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Quantum order-by-disorder near criticality and the secret of the partially ordered phase of MnSi FRANK KRUGER, UNA KARAHASANOVIC, University of St Andrews, ANDREW GREEN, University College London — The vicinity of quantum phase transitions has proven fertile ground in the search for new quantum phases. We propose a physically motivated and unifying description of the phase reconstruction near metallic quantum-critical points using the idea of quantum order-by-disorder. Certain deformations of the Fermi surface associated with the onset of competing order enhance the phase space available for low-energy, particle-hole fluctuations and self-consistently lower the free energy. Applying the notion of quantum order-by-disorder to the itinerant helimagnet MnSi, we show that near to the quantum critical point, fluctuations lead to an increase of the spiral ordering wave vector and a reorientation away from the lattice favoured directions. The magnetic ordering pattern in this fluctuation-driven phase is found to be in excellent agreement with the neutron scattering data in the partially ordered phase of MnSi.

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