Topology, Skyrmions and their dynamics – “Banana kicks in magnetism”

Karin Everschor-Sitte (JGU Mainz)

The Nobel Prize in Physics 2016 was awarded to David J. Thouless (1/2), F. Duncan M. Haldane (1/4) and J. Michael Kosterlitz (1/4) “for theoretical discoveries of topological phase transitions and topological phases of matter”. By incorporating concepts of topology into physics the Nobel Laureates opened the path towards several current research fields including topological insulators, topological superconductors and topological magnetic textures like magnetic “skyrmions”.

Skyrmions are topologically stable whirls that are realized in different areas of physics and were initially discovered by Tony Skyrme in particle physics in the 1960's.

Here we will focus on skyrmions that occur in magnetic systems, which were observed experimentally for the first time in 2009. Due to their interesting physics based on their topological properties magnetic skyrmions have become a very active research area. For example, the peculiar twist of the magnetization in skyrmions leads to a very efficient coupling to electric currents making skyrmions also interesting for spintronics and allowing for “banana kicks” in analogy to the ones in soccer.