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Anomalous magnetoresistance and quadratic Hall effect in a time-reversal symmetry breaking state without net magnetization BENEDIKT BINZ[1], ASHVIN VISHWANATH, University of California, Berkeley — Recently, the authors proposed a magnetic structure that breaks time reversal symmetry in the absence of net magnetization as an explanation for the high pressure "partially ordered" state of MnSi. The structure has a magnetic octupolar moment, but no net dipole moment. Based on symmetry, we demonstrate that this leads to anomalous magneto-transport properties: a magnetoresistivity which is linear and a Hall conductance which is quadratic in the applied magnetic field. Field cooling procedures for obtaining single domain samples are also discussed. The anomalous effects are elaborated in the case of three geometries chosen to produce experimentally unambiguous signals of this unusual magnetic state; e.g., it is predicted that a field in z-direction induces an anisotropy in the x-y plane. Another geometry leads to a Hall voltage which is parallel to the magnetic field.

[1]now at University of Cologne, Germany

Benedikt Binz
University of California, Berkeley

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