

Ring and Chain

pg.1

I was coming back from the mailbox, having dropped off a couple of trash cans for the trash truck the next day. It was one of those nights when I forgot to take the trash out, so I finished the job quite late.

As I headed back to the house, I saw the craziest thing. I pointed my dying flashlight toward a noise way down the driveway and saw something glowing faintly. I rubbed my eyes, wondering if what I was seeing was real. It was! And they were coming at me fast—4 circles of light bobbing up and down in the air... and getting bigger by the second. Whaaaaat???

U-Think: What in the world was going on?

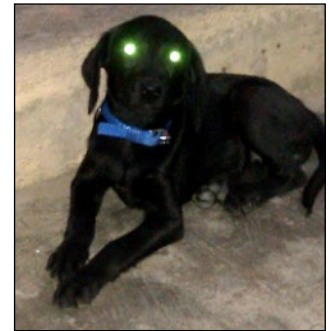
I had a freaky moment; then I realized what it was: four mirrors coming hard and fast after me!

U-Think: Four mirrors. What do I mean?



I laughed as two lickens came with their tails wagging; they were quite the surprise! It was Chloes and Kalea, our dogs! The four dots moving up and down were the mirrors in the back of their eyes behind their retinas.

U-Think:What do I mean by that?



The Tapetum Lucidum

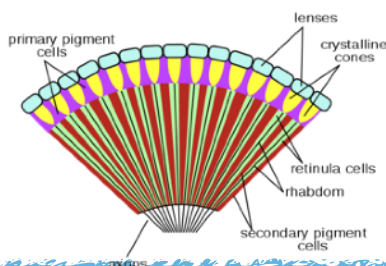
Dogs, and many other animals, have the greatest little device God put into their eyes. A dog's eyeball takes molecules they eat and makes billions of molecular crystals in a flat layer in the back of their eyes behind the cells they see with. The layer of crystals is called the Tapetum Lucidum.

Light goes into a dog's eyes and streaks through the seeing cells in the back of his eyes, the rods, and the cones. Then it blasts through them, hits the nano-crystal mirror, and reflects back out through the eye cells a second time and then out of their eyes. My flashlight beams bouncing out of Chloe and Kalea's eyes were what made the four circles come at me! This tapetum lucidum mirror helps dogs to see MUCH better at night. Eyes are strange things. Ours are normal, but animal and bug eyes get quite wild!

Strange Fly Eyes

Fly eyes have no better way to describe them than to say THEY ARE CRAZY. They look like something out of a monster movie! Yet they can do one thing better than our eyes can: They see faster than we do.

If you have a fluorescent light on in your kitchen at night and you and a fly are in the kitchen at the same time, you will see very different things. You might get a bowl of ice cream, then wander to the refrigerator and get some whipped cream and chocolate sauce and think nothing at all about the light. Your mind is on the ice cream!.



<< Each facet of an insect eye is called an Ommatidium. A fly has 8000. A dragonfly has 25,000! Each has its own crystal lens that proteins make by the insects DNA govern the formation of. Amazing!

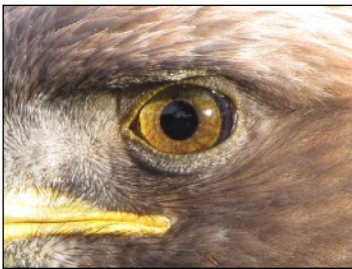
Ring and Chain

pg.2

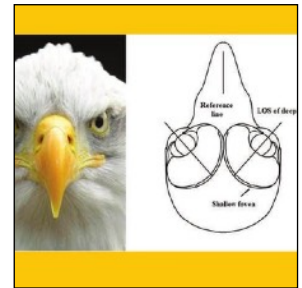
The fly, however, would be seeing quite the light show! The fluorescent light would be high-speed flickering, dark, light, dark, light— 60 times a second! The whole kitchen would be pulsing with on-off lights. We would get so sick if we saw what the fly does...but we don't. It's because our eyes are slower than a fly's.

A fly's eyes send messages to the brain tiny brain 200 times a second. Our eyes only hit 30-60 times a second. This is why it is hard to swat a fly. Their eyes are faster than ours!

Eagle Eyes



Have you ever heard someone say, "I have eagle eyes"? They don't. They aren't even close! **U-Think:** How are eagle eyes different than ours?



We see with two different kinds of cells called rod and cone cells. Cone cells enable us to see colors. Rod cells help us to see when it is darker. A big way that an eagle's eyes are different than ours is that the rods and cones are thinner. By comparison, it's like ours are like telephone poles, and theirs are thinner, like a paper towel tube. Eagle eye

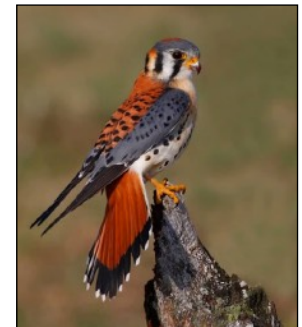
cells are very thin compared with ours. And this gives the eagle better long-distance vision than us.

Eagles can see things far away, much more clearly than us. They have better acuity of vision in seeing things far away. An eagle can be a mile from a rabbit and see it clearly running around on the ground. And eagles, like most birds and the fly, can also see much faster than we do.

High-Speed Chases We Could Never Do

We were shopping once at a grocery store when a small sparrow hawk ripped around the cars in hot pursuit of another bird. The bird zipped into a large bushy tree, and the hawk zoomed in right after it, weaving and dodging through the branches so fast that I couldn't see much of what was happening. But the hawk could see it all perfectly and react so fast that it didn't crash.

God equipped many of the birds of the world with high-speed eyes and high-speed reflexes. Flight is very dangerous when flying through trees at high speeds. If birds didn't operate at higher speeds than us, not many would last too long.



The Sparrow Hawk



So if someone says, "I have eagle eyes," you can use the opportunity to share some of the wonders of eagle eyes that God built into them. You can use the opportunity to share something that shows them a little of how big and wonderful God is by showing the wonders of how He creates birds!

Your Experiment

We love this demo we are giving you called the Ring and Chain. It works a little bit on eagle speed. Have. Go to the experiment section now and learn about it!



Experiment: Eagle Eyes & Ring and Chain 30 min

SUPPLIES:

- A dollar
- Ring and Chain (Pak)



Introduction:

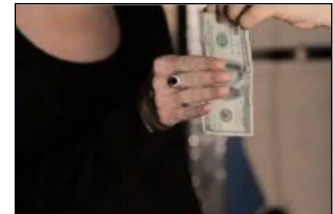
These demos are all about the speed of our eyes and the speed of birds' eyes.

Our eyes have a flash rate of 30-60 times a second. Bird eyes are often sending messages to the brain at 200 times per second. Each of these activities birds like an eagle could easily see and do...But us? Not so

PROCEDURE:

1. Dollar Drop

Have a friend hold their hand out like they are going to shake your hand. Have them open their thumb and their pointer finger 2". You hold a dollar with your hand by holding it at the top and letting it dangle down like a sheet on a clothesline. Put the dangling dollar between their thumb and pointer finger halfway down. Tell them you want to see if they have the grabbing speed of an eagle. Ask them to grab the dollar once you let it go before it falls through their fingers. Wait for 5 seconds or so, then release it. They will never be able to grab it unless they grab it by luck. If your dollar is straight up and down, it falls too fast for them to react!



2. Ring and Chain

In this one, you will drop a ring through a chain and have it get "tied" by the chain faster than they can see. An eagle could easily see this, but it happens faster than they can see. Watch this video: [Ring and Chain](#). It takes about 50-100 times to learn how to do this well. Persevere!



You can wear the ring and chain around your neck and use them whenever you want. It's great to have a little science story like the one we gave you about hawks and eagles to use as an opportunity to share about the Lord! Happy

QUESTIONS



1. What is the speed human eye cells send messages to the brain (the flash rate)?
2. What is the speed bird eye cells send messages to the brain (the flash rate)?