Universität Münster

Allgemeines Physikalisches Kolloquium

Donnerstag, 16.04.26 – 16 Uhr c.t.

IG1 – HS 2 | Wilhelm-Klemm-Str. 10

Kolloquiums-Kaffee ab 16 Uhr vor dem Hörsaal

Prof. Dr. Alexander Mook

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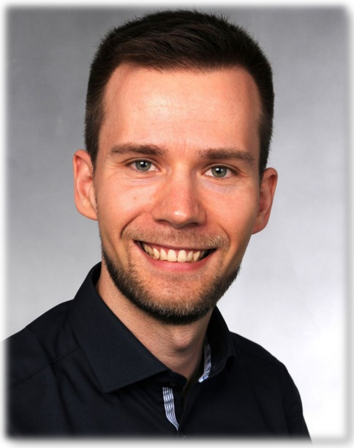

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Antrittsvorlesung

Symmetry Lost, Magnetism Gained: Altermagnetism at Surfaces

Magnetism is often introduced through familiar examples such as ferromagnets, where all magnetic moments align, or antiferromagnets, where they cancel each other. In recent years, a new and less intuitive form of magnetic order – *altermagnetism* – has been identified [1]. It combines features of both: although the total magnetization vanishes, the electronic excitations can still distinguish between opposite spin directions, leading to observable effects typically associated with ferromagnetic materials. This makes altermagnets particularly promising for spintronics, where one aims to use the electron's spin to store and process information – potentially allowing for devices that are both fast and robust without producing stray magnetic fields.

In this talk, I will show that such unconventional magnetism does not only depend on the properties of the bulk material, but can also emerge at its boundaries [2]. Surfaces naturally break some of the symmetries present in the interior of a crystal. As a result, they can fundamentally alter the behavior of electrons – and, as I will demonstrate, even *create* altermagnetic features in systems that are not altermagnetic in the bulk.

Starting from basic symmetry principles, I will introduce the key ideas behind altermagnetism and explain how surfaces modify them. I will then discuss simple physical pictures as well as theoretical results that illustrate how spin-dependent effects arise at surfaces, and how they could be detected experimentally.

This perspective highlights a broader lesson: by looking at familiar materials in new ways – focusing on symmetry, geometry, and reduced dimensionality – we can uncover unexpected phenomena. In this sense, some of the most interesting physics does not happen deep inside a material, but at its very edges.

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Fachbereich Physik