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Microscopic theory of metamagnetism and nematic order in $\mathbf{Sr_3Ru_2O_7}$ SRINIVAS RAGHU, Stanford University, ARUN PARAMEKANTI, University of Toronto, EUN-AH KIM, Cornell University, STEVEN KIVELSON, Stanford University — The bilayer ruthenate compound $Sr_3Ru_2O_7$ exhibits a remarkable set of low temperature electronic properties. In an externally applied magnetic field, ultra-pure crystals of the compound undergo a metamagnetic transition at a temperature which can be tuned towards zero as B $\parallel$ c approaches a critical value of $\sim$8T. This putative metamagnetic quantum critical point, however, is preempted by a nematic fluid phase with order one resistive anisotropy in the ab plane. In this talk, we consider the microscopic origins of metamagnetism and the accompanying nematic order, focusing primarily on the quasi-one-dimensional bands in a bilayer model. Making use of local Coulomb interactions in conjunction with the sharp divergence of the density of states near a van-Hove singularity, we construct a phase diagram which enables our system to traverse a metamagnetic transition into a nematic phase followed by a second metamagnetic transition into a phase which preserves C_4 rotational symmetry, with increasing magnetic field. We treat quantum nematic fluctuations in the vicinity of the metamagnetic transitions to 1-loop order and consider the extent to which nematic fluctuations can give rise to the observed "pseudogap" in the local density of states of this material.

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