Anatomy of a Cat

Eyes and Vision

The belief that cats can see in the dark is an exaggeration. Felines can see no better in total darkness than humans can, but special night-vision adaptations allow them to see extremely well in even the dimmest light, a vital ability for nocturnal hunters. While sensitive hearing may help the cat initially detect prey, its keen, nighttime-adapted vision permits it to identify the location of a potential meal with deadly, laser-beam accuracy.

Seeing in the Light and Dark

Shine a light on a cat in a darkened room or look at a photograph of a cat taken with a flash and you'll observe the eerie green or yellow glow reflecting from its eyes. To take full advantage of available light, the back of the cat's retina contains a layer of mirror like cells, called the tapetum lucidum, that collects and reflects light back to re-stimulate the retina's rods — much like the effect seen when a car's headlights shine on a road marker at night. Present in nearly all carnivores and many other mammals, this layer of cells is particularly thick, up to as many as fifteen cells, in cats. Not visible in normal conditions, the tapetum lucidum appears only when light is aimed directly into the animal's eyes.

A cat's vision is sharpest between 2 and 3 feet from its face, and its focus is on the center of what the cat observes rather than on the entire landscape. This is a helpful adaptation when it comes to zeroing in on small prey. Cats also can detect motion much better than humans can. Since the many rods in the cat's retina serve as motion detectors as well as light receptors, anything running across a cat's field of vision is more likely to be detected than something coming straight toward it.

What Beautiful Eyes You Have

Despite the presence of color-detecting cones, cats have little or no need to distinguish colors. Until fairly recently, cats were widely believed to be colorblind. In tests, however, domestic cats were successfully trained to distinguish blue, green and yellow (but not red). Their light-sensitive vision also allows them to differentiate among several shades of gray.

Because a cat's eyes are designed for keen night vision, its large pupils must constrict to limit the amount of light entering the retina during the day, thereby preventing them from being dazzled. Domestic cats and many smaller wildcat species possess pupils that narrow to a mere slit, allowing them to see well even in extremely bright light. Big cats such as lions, which hunt in daytime, possess pupils that constrict into small, tight circles instead; their night vision is not as acute as that of their nocturnally active cousins.

In low-light situations, both wild and domestic cats will fully dilate their elliptically shaped pupils into almost perfect spheres to harvest the maximum amount of light. Cats also open and close their pupils during periods of stress or confrontation. A fearful cat's pupils will be fully dilated to create a wider field of vision and take in as much of the surroundings as possible, while those of an aggressive cat are considerably constricted as a threat signal.

Predator Vision

Cats have a range of binocular vision greater than any other carnivores, which contributes to their remarkable hunting skill. This visual ability comes at a price, however. Cats, like humans, have only limited peripheral vision, which means that they have to roll their eyes or move their heads to view anything located on either side of them.

Predators rely on acute distance judgment and depth perception to time leaps and strike prey successfully. Their eyes face forward, offering a wide field of overlapping sight. In this area of binocular vision, depth perception and distance assessment are keenest. The eyes of prey, on the other hand, are generally placed on the sides of the head, offering them a wider range for detecting approaching predators but less depth perception.

The Third Eye

Cats' upper and lower eyelids, like those of humans, sheathe the eyeballs. For further protection, all cats have an opaque, white third eyelid, called the nictitating membrane, between the lower lid and inside corner of each eye. This layer helps moisten the eye and clear dust from the surface of the cornea. When dozing, this third eyelid closes, perhaps to act as a shade. As soon as the sleeping cat is alerted by any sound, the nictitating membrane flicks back to the inside corner of the eye.

- Hidden from view behind the outer eyelids of a sleeping cat and barely noticeable in the corner of the eyes while the cat is awake, the nictitating membranes are sometimes visible in felines that doze with open eyelids. While most cats do sleep with their eyes completely closed, some rest with their eyes partially open.
- Cats with very short noses, such as Persians, may not be physically able to close their eyes completely because the eyes bulge more, causing the nictitating membranes to be visible during sleep.
- The membranes also are seen when cats blink, which, quite mysteriously, they do infrequently — sometimes as little as once every few minutes.