# Robust orbital nanomagnets

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A new type of nanomagnet for which the dominant contribution to magnetization comes from orbital degrees of freedom is discussed. In our proposal we show that nanoislands of quantum spin Hall insulators can host robust orbital edge magnetism whenever a single electron resides at the highest occupied Kramers doublet upgrading the spin edge current into a charge current [1]. The resulting orbital magnetization scales linearly with size, outweighing the spin contribution for islands of a few nm in size. This linear scaling is a specific of the Dirac edge states, different from Schrodinger electrons in quantum rings. Modeling Bi(111) flakes, whose edge states have been recently observed [2], we show that orbital magnetization is robust with respect to disorder, thermal agitation, shape of the island and crystallographic direction of the edges, reflecting its topological protection.

[1] P. Potasz, J. Fernandez-Rossier, in preparation.
[2] I. K. Drozdov, A. Alexandradinata, S. Jeon, S. Nadj-Perge, Huiwen Ji, R. J. Cava, B. A. Bernevig, A. Yazdani, *Nat. Phys.* **10**, 663-669 (2014).