6th Grade Science 10/28/18

EQ: How do color sensors work?

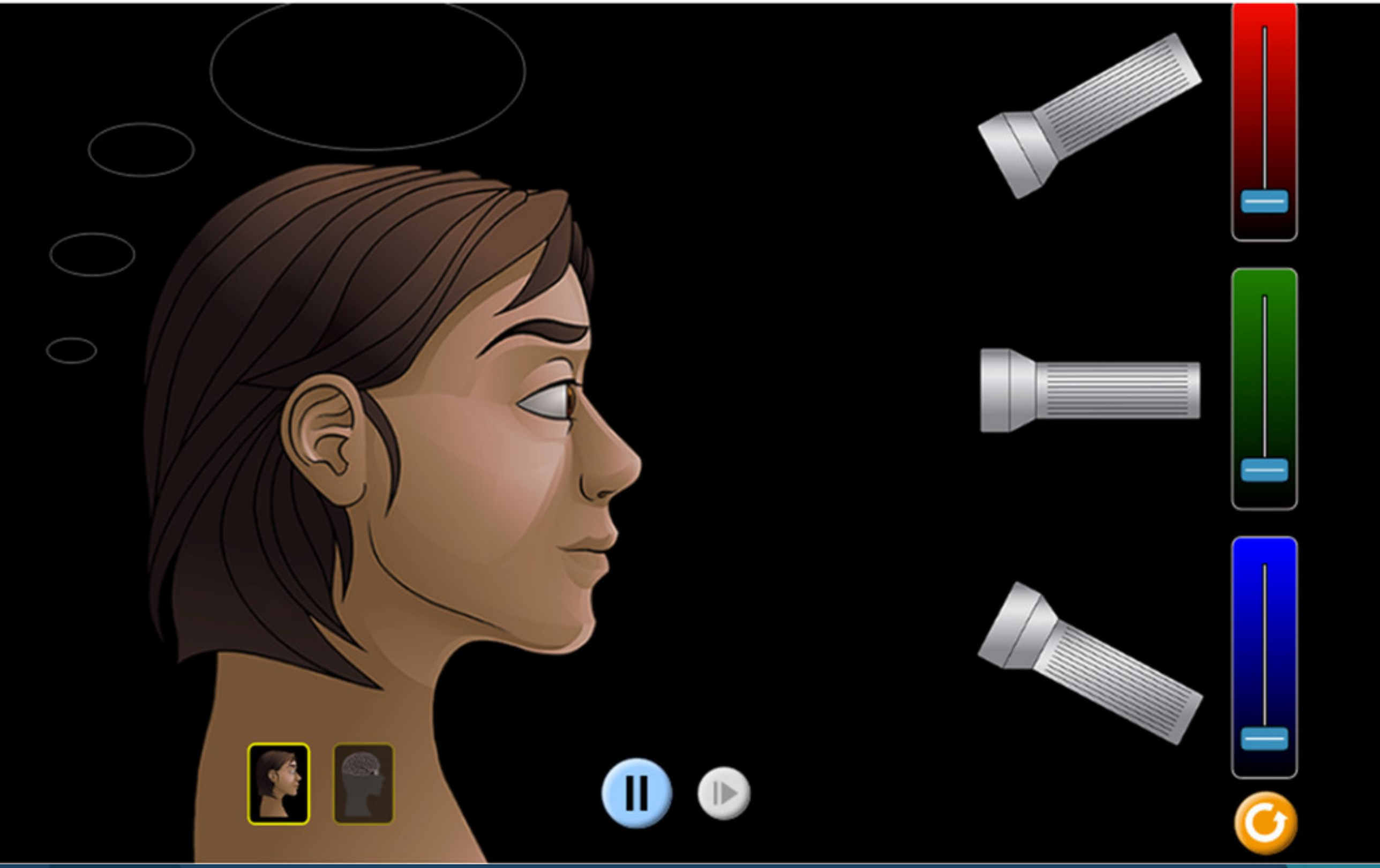
CW: Activity 9.3

HW: Reading 9.3 Making color photographs pgs. 111-113
Mark the text as you read and answer questions.

Agenda

- Activity 9.3

- Marking the Text: Reading 9.3



Making Sense

- Computers can only emit red, green and blue light. Yet, your computer screen shows a picture with green grass, a blue sky, a yellow sun and a brown house. How do you think the screen makes these different colors?

Pg. 93

ACTIVITY 9.3 – HOW COLOR SENSORS WORK

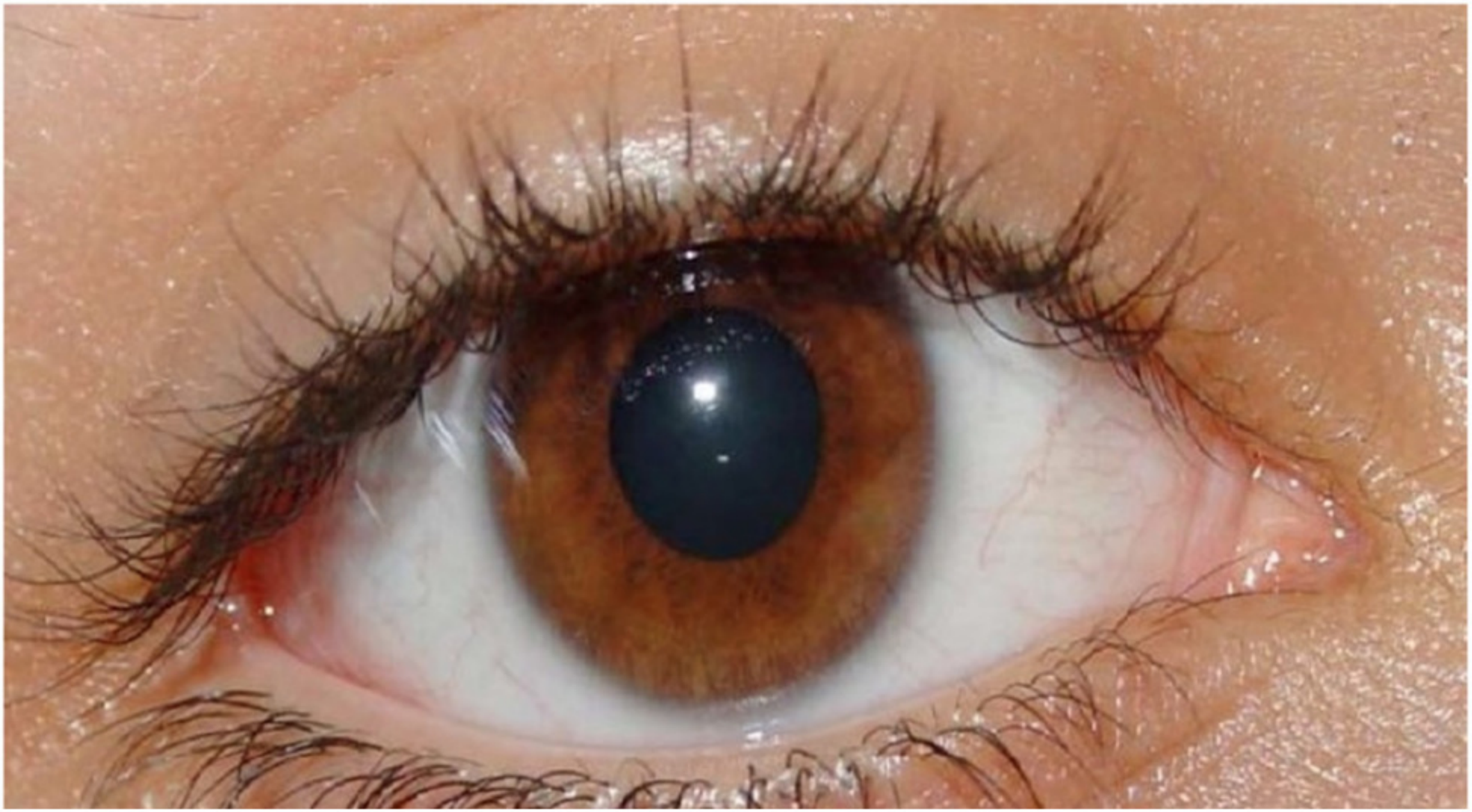
What Will We Do?

We will learn how the eye and digital cameras detect different colors of light. We will also learn why mixtures of colors of light appear to our eyes to be new colors.

Procedure

1. Look at the images that describe the structure of two things: the human eye and a digital camera. Use the space provided to take notes.

Based on what we have learned about light, why do you think the pupil looks black with a white spot on it?

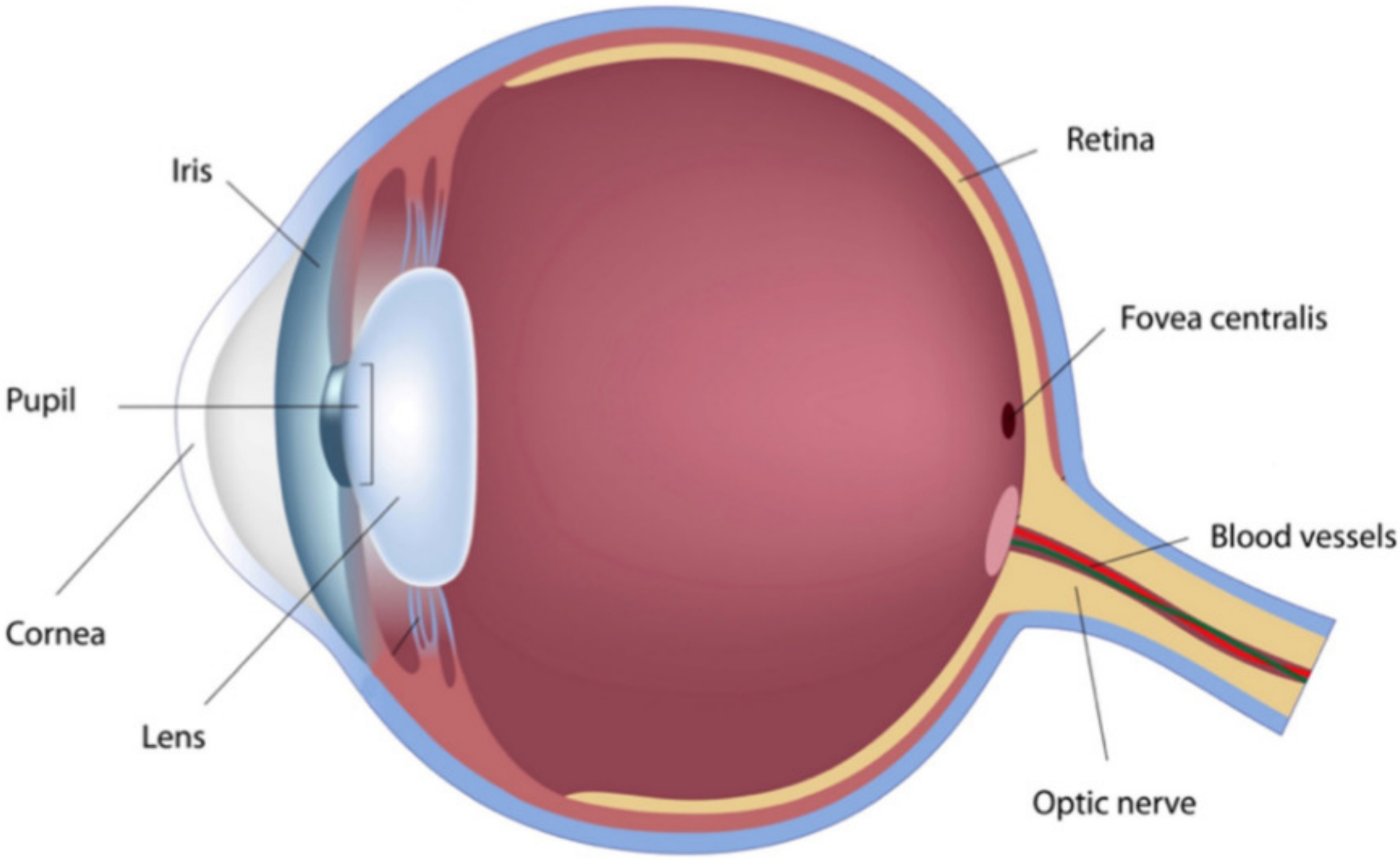


Open Ended Question

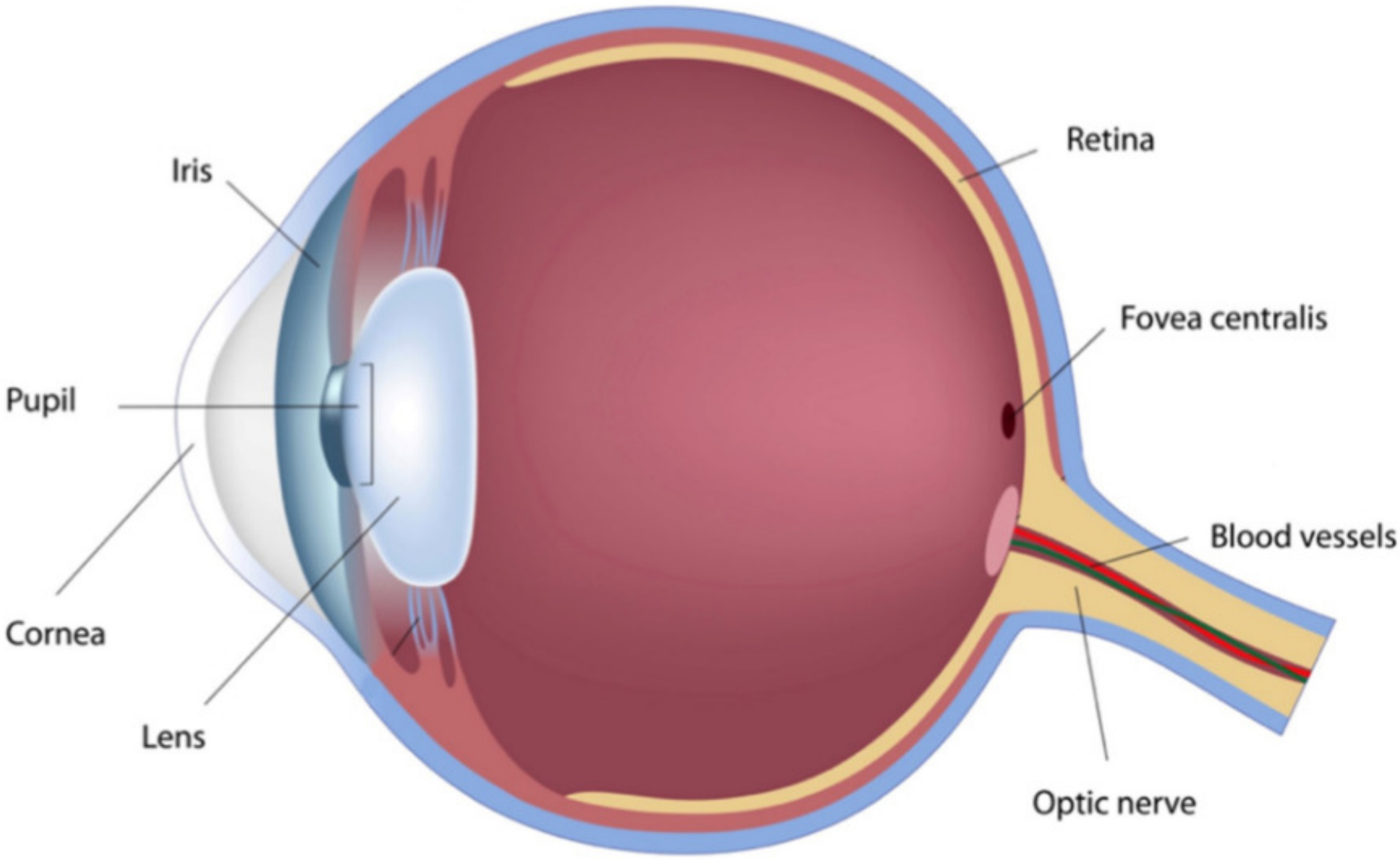
Based on what we have learned about light, why do you think the pupil looks black with a white spot on it?

Please enter your answer here.

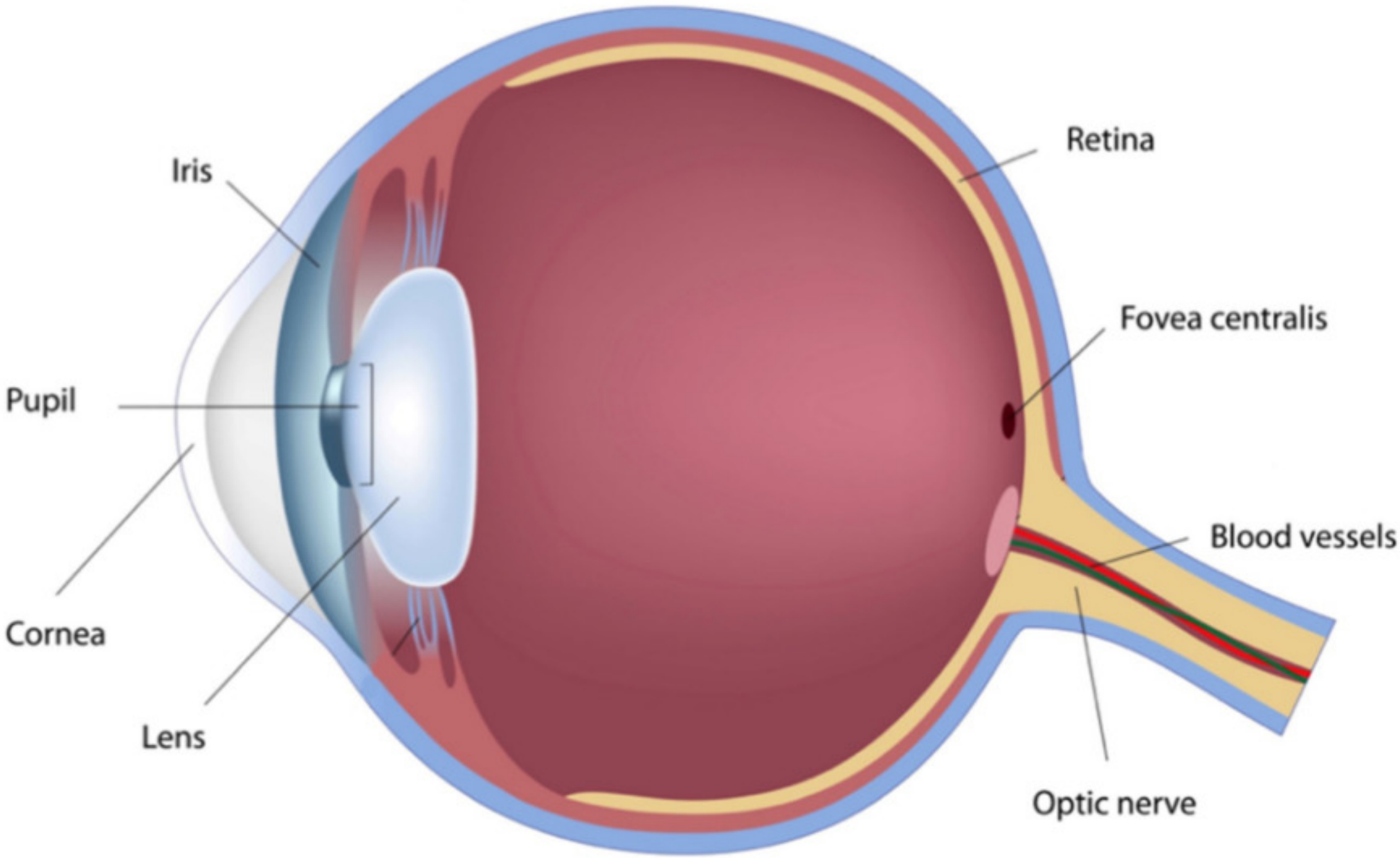
When a person sees an object, light from the object comes from the left and enters the eye through the cornea and then through the lens, which is another high-



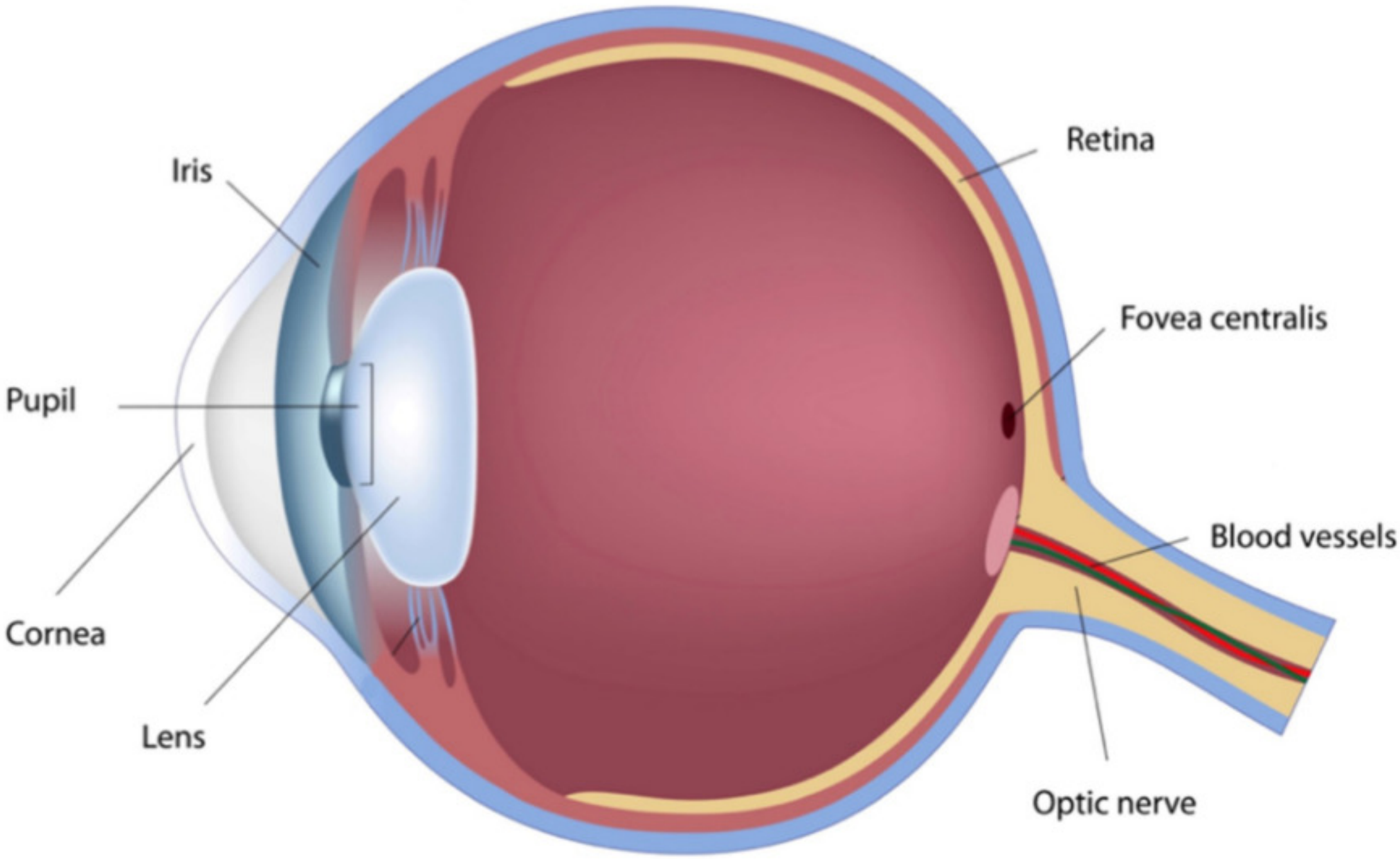
The iris is the name for the colored ring you can see around the pupil.



The light continues through the eye (which is filled with a transparent water-based fluid) and reaches the back of the eye, called the retina, where it is almost completely absorbed.

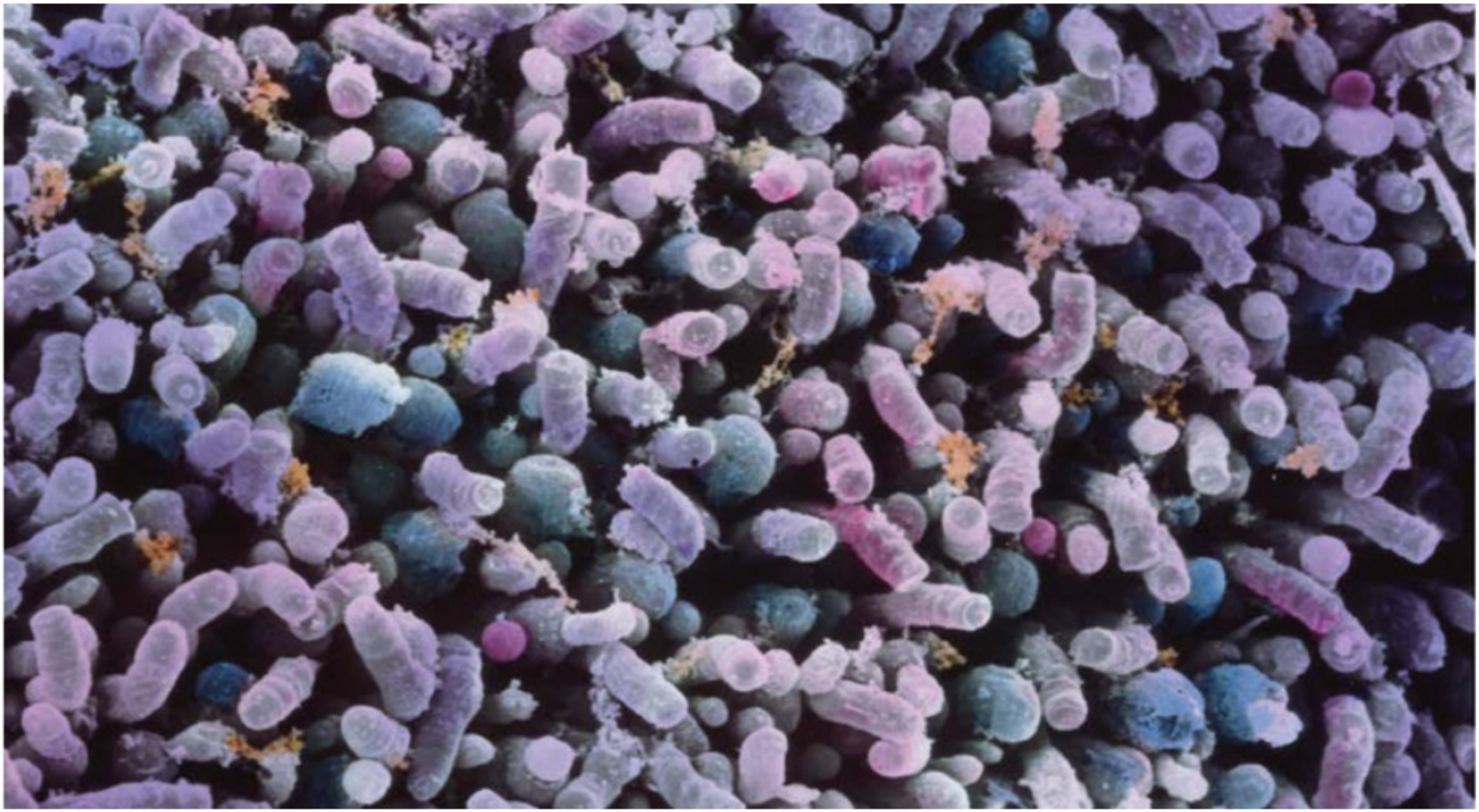


You may have seen photos where the people have red eyes. This red-eye effect is the result of red light that has been reflected by the retina, come back out of the eye through the lens, pupil, and cornea, and continued moving to the left until it reaches the camera.

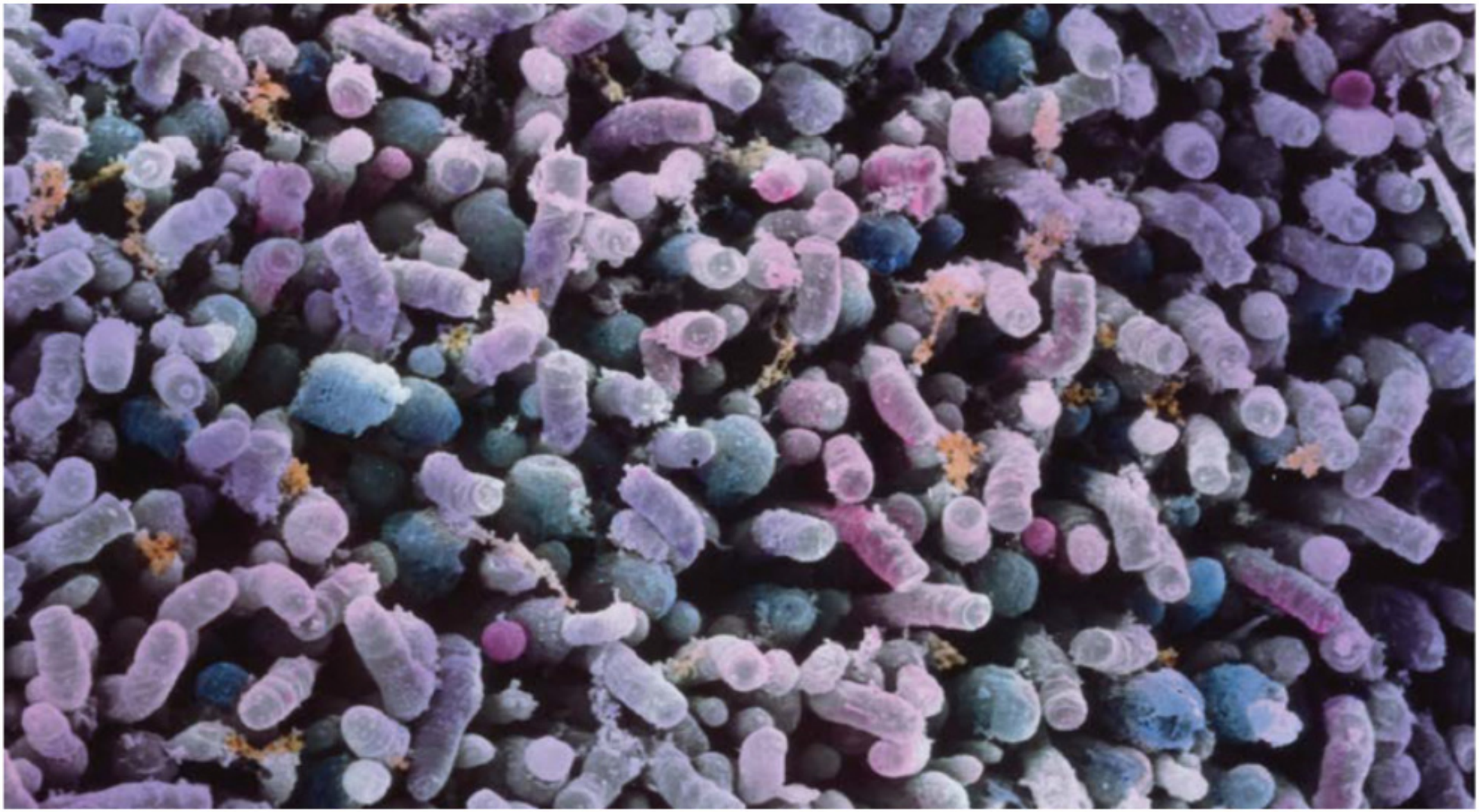


The Retina

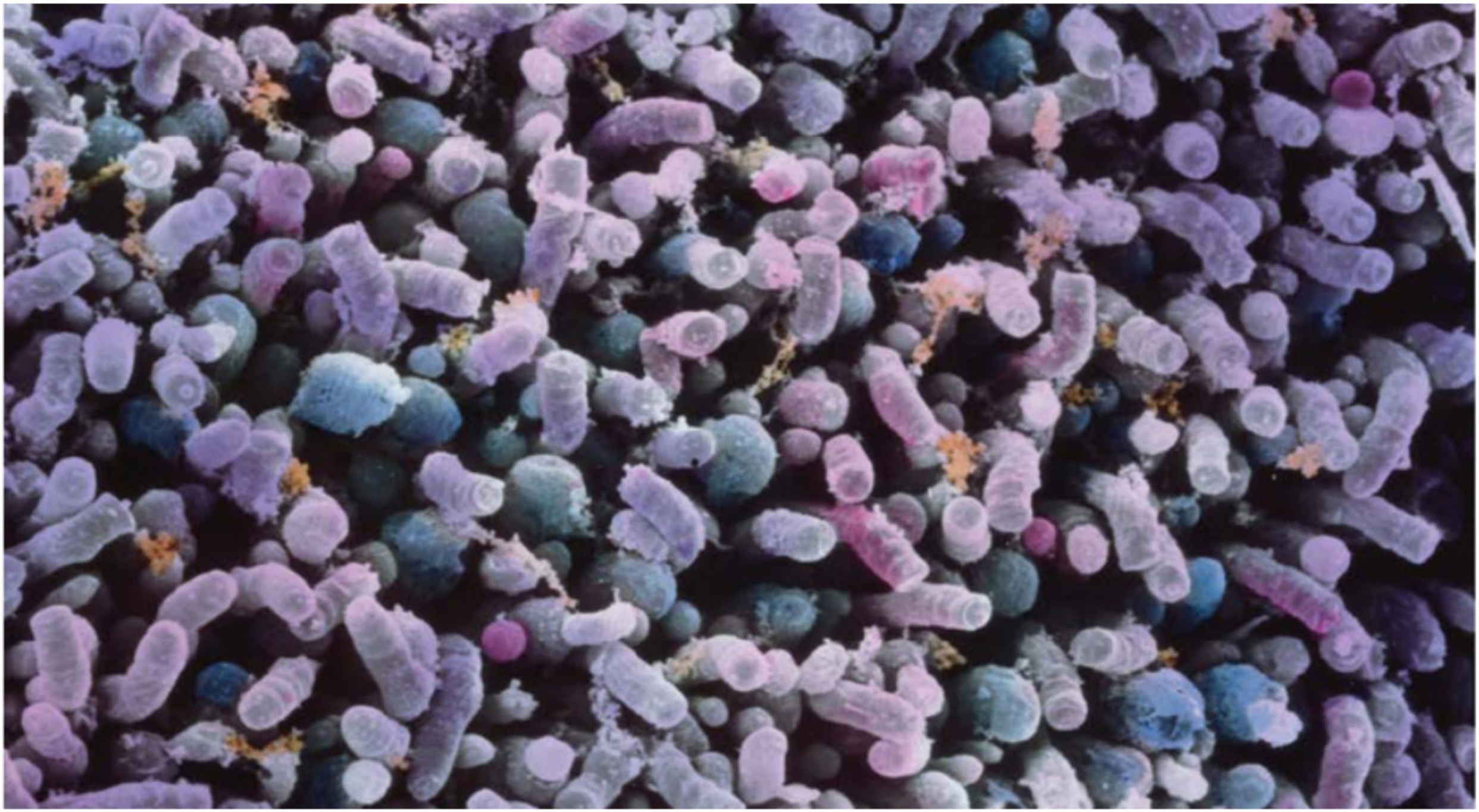
The retina is full of small cells that are sensitive to light. Some are sensitive to different colors of light and are called cones because they are shaped like pinecones.



Others shut down at normal light levels and become active only when the light is very weak. When the light is this weak, the cone cells do not work. The cells that work only at very weak light intensities are called rods. They are rod-shaped.



When light hits any of these cells, they produce an electric signal that is carried by the optic nerve to the brain.



Retina: This image shows the cones and rods from the side.

There are a lot more rods than cones in this photo. This is not true for all parts of the retina.

There are three different kinds of cone cells. One kind is sensitive mainly to red light, a second kind is sensitive mainly to green light, and a third kind is sensitive mainly to blue light.

When a person sees red light, the red cones do most of the signaling, which goes to the brain. When a person sees green light, the green cones do most of the signaling, and likewise when blue light is seen.

Both red and green cones are equally sensitive to yellow light. When the brain gets equal signals from both green and red cones, it interprets this as yellow light. That is why red and green light together look like yellow

You can use a similar explanation to understand why you see the mixture of any two colors of light as if it was a different color.

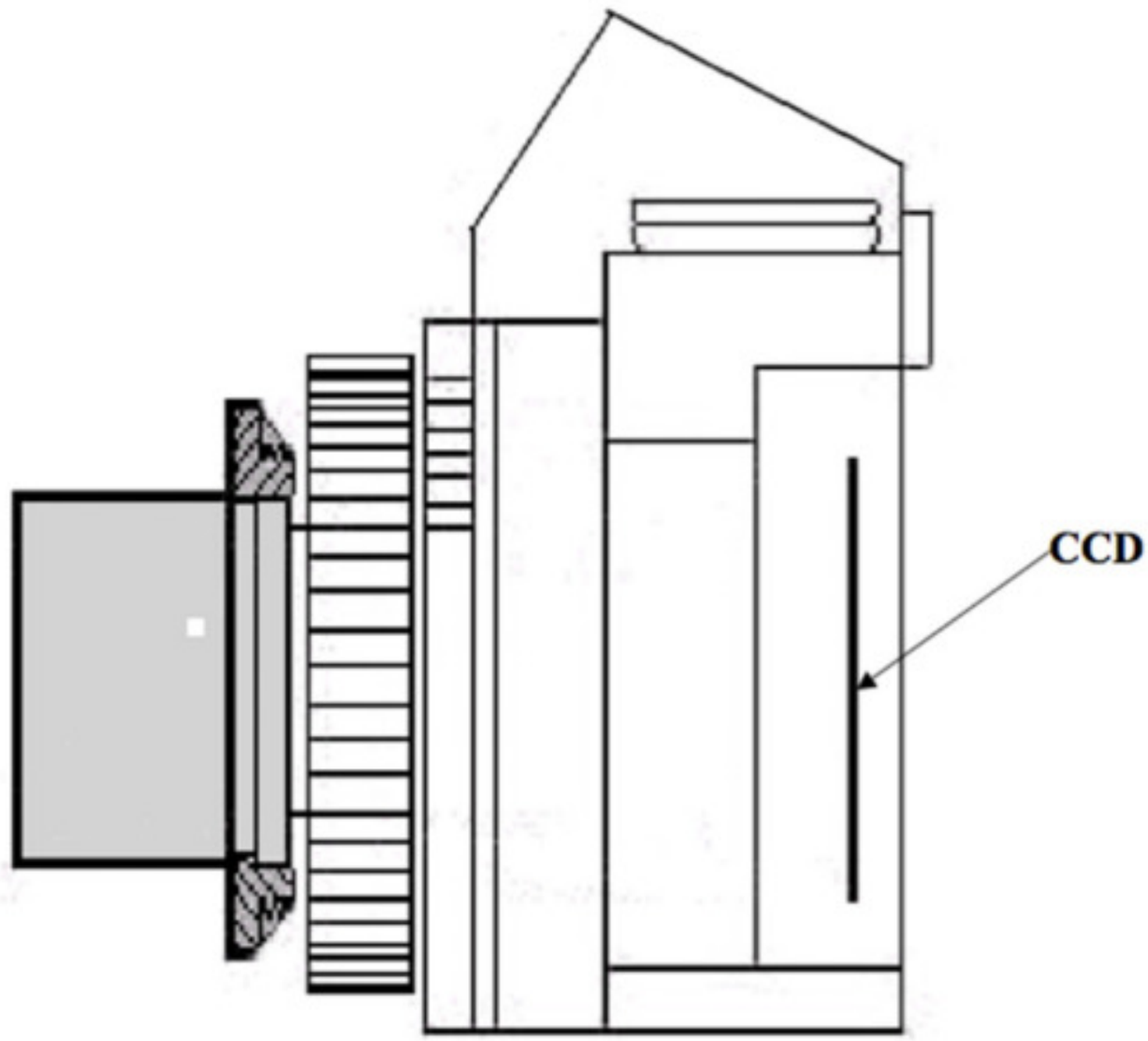
They make cones signal in combination, which is interpreted by the brain as a new .

Open Ended Question

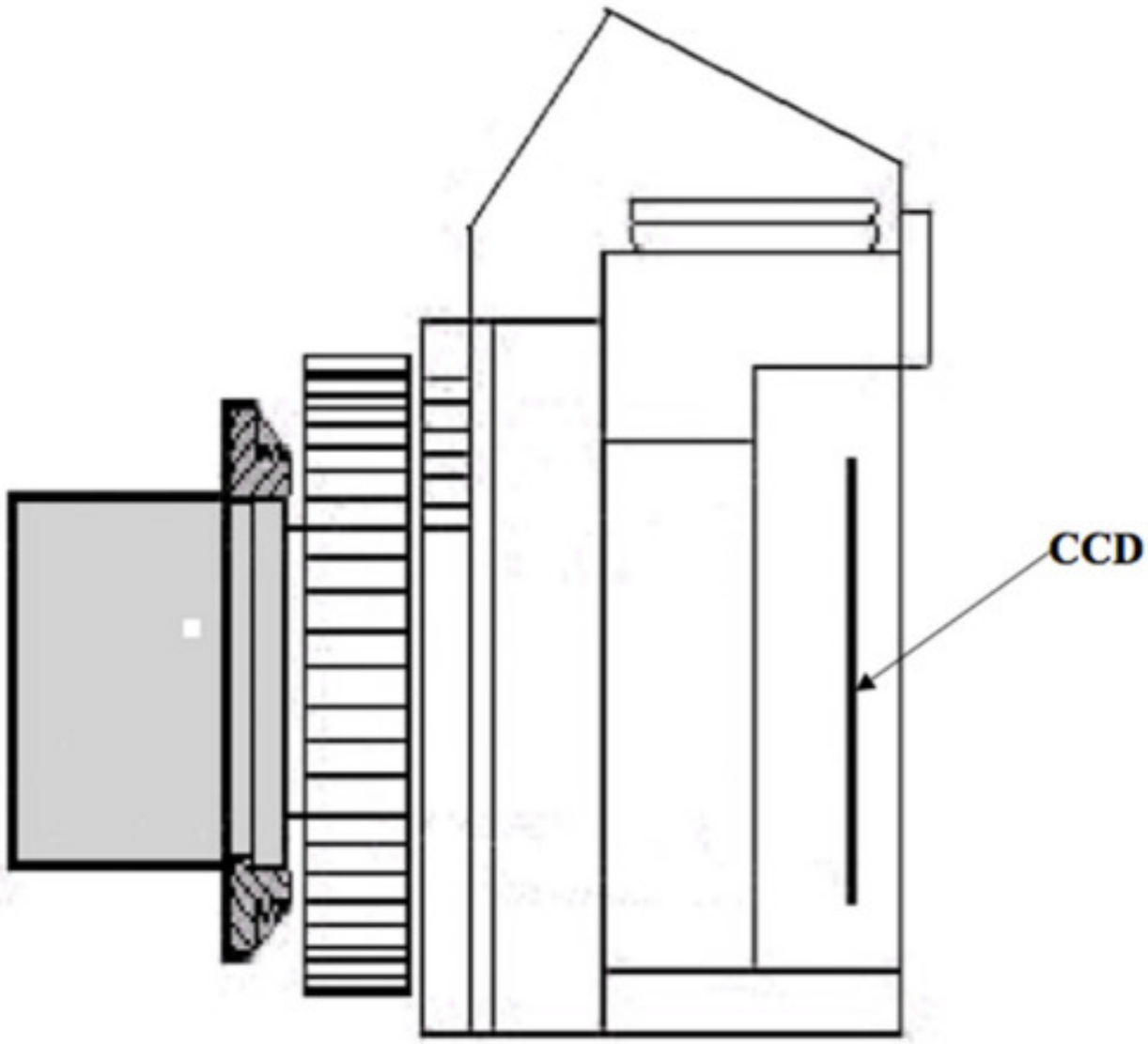
Why do you think the computer simulation used red, green, and blue light rather than other colors of light to make new colors?

Please enter your answer here.

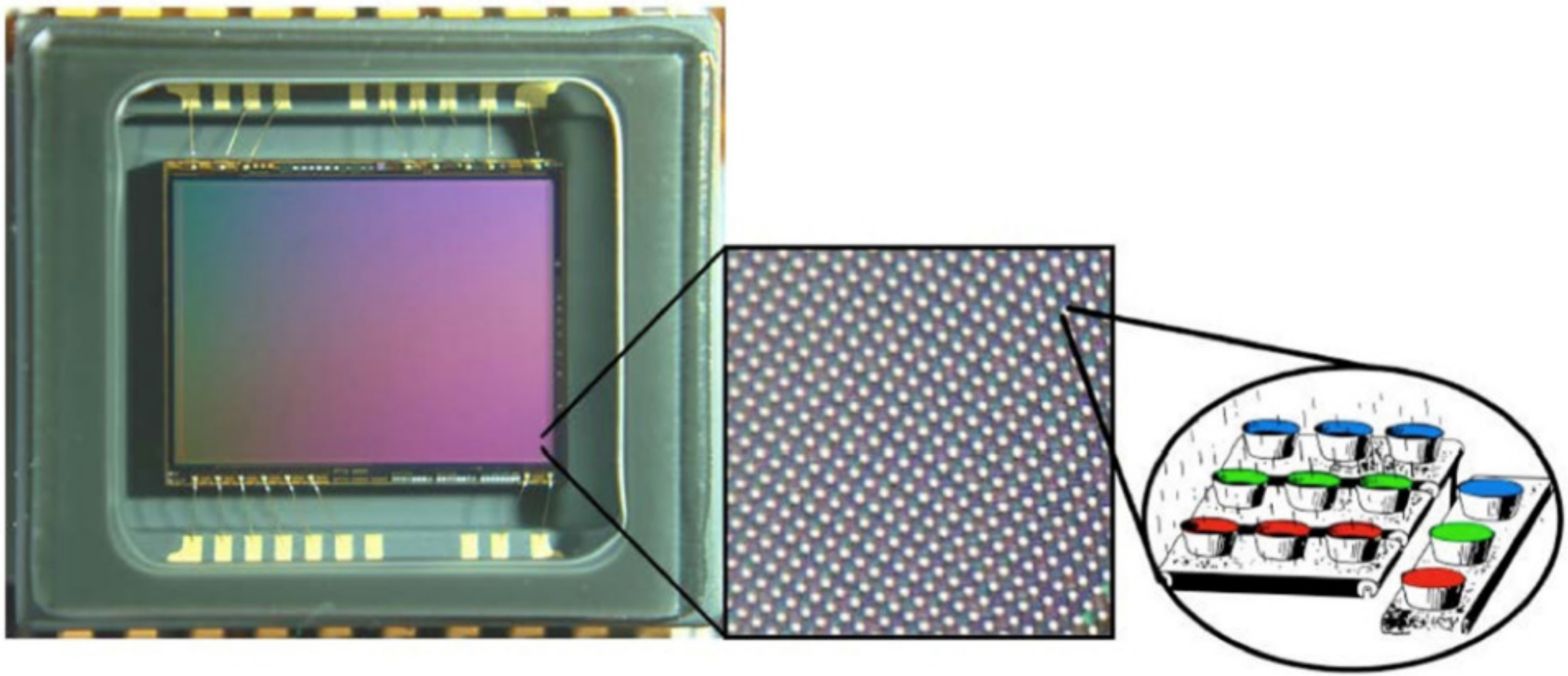
In both the eye and the camera, light comes from the left, goes through an opening (called the iris in the eye and the shutter in the camera) and continues through



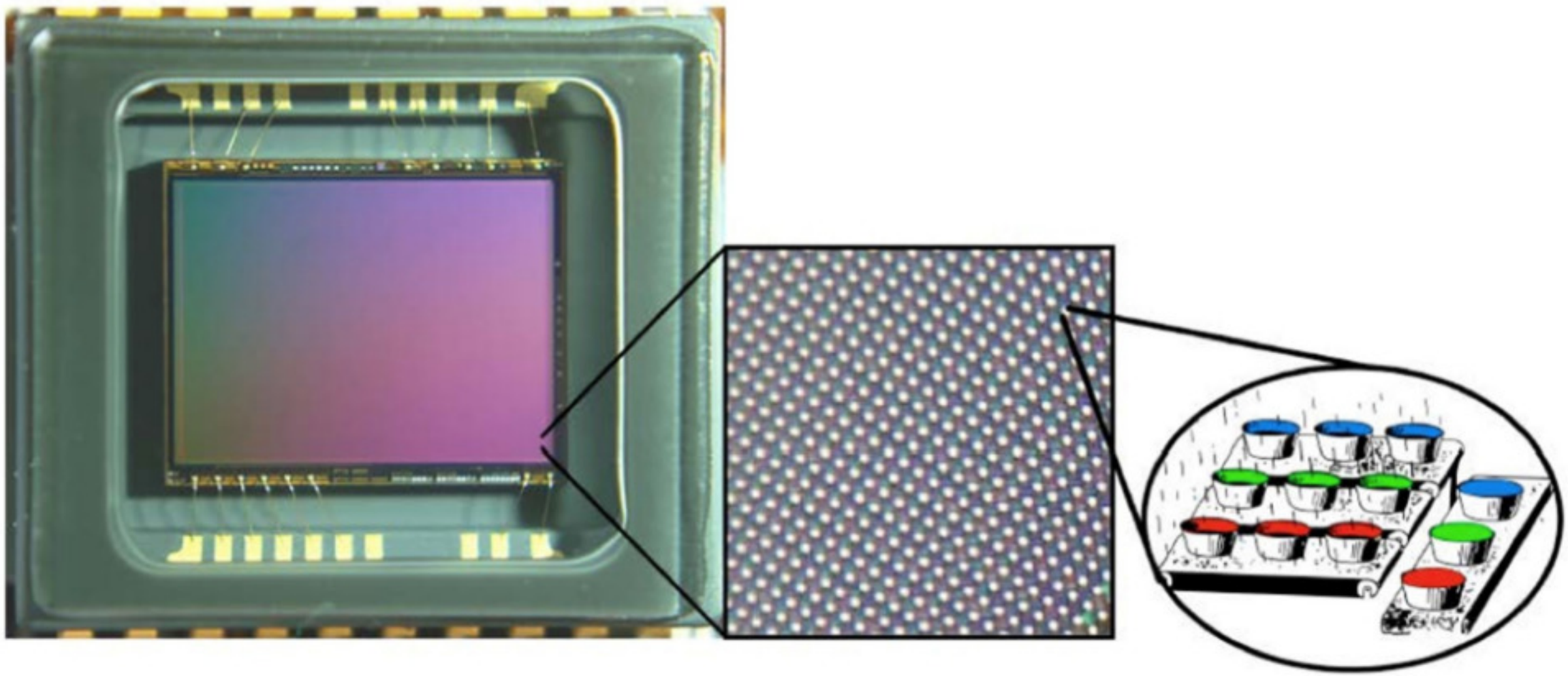
The back of the eye is called the retina. The back of a camera is called the film (if it is a camera that uses film) or a CCD (if it is a digital camera).



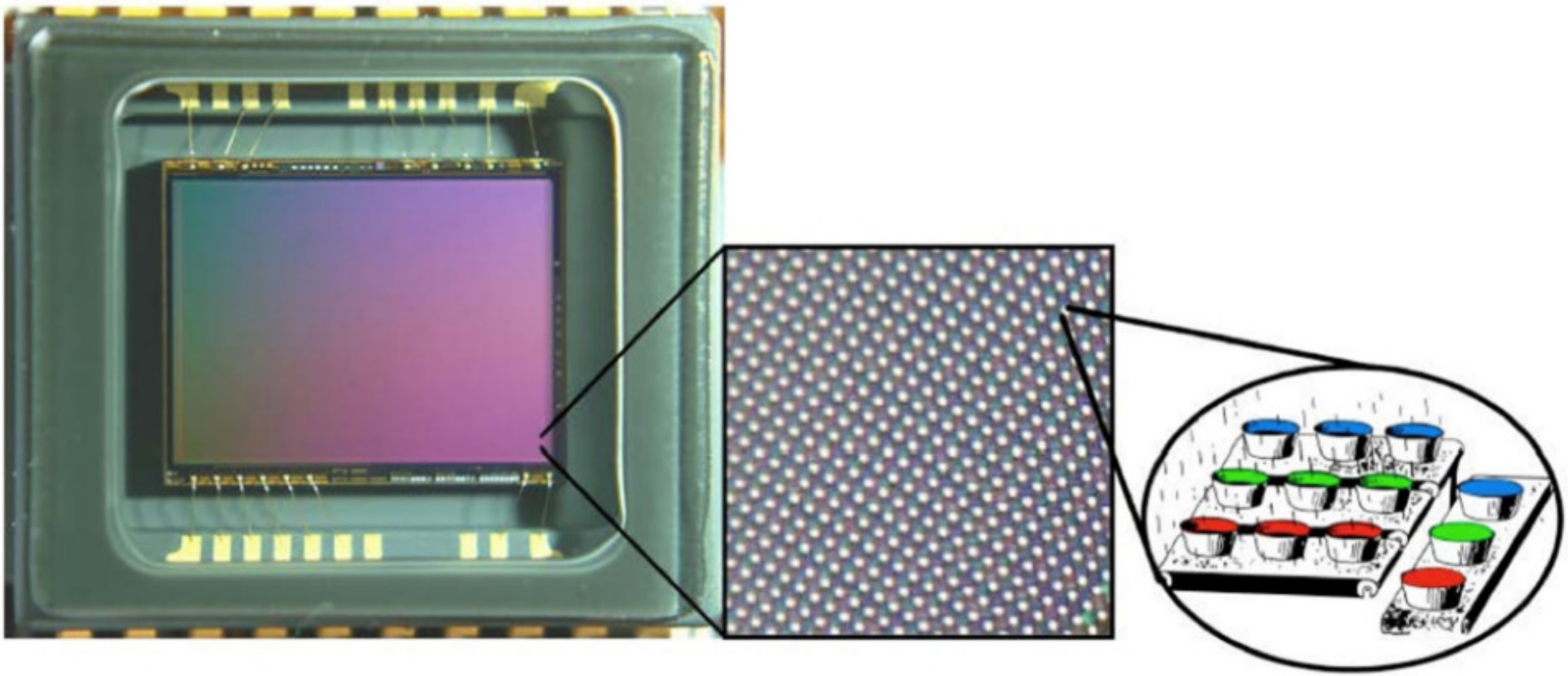
Charge Coupled Device: The image shows a CCD on the left. Its actual size is 30mm across or about 1in.



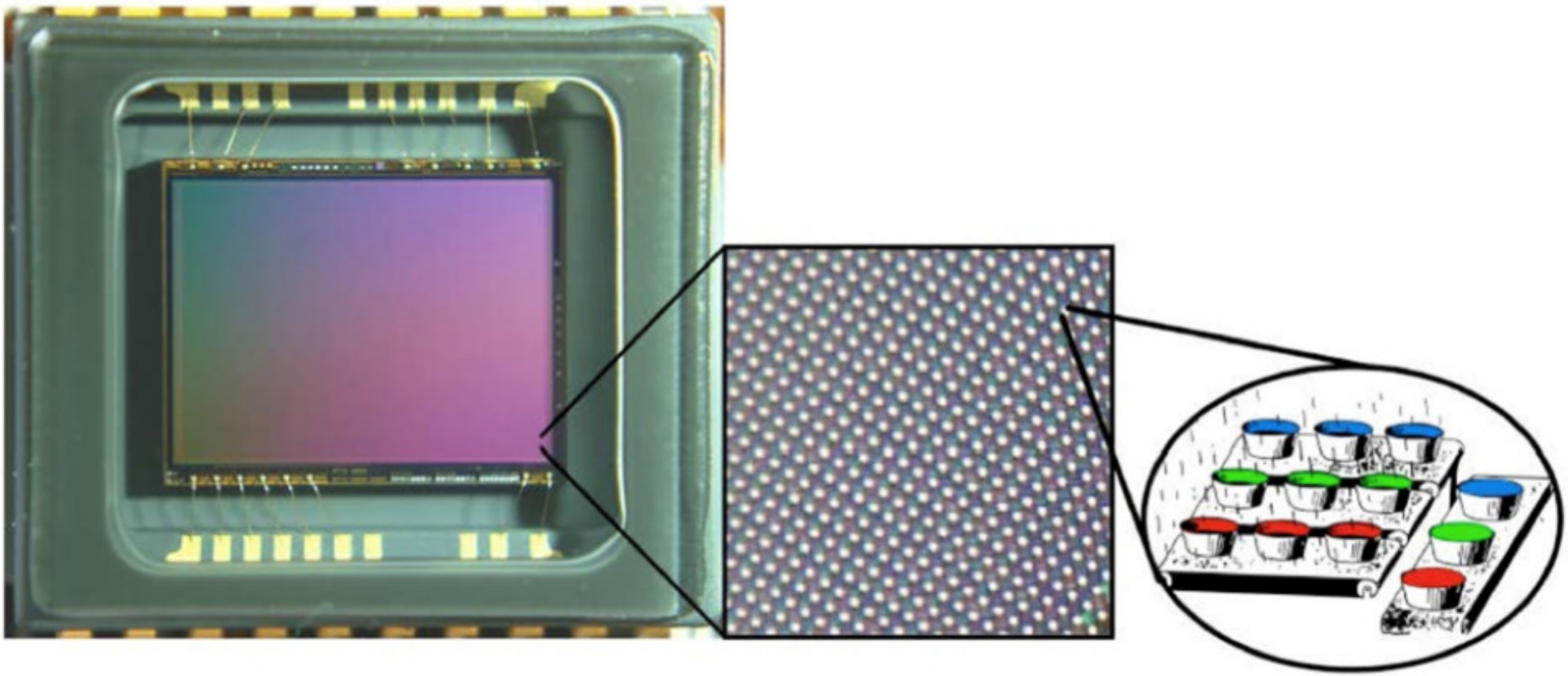
A photographer took the small square in the bottom right-hand corner of the CCD and enlarged it.



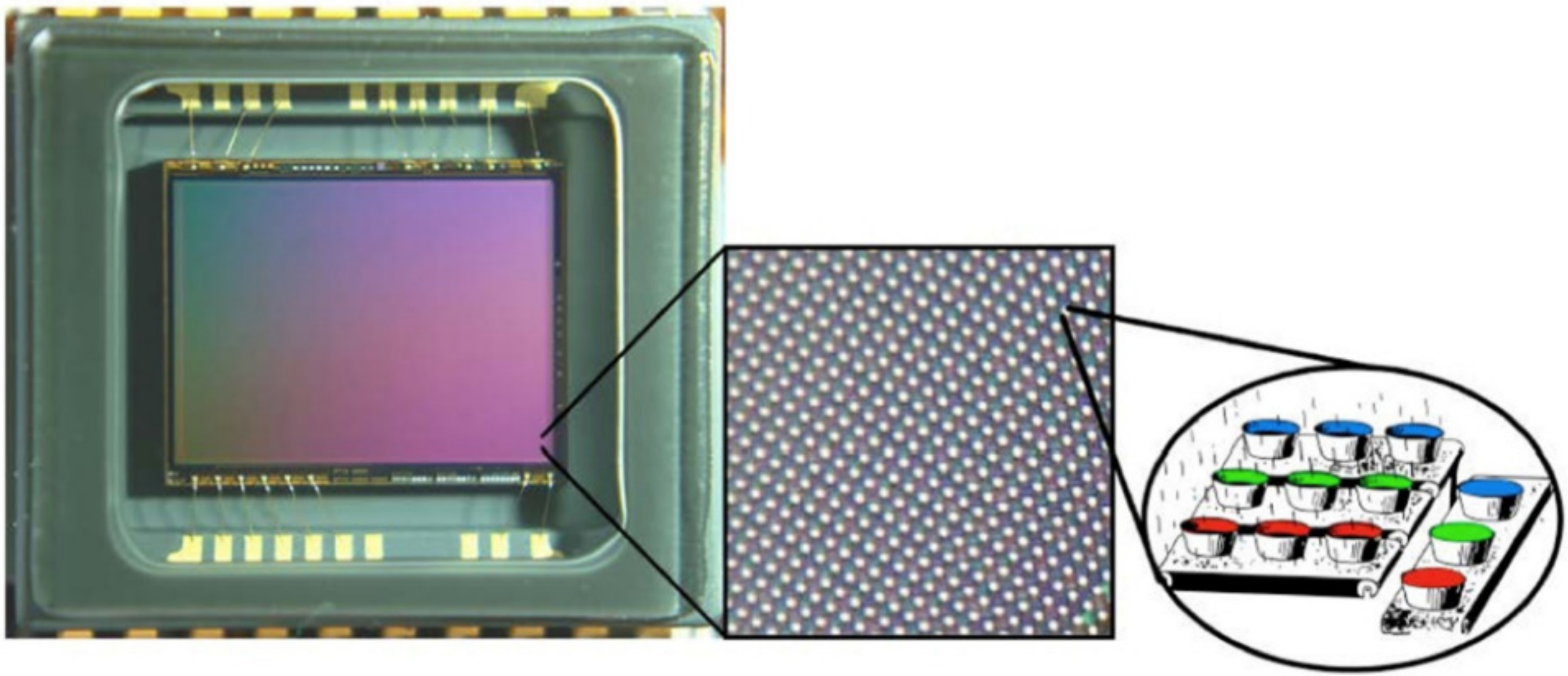
The white lines in the enlarged image are very thin electrical wires that take electrical signals from the CCD to the miniature computer that is in every digital camera.



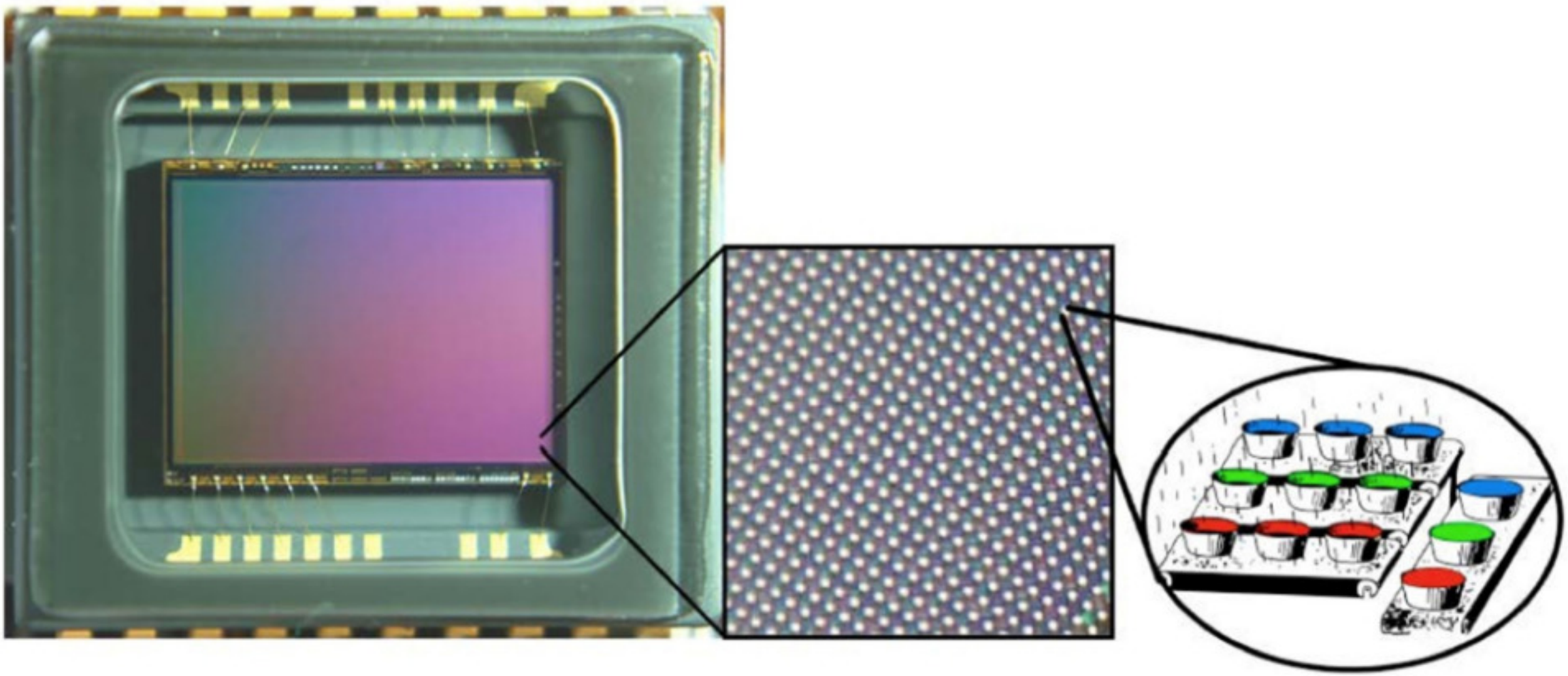
An artist took the small square from the photo in the center and drew how



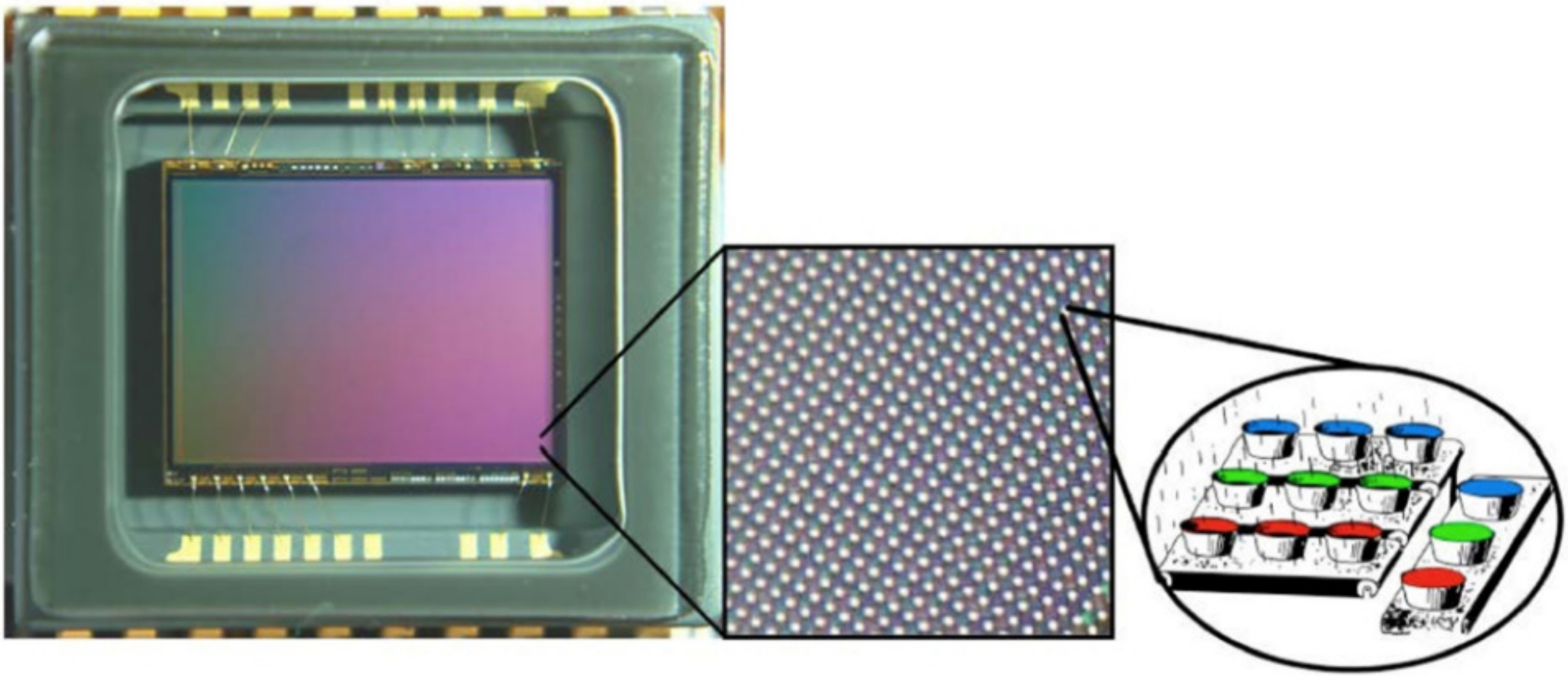
In reality, there are no microscopic cups on the CCD—the surface is flat—but the artist felt that the cups would provide a visual to explain that there are small circular areas that are sensitive to light.



The cups are arranged in rows of three—one red cup, one green cup, and one blue cup. This is not the color of the cups but the color of light to which



Just like there are three types of cones in the retina, there are three types of light sensors on the CCD. The CCD was made to simulate the way the human



Open Ended Question

What new questions do you have about the mixing of different colors of light to make new colors?

Please enter your answer here.

Activity 9.3

- Answer questions in Activity 9.3 pgs. 109-110

Look around the room

All the details you see are a result of objects absorbing and transmitting some colors of light and scattering the rest.

Some of this scattered light enters the eyes through the pupils and reaches the retinas, where it is absorbed by the billions of cells there.

These cells make electrical signals according to the color and the intensity of the light that reaches them and transmit the signals, by way of the optic nerve, to the brain where an image of what is outside is created.

Scientific Principle

- When different colored lights are mixed, they appear as a new color, and they appear brighter
- White light is the brightest and is a mixture of all colors of light
- Black is the absence of light

Open Ended Question

Have you ever seen a black-and-white movie? Why do you think older movies were made in black and white?

Please enter your answer here.

HW: pgs 111-113 As you read, mark the text and answer questions

📖 Reading 9.3 – Making Color Photographs

Getting Ready

Have you ever seen a black and white movie? Did you ever wonder why old movies were always in black and white instead of in color? After all, everything in the movie was actually colored.

Today, you will read about how cameras make pictures in color. What you learned in class about color mixing can help you think about movies and about photographs.