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**The reference-probe model in avian magnetoreception** MARIA PROCOPIO, THORSTEN RITZ, University of California, Irvine — The sensory mechanism that allows magneto-sensitive organisms to detect the direction of the geomagnetic field for navigation purposes is still largely unclear. One of the two leading hypothesis stipulates that photoindused radical-pair reactions in photoreceptor proteins act as the primary magnetic sensor in migratory birds. In recent years the radical-pair mechanism has been receiving considerable support, qualifying the avian compass for a place in the emerging field of quantum biology. Investigations on such a spin-based sensor have focussed on uncovering the design features for bioinspired technology. The reference-probe model has been suggested as an optimal radical-pair design. Radical-pairs with probe character have been shown to achieve not only optimal but also robust directional sensitivity to weak magnetic fields. However, the relevance of the reference character has not been studied yet. Here we introduce a method to investigate the contribution of the reference character to optimality and robustness. By analytical and computational studies, we find that the probe character is crucial for optimality, while the reference character captures robust features. Our results suggest the reference-probe model to contain both optimal and robust design features.

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