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Classical and Quantum Routes to Linear Magnetoresistance JINGSHI HU, University of Chicago & Massachusetts Institute of Technology, T.F. ROSENBAUM, University of Chicago — We show that either adding a few parts per million of the proper chemical impurities to indium antimonide, a well-known semiconductor, or redesigning the material's structure on the micrometer scale, can transform its response to an applied magnetic field. The former approach is a spectacular manifestation of magnetotransport in the extreme quantum limit, when only one Landau band is partially filled; the latter a classical outgrowth of disorder, turned to advantage. In both cases the magnetoresistive response at the heart of magnetic sensor technology can be converted to a simple, large and linear function of field that does not saturate. Harnessing the effects of disorder has the further advantage of extending the useful applications range of such a magnetic sensor to very high temperatures by circumventing the usual limitations imposed by phonon scattering.

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