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(I) Disordered Phases in quasi-1D models of Kitaev Materials

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Most of us are familiar with ferromagnetic and antiferromagnetic materials. Although in some cases quantum fluctuations can be strong in such systems we would usually say that the ground state is ordered and described by a non-zero local order parameter. In such systems, the interaction between the quantum spins do not depend on the bond direction. Today, there is a growing class of magnetic materials where it is believed that the interactions indeed are bond-dependent in a way first imagined by Alexei Kitaev thereby opening a way for realizing so called topological phases. Bond-dependent interactions are strongly frustrating for the system and hinders conventional ordering. However, in these Kitaev materials other interactions are also often present, among them the well known Heisenberg coupling and also off-diagonal Gamma (Γ) terms giving rise to an unusally rich phase diagram. Even for the simplest models of Kitaev materials it is extremely difficult to arrive at a precise understanding of this complex phase-diagram. Hence, in order to obtain accurate results it is often useful to restrict the analysis to low-dimensions and here we mainly discuss chains and two-leg ladders. Using advanced numerical techniques, it is possible for such models to determine the phase-diagram with very high precision, including the effects of an applied magnetic field. An astonishing abundance of phases arises from the combination of frustration and applied field. In this talk I will focus on some of these phases that appear disordered, without any conventional local magnetic ordering, but where a hidden string-order can be identified. Surprisingly, such string-order was first suggested in the context of surface roughening.

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