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Special Species

With Eyes Larger Than Their Brains, These Eagles Swoop Down at 200MPH

They may only weigh a total of ten pounds but they have the best vision in the animal kingdom, with eyes that weigh more than their brains. They can see four to five times further than we can, and when they set their sight on prey, even your small pet, watch out.

Reviewed by Dr. Becker

STORY AT-A-GLANCE

- Eagles have among the best eyesight in the animal kingdom, estimated to be four to eight times more powerful than human eyesight. Birds of prey can see four to five times farther than we can, which gives them 20/5 or 20/4 vision
- Eagles' sharp eyesight, which includes excellent color vision, makes them superb hunters. They spot prey from great distances and can dive toward the ground at 125 to 200 miles per hour
- There are two features of an eagle's eyes that give him such sharp vision. One is the retina, and the other is the fovea. Together they give him the ability to pick up fine details in his field of vision, and magnify them
- Eagle eyes are angled 30 degrees away from the center of the face, giving them a 340-degree visual field, as compared to a human's 180-degree field

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If you've ever heard someone referred to as "eagle-eyed," it means he or she has very good vision. In fact, eagle-vision is among the best in the animal kingdom.

An eagle's eyesight is estimated to be four to eight times more powerful than the average human's. Birds of prey, including eagles, can see four to five times farther than we can, which means they have 20/5 or 20/4 vision. And while eagles weigh an average of only about 10 pounds, their eyes are about the same size as ours, and are larger by weight than their brains.

An Eagle's Eyesight Makes Him An Expert Hunter

It is believed that an eagle can spot an ant crawling on the ground from atop a 10-story building, or a rabbit two miles away. As he drops from the sky to attack his prey, the muscles of his eyes make constant adjustments to the curvature of the eyeballs, enabling him to keep his prey in sharp focus as he makes his approach.

Eagles, like all birds, also have excellent color vision. They see colors more vividly than we do, and can distinguish more shades. They also see ultraviolet light, which allows them to detect the urine trails of small prey.

They can distinguish between five different-colored squirrels, and can find even camouflaged or hidden prey on the

ground below. Bald eagles can see fish in the water while they soar or glide several hundred feet above the earth. This is more difficult than you might think, because most fish are counter-shaded — darker on top/lighter on their underside — and harder to spot from above.

From a perch at the top of a tree, the eagle can dive at 125 to 200 miles per hour to catch prey with its talons.

Two Highly Specialized Features of the Eagle's Eye

According to scientists, there are two features of an eagle's eyes that give him such sharp vision. One is his retina, which has more light-detecting cells (cones) than a human retina. This gives him the ability to see fine details similar to how higher pixel concentrations improve camera images.

The second feature is a much deeper fovea than human eyes have. Foveas are the cone-rich structures in the backs of the eyes of both humans and eagles that detect light from the center of the visual field. Whereas the fovea in the human eye resembles a shallow bowl, the fovea of birds of prey is U-shaped. It could be that the depth of the fovea allows their eyes to function like a telephoto lens, enhancing magnification in the center of their vision field.

The eagle's fierce look comes from the placement of a bony ridge above the eyes, a small bit of bare skin between the eyes, and a sharp beak. The ridge protects the eyes from protruding tree branches and from struggling prey. The bird's feathers typically don't grow over the eyes.

A 340-Degree Visual Field

In addition to their ability to see longer distances and perceive more colors than us, eagles also have almost double our field of view. Eagle eyes are angled 30 degrees away from the center of the face, giving them an almost unobstructed rear view. Eagles have a 340-degree visual field as compared to a human's 180-degree field, which is advantageous for both hunting prey and escaping predators.

Each eagle eyeball moves separately, and the eyeball is so large and tightly fit that it barely turns within the eye socket. Eagles swivel their heads to locate prey and other objects of interest, moving their telephoto lens (the fovea) across their entire field of view. Once he's spotted prey, he turns his head toward it and uses his stereoscopic vision (input from both eyes simultaneously) to judge the distance he must cover and the speed at which he must approach.

Eagles' eyelids close when they sleep. They also have an inner eyelid called the nictitating membrane that sweeps across the eye from front to back every three or four seconds, removing dirt and dust from the cornea. The membrane is translucent, so the eagle can see through it as it slides back and forth.

Scientists believe that because eagles and other birds of prey use so much brainpower processing visual cues, they have a less developed sense of smell and taste as compared to other groups of animals.

Sources and References

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