By Michael Lipske / Photographs by Alex Badyaev

THE EYES OF A SCIENTIST

Photography plays a crucial role in the diverse wildlife research projects conducted by an Arizona biologist

"Every now and then you get lucky," Alex Badyaev says of his portrait of northern flying squirrels—a male in amorous pursuit of a female—soaring across a moonlit sky in Montana. But sometimes luck requires careful planning.

Before pressing his camera's shutter, Badyaev spent weeks charting the routes and routines of several female squirrels in the Bob Marshall Wilderness, where the University of Arizona professor and evolutionary biologist spent eight months studying the mammal family's most sophisticated gliders. Strictly nocturnal, flying squirrels emerge after midnight—"you can set your clock by them," says Badyaev—and follow predictable flight paths through the trees as they visit food caches.

Knowing that one female regularly soared across a certain gap in the forest canopy, Badyaev snowshoed into the woods one frigid February night under a full moon. Hoisting four strobes on a rope thrown over a spruce branch, and praying that the battery-operated flashes would fire in the subzero temperature, he set up his tripod and camera and waited. "You could hear the squirrels coming—a sort of squabble sound when they're jumping from one tree to another—and then they got to my tree," says the scientist. The female leapt first, followed by the male. "Of course, 99 percent of the photos didn't include the animals." But in the end, he *got* the shot.

Getting the shot is key to much of Badyaev's fieldwork. The research group he heads up in the university's Department of Ecology and Evolutionary Biology has investigated

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A JUVENILE VAGRANT shrew in Montana dreams big, falls short, as it tries taking down a viceroy butterfly. Not taught by their parents which prey to seek, young shrews are "clueless about what to eat and only learn by crazy hunting," says Badyaev, who took the photo while studying the effects of climate change on the tiny animals. Unlike most mammals, shrews are born with jaws that have not yet hardened into bone. As part of his research, Badyaev discovered molecular mechanisms that enable a young shrew's jaws to adapt to available prey—whether hard beetles or soft grubs—and that determine the ultimate biting power of its adult jaws.

UNITED AGAINST THEIR COMMON ENEMY, a Harris's antelope squirrel (middle) and a rock squirrel mob a western diamondback rattlesnake in Arizona's Sonoran Desert. "Every species in the desert that is potential prey for a western diamondback has evolved a complex ritual for letting the reptile know it's been discovered," says Badyaev. For a study of predator-prey interactions, he photographed not only squirrel mobbing behavior, but also the different hunting styles employed by diamondbacks that prey mostly on rodents compared to snakes of the same species that only strike at birds.

FROM ITS FORAGING perch above a forest meadow in western Montana, a male mountain bluebird conducts surveillance on the surrounding insect population. In a long-term study, Badyaev and his colleagues tracked the displacement of mountain bluebird populations by more aggressive western bluebirds, a species that once was nearly extinct in the West. The western bluebird's comeback is a direct result of people putting out nest boxes by the thousands across valley floors, beginning in the 1970s, to create more breeding habitat. Mountain bluebirds have since retreated to higher elevations, where summer snowstorms have kept western bluebirds from usurping habitat. But now, researchers have discovered, a warming climate is enabling lower elevation species such as the western bluebird to extend their ranges to formerly inhospitable mountainsides, posing a new threat to mountain bluebirds.

TWO LESSER long-nosed bats (top left) feed on pollen and nectar from a blooming agave in the desert near the University of Arizona campus. Badyaev's research group is investigating the genetics behind the rapid healing that occurs when these bats—following collisions with cacti or other bats—tear holes in their wings. On an August evening in Montana, the scientist's son (above) watches long-legged *Myotis* bats chasing satin moths outside his window. "It's his bedtime television," says Badyaev.

A MALE HOUSE FINCH feeds his offspring in a nest in the spiny sanctuary of a cholla cactus in the Sonoran Desert, where Badyaev photographed them as part of a long-term study of the species. Native to the southwestern United States, house finches were imported to New York for the pet trade during the last century, and the descendents of those birds, which now number in the millions, have since colonized most of eastern North America. Badyaev and his students are researching how these desert birds adapt so readily to much colder and wetter environments.

dozens of wildlife species—from bumblebees to bats to grizzly bears. Badyaev's abiding interest is the origin of adaptations that animals develop in response to their environment. Almost all his projects have started with intense observation of how his subjects behave in the wild. "I've always observed animals for a long time," he says, "but now photography allows me to record in detail some wildlife behaviors and adaptations rarely seen by anyone before. It's become a crucial tool in my work."

Montana and Arizona are a long way from the Moscow apartment where Badyaev grew up and volunteered at the city's zoo. "I was a very serious kid, very much into animals and biology," he says. He was so serious and scientifically savvy that a leading Russian ornithologist invited him to join a long-term research expedition in the remote Kamchatka Peninsula. Badyaev was 13 years old at the time.

Decades later and now a leading scientist himself, Badyaev occasionally finds time for more personal photography projects, such as focusing on the action around a window of his research cabin in the Montana wilderness. As with his flying squirrel photos, he thought long and hard about how to record his 13-month-old son Victor watching bats and moths through the glass. Capturing the scene with his camera required setting up several remote-controlled flashes that would illuminate predators and prey without overpowering the warm window light or disturbing the animals.

"So everyone goes about their business," says Badyaev. "The child watches the bats, the bats catch moths, and I just walk around with my camera and photograph." It's a baby picture only a biologist dad could create.

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