

Hysteresis and metastability of the antiferromagnetic Heisenberg spin icosahedron

Jürgen Schnack, C. Schröder, H.-J. Schmidt, M. Luban

Fachbereich Physik - Universität Osnabrück

<http://obelix.physik.uni-osnabrueck.de/~schnack/>

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What happens if people coming from



transport theory



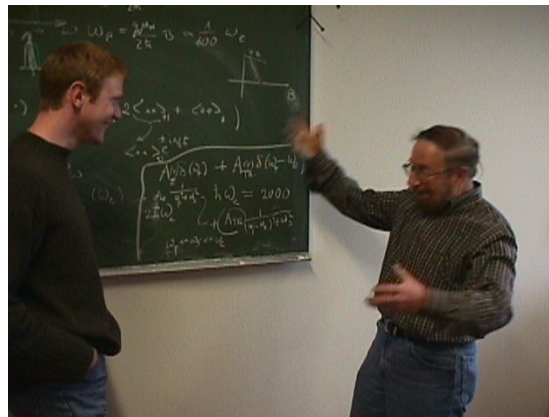
general relativity



nuclear physics

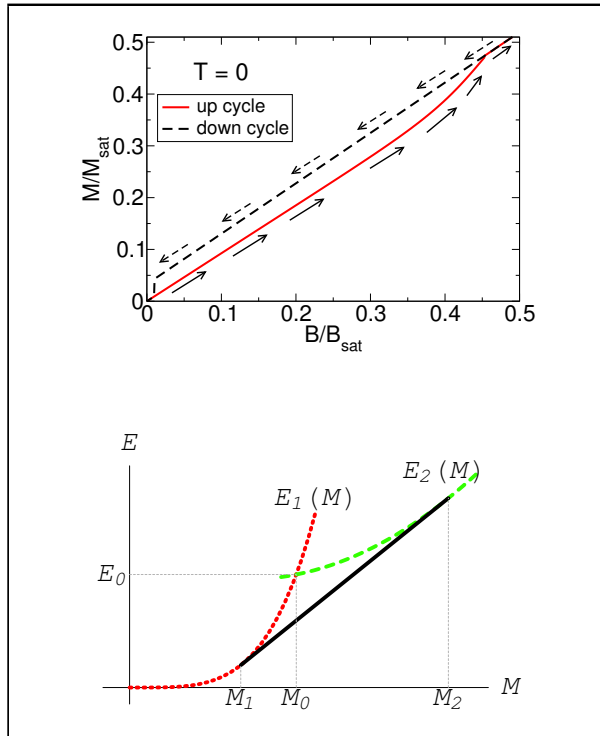


Zener diodes



are triggered by a “magnetic” enthusiast?

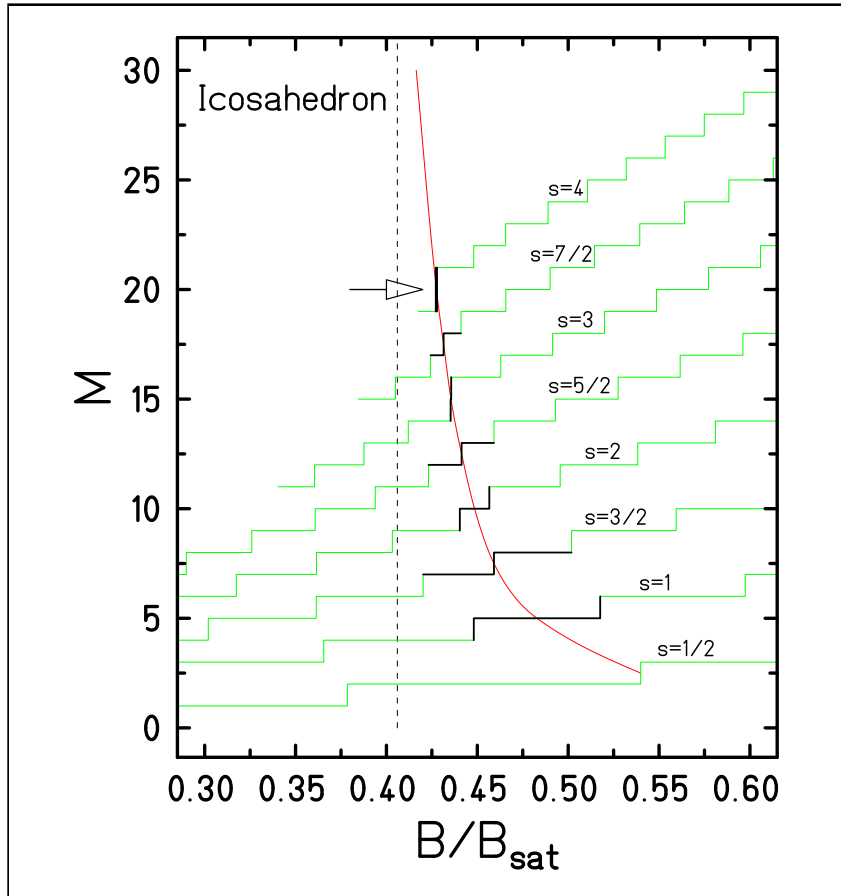
Metamagnetic phase transition I



- Normally hysteretic behavior of SMM is an outcome of magnetic anisotropy.
- The classical AF Heisenberg Icosahedron exhibits a pronounced hysteresis loop.
- It shows a first order phase transition at $T = 0$ as function of B .
- The minimal energies are realized by two families of spin configurations.
- The overall minimal energy curve is not convex \Rightarrow magnetization jump.

C. Schröder, H.-J. Schmidt, J. Schnack, M. Luban, Phys. Rev. Lett., submitted, cond-mat/0501558

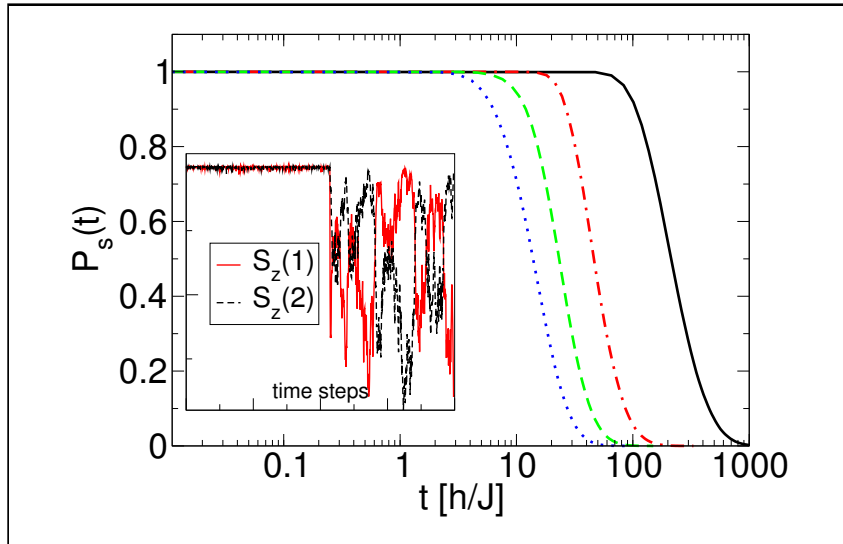
Metamagnetic phase transition II



- Quantum analog:
Non-convex minimal energy levels
⇒ magnetization jump of $\Delta M > 1$.
- Lanczos diagonalization for various s .
- True jump of $\Delta M = 2$ for $s = 4$.
- Polynomial fit in $1/s$ yields the classically observed transition field.

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Metamagnetic phase transition III



- Finite temperature \Rightarrow finite lifetime distribution.
- Lifetime increases with decreasing T .
- $t_s \rightarrow \infty$ for $T \rightarrow 0$.

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Collaboration

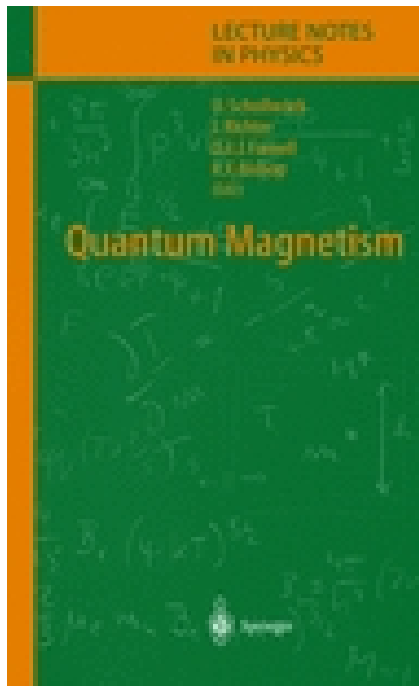
- K. Bärwinkel, H.-J. Schmidt, M. Allalen, M. Brüger, D. Mentrup, M. Exler, P. Hage, F. Hesmer, F. Ouchni, P. Shechelokovskyy (Uni Osnabrück);
- M. Luban, R. Modler, P. Kögerler, D. Vaknin, ... (Ames Lab, Iowa, USA);
- Chr. Schröder (FH Bielefeld & Ames Lab, Iowa, USA);
- H. Nojiri (Tohoku University, Japan);
- R.E.P. Winpenny (Man U); L. Cronin (University of Glasgow)
- J. Richter, J. Schulenburg (Uni Magdeburg);
- S. Blügel (FZ Jülich); A. Honecker (Uni Braunschweig).
- E. Rentschler (Uni Mainz);

Thank you very much for your attention.

Buy now!

Quantum Magnetism

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