

The Outside Story

There's More to Fur Than Meets the Eye

By Susie Spikol

A flash of orange streaks across the meadow – a red fox, like a starburst in the snow. Its fur shimmers in the early morning light, and I, bundled in my winter layers and still shivering cold, envy the fox's luxurious coat.

At its simplest, hair – or fur – keeps mammals warm by trapping heat close to the skin. Fur can also repel water. A careful look at winter pelts reveals that not all fur is the same. Long strands of bristle-like fur, known as guard hairs, make up the outside surface of many species' coats. This fur often gives the animal its color and pattern. Under the guard hairs, thick, wavy underfur increases the coat's surface area and traps warm air against the body.

All types of fur are made of keratin, the same insoluble protein that forms our fingernails and our own mane of hair. This protein coats each strand of hair, preventing water from soaking through. A fox's long guard hairs act like a raincoat, shedding water, while its dense undercoat is like the insulating base layers we wear on cold winter days.

For semi-aquatic mammals such as mink and beaver, fur can be virtually waterproof. These animals have glands near the base of their tails which produce oil. The animals spread this oil across their pelts through consistent and careful grooming to help seal their fur from moisture and keep their bodies dry and reasonably warm, even as they swim under the ice.

Most mammals shed their summer hair and grow new winter-worthy fur in the fall. Deer lose their reddish coats, which lack underfur, and grow gray-brown pelts with thick, woolly undercoats. Their winter guard hairs are hollow-shafted, which allows them to retain warmed air, and deer use special muscles to adjust the direction of these hairs and optimize their insulation.

Other mammals go for a completely new winter look. Snowshoe hares and most weasels in the Northeast turn white in the winter, increasing their ability to blend into a snowy landscape. Recent research suggests decreasing snowfall due to climate change will adversely impact these animals; instead of blending into their environment for protection from predators, their winter white will stick out on a brown landscape.



Fur plays other essential roles in most mammals' lives, including visual communication. Think, for instance, of a dog raising its hackles to appear larger when threatened. Whiskers, another type of hair, are specialized for sensory reception; nerves at the base of each of these unique hairs alert mammals to vibrations and air currents, helping them judge distances, navigate burrows and other dark spaces, find prey, and sense danger. Some small mammals may use hair – beyond their whiskers – to identify danger, perhaps relying on guard hairs to detect predators.

Ian Baker, a wildlife enthusiast and physicist specializing in infrared sensors, noticed when he watched trail cam videos that certain predators, such as owls and cats, hunted in ways that seemed to conceal their body heat. Cats, he observed, ambushed their prey with their bodies stacked up behind their cold nose, and barn owls twisted their torsos, obscuring the hottest parts of their body – their legs and wing pits. He wondered if predators conceal their body heat because their prey can sense it.

Baker collected guard hairs of mice and examined them under the microscope. He noticed these hairs had evenly-spaced bands of pigment, similar to structures he was familiar with from his work with infrared sensors. The pigment bands matched measurements of tools – such as thermal cameras – designed to pick up the heat signature of life. The hair also shared many structural similarities to these heat-sensitive antennae, including such characteristics as stiffness, inability to rotate or spiral, and each hair ending in a long, tapered tip.

Baker looked at other small mammals, including rats, squirrels, shrews, and rabbits, which all seemed to share the same guard hair structure. Could it be that this fur acts not only as a warm winter coat, but also as a predator detector tuned perfectly to the heat signature of those most likely to eat them? Scientists are still working to verify this discovery.

Meanwhile, in the early morning light of winter, I watch the red fox disappear into the woods, and I feel the hair on my neck tingle. I lean into this feeling, wondering what that bit of electricity I'm feeling is really trying to tell me.

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