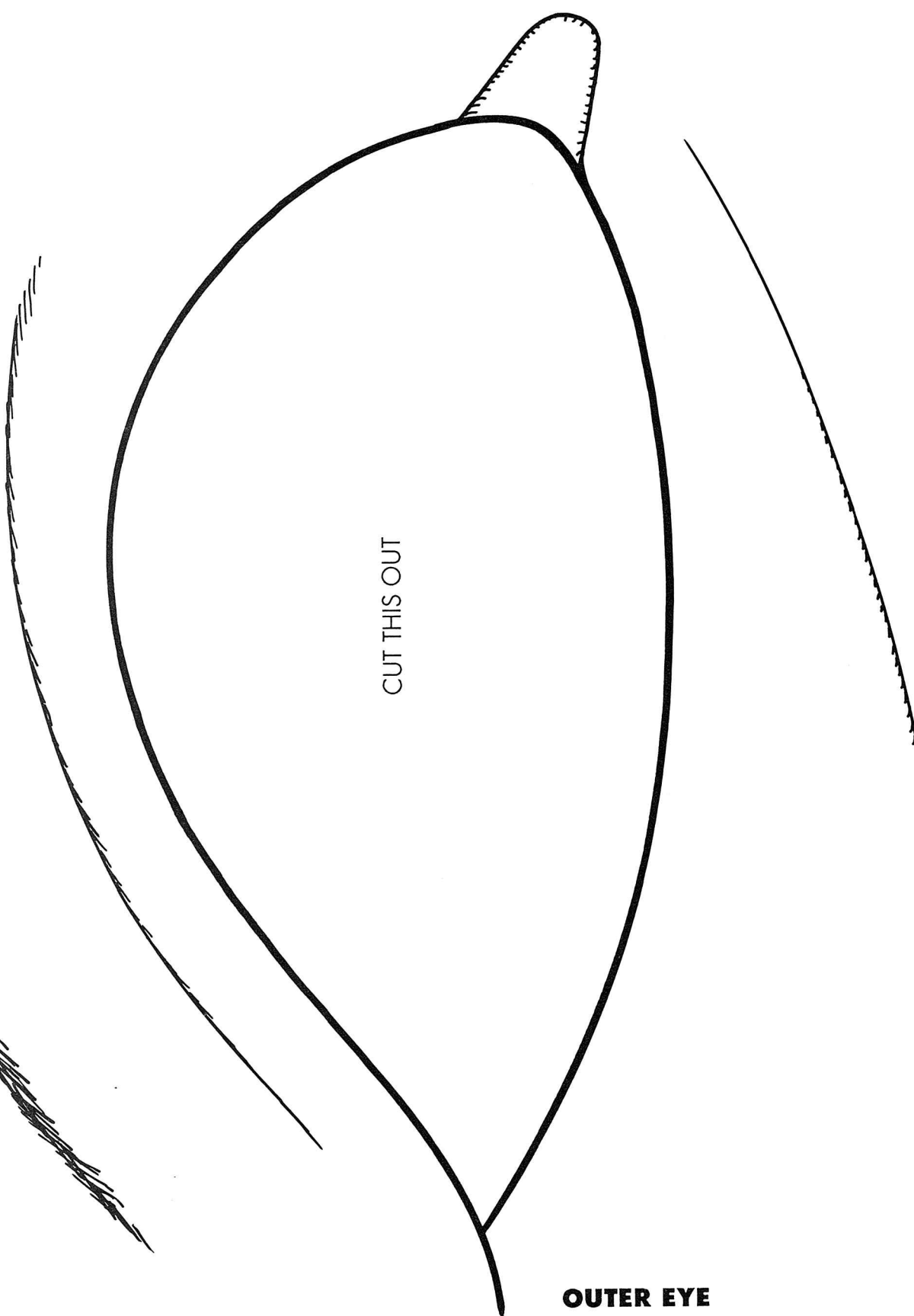
CORNEA

TAPE 6



TAPE 6

CUT THIS OUT



OUTER EYE