

## Seminar announcement

## Tuesday, June 11, 2024 1:30 pm WSI, Seminar room S 101 <u>Exclusively in person</u>

## "OLEDs – a model for avian magnetoreception"

The operational principle of an OLED – spin-dependent electron-hole recombination – is basically the reverse mechanism of photoinduced charge generation in retinal pigment-protein complexes. One of nature's more intriguing puzzles is the navigational ability of some bird species. It has been argued that spin-spin interactions of photogenerated carrier-pair species, and the subtle changes to spin quantum beating between singlet and triplet pair states with the magnitude and direction of geomagnetic fields, may be responsible for biological magnetoreception: birds effectively "see" magnetic fields. Indeed, OLEDs are also found to be sensitive to fields of a few hundred nanotesla, and exhibit an anisotropy of almost 50 % in magnetoresistance and magnetoelectroluminescence at geomagnetic field strengths.

The coherent motion of spins can be probed directly in the time domain by pulsed currentdetected magnetic resonance, allowing hyperfine and spin-orbit coupling effects to be discriminated from dipolar and exchange interactions in the spin pair. Current-detected NMR permits isotopic fingerprinting of the active material. With suitable molecular model systems, spin quantum beats can even be probed down to the single-molecule level. Since a carrier spin in a magnetic field constitutes a near-perfect two-level system, analogues of quantum-optical phenomena such as superradiance emerge under resonant drive. Magnetic resonance persists down to very small Zeeman energies, opening up an intriguing regime of light-matter interaction: the condition of "deep-strong" drive, where the Rabi frequency at which the system is driven exceeds its natural frequency.

Please reach out to David Egger (david.egger@tum.de) in case you would like to setup a personal meeting with John Lupton.

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