

Songbirds Check Compass Against Sunset to Stay on Course

Songbirds can migrate for thousands of kilometers at night and in poor weather yet still end up in the right place. How do they do it? In lab experiments, birds can remember landmarks, check the stars or the sun, or follow a magnetic compass. Now, in a logistical tour de force, three researchers have shown for the first time what happens in the wild.

After radio-tracking individual birds across the U.S. Midwest for hundreds of kilometers, the group reports on page 405 that night-flying thrushes set their course using a magnetic compass, which they calibrate to the setting sun before takeoff each evening. The new evidence is “extraordinarily straightforward and convincing,” says John Phillips of Virginia Polytechnic Institute and State University in Blacksburg.

Most of what’s known about bird navigation comes from lab experiments. Researchers place a bird inside a small, vertical funnel, then alter the magnetic field, the orientation of polarized light, or other cues. By watching in which direction the birds attempt to hop out, scientists try to discern which cues the birds rely on most. But these “cue-conflict” studies have often yielded conflicting results. “What was needed was a clean experiment with birds in the wild,” says Phillips.

About 20 years ago, William Cochran, then at the Illinois Natural History Survey, attempted just that. He radio-tracked two migratory birds for 6 days, and they appeared to use the sunset to calibrate a magnetic compass. Calibration would help navigation, he reasoned, because magnetic field lines vary from place to place and don’t always point toward true north. Birds might wander off course if they didn’t double-check their bearings.

Cochran had put the work aside, but when Martin Wikelski of Princeton University and Henrik Mouritsen of the University of Oldenburg in Germany approached him about the idea, the trio decided to test it. They captured several dozen gray-cheeked thrushes and Swainson’s thrushes near Champaign, Illinois, and glued small radio transmitters to

them. Before releasing the birds, they exposed some to “false” magnetic fields, rotated 80° to the east, during sunset.

The researchers followed the birds as they flew through the night, tracking them using a meter-tall antenna mounted on top of a battered 1982 Oldsmobile. “It’s quite a chase,” Wikelski says. Many nights, the team was delayed when suspicious police officers pulled over the electronics-laden car.

Control birds flew northerly, but those that had been in the al-



Night moves. Radio-tracking charted the highly accurate flights of migrating thrushes.

tered magnetic field flew westward for the entire night. The next evening, after sunset, the experimental birds corrected their course and headed north.

The birds seem to calibrate their compass at sunset, per-

haps from the position of the sun or the pattern of polarized light it creates in the sky. They may set their course by comparing the twilight cues with the orientation of the magnetic field lines. However, it’s not certain that once airborne, the birds actually fly by their magnetic compass, Phillips notes; after getting their bearings at dusk, they might keep their eyes on the stars.

This work may explain why birds don’t get lost when they cross the equator. That had been an enigma because birds can’t tell magnetic north from south. Instead, they check the inclination of the field lines relative to the ground; the angle becomes steeper near the poles. A bird using only its magnetic compass would risk getting turned around near the equator, but calibrating it to the sunset would keep it on track. Of course, the position of the sunset changes with latitude and season, but Wikelski thinks that birds may be able to correct for that through a biological clock that tells them the time of year.

—ERIK STOKSTAD

ScienceScope

Gift Lifts Plan to Bar-Code Life

Let the bar-coding begin. The Alfred P. Sloan Foundation has given a \$669,000 grant to a consortium of herbaria, museums, and research institutes to jump-start the Barcode Life Initiative, which aims to create an online catalog of the world’s flora and fauna.

Each “bar code” will be a short DNA sequence taken from a mitochondrial gene. The sequences define individual species and will help researchers classify known organisms and detect new ones (*Science*, 13 June 2003, p. 1692). Initially, bar coders will focus on specimens in museum and herbaria collections, taking advantage of new techniques for using old DNA, says Scott Miller of the Smithsonian’s National Museum of Natural History, which will host the initiative. Eventually, handheld bar-coding devices should enable researchers to catalog field specimens as well.

The 30-month grant, made late last month, will enable bar coders to set up shop and recruit non-U.S. scientists. Initiative backer James Hanken, an evolutionary biologist at Harvard University, says attracting “major international involvement is a high priority.”

—ELIZABETH PENNISI

Writing the Biosecurity Bible

Government officials this week got an earful of advice from researchers on how to revise and expand the bible of biosafety. Their message: New security guidelines aimed at keeping potential bioweapons out of the wrong hands need to be flexible.

About 100 academic and government scientists showed up at the 12 April workshop hosted by the White House Office of Science and Technology Policy to discuss what should be included in a new edition of *Biosafety in Microbiological and Biomedical Laboratories*—the influential safety guide known as the *BMBL*. In particular, an expert panel wanted to know what scientists wanted to see in a new chapter on “biosecurity,” which could help researchers comply with a host of new U.S. bioterror regulations.

Suggestions ranged from a model study of the threats facing a typical laboratory to a detailed assessment of the risks posed by specific organisms. Edward Hammond of the Sunshine Project, a Texas-based bioweapons control group, said that the *BMBL* should urge scientists working with select agents to share information with the public. And Ellyn Segal, biosafety manager at Stanford University, echoed many speakers when she said the guide should balance “concerns of biosecurity [against] the impact on research.”

The government hopes to publish a new *BMBL* by mid-2005. Researchers can send their suggestions to levinson@ostp.eop.gov.

—DAVID MALAKOFF