

Superoxide May Help Birds Navigate

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The molecule superoxide, normally thought of as toxic and cell-damaging, may be crucial to a migrating bird's sense of direction according to researchers from the University of Illinois and Goethe University. The researchers proposed that superoxide interacts with a molecule called cryptochrome to help provide birds with a sense of geomagnetism.

Cryptochrome is a blue-light photoreceptor found in plants and in the eyes of birds and other animals, including humans. The senior author of the current research, Dr. Klaus Schulten, was the first to propose (in 2000) that cryptochrome was a key component of birds' geomagnetic sense, a proposal that was later corroborated by experimental evidence. Dr. Schulten made this prediction after he and his colleagues discovered that magnetic fields can influence chemical reactions if the reactions occur quickly enough to be governed by pure quantum mechanics. "Prior to our work, it was thought that this was impossible because magnetic fields interact so weakly with molecules," he said. The rapid chemical reactions involve electron transfers, Dr. Schulten said, "which result in freely tumbling spins of electrons. These spins behave like an axial compass. Changes in the electromagnetic field, such as those experienced by a bird changing direction in flight, appear to alter this biochemical compass in the eye, allowing the bird to see how its direction corresponds to north or south." Dr. Schulten noted that "other researchers had found that cryptochrome, acting through its own molecular spins, recruits a reaction partner that operates at so-called zero spin. They suggested that molecular oxygen is that partner. We propose that the reaction partner is not the benign oxygen molecule that we all breathe, but its close cousin, superoxide, a negatively charged oxygen molecule." Although known primarily as an agent of aging and cellular damage, superoxide has recently been recognized for its role in cellular signaling. The current research appears in the June 17 issue of the Biophysical Journal. [[Press release](#)] [[Biophysical Journal abstract](#)]

