

Prize Talk PRV VI Thu 13:00 HSZ/0003
Knots and Links in Magnetism — ●MARIA AZHAR — Faculty of Physics and Center for Nanointegration Duisburg-Essen (CENIDE), University of Duisburg-Essen, 47057 Duisburg, Germany — Laureate of the Hertha-Sponer-Prize 2026

Magnetic materials can host remarkably stable, intertwined structures that behave like knots, links, and braids; discrete objects that can be counted and, in principle, used to store information. This talk explains why such complex patterns can exist, ranging from magnetic whirls (Skyrmions) to knots and links (Hopfions), and three-dimensional objects that have only recently been observed, such as screw dislocations

of spiral magnetic order.

In some magnets, the far-field is non-uniform, which fundamentally changes which knots or links are possible. Stability is then no longer described by a single number: new states emerge with fractional character, smoothly connecting configurations that would otherwise appear distinct.

At a deeper level, these phenomena follow a simple yet profound geometric idea: magnetic configurations map one sphere onto another, and their winding determines stability. Understanding the underlying principles turns knots and links into practical building blocks for robust and controllable magnetic matter.