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Fractional Quantum Hall states in strongly correlated multi-orbital systems[1] MARIA DAGHOFER, JÖRN W.F. VENDERBOS, STEFANOS KOURTIS, JEROEN VAN DEN BRINK, IFW Dresden — For topologically nontrivial and very narrow bands, Coulomb repulsion between electrons has been predicted to give rise to a spontaneous fractional quantum-Hall (FQH) state in absence of magnetic fields. We will discuss how orbital degrees of freedom in frustrated lattice systems lead to a narrowing of topologically nontrivial bands [1]. This robust effect does not rely on fine-tuned long-range hopping parameters and is directly relevant to a wide class of transition metal compounds. In addition, we will show that strongly correlated electrons in a t_{2g}-orbital system on a triangular lattice self-organize into a spin-chiral magnetic ordering pattern that induces precisely the required topologically nontrivial and flat bands [2]. On top of a self-consistent mean-field approach, we use exact diagonalization to study an effective one-band model for the emerging flat band in the presence of longer-range interactions and establish the signatures of a spontaneous $\nu = \frac{1}{3}$ FQH state.

[1] J. W.F. Venderbos, M. Daghofer, J. van den Brink, PRL **107**, 076405 (2011)
[2] J. W.F. Venderbos, S. Kourtis, J. van den Brink, M. Daghofer, arXiv:1109.5955

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