How an Owl Hears

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How an Owl Hears: Five Key Facts

Owl at night (Photo: Wiki Commons, Martin Mecnarowski).

Owl Hearing Explained

https://infinitespider.com/how-an-owl-hears/

Nature never does anything without a reason and there's a reason for everything that birds do, such as why hawks and eagles hunt during the day and most owls hunt at night. In ecology lingo it's called "habitat partitioning," which means using different parts of the habitat at diferent times or in diferent ways and not overlapping. This allows predatory birds like eagles and hawks to avoid conflict, and mice to be terrified 24 hours a day (it's rough being lowest on the food chain).

Hunting at night isn't nearly as simple as hunting during the day. Night hunters can't use their eyesight very well (except during times of the full moon), prey animals can hear them coming (because it's more still), and they have to land on a scampering wee beastie that is moving lightning fast (in, under, and around things) on the forest floor (or flying) with accuracy. Not much to ask, 'eh? Owls are spectacular hunters, and I've come to appreciate their adaptations for catching prey, in particular their accuracy and hearing. That's why I thought I'd do a post on how an owl hears.

FACT 1: Owls Fly Silently

First rule of night flight, if you can't see well then you have to rely on another sense, namely hearing. If you rely on hearing you can't be all noisy and flappy and generally scaring your prey or making so much sound you can't hear your food scurrying around.

For this reason owls have feathers that are muffled. Most bird wings are quite loud when they flap because this is how air flows over them (for physics nerds it's called Bernoulli's Principle). Owls have tiny barbs, hooks and bows on the feathers along the leading edge of their wings. These break up the air flowing over the wing, from one big air flow of turbulence to many small turbulences. These tiny air turbulences flow over and down the surface of the wing to the trailing edge of the wing. Owls also have flexible, raggedy fringes on the ends of their feathers. These further break up air flow and air noise, allowing them to fly silently. Since prey animals don't really think about looking overhead when they are running for safety, the silent flight of owls makes them especially deadly.

FACT 2: Owls Have Satellite Faces

Barred owl (Photo: Flicker Sharing, A. Davey)

If you look at the face of an owl you can't help but notice how it's shaped. There are some pretty specialized terms for the feathers on an owl's face. These include:

Facial disk-the satellite face (sometimes heart-shaped).

Facial ruff –this is the outer ring of feathers on the owls face (sort of like the lip of a cereal bowl). They form a curved wall of feathers that give the facial disc its cupped appearance. The symmetry or asymmetry of an owl's ruff is species-specific. Diurnal owls (like burrowing owls) have symmetrical faces, while nocturnal owls (barred owls) usually have asymmetrical faces, we'll talk more about why this is important later.

Auricular (are-ick-you-lar) feathers-the feathers covering the facial disc. These feathers also cover the facial ruff, so much so that often it can't be seen. You have to be pretty chummy with an owl to see its ruff. The auricular feathers are what we usually see. All of the feathers of the face (and the ruff) can be controlled by the owl through facial muscles, which means they can shift and change the shape of their facial satellite disc, to channel sound to their ears.

The feathers of the ruff act like reflectors for sound, and they increase the area over which sound can be collected by forming the owl's cupped satellite face. The feathers also increase the surface area over which sound is collected, thereby increasing sound sensitivity by about twenty decibels. In terms of sound ratios, that's a lot! The interesting thing is that diurnal owls (like burrowing owls) have symmetrical ruffs, while nocturnal owls have asymmetrical ruffs. It's thought that this asymmetry helps the owls in orienting sound. This relates directly to Fact 3 below.

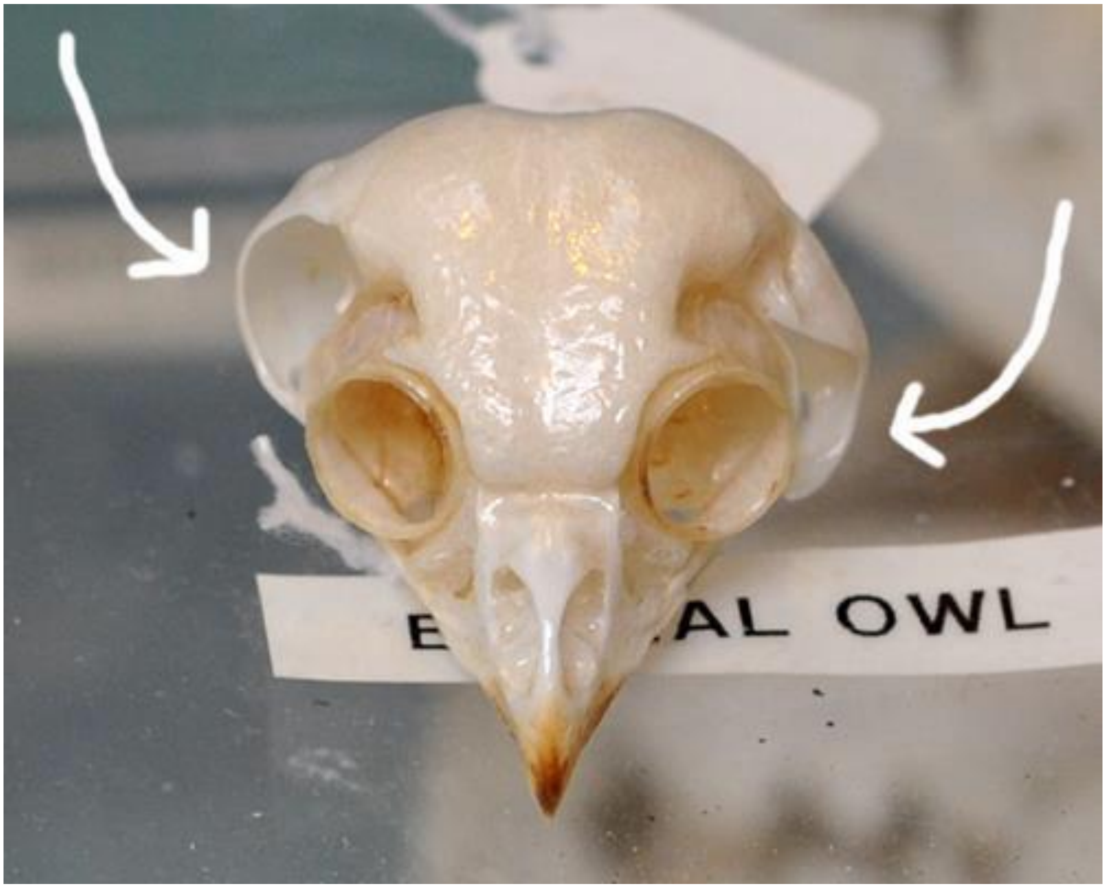
Fact 3: Owl Ears Are in Different Places

Great horned owl (Photo: Wiki Commons)

We've all seen pictures of great-horned owls or owls with funky tufts of feathers on their heads. These tufts are not ears -- they are just tufts of feathers that can tell you what an owl's mood is, sort of like how a cat swivels its ears to tell you how it feels. An owl's ears are actually located behind the feather ruff and on the edges of the facial disc.

Now here's the funky part, in most nocturnal owls, their ear holes are not directly across from each other like ours are (see owl skull picture below). Picture taking one of your ears and moving it about four inches up the side of your head. By having ears in two different locations owls can triangulate the location of sounds. It's estimated that soundwaves reach an owl's left ear about 200 microseconds faster than the right ear.

The asymmetry of an owl's ruff and ears allows owls to be maximally sensitive to sound. If an owl hears a mouse scurry below it, the sounds that the ears receive differs in intensity (the technical term for this is "interaural distance differentiation") based on where the mouse is located and moving. Owl nervous systems can separate out where the sounds come from based on which ear hears the sound more intensely.



Owl ears in di5erent places (Photo: JJ Williams, Star Tribune)

Fact 4: Owls Have a Big Map-Brain

Owls also have a very developed medulla, a part of the brain that allows for spatial mapping. It's thought that an owl has three times more neurons (computing power) than other birds. An owl that is sitting on a perch and hunting has to be able to mentally map (in the dark) an object in three dimensions. Think of their medulla as being the triangulation calculator. To visualize their triangulation of prey location, if the prey is below and in front of an owl, visualize a mouse on the ground at the point of a triangle with two uneven lines coming from the mouse and stretching up to the owl on the branch. The owl would be in the middle of the base of the triangle, and it would move its head back and forth until the two sides of the triangle were equal. An owl does this triangulation continually, without thinking, and even in rapid sequence while flying. There are lots of experiments owl researchers have done to study owl hunting/hearing. In one study they had a mouse walk across foam (in the dark) with a rustling piece of paper tied to its tail to see what the owl would strike. (spoiler alert: the owl struck at the paper not the mouse.

Fact 5: An Owl's Beak Faces Down

Barred owl up close (Photo: Wiki Commons).

Most birds of prey have beaks that extend in front of their faces, which allows them more surface area for breaking the necks of prey, ripping and tearing food, and for creating a more aerodynamic head. Owls don't have this. They are built to maximize sound reception. By having a beak that is snug against their face, the sounds that come to them bounce off the beak and are redirected to the facial disc and the ears.

Owls are amazing creatures, and how an owl hears is even more amazing. They have many unique adaptations that make their habitat partitioning work. If you see an owl out flying at night, stop to admire how it moves and the computing brain power it takes just to fly without running into things in the dark (much less landing on prey!).