

Introductory Remarks to Symposium 31

**Magnetoreception –
the sixth sense***Rabea Bartölke, Jingjing Xu and Henrik Mouritsen, Oldenburg*

Migratory birds sense the Earth's magnetic field for navigating precisely over thousands of kilometers each year. In contrast to other sensory systems, we are still at the beginning of understanding how the magnetic sense works. However, thanks in part to a strongly multidisciplinary approach ranging from biophysics and biochemistry to neuroscience, genetics and behavior pushed forward by SFB 1372, a lot of new scientific evidence related to this long-standing problem has been published in recent years. The leading hypothesis suggests that a spin-correlated radical pair in a protein called cryptochrome located in the retina is sensitive to Earth-strength magnetic fields. This sensory mechanism would be the first to rely on coherent quantum phenomena that indirectly allow magnetic interactions a million times smaller than the thermal energy barrier to affect a biological sensory system.

This symposium will present an overview of our current understanding of the magnetic sense from world-leading, established scientists and young researchers alike, all working at the forefront of their fields ranging from genetics, biophysics, biochemistry, neurobiology to behaviour. Peter Hore will explain the quantum physical effects on which the birds' magnetic compass sense seems to be based and how to measure these effects. We will then discuss the first protein from a night-migratory songbird that can create such a magnetically sensitive radical pair: cryptochrome 4 (Jingjing Xu) and recent findings of how this signal could then be further transduced within the cell (Rabea Bartölke). Corinna Langebrake will illustrate the potential involvement of cryptochromes in magnetoreception from a phylogenetic viewpoint. We will then zoom out to look at the retinal circuitry of birds (Karin Dedek) as well as the neuronal circuitry in the bird brain (Henrik Mouritsen) to understand how magnetic information is processed. Finally, we will present how quantum chemistry can predict the disruption of the magnetic compass by broadband electromagnetic noise in behavioural experiments (Bo Leberrecht) and whether electrosmog affects free-flying migratory birds in the wild (Thiemo Karwinkel).

Symposium 31

*Friday, March 24, 2023
13:00 - 15:00, Lecture Hall 8*

Chairs: Rabea Bartölke, Jingjing Xu and
Henrik Mouritsen, Oldenburg

- 13:00 **Opening Remarks**
- 13:05 Peter Hore, Jingjing Xu and Rabea Bartölke, Oxford, UK and Oldenburg
CRYPTOCHROMES AS PRIMARY MAGNETIC SENSORS IN MIGRATORY BIRDS (S31-1)
- 13:55 Corinna Langebrake, Wilhelmshaven
LOSS OF A POTENTIAL MAGNETORECEPTOR IN NIGHT MIGRATORY PASSERINES – A PHYLOGENETIC ANALYSIS OF CRYPTOCHROMES IN BIRDS (S31-2)
- 14:05 Henrik Mouritsen and Karin Dedek, Oldenburg
THE NEUROBIOLOGY OF LIGHT-DEPENDENT MAGNETORECEPTION IN MIGRATORY BIRDS (S31-3)
- 14:30 Bo Leberrecht and Thiemo Karwinkel, Oldenburg and Helgoland
RADIOFREQUENCY EFFECTS ON MAGNETIC ORIENTATION BEHAVIOR IN BIRDS (S31-4)
- 14:55 **Concluding Remarks**



SFB 1372
Magnetoreception and Navigation
in Vertebrates

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