Marie Kotasová Adámková • Tomáš Kopecký

How Do Animals See?

Albatros

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Dog

DOGS AND TELEVISION

Have you ever wondered if dogs perceive TV the way we do? Surprisingly, they do. They even have their **own TV channel**, which is tailored to their needs and helps stop them from feeling lonely when their owner is not at home. You will find a ton of dog action on dog TV shows, because dogs prefer things in **motion** rather than static shots, all of course in the shades of popular dog colors. Dogs also like to watch TV from short distance, because of their **nearsightedness**.

Dog

DOG BREEDS

You undoubtedly know that there are a great number of breeds of domestic dog. They can be small or big, hairy or naked, friendly or strict guards. It is surprising how many different breeds evolved from the wild wolf! Dog breeds have always been **bred for some purpose**. In some breeds, mainly **hunting dogs**, the reason for the breeding was to sharpen, as much as possible, the dog's senses.

NIGHT HUNTERS

Wolves mainly hunt at night when it's dark. The only source of light is often the moon and stars. A perfect sense of smell and hearing are the best helpers when hunting, although visual orientation is important for them as well. The light receptors are adapted to this: **dogs have only two types of cones in the retina, but they have many rods**, thanks to which they can distinguish many shades of gray. While their perception of color by cones is limited to shades of **yellow, blue, and black,** the number of rods allows dogs to see well, albeit in **shades of gray**, even when very little light is available.

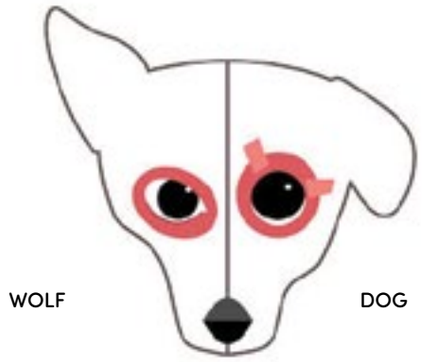
FIELD OF VISION

The extent of the **visual field** in the domestic dog is significantly affected by the **shape of the skull**. The extent of the visual field in dogs with short snouts is smaller than in dogs with longer snouts.

FLAT EYES

Dog eyes are a bit flatter than ours. Because of this, their **lenses cannot focus as well as ours can**. That's why dogs like to sniff you. Dogs also have a **larger pupil** and their eyes angle slightly to the side. They therefore have **better peripheral vision** and can see you, even if you approach them from the side.

DOG EYES



Dog eyes are framed by a **special pair of muscles** that engage when the eyebrows are stretched. With such a look, which is especially well mastered by **puppies**, the owner falls in love with the dog in the same way they might with a **human baby**. Wolves, on the other hand, do not have this ability, which means that it only evolved in **domesticated dogs** to help them bond with their owners.

Chameleon

COLORS OF A LIZARD'S WORLD

There are many interesting things about chameleons. They hunt their prey with their **sticky tongue**, which darts out directly into branches and leaves. Chameleons are well suited for this, because their **eyes are situated on the sides of their heads** and can even **move independently** from one another. Chameleons also have a huge field of vision, up to 360 degrees, even partially seeing behind themselves.

Chameleon

COLOR CHANGE

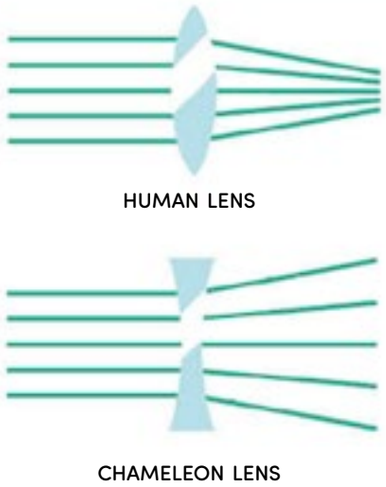
Chameleon skin consists of several layers: the upper transparent layer and the other three lower **layers**, each of which **reflects light differently**. Thanks to this, chameleons can mix colors based on their **current mood**. Color therefore plays an important role in **communication**. Chameleons create the most pronounced coloration to scare off their enemies and attract females. This is why they have to be able to reliably **distinguish between colors**.

SPLIT VISION

Independent eye movements give the chameleon the ability to **see in more than one direction** at a time without moving its head. It can literally look to the **left with one eye** and to the **right with the other**. How do they do this? Each eye and eyelid is fused, and they have strong eye muscles as well. Their eye movements are also very fast, preventing their prey from noticing them. **When the chameleon finds its prey, it aims both eyes at it**, judges the distance, and then attacks with absolute precision.

CURVED LENS

The chameleon has a **curved lens**, also known as a negative lens. It significantly enlarges the image seen on the retina. The chameleon can therefore **increase its visual perception** way more than most animals! The curved cornea contributes to this as well—thanks to it, the chameleon can concentrate light into a **narrow visual field**.



EYE IN A TOWER

Take a look at how the eyes of a chameleon are placed. It is as if they were hidden in some kind of tower, with only their tips peeking out. These "towers" are made up of **overgrown eyelids**. They are extremely strong and designed **to protect the eyes**.

BLINKING REPTILES

Lizards, together with snakes, belong to the class of vertebrates called reptiles, but their eyes are slightly different: they are more like those of birds. Unlike snakes, **lizards have movable eyelids and can blink**. Did you know that lizards **get rid of the cornea during shedding**? They do not, however, shed their skin in one piece like snakes, but rather in patches.

Cat

SPATIAL VISION

Cat's eyes face forward, just like yours. Thanks to this, cats have perfect spatial vision. This allows them to **estimate distances very accurately**. By contrast, the properties of the eye that enable high-quality spatial vision reduce the extent of the visual field, which is a little narrower than that of humans. This, however, is compensated for by greater **head mobility**. Cat's eyes also catch even the slightest movement in grass caused by the presence of prey, clearly distinguishing it from movements caused by the wind.

Cat

CAT'S PUPIL

Another interesting adaptation of cat eyes is the ability to actively **control the amount of light that reaches the eyes**. When a cat is lying **in the sun**, its pupils are retracted into the shape of a **narrow slit**. When the cat is active **at dusk**, in contrast, its pupils occupy almost the **entire surface of the iris**. In addition, the pupil has the shape of a vertical slit, thanks to which the cat's vision has a higher resolution in the horizontal direction. And that's not all! **A cat's pupil has a 50% larger diameter than a human's**.

NIGHT HUNTER

Every mouse would definitely agree that a cat is a dangerous night hunter. Not only does the **tapetum lucidum**—*a reflective pigment in the eye that makes it shine when illuminated in the dark*—help the cat hunt, but so does the high-quality spatial vision allowed by the **curved cornea** and the **large number of rods**. With such equipment, the cat does just fine with only starlight even on the darkest night. Do cats see colors? They can see some, their eyes have **some cones** as well. There aren't very many of them, though, and during the day, cats see only **shades of blue and yellow**.

A THIRD LID

Like many other vertebrate species, cats have developed a **third eyelid** called a **nictitating membrane**. The cat, however, **cannot control it**. The nictitating membrane slides across the eye, for example, when there is an imminent danger.

TAPETUM LUCIDUM

The eyes of cats are very similar to those of humans. Its structure differs, however, in terms of the presence of special cells located behind the retina. These cells form a special **reflective layer** in the cat's eye, scientifically called *tapetum lucidum*. You can see it at night when the **eyes of cats are green**. Light consequently passes through the eye twice and the cat can see better and much clearer at dusk.

BLURRED VISION

Tapetum lucidum basically works like a mirror. This results in one **negative effect:** the **scattering of the light**, which decreases the resolution of the resulting visual perception. Similarly, **image sharpness** is low due to the low number of cones in the eye. Objects at a distance of more than 20 feet appear blurry to cats and therefore they always **hunt their prey up close**.

Written by Marie Kotasová Adámková
Illustrated by Tomáš Kopecký
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Have you ever wondered how animals perceive the world around us? Whether they see the same colors we see? Whether the vision of a fish is blurry underwater like ours? Or whether dogs like to watch TV, or cats really can see in the dark? If you have ever wished you could ask the animals themselves, don't worry, because the book you are holding in your hands holds the answers to these questions and many more.

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