



## Quantum Colloquium

# On Isings Model of Ferromagnetism

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Host: Zhanybek Alpischev

The 1D Ising model is a classical model of great historical significance for both classical and quantum statistical mechanics. Developments in the understanding of the Ising model have fundamentally impacted our knowledge of thermodynamics, critical phenomena, magnetism, conformal quantum field theories, particle physics, and fractionalization in many-body systems. Despite the theoretical impact of the Ising model there have been very few good 1D realizations of it in actual real material systems. However, it has been pointed out recently, that the material  $\text{CoNb}_2\text{O}_6$ , has a number of features that may make it the most ideal realization we have of the Ising model in one dimension. In this talk I will discuss the surprisingly complex physics resulting in this simple model and review the history of Isings model from both a scientific and human perspective. In the modern context I will review recent experiments by my group and others on  $\text{CoNb}_2\text{O}_6$ . In particular I will show how low frequency light in the THz range gives unique insight into the tremendous zoo of phenomena arising in this simple model system. C. M. Morris, R. Valds Aguilar, A. Ghosh, S. M. Koohpayeh, J. Krizan, R. J. Cava, O. Tchernyshyov, T. M. McQueen, N. P. Armitage, "A hierarchy of bound states in the 1D ferromagnetic Ising chain  $\text{CoNb}_2\text{O}_6$  investigated by high resolution time-domain terahertz spectroscopy", *Phys. Rev. Lett.* 112, 137403 (2014). Julia Steinberg, N.P. Armitage, Fabian H.L. Essler, Subir Sachdev, "NMR relaxation in Ising spin chains", *Phys. Rev. B* 99, 035156 (2019). C. M. Morris, Nisheeta Desai, J. Viirik, D. Hvonon, U. Nagel, T. Rm, J. W. Krizan, R. J. Cava, T. M. McQueen, S. M. Koohpayeh, Ribhu K. Kaul, and N. P. Armitage, "Duality and domain wall dynamics in a twisted Kitaev chain", *Nat. Phys.* 17 832 (2021).

**Tuesday, February 11, 2025 11:00am - 12:00pm**

Office Bldg West / Ground floor / Heinzl Seminar Room (I21.EG.101)



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