

Evidence suggests birds use eye proteins and magnetite-based receptors to navigate

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A pair of researchers from Goethe-Universität Frankfurt and Max von Laue-Straße 13 report that research by others has shown that there are two main physical attributes birds use to navigate. In their paper

published in *Journal of the Royal Society Interface*, two researchers outline the current state of the study of navigation in birds and what they found.

Some [birds](#) have demonstrated extremely sophisticated navigational abilities, flying thousands of miles during migrations—yet, scientists still do not know how they do it. In this new effort, husband and wife research team Roswitha and Wolfgang Wiltschko outline research that has been conducted by several groups in the field and what has been found. They also note that one major part of the process is still a mystery—how the bird brain processes the information it receives and translates it into accurate [navigation](#).

The researchers begin their report by noting that several studies have shown that birds navigate long distances by making use of the Earth's magnetic field. What has been difficult has been figuring out how they do so. Most in the field believe birds use two attributes of the magnetic field; the direction of field lines and their intensity. The Wiltschkos highlight several studies that have led to evidence of radical pair processing in the eyes via a special protein—allowing the birds to actually "see" the [magnetic field](#) as they fly. As for sensing and gauging the intensity of the field, they cite several reports that have led to suggestions that there are bits of metal ([magnetite](#)) embedded in tissue that "feel" the magnetism and nerves that carry the information to the brain. They note that there is not a consensus as of yet regarding where the embedded metal may be, but some have suggested it likely resides somewhere in the beak.

What is still a mystery, however, is how and in what parts of the brain navigation is carried out. The Wiltschkos point out that some research has led to theories that suggest that the [hippocampus](#) is heavily involved. Generally known for its role in memory, the birds may be adding navigational information to the geographic information they bank as they

grow older. The researchers also note that most in the field believe that birds use a different form of navigation than other mammals, such as fish and reptiles.

More information: Roswitha Wiltschko et al. Magnetoreception in birds, *Journal of The Royal Society Interface* (2019). [DOI: 10.1098/rsif.2019.0295](https://doi.org/10.1098/rsif.2019.0295)

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