

'Neurologger' reads bird brains in flight

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Using a "neurologger" specially designed to record the brain activity of pigeons in flight, researchers reporting online on June 25th in *Current Biology*, a Cell Press publication, have gained new insight into what goes through the birds' minds as they fly over familiar terrain. The study is the first to simultaneously record electrical brain activity integrated with large-scale navigational movements of free-flying birds, according to the researchers.

"We've successfully applied electrophysiological methods, previously used for the investigation of [brain](#) functions in the lab, to a freely flying bird in nature," said Alexei Vyssotski of the University of Zurich. "The approach revealed places of interest for the [pigeons](#) and the pattern of their brain activation at such locations."

Homing pigeons are so named for their uncanny ability to find their way back home. Evidence suggests that the birds rely on the position of the sun, the Earth's [magnetic field](#), and a keen [sense of smell](#) to guide their way, but the underlying sources for their remarkable navigational skill are still much debated.

Over familiar landscapes, pigeons also depend on visual cues to get around, earlier studies have shown. To learn more about how the birds respond to what they see in the current study, Vyssotski's team devised a miniature neurologger device, designed to record and store EEG signals. Those signals reflect the firing of neurons within the brain. Vyssotski said that a recording session with the device, which weighs a mere two grams, can last up to several days, during which time the birds' flight

paths were also tracked with GPS.

The researchers got some baseline information by recording the [brain activity](#) of birds in the lab and of birds flying over the relatively featureless open sea. They then followed pigeons donning the neurologgers as they flew over a landscape including familiar and other relevant landmarks.

When pigeons pass over visual landmarks, their brains show a bi-phase activation pattern, consisting of high-frequency oscillations followed by middle-frequency activity, they report. "The middle-frequency activity was the most reliable indicator of visual stimulation," Vyssotski said. "When a pigeon looked at something with attention, this activity increased."

High-frequency brain waves showed an even more intriguing pattern, he said. That kind of activity seemed to reflect the birds' flight history and their recognition of places they had visited before. "In other words, activation of these oscillations may be associated with some memory processing or some other high-level brain functions."

Interestingly, the brain recordings revealed that the pigeons took unusual interest in a couple of locations that did not seem to be relevant to finding their way home. Upon further investigation, the researchers discovered a farm and cattle paddock in one of those spots, and in the second case, a nearby barn. The "riddle" was solved by visiting those places, Vyssotski said. Both harbored colonies of feral pigeons, lending them special significance for the [birds](#).

The same technique could be used to elucidate places of importance to other species in their natural environments, the researchers said, and for understanding the patterns of brain activity associated with such locations. In so doing, this line of research "can help to understand how

the [animal] brain operates in the real world."

Source: Cell Press ([news](#) : [web](#))

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