PHYSIKALISCHES KOLLOQUIUM

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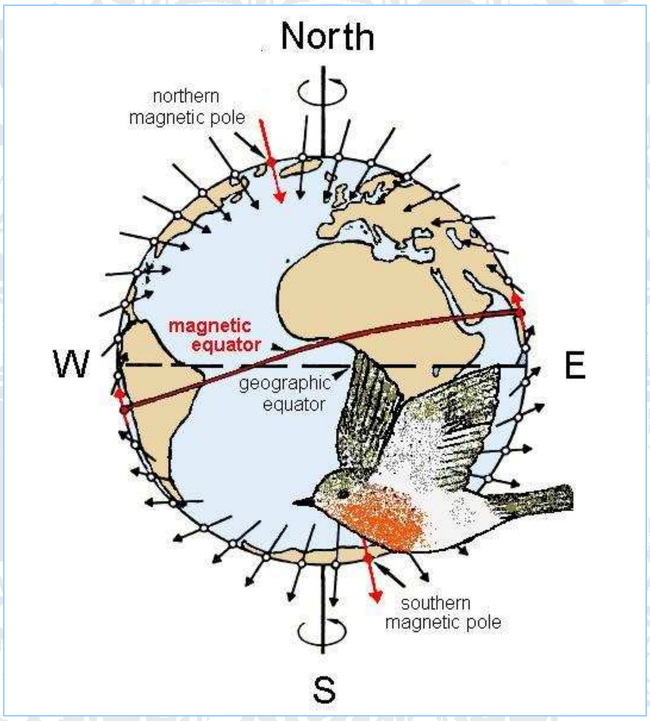
IM GROßEN HÖRSAAL



THE AVIAN MAGNETIC COMPASS

PROF. DR. WOLFGANG WILTSCHKO

FACHBEREICH BIOWISSENSCHAFTEN,
JOHANN WOLFGANG GOETHE-UNIVERSITÄT FRANKFURT

Behavioral analyses of the magnetic compass of birds revealed some remarkable differences to the technical compass, like not using the polarity of the magnetic field, a narrow, but flexible functional window around the local magnetic intensity, and a light dependency. These characteristics are in agreement with the model proposed by Ritz et al. (2000), suggesting that spin-chemical interactions like radical pair interactions represent the primary processes underlying the detection of magnetic directions. This model was tested in 'behavioral spectroscopy' experiments, where we exposed birds to radio-frequency fields of different frequencies and intensities. The results support the model: radio-frequency fields applied parallel to the axis of field lines did not markedly affect the orientation, while the same fields presented at an angle disrupted the birds' orientation. By systematically changing the frequency at the intensity of 480 nT, we could estimate the life time of the crucial radical pair as between 2-10 µs. By systematically changing the intensity of the radio-frequency fields, we could identify an extremely sensitive resonance at the Larmor frequency, which implies specific properties of the crucial radical pair. Cryptochromes, a blue-light absorbing photopigment known to form radical pairs, has been proposed to be the receptor-molecule. It has been found to be present in the retina, where it is present in a specific type of photoreceptor.