Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

**Spintronic anisotropy: proximity-induced superparamagnetism**[1]

MACIEJ MISIORNY, MICHAEL HELL, MAARTEN WEGEWIJS, Forschungszentrum Juelich — Superparamagnetism of molecular magnets, i.e. the preferential alignment of their spins along an easy axis, is a useful effect for nanoscale applications as it prevents undesired spin reversals. In these systems such a stabilization of axial spin states is ensured by the magnetic anisotropy barrier stemming from intrinsic spin-orbit coupling. Here we demonstrate that any spin-isotropic high-spin quantum dot coupled to ferromagnets can in fact acquire such superparamagnetic properties in a spintronic way [1], even though spin-orbit interaction is negligible. We predict a proximity-induced spin-anisotropy barrier, which has hallmarks of a spintronic exchange-field of quadrupolar nature: it is highly localized, electrically controllable, increases with tunnel coupling and spin-polarization. Such a field is a generalization of the dipolar exchange field that relates to a current-induced spin-torque, effect well established in spintronics [1-3].

[1] M. Misiorny, M. Hell and M. Wegewijs, Nature Phys. advanced online publication, 6 October 2013.
[2] J. Martinek et al., Phys. Rev. Lett. 91, 127203 (2003); Phys. Rev. B 72, 121302 (2005).
[3] J. Hauptmann et al., Nature Phys. 4, 373 (2008).
[4] M. Gaass et al., Phys. Rev Lett. 107, 176808 (2011)

[1]We acknowledge the financial support from the DFG (FOR 912), the Foundation for Polish Science (M.M.) and the Alexander von Humboldt Foundation (M.M.).

Maciej Misiorny
Forschungszentrum Juelich

Date submitted: 13 Nov 2013 Electronic form version 1.4