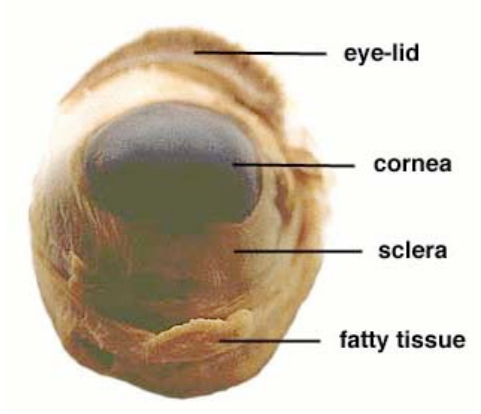
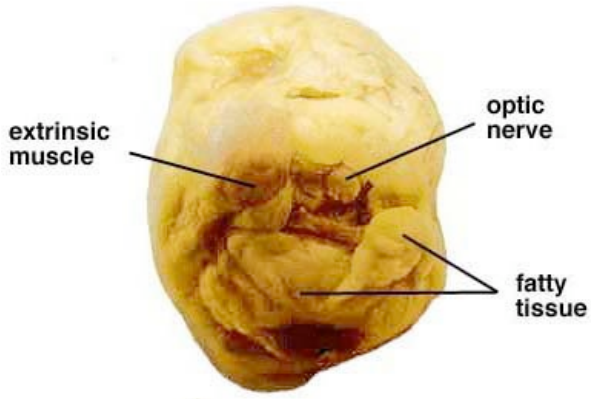
Sheep Eye Dissection Guide

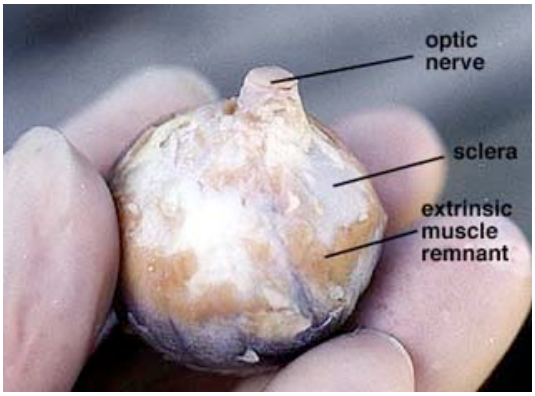
The anatomy of the human eye can be better shown and understood by the actual dissection of an eye. One eye of choice for dissection, that closely resembles the human eye, is that of the sheep. Differences between the two eye types will be mentioned as the dissection is completed.





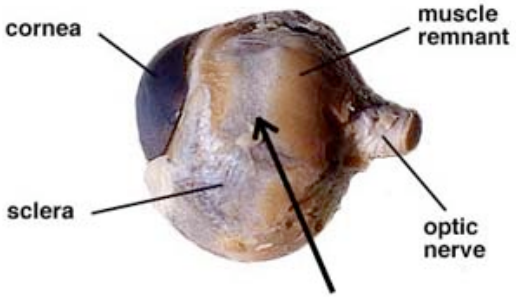
Step 1:

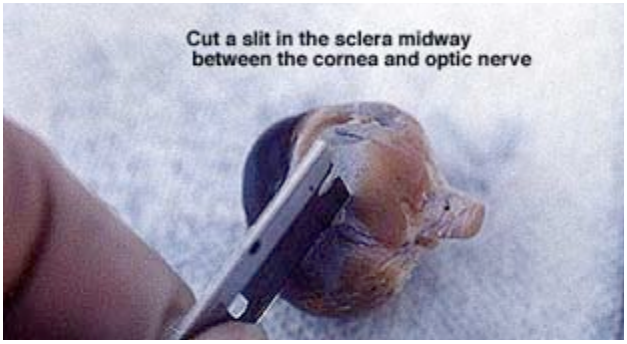
Wash the sheep eye in running water to remove the preservative fluid. Dry the eye with paper toweling. Examine the front of the eye and locate the eye-lid, cornea, sclera (white of the eye) and fatty tissue. Examine the back of the eye and find extrinsic muscle bundles, fatty tissue and the optic nerve. 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 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.





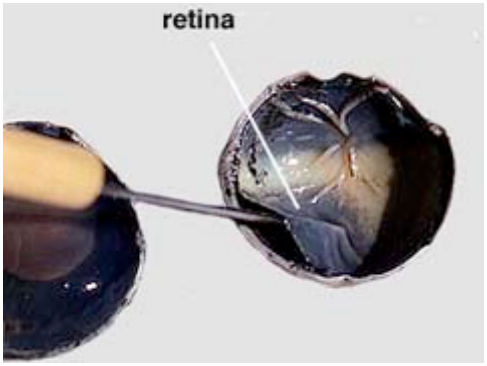
Step 3:

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 scalpel 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.


Insert the point of the scissors into the slit and cut the sclera all the way around the ball of the eye.

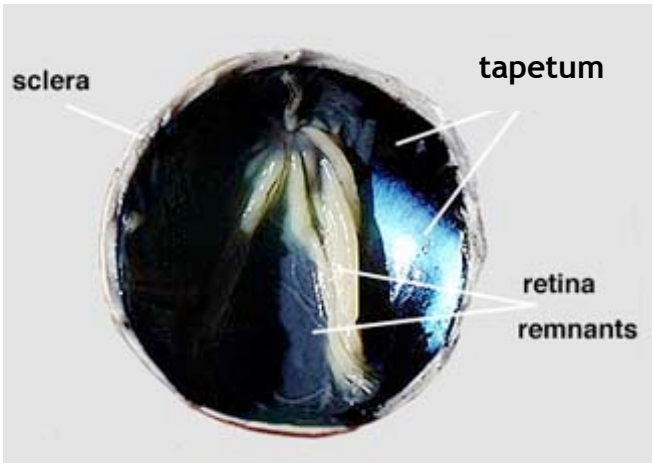
Step 4:

Insert the point of the scissors into the slit made by the scalpel 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.***



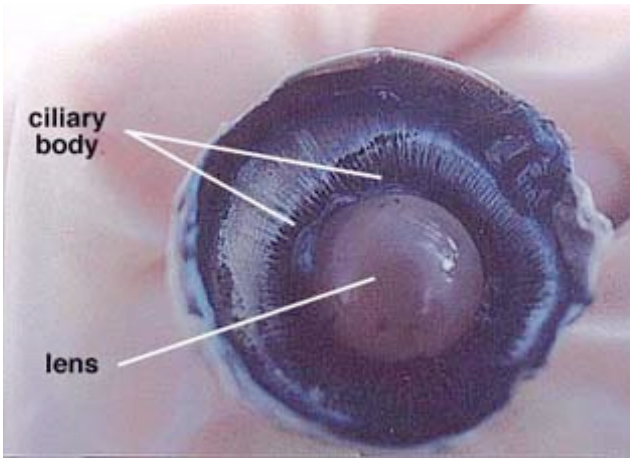
Step 5:

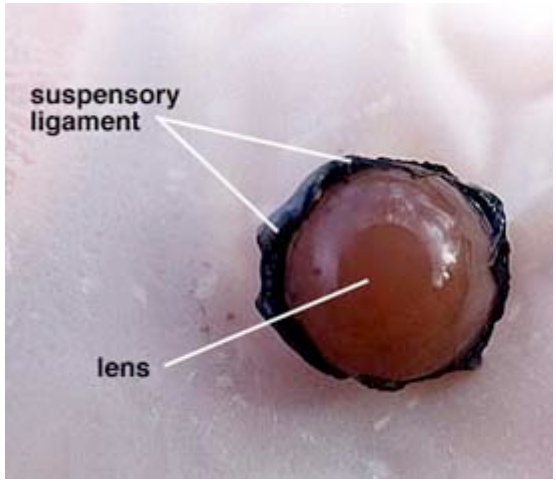
Arrange the two hemispheres of the eye as you see in the left photograph. Observe the semi-fluid vitreous humor that fills the central cavity of the eye. It is transparent in the living eye but might be cloudy in the preserved specimen. The vitreous humor along with the aqueous humor helps to maintain the shape of the eye. Use your probe to lift and pull the retina back from the underlying layer. 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.



Step 6: Use your forceps to peel the retina away from the underlying layers. The retina should remain attached at the blind spot. Under the retina, the back of the eye is covered with a shiny colorful layer called the tapetum. Humans don't have a tapetum, its only found in animals with good night vision. The tapetum reflects light back out of the eye to help them see better at night.

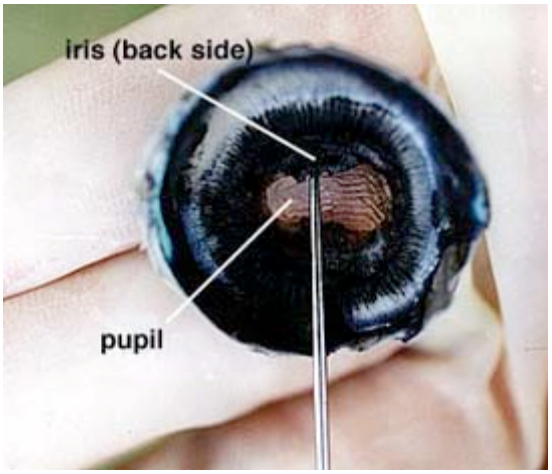
Step 7: Use your forceps and probe to remove the vitreous humor from the anterior hemisphere of the eye. See right photograph above. This will take some time and effort as the semi-fluid material separates easily. It helps to turn the hemisphere on edge and to use a scrapping motion to remove the fluid.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





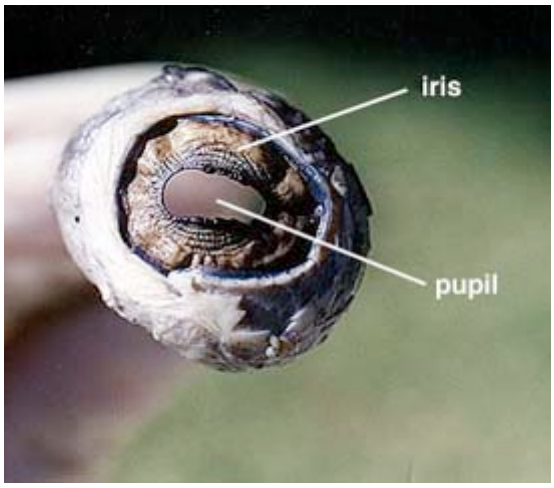
Step 8: Removal of the vitreous humor reveals the lens, ciliary body and suspensory ligaments which you should identify and observe. In the normal condition the lens is transparent except, when as a condition of aging, the lens turns cloudy. The cloudy condition, called cataract, prevents or reduces 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 and set it aside on your towel. Note the shape of the lens, its stiffness and opaqueness. Suspensory ligaments may also be visible along the edge of the lens.



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.

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.



Step 11: Remove the cornea from the front eye hemisphere. Use the scalpel 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. Which structure of the eye would be just behind the pupil opening?

Step 12: Lay out your dissected structures so you can easily identify them. You should be able to identify/label the following:

- ☐ iris
- ☐ pupil
- ☐ sclera
- ☐ cornea
- ☐ lens
- ☐ retina
- ☐ tapetum
- ☐ optic nerve

Step 13: Clean up!

Step 14: Answer the questions for homework. You will need to use the glossary and information in this packet to help you answer the questions.

Glossary

EYE ANATOMY

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.