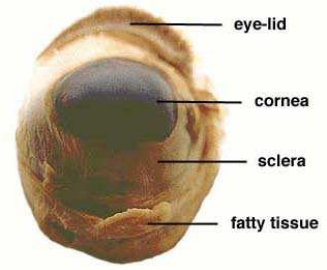
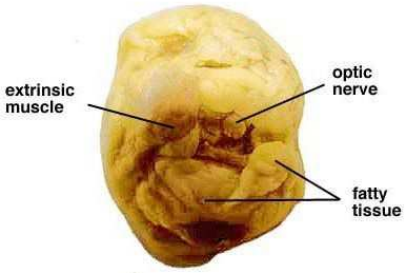
Sheep Eye Dissection Instructions

The anatomy of the human eye can be better shown and understood by the actual dissection of an eye. One eye of choice for dissection, that closely resembles the human eye, is that of the sheep. Sheep eyes are removed at the time the animal is slaughtered and then preserved for later use. Differences between the two eye types will be mentioned as the dissection is completed.

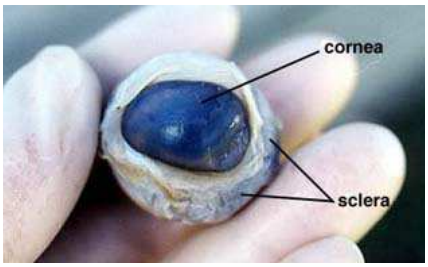
Begin the dissection by gathering the equipment and supplies listed here (sheep eye, dissecting pan, scissors, single edge razor blade, probe, forceps, paper towels and a notebook and pencil for recording information about the eye as it is dissected).

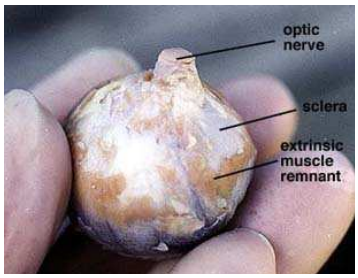




PART 1: External Anatomy of the eye

Step 1: Wash the sheep eye in running water to remove the preservative fluid. Dry the eye with paper toweling. Examine the front of the eye and locate the eye-lid, cornea, sclera (white of the eye) and **fatty tissue**. Examine the back of the eye and find **extrinsic muscle bundles** (brown), fatty tissue (yellow) and the optic nerve. The four extrinsic muscles (humans have six) move the sheep eye while the fatty tissue cushions the eye. If the optic nerve is not visible use the probe to move the fatty tissue around until the nerve is exposed.





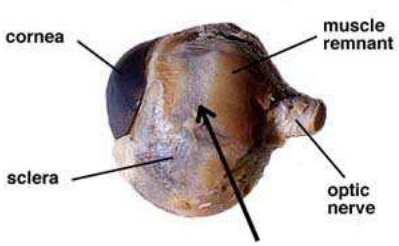
Step 2: Use your scissors to cut away the eye-lid, muscle and fatty tissue from both the front and rear surfaces of the eye. Be careful not to remove the optic nerve. Cut along the surface of the sclera until all the tissue is removed and your specimen looks similar to the photographs you see here. The sclera is very tough so you do not need to worry about cutting into this layer of the eye. When you have finished removing the tissue surrounding the eye identify the **sclera**, **cornea**, **optic nerve**, and the remaining extrinsic muscle remnants. The cloudy nature of the cornea is caused by the death of this tissue. It is transparent in the living state.

IDENTIFY THESE STRUCTURES ON STUDENT LAB SHEET:

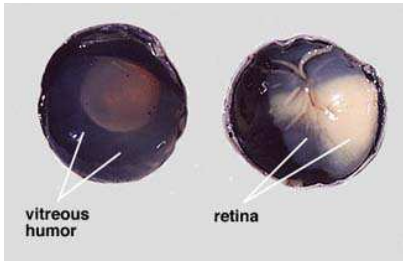
★ Eye lid ★ Cornea ★ Sclera ★ Optic Nerve ★ External Eye Muscle ★ Fatty Tissue

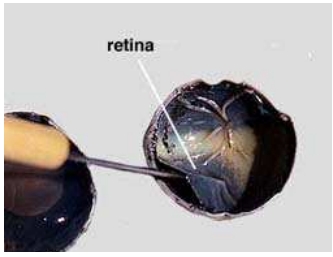
Part 2: Internal Posterior Anatomy

Step 3: Place your eye specimen in the dissection pan. Turn the specimen so the cornea is on the left and the optic nerve is on your right. Select a place to make an incision of the sclera midway between the cornea and optic nerve. Use the point of a very sharp razor blade to make a small cut through the sclera. Fluid should ooze out of the eyeball when you have cut deeply enough. You will be reminded of how tough the sclera is when you make this cut.

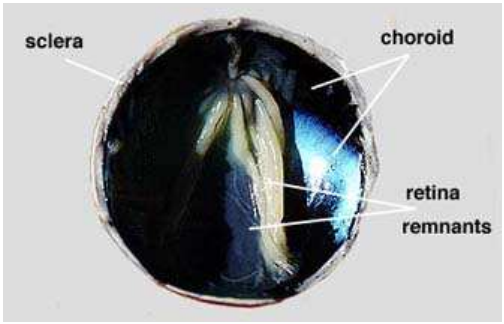


Step 4: Insert the point of the scissors into the slit and cut the sclera with a shallow snipping motion. Turn the eye as you continue the cutting action. Cut the sclera all the way around the ball of the eye. You will need to support the eye in the palm of your hand while you complete this step of the dissection. Do not be surprised if some fluid from the eye oozes from the slit as you make this cut. Take the notes you need to record what you have observed so far.





Step 5: Arrange the two hemispheres of the eye as you see in the left photograph. Observe the semi-fluid **vitreous humor** that fills the central cavity of the eye. It is transparent in the living eye but might be cloudy in the preserved specimen. The vitreous humor along with the aqueous humor helps to maintain the shape of the eye. More will be said about the aqueous humor later. The **retina** lines the posterior cavity of the eye and extends forward to the ciliary body. Use your probe to lift and pull the retina back from the underlying **choroid** layer. See the photograph on the right side above. Notice that the retina is only firmly attached to the choroid at one place. This region is the optic disc or **blind spot**. Here the nerve fibers leave the retina and form the optic nerve which is directly behind the blind spot. Take the notes you need to record what you have observed so far.



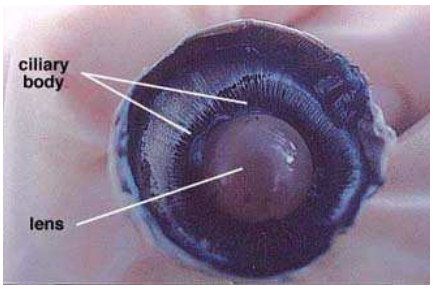
Step 6: Use your forceps to peel the retina away from the underlying choroid coat. The retina should remain attached at the blind spot. The choroid coat is dark and relatively thin. Use your forceps or probe to gently separate the choroid from the outer sclera. Verify that the eye has three distinct layers, the retina, choroid and sclera. See left photograph above. The choroid contains an extensive network of blood vessels that bring nourishment and oxygen to itself and the other two layers. The dark color, caused by pigments, absorbs light so that it is not reflected around inside of the eye. The **tapetum lucidum**, which is not found in the human eye, functions to reflect light onto the retina. It especially helps animals with night vision since it can reflect light even at very low intensities. It is shiny, glittering with a bluish color. In just a moment you will see that the choroid extends forward to the ciliary body.

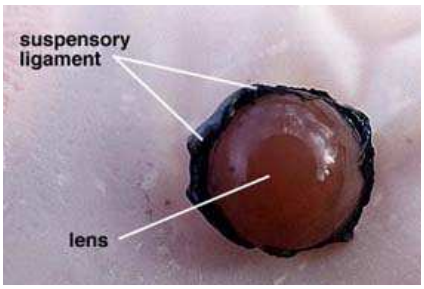
IDENTIFY THESE STRUCTURES ON STUDENT LAB SHEET:

★ Vitreous Humor ★ Retina ★ Blind Spot ★ Choroid ★ Lift up layers of retina & Choroid

Part 3: Anterior Interior Anatomy

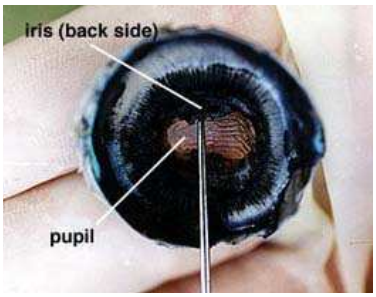
Step 7: Use your forceps and probe to remove the vitreous humor from the anterior hemisphere of the eye. See right photograph above. This will take some time and effort as the semi-fluid material separates easily. It helps to turn the hemisphere on edge and to use a scrapping motion to remove the fluid. Try not to disturb the lens that is just below the vitreous humor.





Step 8: Removal of the vitreous humor reveals the **lens**, **ciliary body**, and **suspensory ligaments**. In the normal condition the lens is transparent except, when as a condition of aging, the lens turns cloudy. The cloudy condition, called cataract, prevents or reduces the amount of light reaching the retina. Cataract can be treated by removing the lens and replacing it with a stiff artificial one. The normal lens is convex shaped and somewhat elastic. It is held in place by the suspensory ligaments that in turn join with the smooth muscle containing ciliary body. When the smooth muscle fibers contract the resulting force flattens the lens and the degree of bending of the light rays is reduced. Relaxation of the smooth muscle results in a thickening of the lens and a greater bending of the rays of light.

Step 9: Remove the lens by pulling it free from its attachments. Note the shape of the lens, its stiffness and opaqueness. Suspensory ligaments may also be visible along the edge of the lens. Take the notes you need to record what you have observed so far.



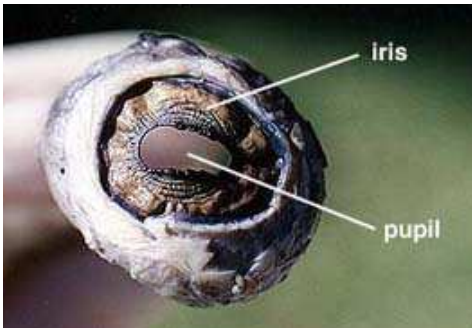
Step 10: When the lens is removed, an opening, allowing light to enter the eye is seen. This opening, the pupil is located in the center of the iris. Two muscle layers of the iris regulate the size of the pupil. One layer increases the pupil size with decreasing light intensity and the other layer reduces pupil size with increasing light intensity. Note the oblong shape of the sheep pupil, in humans the pupil is circular. The back side of the iris can be seen just above the pointer in the photograph. Part of the iris is being lifted by the pointer but the iris continues all the way around the pupil opening.

A second cavity or space is present between the iris and the cornea. This space is filled with a second semi-liquid fluid, the aqueous humor. This fluid, like the vitreous humor helps to maintain the shape of the eye. Glaucoma is a condition where the fluid pressure becomes too high causing eye damage.

IDENTIFY THESE STRUCTURES ON STUDENT LAB SHEET:

★ Ciliary Body/Muscle ★ Lens ★ Suspensory Ligament ★ Iris ★ Pupil ★ Aqueous Humor

Part 4: Removal of Cornea and Lens



Step 11: Remove the cornea from the front eye hemisphere. Use a razor blade to puncture a small slit at the boundary between the **cornea** and **sclera**. Then insert the scissors into the slip and cut all the way around the cornea to remove it. Notice the thickness of the cornea. How does it compare to the thickness of the sclera? Carefully observe the front side of the iris and pupil. What shape is the sheep's pupil? How does it compare to the shape of the human pupil? Notice that the back or posterior color of the iris is black while the anterior or front of the iris is colored. What color is your sheep's eye?

Step 12: Find the lens. Wash all the ligaments and vitreous gel from the lens. Use your fingernails to tear the lens apart and observe the texture of the lens.

IDENTIFY THESE STRUCTURES ON STUDENT LAB SHEET:

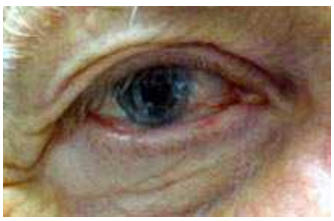
- Color of Anterior view of Iris

Lab: Sheep Eye Dissection Student Sheet

- The teacher will sign off on the following parts as you find them.
- You should be able to explain their function when you show them to your teacher.

Part 1: External Anatomy (Follow Steps 1 & 2.)

Identify:



- External Eye Muscle
- Cornea
- Sclera
- Optic Nerve
- Fatty Tissue

Questions:

1. Why don't you have to worry about cutting into the sclera when you are removing the extrinsic muscles and fatty tissue?
2. How does the fat tissue look different from the muscle tissue?

Part 2: Posterior Anatomy (Follow Steps 3-6)

Identify:

- Vitreous Humor
- Retina
- Blind Spot
- Choroid
- Lift up layers of retina & Choroid

Questions:

3. What is the "Posterior"?
4. How did you find out that the sclera is so tough?

Part 3: Anterior Anatomy (Steps 7, 8, 9. 10)

Identify:

- Ciliary Body (Muscle)
- Lens
- Iris (Back Side)
- Pupil
- Suspensory Ligament

Questions:

5. What is the "Anterior"?
6. How do ciliary bodies (muscles) help you see?
7. What is a cataract?
8. Which structure of the eye would be just behind the pupil opening?
9. What is "Glaucoma"?

Part 4: Cornea and Lens (Step 11&12)

Identify:

- Iris (color on front side)
- Lens texture

Questions:

10. How does the thickness of the cornea compare to the thickness of the sclera?
11. What color is your sheep's eye?
12. Describe the texture of the lens.
13. What shape is the sheep's pupil? How does it compare to the shape of the human pupil?