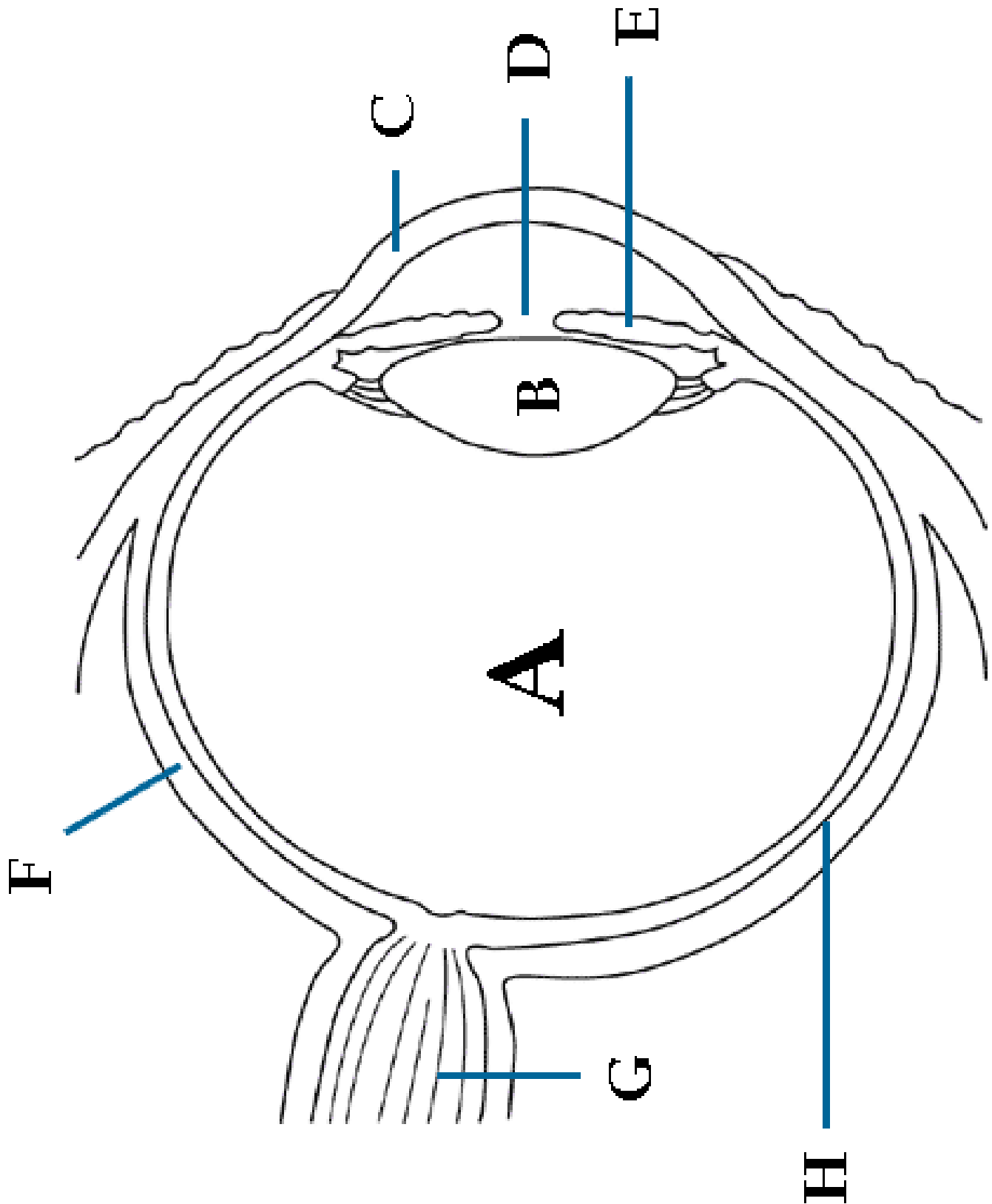


COW'S EYE dissection
Step-by-Step Instructions

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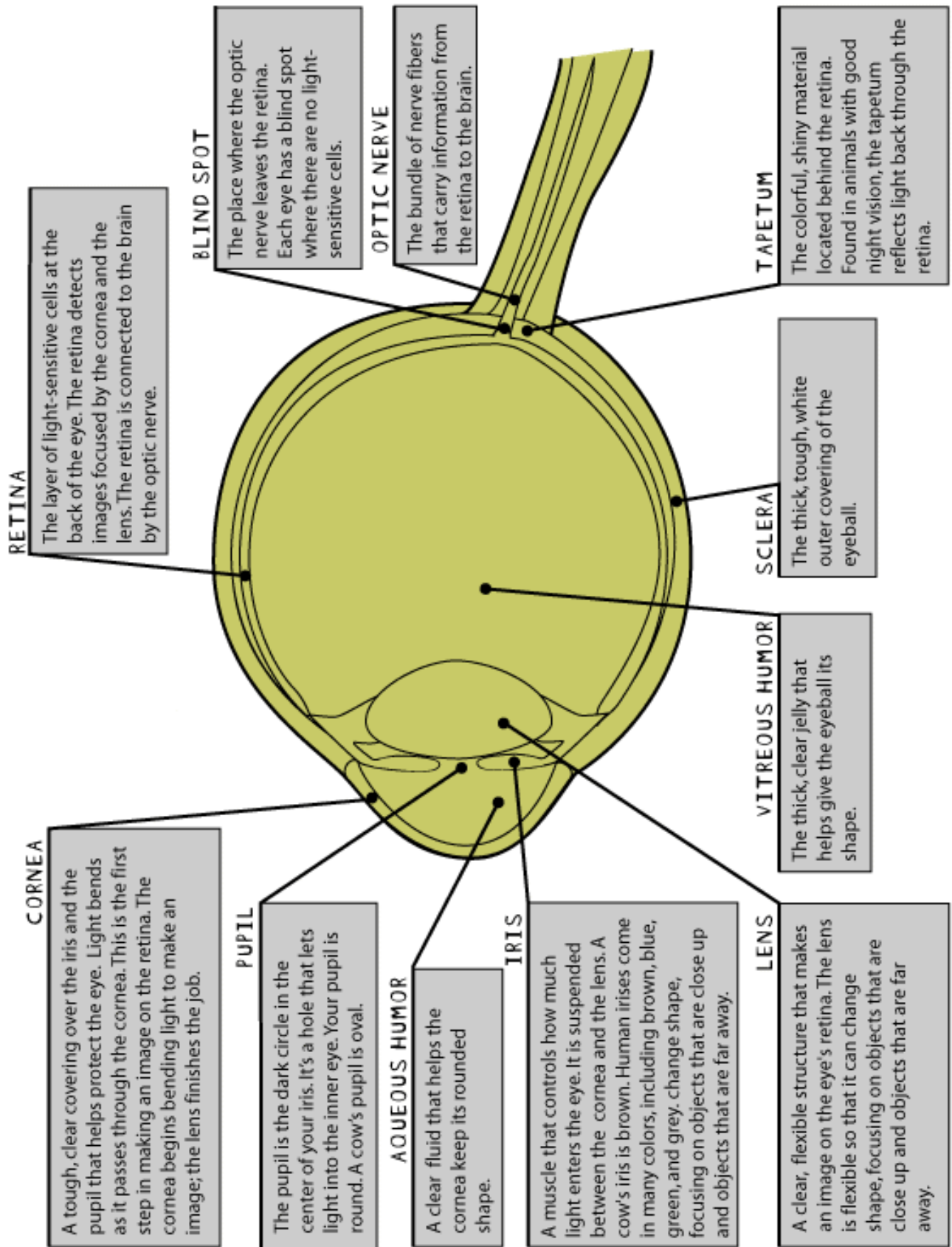
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COW'S EYE dissection

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Overview

Please read each direction out loud with your partner for this entire lab.

Remember, Safety First!

- Put on latex gloves—raw meat contains BACTERIA
- Be careful because you'll be using a scalpel and scissors to cut the cow's eye and you don't want to cut through it and into yourself!
- When you're done, you're going to want to THOROUGHLY wash the bacteria off your hands, (i.e. the full alphabet song x2!) even if you wear gloves.



Please Note: You are going to be asked to do a series of diagrams. If you wish to take photographs (also encouraged) please do so, but make sure that the cameras are well cared for. Immediately after class, please print/upload your photos and submit them via paper/email along with the notes from this activity.

Introduction: Can you find and label the parts in a cow's eye?

Examine the outside of the eye. See how many parts of the eye you can identify.

- You should be able to find the white part (or **sclera**), the tough, outer covering of the eyeball—notice how tough and strong it is... why do you think this is so?
- You should also be able to point the fat and muscle surrounding the eye.
- You should be able to find the covering over the front of the eye (the **cornea**), which is blue—when the cow was alive, the cornea was clear. In your cow's eye, the **cornea** may be cloudy.
- You may be able to look through the **cornea** and see the **iris**, the colored part of the eye, and the **pupil**, the dark oval in the middle of the **iris**.



Draw a sketch below of this step and label as much as you can, specifically the **sclera** and **cornea**. You may be able to look through the cornea and see the **iris**, the colored part of the eye, and the **pupil**, the dark oval in the middle of the iris.

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The Muscles that Control the Eye

Without moving your head, look up. Look down. Look all around.

There are six muscles attached to your eyeball and move your eye so you can look in different directions. Cows have only **four** muscles that control their eyes. They can look up, down, left, and right, but they can't roll their eyes like you can.

Fat Cushions the Eye

Reach up and feel around your eye. Describe what you feel.

In the cow's eye dissection, we cut away all the fat and muscle so that we can see the eyeball.

The Cornea Protects the Eye

A clear tough surface called the cornea covers the front of the eye and serves as protection. If you make a cut in the cornea, a clear fluid oozes out. That's the aqueous humor, which is made of protein and water. The aqueous humor helps give the eye its shape. (Sometimes it's a bit gel-like.)

The cornea is made of pretty tough stuff—it helps protect your eye. It also helps you see by bending the light that comes into your eye.

Cutting the Sclera

Now we are going to cut through the sclera, in the middle of the eye, and divide the eye in half, right around the middle. You'll end up with two halves. The cornea will be on the front half of the eye. The cornea is made of many layers of tissue.

Rotate the eye and cut around the cornea. Be careful not to cut too deep or you may cut the lens. You will hear the crunch of the scalpel as you cut through those layers. As the cornea starts to cut free, hold it in the center and make the last cuts around it.



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Once you have removed the cornea, place it on the board (or cutting surface) and cut it with your scalpel. Listen carefully. Hear the crunch? That's the sound of the scalpel crunching through layers of clear tissue. The cow's cornea has many layers to make it thick and strong. When the cow is grazing, blades of grass may poke the cow's eye—the cornea protects the inner eye.

Describe with words/pictures what you experienced. What do you see?



The Pupil Lets in Light

Ok, take a little break and look at your eye in a mirror and you'll see a colored circle with a black spot in the middle. The colored circle is the iris. The black spot in the middle of the iris is the pupil, a hole through the iris that lets light into the eye.

What do you predict will happen when you shine a flashlight near your eye?

Now try it. Draw two diagrams of the pupil and iris, one *before* the flashlight is on and one *after* it is shown. Be sure to label all the important parts.

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The Lens

Here is the back half of the eye. With the cornea and the iris out of the way, you can see the lens. It looks gray in this photo, but it's really clear.

The clear goo around the lens is the vitreous humor. The eyeball stays round because it's filled with this clear goo.

The next step is to pull out the iris. The iris is between the cornea and the lens. It may be stuck to the cornea or it may have stayed with the back of the eye. Find the iris and pull it out. It should come out in one piece.



You can see that there's a hole in the center of the iris. What is this hole's job?

Looking Through the Lens

Draw a diagram of what you have thus far.

What do you see if you look through the lens?

What does it feel like?

Put the **lens** down on a newspaper and look through it at the words on the page. What do you see?

What does the lens do?

Does it have even thickness? Why/why not?

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The Retina

Now take a look at the rest of the eye. If the vitreous humor is still in the eyeball, empty it out. On the inside of the back half of the eyeball, you can see some blood vessels that are part of a thin fleshy film. That film is the retina.

Before you cut the eye open, the vitreous humor pushed against the retina so that it lay flat on the back of the eye. It may be all pushed together in a wad now.

The retina is made of cells that can detect light. The eye's lens uses the light that comes into the eye to make an image, a picture made of light. That image lands on the retina. The cells of the retina react to the light that falls on them and send messages to the brain.

The Retina is Attached in One Spot

Use your finger to push the retina around. The retina is attached to the back of the eye at just one spot. Can you find that spot?

Draw and describe it below.



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As you probably guessed, that's the place where nerves from all the cells in the retina come together. All these nerves go out the back of the eye, forming the **optic nerve**, the bundle of nerves that carries messages from the eye to the brain. The brain uses information from the retina to make a mental picture of the world.

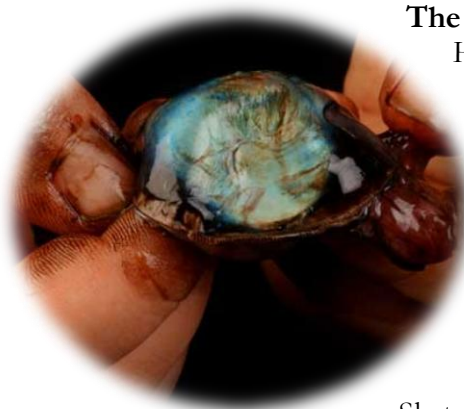
The spot where the retina is attached to the back of the eye is called the **blind spot**. Because there are no light-sensitive cells at that spot, you can't see anything that lands in that place on the retina.



The Tapetum

Here's the inside of the back of the eye again. Behind the retina is a layer of shiny, blue-green stuff called the **tapetum**. It reflects light from the back of the eye.

Have you ever seen a cat's eyes shining in the headlights of a car? Cats, like cows, have a **tapetum**. A cat's eye seems to glow because the cat's **tapetum** is reflecting light. If you shine a light at a cow at night, the cow's eyes will shine with a blue-green light because the light reflects from the **tapetum**.



Sketch a cartoon of this phenomenon in the space below.

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The Optic Nerve Carries Messages to the Brain



Look at the other side of the back of the eye. Can you find the optic nerve?

To see the separate fibers that make up the optic nerve, pinch the nerve with a pair of scissors or your fingers.

If you squeeze the optic nerve, you may get some white goop.

That is myelin, the fatty layer that surrounds each fiber of the nerve.

Write what you know about myelin in the space below.

Please reflect on this lab. How was it for you? Did you find it useful? Do you understand the form and function of the eye any better? Any suggestions for future lab dissections?

Clean-up

When you're done dissecting the cow's eye, wrap all the pieces of the eye in plastic and throw them away. If you used a scalpel blade, handle it carefully. Remember to wash your hands **THOROUGHLY!**

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Glossary

Aqueous humor: A clear fluid that helps the cornea keep its rounded shape.

Blind spot: The place where all nerves from the retina join to form the optic nerve. Each eye has a blind spot where there are no light-sensitive cells.

Cones: One kind of light-sensitive cell in the retina. Cones give you color vision in bright light.

Cornea: A tough, clear covering over the iris and the pupil that helps protect the eye. Light bends as it passes through the cornea. The cornea begins bending light to make an image; the lens finishes the job.

Iris : A muscle that controls how much light enters the eye. It is suspended between the cornea and the lens. A cow's iris is brown. Human irises come in many colors, including brown, blue, green, and gray.

Lens: A clear, flexible structure that makes an image on the eye's retina. The lens is flexible so that it can change shape, focusing on objects that are close up and objects that are far away.

Myelin: The fatty layer that surrounds each nerve fiber.

Optic nerve: The bundle of nerve fibers that carry information from the retina to the brain.

Pupil: The pupil is the dark circle in the center of your iris. It's a hole that lets light into the inner eye. Your pupil is round. A cow's pupil is oval.

Retina: The layer of light-sensitive cells at the back of the eye. The retina detects images focused by the cornea and the lens. The retina is connected to the brain by the optic nerve.

Rods: One kind of light-sensitive cell in the retina. Rods respond in dim light.

Sclera: The thick, tough, white outer covering of the eyeball.

Tapetum: The colorful, shiny material located behind the retina. Found in animals with good night vision, the tapetum reflects light back through the retina.

Vitreous humor: The thick, clear jelly that helps give the eyeball its shape.