IMPRS Seminar 24 March 2023
3:30 pm at MPI-PKS

The emergent research landscape of altermagnetism: d-wave unconventional magnetism and its new connections

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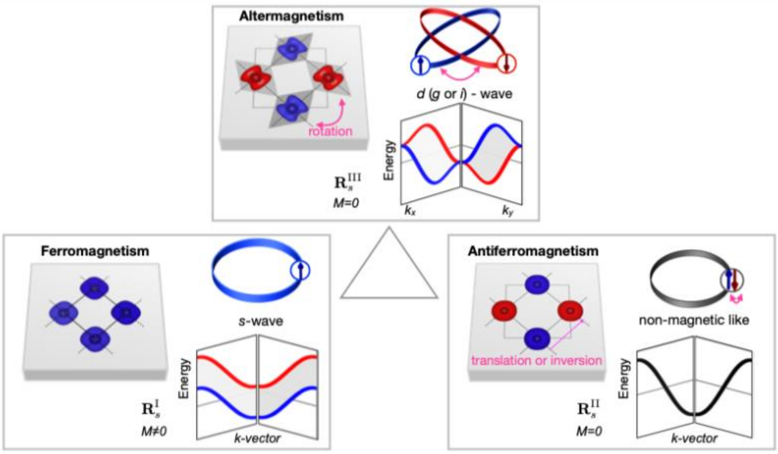
Abstract: Antiferromagnetic spintronics has been a very active research area of condensed matter in recent years. As we have learned how to manipulate antiferromagnets actively and their emergent topology, further surprises awaited. Turning off spin-orbit coupling, a new fresh view at the family of antiferromagnetic ordered systems reveals also an emergent new class, with properties characteristic of ferromagnets and antiferromagnets, as well as properties unique to itself. This third phase is characterized by compensated magnetic order and a spin-splitting momentum locking, suggesting its name altermagnetism. We show that this new phase is as abundant in nature as conventional ferromagnetism and antiferromagnetism. Its discovery as a distinct phase comes by using a non-relativistic spin-symmetry formalism which, counter to magnetic symmetries, delimits the phase uniquely. Material candidates occur in both three-dimensional and two-dimensional crystals, in diverse structural or chemistry types, and in conduction types covering the whole spectrum from insulators to superconductors. Altermagnets can have impact on prominent research areas, including spintronics, ultra-fast optics, neuromorphics, thermoelectrics, field-effect electronics, multiferroics, magnonics, valleytronics, magnetic topological matter, and unconventional superconductivity.



References:

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[7] Libor Šmejkal, Rafael González-Hernández, T. Jungwirth and J. Sinova, Crystal time-reversal symmetry breaking and spontaneous Hall effect in collinear antiferromagnet, Sci. Adv. 6, 23 (2020)