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Disorder, itinerant ferromagnetism and the anomalous Hall effect in two dimensions PARTHA MITRA, ARTHUR HEBARD, Department of Physics University of Florida — This talk will describe research motivated by the lack of consensus on what happens in a band ferromagnet such as iron when the itinerancy of the electrons, which carry spin information, is compromised by disorder. We address this challenging problem by performing *in situ* studies of magnetotransport in a series of films having sheet resistances varying from 50 to 1,000,000 Ohms. In the weakly disordered regime of this two-dimensional system, where the quantum corrections to the conductivity have logarithmic temperature dependence, we find a surprising scaling of the longitudinal and anomalous Hall (transverse) resistances. For higher disorder the scaling breaks down and the anomalous Hall resistance R_{xy} saturates at a constant value near 100 Ohms. These results imply the presence of an *anomalous Hall insulating* state where the longitudinal L_{xx} and transverse L_{xy} conductivities approach zero with a ratio $R_{xy} = L_{xy}/L_{xx}^2$ that remains constant.

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