



■ When I first began to read scientific papers about owls, I was bothered by how little was really known about how owls live and how they are able to hunt food at night. For instance, people had found that many kinds of owls have left ears that are completely different from their right ears (*see photo*). Such owls also have special feathers on the front edges of their wings that reduce the amount of noise the wings make when the owls fly (*see diagram*). Neither of these peculiarities is found in other birds. But

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A barn owl must catch several hundreds of tiny field mice a year to feed itself and its young—and it catches most of them in the darkness of night. In this series of three articles, a biologist tells how he discovered...

HOW OWLS HUNT

by Roger Payne

PART 1

no one had really tried to find out whether the strange ears and silent flight were of use to an owl.

The Barn Owl's Food Problem

One thing that was known about the lives of owls in the wild was what they eat. For instance, the barn owl is known to live mainly on field mice. People discovered this by examining the *food pellets* coughed up by owls after they have digested the meat of an animal. A food pellet is a neat, nearly dry, odorless wad of the undigested remains (mostly fur and bones) of the owl's prey (*see photos later in article*). If you collect pellets beneath trees that owls inhabit, and tear these pellets apart, you can find out what the owl has been eating.

I had heard that barn owls eat field mice, but I thought they must catch lots of other animals because it would be hard to catch enough field mice every day. Also, barn

owls have an average of nine offspring a year. So in the summer, when they are feeding their young, barn owls would have to catch nine times as many field mice. To do this at night, when it is almost impossible to see the mice, seemed extraordinary. But maybe field mice are a lot easier to see at night, when they are running all about, than in the daytime, when they are asleep in their burrows.

Again I went to the library, and again I was discouraged to find that so little was known—this time about the lives of mice. I did find, however, that it is probably very difficult for the owls to see field mice, because the mice build tunnels on top of the ground through the bottoms of grass stems. They push a path through the grass stems, chewing off any that are in the way, and stuffing the remaining bits into the side of the path or into the criss-cross stems that form the roof. Unless the mice have done a really bad job, they can move along such winding grass arbors without being seen most of the time.

Despite these tunnels, though, each barn owl probably catches up to several hundred field mice each year. I began to wonder whether the mouse tunnels work against mice as well as for them. If most of the time mice could not be seen, then most of the time they could not see danger approaching. Perhaps, too, the tunnels are not sound-proof. Besides, field mice could not spend their whole lives in the grass tunnels. The tunnels have to be lengthened and cleaned. New food has to be found, gathered, and eaten. Mates have to be met, battles fought to establish ownership over part of a field, and so on. All these activities must require leaving the tunnel. And it must be very nearly impossible for a mouse to build,

gather, chew, explore, or fight without making sounds.

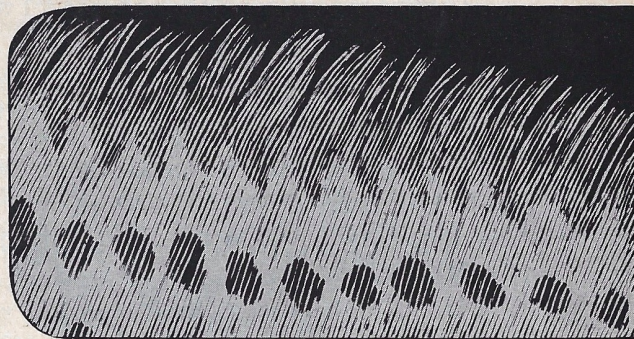
I thought about these things, and suddenly several things clicked into place—the peculiar ears of owls; their silent flight; the necessary noisiness of mice. To locate anything as small as a mouse by hearing, an owl would have to be able to follow its sounds very precisely, and, therefore, would require special ears. If the mouse heard an owl approaching, it would probably stop making sounds, and the owl would fail to find it, so the owl would need to fly quietly. Also, if the owl did not have to see a mouse at all to catch it, it would make little difference to the owl whether its waking hours were spent in light or dark. Maybe owls are active at night because mice are.

A Tame Owl Learns To Hunt

I decided to try some experiments to see whether a barn owl could catch a mouse when it could not see the mouse. I got my start working with Dr. William Drury, who ran a research station for the Massachusetts Audubon Society. We started experimenting in a deserted building near Dr. Drury's house. Having boarded up the windows in one very large room (40 feet long), I spent two weeks plugging cracks with putty and masking tape until I could see no light—even with full sunlight outside. Then, just to make doubly sure the owl could not see anything, I did my experiments only at night.

I was lucky in getting a full-grown barn owl that was quite tame. I decided that I would let the owl get used to the dark room for a few weeks, and then see if it could catch a mouse in total darkness. To be sure that the mouse

(Continued on the next page)



Many kinds of owls have a fringe along the front edge of their wing feathers (see diagram). This fringe cuts down the noise that the wings make when the owls fly.

If you draw a line between the centers of this barn owl's eyes, you can see that its left ear flap (which covers the ear opening) is slightly higher than the right ear flap and opening. Scientists believe this helps the owl locate the direction from which a sound is coming.



This owl and its young are surrounded by food pellets—wads of bone wrapped in fur that an owl coughs up after it digests the meat of its prey. A single pellet is shown below with the skulls and some bones of a bird, a shrew, and a mouse.



How Owls Hunt (continued)

would make noises when it moved about, I spread dry leaves on the floor of the room. And, to keep the owl from colliding with anything when it flew, I left the room empty except for one perch at each end.

The first time I offered the owl a chance to catch a mouse in total darkness, nothing happened. I turned on the lights, but even then the owl did not seem to know what to do. Instead of flying down to land on the mouse directly, it alighted on the floor and then caught the mouse by running it down. When an owl runs it leans far forward and takes very long strides; I felt as if I were watching a dinosaur running down its prey.

It occurred to me later that because my owl had been raised in captivity it had never seen other owls catch mice, so it might have to discover for itself how to do it. The owl kept running down the mouse, instead of flying directly to it. Then one time it launched itself into the air and came down on the mouse. Every time after that, it flew directly to the target.

A Strike in the Dark

The next time, I tried the owl with the lights off. Sitting in the still darkness, I could occasionally hear the owl shifting on the perch. I could picture it hesitating to launch itself into the pitch-black air between it and the mouse on the floor. After I gently tossed the wild mouse into the leaves, it “froze” as it landed, and waited 45 minutes before moving at all. Then it moved only a step every half-minute or so, to judge by the faint and occasional creak of a leaf. It seemed that we three—the mouse,

the owl, and I—were all waiting tensely for someone else to make the first move, scarcely daring to breathe or swallow, alert to any sound.

After about 15 minutes, I heard a slight rasping sound—a sound I came later to know well—the sound of the owl’s talons scraping off the perch as it started its flight. There was a moment of unbearable silence and then a crash. My hand was on the light switch; I snapped it on. To my amazement, I saw that the owl was grasping the mouse in its claws. Everything had exceeded my wildest hopes. I had witnessed, at least with my ears, an owl flying in darkness through a room longer than most houses and pinning to the floor an object the size of my thumb.

Perhaps you can understand why my immediate question was, “How on earth did the owl do it?” (It is now 10 years since that night, and still I have only some of the answers.)

I was immediately filled with doubts. Had it just been a lucky shot by the owl? Would it ever try again? Would it ever succeed again? Was it the owl’s hearing, as I suspected, or some other sense that had guided it to the mouse? I hardly dared try the experiment again, but unless I did, I could say nothing with confidence.

After an hour, I released a second mouse again in the dark. This time the owl struck with even less hesitation than before. My excitement grew when I realized I had shown for the first time that an owl’s ability to locate mice does not depend on training or practice. The owl I was testing had never before hunted or watched other owls hunt, yet was able to catch prey on the first try, in light or dark.

Since that first day, I have repeated the experiment hundreds of times, using four different barn owls. Again and again the same thing has happened—the barn owl catches a moving object without seeing it at all.

Was Sound the Owl's Only Clue?

I had started with the idea that an owl might be locating its prey by hearing it move, but my first experiment did not prove that. The owl might have been using one of several other clues. Mice are very smelly creatures, for instance, and perhaps owls can detect them by smell. Also mice are very warm-blooded animals, so they might be detected by the heat they give off.

To disprove these two possible explanations—heat and odor—I needed a cold-blooded mouse that did not smell. If an owl could catch such a mouse in darkness, it would have to be hearing that directed the owl's strike.

I was able to make a "mouse" to these specifications by tying a crumpled, mouse-sized wad of paper to a thread and dragging it through the leaves on the floor in total darkness. The only truly mouse-like thing about the paper wad was the noise it made as it brushed the leaves. The owl caught it repeatedly in total darkness, and thereby proved the owl could locate objects using only its ears. There was still a problem. I could think of two ways an

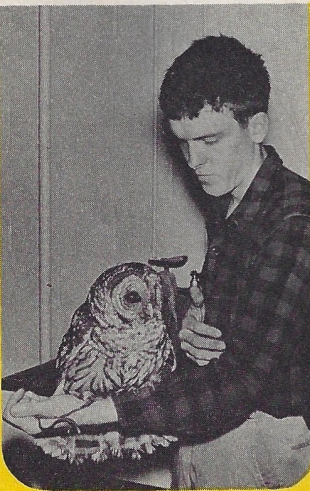
owl might locate its prey by hearing: It might simply follow a mouse sound to its source, that is to say, "home in" on the sounds made by a mouse. Or it might locate mice the way some bats find insects—by making loud sounds and listening for the echoes (*see "Hunting with Echoes," N&S, October 17, 1966*).

To solve this problem I needed something that made mouse-like noises but was shaped utterly differently. If the owl could strike such an object in total darkness it would prove that the owl was homing in on sounds, not locating them by echoes, because any very unmouse-like object should give the owl very different echoes from those bouncing back from real mice.

My solution to this problem was to use a tiny loudspeaker. Through the speaker I broadcast a tape recording of mice running through leaves, and the owl struck the loudspeaker with ease—in total darkness.

As a final proof of my case for hearing, I plugged one ear of a barn owl with a small cotton wad and let the owl try to catch a mouse in complete darkness. It missed every time, indicating that when I interfered with its hearing it could no longer locate mice ■

How can an owl locate a mouse so accurately by hearing alone? See Part 2 of this article in the next issue.



The author, Roger Payne, was a graduate student at Dartmouth College, Hanover, New Hampshire, when he was photographed with this barred owl.

WHY I STUDY OWLS

When I was your age, I loved owls. I have always loved owls. Months could pass in which I never thought of an owl, but whenever I saw a picture of an owl, I had a special feeling. It would hit me that here was something I really cared about and that I would like to spend some time in a forest where owls lived.

I spent summers in the country, but I was sure

that owls were so special that they would never think of living in the woods near our house. So I never looked for them or bothered to ask anyone if there were any around. Long after we had moved away, I learned that we had been living right in the midst of owl country.

When I got to my senior year in college, I found that there was a course about birds that I could take and even get credit for. What was even better, though, was that in this course everyone was asked to spend a lot of time reading about one group of birds; to do some research if possible, and then to write about it. I chose owls before anyone else could beat me to it. (As it turned out, nobody else even cared.) It was the first time I realized that something I really wanted to do might be considered work by others—and that was perhaps the most important thing I learned in college.

Since that time I have studied owls for years at a time. I have seen them in the wild, and have kept up to 50 owls of 14 different types at one time. I have grown to like them more and more. Because I am now a biologist, I actually earn a living by studying owls. This has never ceased to amaze me, since I would gladly pay someone for the chance to study owls if only I had the money.

—Roger Payne