



TECHNISCHE
UNIVERSITÄT
WIEN
Vienna University of Technology



Doctorate Program
<http://solids4fun.tuwien.ac.at/>

Guest Lecture

Title: Magnetic Chirality

Speaker: Sang-Wook Cheong

Address: Rutgers University

Date: Monday, 14 November 2022

Time: 11:00

Place: Freihaus, Fachgruppenraum Physik, yellow area, 1. OG
(behind the lift)

Abstract:

Chirality with all broken mirror symmetries, combined with any spatial rotations, matters ubiquitously from DNA functionality, vine climbing, to the piezoelectricity of quartz crystals. Chirality does not necessarily involve the presence of screw-like twisting, and magnetic chirality means chirality in spin ordered states or mesoscopic spin textures. Magnetic chirality does not change with time reversal operation, and chirality prime (\mathcal{C}') means that time reversal symmetry in addition to all mirror symmetries, combined with any spatial rotations, are broken. In the case of \mathcal{C}' , there exist two kinds: type-I \mathcal{C}' with unbroken “space inversion \otimes time reversal” and type-II \mathcal{C}' with broken “space inversion \otimes time reversal”.

Four examples of magnetic chirality will be discussed: helical spin state, magnetic toroidal moment combined with canted moment, magnetic quadruple moment combined with alternating canted moments, and Bloch-type skyrmions. We will also discuss a few examples of type-I \mathcal{C}' type-II \mathcal{C}' , and the emergent physical phenomena of \mathcal{C} and \mathcal{C}' such as self-inductance, magneto-optical Kerr effect, anomalous Hall effect and linear magnetoelectricity. Some of these exotic phenomena have been recently observed, and many of them need to be experimentally confirmed in the future.