

What Makes Magnets Magnetic? Theories on Magnetism in Condensed Matter

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Magnets have been known to human beings for nearly three thousand years, but our understanding on magnet is far from complete. What is the origin of magnetism? Why is magnetism so difficult to study theoretically? How to overcome such difficulties? In this talk, modern understanding on the essence of magnetism in condensed matter is discussed, and important theories and their recent development are reviewed. We introduce basic models to study magnetism (the Heisenberg model, the Hubbard model, and the periodic Anderson model) and methods to solve those models (the mean-field theory (Stoner model and Weiss model), Monte-Carlo methods, the dynamical mean-field theory, and the dynamical cluster approximation).