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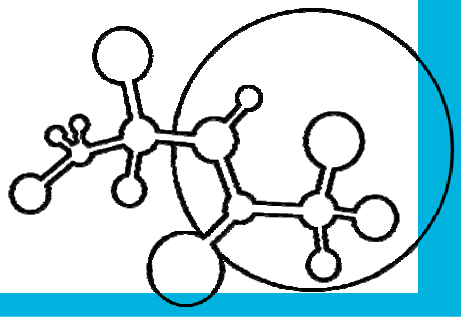

Quantum Efficiency Seminar and Colloquium

Wolfgang Wiltschko
FB Biowissenschaften,
J.W.Goethe-Universität Frankfurt am Main

Magnetoreception: behavioral tests of the Radical Pair Model

The magnetic compass of birds was analyzed by testing migratory birds in test cages in different magnetic field, using their orientation as an indicator of how they interpreted these fields. These tests revealed that birds derive their directional information without relying to the polarity of the magnetic field. The magnetic compass works only in a rather narrow intensity range around the local geomagnetic field. Yet this functional window proved flexible and can rapidly be adjusted to intensities outside its normal range. These characteristics are in agreement with the Radical Pair Model proposed by Ritz et al. (2000), suggesting the spin-chemical processes represent the primary processes underlying the detection of magnetic directions.

Testing further predictions from the model, we exposed birds to monochromatic light of various wavelength and radio-frequency fields of different frequencies and intensities. The magnetic compass proved light-dependent and was disrupted by radio-frequency fields applied at an angle to the magnetic vector, while the same field applied parallel to the axis of magnetic field had no effect. By systematically changing the frequency we could estimate the life time of the radical pair as between 2-10 µs. We could also identify an extremely sensitive resonance at the Larmor frequency, which implies specific properties of the crucial radical pair. Cryptochromes have been proposed as the receptor-molecule; Cry1a was found along the disks in the outer segments of the UV/V single cones in the birds' retina, supporting this assumption.

Further studies showed that the functional window of the magnetic compass of robins could be adjusted to a 4 µT field, less than 1/10 of the local geomagnetic field, which demonstrates the power of the Radical Pair mechanism.

Date: **Tuesday, May 24th, 2011 4:15 pm**
Location: **FRIAS Seminar Room, Albertstr. 19, Freiburg**

Contact: Andreas Buchleitner, Institute of Physics, Quantum Optics and Statistics,
T +49 761 203 5929 F +49 761 203 5967 E beate.spingler@frias.uni-freiburg.de
www.physik.uni-freiburg.de

Physikalisches Institut
Albert-Ludwigs-
Universität Freiburg