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Avian magnetoreception – a radical sense of direction

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Abstract

Small migratory songbirds travel spectacular distances each year, navigating by a variety of means most of which are poorly understood. Among them is a remarkable ability to perceive the direction of the Earth's magnetic field. Despite more than 50 years of research, the biophysical mechanism of this extraordinary sense remains obscure. In this lecture, I will discuss the proposal that the birds' magnetic compass relies on light-dependent chemical reactions in their eyes. Specifically, the unique quantum mechanical properties of photochemically formed radical pairs in cryptochrome proteins could allow detection of magnetic interactions six orders of magnitude weaker than previously thought possible. I will outline the basis of the radical pair mechanism, present some of the evidence for the involvement of cryptochrome, and comment on the fundamentally quantum nature of this hypothesis.
