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HOW PREDATORY BIRDS SEE MORE SHARPLY THAN US

Large Eye's - First, they have especially large eyes. Large eyes let in the maximum amount of light, and they also allow for a large image. If a retinal image is spread over a greater number of visual cells, there will be greater resolution to the detail in the image. A bird's eye is so huge it occupies a significant portion of the skull (like in this owl skull), allowing only limited room for the brain.

Accommodation - Second, to determine the size and distance of a prey, animals rely on memory as well as visual information. They have to know (remember) how large the prey animal is, and then judge its distance based on the size of the image they see. It's also important to be able to develop a clear image of the prey, no matter what its distance. The eye automatically focuses at a variety of distances using a natural neuromuscular adjustment called accommodation. In this process, tiny ciliary muscles surrounding the eye alter the curve of the lens so that it will focus on objects that are far or near. Raptor eyes have exceptional capabilities for accommodation. Thus, as a potential prey moves closer or farther from the eagle or hawk, the predator's eyes remain focused by rapidly changing the lens curvature.

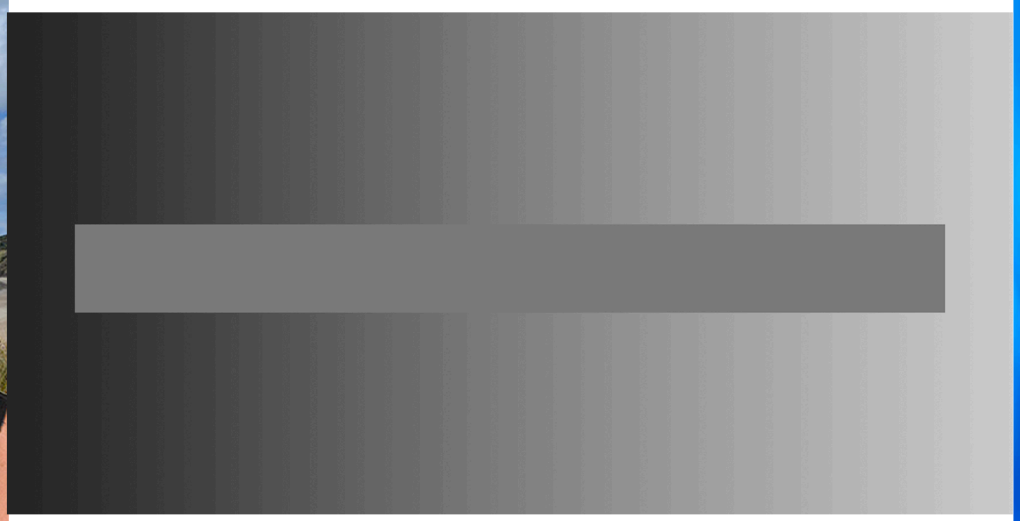
Binocularity - Thirdly, raptors have front facing eyes. This makes possible a binocular vision similar to our own. In binocular vision, the fields of view of the left and right eye overlap. . The right-eye and left-eye visual fields of a hawk overlap about 90 degrees, (in human vision, this overlap is about 120 degrees). A further adaptation in raptors - the cornea and lens are angled toward the beak to increase the overlapping region even more. Binocularity allows for stereoscopic vision, which in turn allows for determination of distance.

When an organism compares the slightly different images from the right and left eye, its brain automatically determines the distance to the object. Raptors, with their greater amount of visual field overlap, have the greatest abilities to use binocularity to develop a sharp, three-dimensional image of a large portion of their view.

Macula - Fourthly, birds needing accurate distance vision, (i.e.: birds of prey and some other species of bird), a second macula evolved in the lateral part of the retina. A macula is a small region of the retina where the concentration of rods and cones is the highest and therefore vision is the sharpest.(Macula degeneration in humans is a common cause of blindness. Book in for an OCT scan) Raptors, with their wide binocular field of view, have BOTH a central and lateral fovea. As a result, a substantial proportion of their visual field projects on the most visually receptive parts of the retina.

Pecten - Lastly,another unique structure in a bird's eye is the pecten. Pecten is a thin, greatly folded tissue extending from the retina to the lens. Predatory birds such as eagles and hawks have the largest and most elaborate pecten of all the birds. The pecten supplies nutrients and oxygen throughout the vitreous humour of the eye, thereby reducing the number of blood vessels in the retina. With fewer blood vessels to scatter light coming into the eye, raptor vision has evolved to be the sharpest vision known among all organisms.

THE EYE TIMES OPTICAL ILLUSION



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