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Unusual Hall effect Anomaly in MnSi under pressure[1]

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Recent works in B20 type transition metal compounds have revealed a new topological object in spin systems – the skyrmion, a particle-like object in which spins point all directions to wrap around the sphere. While neutron scattering and scanning probe experiments[2,3] confirmed the existence of individual skyrmions and skyrmion lattices in a particular part of the phase diagram, the interaction between skyrmions and electronic degrees of freedom remains to be unveiled. In this talk, we report the observation of a highly unusual Hall current in the helical magnet MnSi under pressure.[4] In addition to the normal Hall effect and the anomalous part that arises from spontaneous magnetization, the Hall conductivity displays a distinctive stepwise field profile quite unlike any other Hall response observed in solids. This additional contribution was observed in a much larger range of temperature and applied field than the so-called A-phase,where the skyrmion lattice was observed in ambient pressure. It suggests that fluctuating, *i.e.* non-static, skyrmions might be present over a broad range of the phase diagram under pressure when the magnetic ordering becomes weakened.

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[2]S. Mühlbauer *et al.,* Science **323,** 915 (2009).
[3]X. Z. Yu, *et al.*, Nature, **465,** 901 (2010).
[4]M.Lee *et al.,* Phys. Rev. Lett **102,** 186601 (2009).