

For migrating sparrows, kids have a compass, but adults have the map

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Even bird brains can get to know an entire continent -- but it takes them a year of migration to do so, suggests a Princeton research team.

The scientists have shown that migrating adult sparrows can find their way to their winter nesting grounds even after being thrown off course by thousands of miles, adjusting their flight plan to compensate for the displacement. However, similarly displaced juvenile birds, which have not yet made the complete round trip, are only able to orient themselves southward, indicating that songbirds' innate sense of direction must be augmented with experience if they are to find their way home.

"This is the first experiment to show that when it comes to songbird migration, age makes a difference," said team member Martin Wikelski, an associate professor of ecology and evolutionary biology. "The results indicate that the adult birds possess a navigational map that encompasses at least the continental U.S., and possibly the entire globe."

Two longstanding questions about migrant songbirds are how quickly they recover when thrown off course -- as they can be when they encounter powerful winds -- and just what navigational tools they use to do so. To address the two questions, the team decided to fit a group of white-crowned sparrows with tiny radio transmitters no heavier than a paper clip and track their movements from a small plane.

The team first brought 30 sparrows to Princeton from northern Washington state, where the birds had been in the process of migrating

southward from their summer breeding grounds in Alaska. Half the birds were juveniles of about three months in age that had never migrated before, while the other half were adults that had made the round trip to their wintering site in the southwestern United States at least once.

After the birds were released, they attempted to resume their migration, but both age groups grew disoriented quickly.

"All the birds scattered at first," Wikelski said. "It was clear they were turned around for a couple of days. But while the adults eventually realized they had to head southwest, the younger birds resumed flying straight southward as though they were still in Washington."

The adults, said team member Richard Holland, recovered their bearings because they possess something the younger birds do not, which is an internal map.

"These birds need two things to know where they are and migrate effectively: a 'map' and a 'compass,'" said Holland, a postdoctoral research associate in Wikelski's lab. "What we've found is that juveniles use their compass, but the adults also use their map."

Holland said the birds do not lose the compass as they age, but somehow develop the map, eventually applying both tools to keep on track during migratory flights. Scientists already have determined that the compass is based on the sun or the magnetic field, but where the map comes from remains a mystery -- one that the team will be exploring in coming years.

"It could be the map also derives from the planet's magnetic field," Holland said. "But there are so many local magnetic anomalies in the Earth's crust that it's also possible they are navigating by sense of smell. It sounds crazy, but there's a lot of evidence that homing pigeons navigate this way, so we need to investigate that idea further."

The team's research paper appeared in the Nov. 3 online edition of the journal *Proceedings of the National Academy of Sciences*.

Source: Princeton University

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