UCLA Department of Physics & Astronomy

COLLOQUIUM

Thursday, October 20 at 4 p.m.
1-434 PAB

Magnetic Chirality

Sang-Wook Cheong
(Rutgers University)

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, magnetooptical 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.

Refreshments at 3:20 p.m. on the PAB Patio. Undergraduates Welcome!