The Big Idea

Q: How do you count migrating birds at night?

A: Design an automated moon-tracking device for citizen scientists.

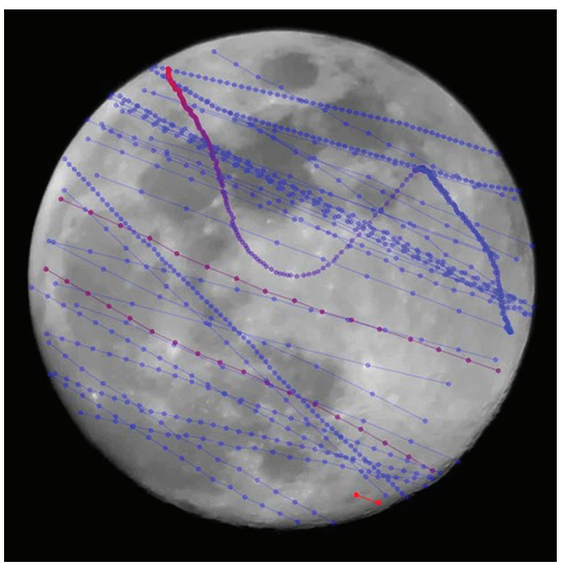
By Chip Minty

Most people can only speculate about birds, and only rarely can we get very close. When we do stop to take an interest, birds fly behind the house, hop into trees, float over a fence, or go anywhere else that we can't go.

Ornithologists obviously know the most about birds and can answer many questions, but their answers often lead to even more questions, more mystery and more fascination.

A team of University of Oklahoma biologists are taking on what could be one of the most fascinating studies of all: the biannual migration that carries billions of birds north and south across North America, primarily at night.

"It's an amazing phenomenon," says Jeff Kelly, OU's Corix Chair and a professor of biology. "I've always been mystified at how birds can fly hundreds or even thousands of miles to places they've never been after being raised in a nest."



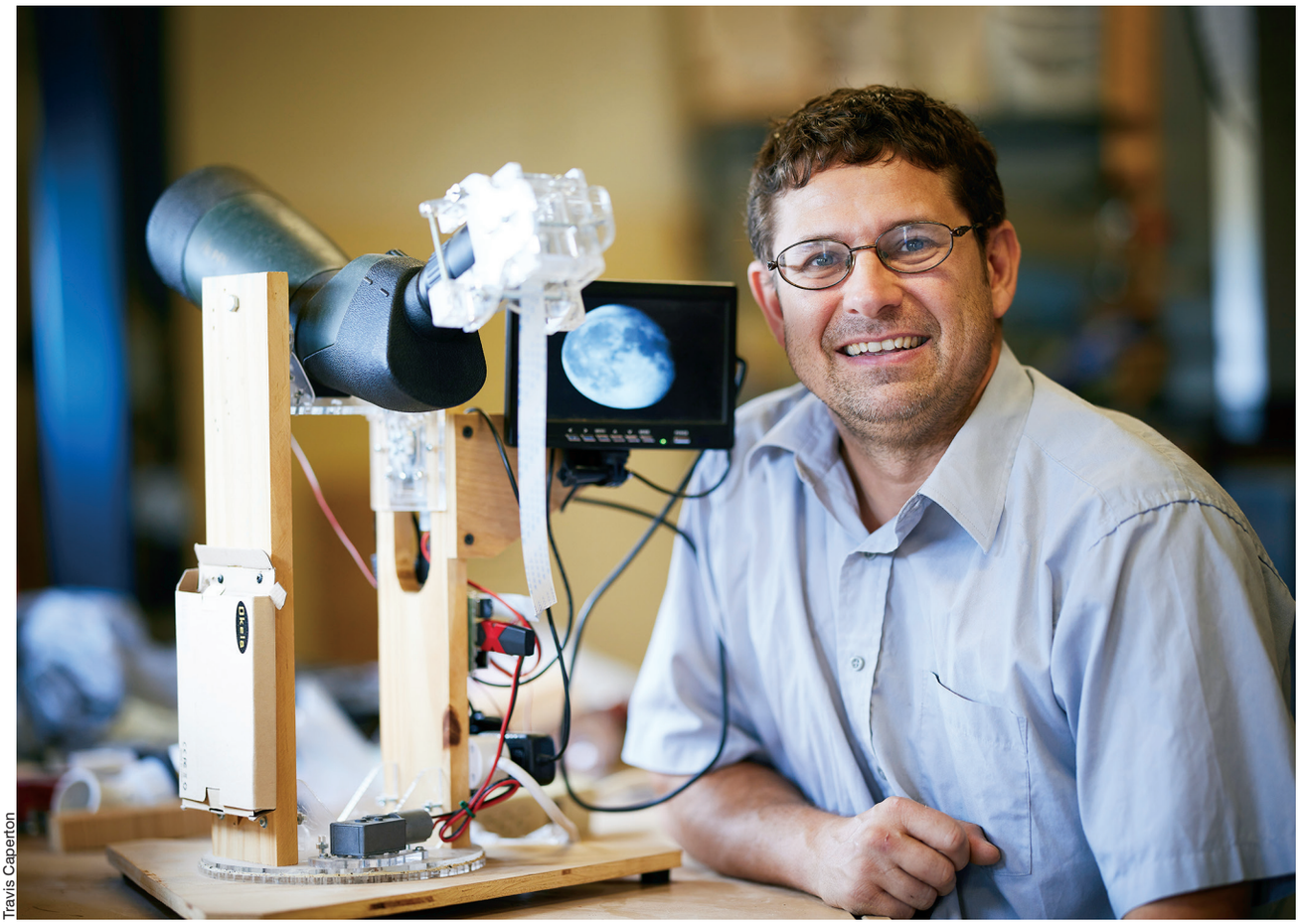
A screenshot from a LunAero time-lapse video shows the digitized trails of migrating birds across the moon during one night's observation.

Kelly is investigating those questions with Eli Bridge, an OU associate professor at the Oklahoma Biological Survey, ornithologist and an avid inventor who specializes in making research easier for biologists who study birds. Bridge is developing a bird-watching device that could shine light on the mysteries surrounding nighttime bird migration.

Counting birds as they migrate has been an occupation of bird watchers and ornithologists for more than a century. The process helps explain bird populations, as well as the decline of some species, and leads to better conservation measures, Bridge says. But the practice is difficult because most migrating birds travel after dark and alone, making them even harder to count.

To address the problem that has been perplexing ornithologists for years, Bridge invented LunAero, the first fully automated, lunar bird-tracking device, which puts a modern twist on an age-old bird-watching ritual. If everything falls into place, he could open new windows of observation that biologists have only dreamed of.

"There's a lot of potential in this, because we can actually



Travis Caperton

Eli Bridge conceived of and developed a device to count migrating birds, which primarily fly at night, by using affordable components accessible to everyday citizen-scientists.

see the birds at night, which you can't do by many other means," he says.

Bridge's device is derived from a practice called "moon watching," which began in the 1870s when scientists camped under a full moon, using binoculars and telescopes to catch bird silhouettes streaking across the white, lunar background. While moon watching is an excellent form of direct observation and a viable way to gain migratory estimates, it is not a method researchers use frequently—partly because of the hours of late-night observation, he says.

There are several alternatives to moon watching, such as weather radar, tracking radar, audio detection, artificial lights and thermal cameras, but birds flying individually in darkness at various altitudes present challenges for those technologies, which struggle to deliver precise, reliable data, Bridge says.

"I watched a graduate student's presentation on moon-watching research several years ago, and I thought, 'We could automate this with a video camera and not have to stay up all night,'" he says. "So, we tried it. We just set up a spotting scope, filmed some birds, and it worked."

From there, Bridge moved forward with design and development. Through stages of trial and error, he has built LunAero as a full-scale, moon-watching device equipped with a scope, a video camera, a minicomputer, a monitor, and two motors that rotate the scope as it follows the moon across the night sky.

Bridge can set up LunAero on a clear night, aim its scope at the moon, turn it on and go to bed. The next morning, he has hours of video, showing birds flitting across a bright, full moon. Without LunAero, he would have been up all night, staring into a telescope, manually recording each passing silhouette.

"If you show this to real engineers, they would just yawn," Bridge says. "But it was a challenge for us. We went through lots of versions to get the gears just right and get the right motors to ensure it didn't jam up. One restraint we put on ourselves is we wanted to make it inexpensive to build."

For example, he says, each motor costs only $15, and the minicomputer costs $40. The monitor was the most expensive component at $50. Now, Bridge is preparing a research proposal to the National Science Foundation, seeking $300,000 in funding for further development necessary to bring the project closer to completion.

Once LunAero is fully developed, he hopes to make its design available to the public so citizen scientists can build their own devices, using the same type of inexpensive components. If the project is successful, Bridge says, people could use LunAero to moon watch in regions across North America, compiling volumes of video chronicling one of the most mystifying rituals in the animal world.

And the best part, he adds, is the birds won't even know they're being watched.

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