



**UNIVERSITÄT  
BIELEFELD**

Faculty of Physics

# Seminar

Theoretische Physik—Theorie der kondensierten Materie  
*Theoretical Physics—Condensed Matter Theory*

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## Quantum Spin Toroidicity in Molecular Spin Rings

Molecular toroidal states [1] are degenerate multiplets with zero magnetic moment, resulting from a vortex arrangement of the spin and orbital angular momenta of unpaired electrons within a single molecule. Their interaction with a spatially non-uniform magnetic field occurs via an anomalous magnetic multipole moment known as toroidal moment [2] or anapole moment [3]. We will discuss here the origin of molecular toroidal states in molecular spin rings [1,4-9] and their signature on spin-transport dynamics [10,7,8], both in the strong [4-6] and weak [7-9] spin-orbit coupling regime, where toroidal states can result from spin-frustration and the superposition of states of opposite spin chirality [7]. Recent results will be presented concerning toroidal states on two neighboring triangles linked by a transition metal ion which are coupled into ferrotoroidic states [11,12], and by direct simulation of the hysteretic spin dynamics triggered by a time-dependent magnetic field we will expose their signature on the observed hysteresis of the magnetisation as measured in crystals of heterometallic  $M\text{III}Dy_6$  double triangles ( $M=\text{Cr, Fe, Mn, Co, Al}$ ) [11,12].

**Donnerstag, 08. April 2021, 09.00 Uhr MESZ**

Zoom Konferenzschaltung— Please contact Jürgen Schnack  
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