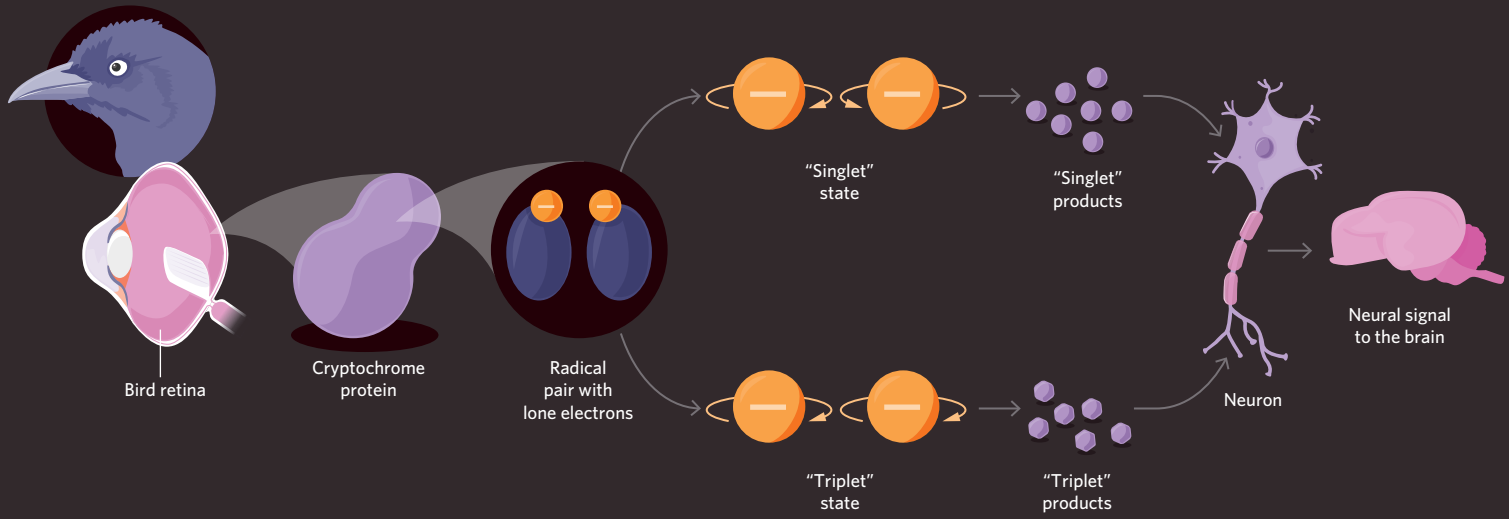
MAGNETORECEPTION: SPINNING SENSORS

According to the radical-pair model of avian magnetoreception, cryptochrome, a protein found in the retinas of birds and other animals, may be the magnetosensor, detecting the direction of magnetic fields via changes to the spin states of some of its electrons.



Reactions within the cryptochrome protein generate pair of molecules that each have a lone electron. These electrons, which can be entangled with each other, occupy one of two states: a "singlet state," meaning the spinning direction of one is related to the spinning direction of the other such that the spins are antiparallel; or a "triplet" state, in which the two electrons tend to have spins that are close to parallel.

The radical pair oscillates between these two states, and the probability of finding it in one state or the other is influenced by the direction of magnetic fields. If the singlet and triplet states of the radical pair are associated with different biochemical reactions, then the yields of products from those reactions can provide information about the direction of a magnetic field.

If those products go on to influence neural signaling from the bird's retina, then this mechanism could provide the basis for magnetoreception.