World's tiniest mirror

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Just as the path of photons of light can be directed by a mirror, atoms possessing a magnetic moment can be controlled using a magnetic mirror. Research reported in the *Journal of Applied Physics* investigates the feasibility of using magnetic domain walls to direct and ultimately trap individual atoms in a cloud of ultracold atoms.

"We are looking for ways to build magnetic systems that can manipulate atoms," says author Thomas Hayward of the University of Sheffield in the United Kingdom. "By using soft ferromagnetic materials, in the form of nanostructures, we can manipulate the material properties and direct atoms."

The researchers describe the design, fabrication and characterization of a mirror formed by the magnetic field created by domain walls within an array of undulating planar magnetic nanowires. Due to the undulation of the wires, the field is switchable. When a magnetic field is applied perpendicular to the wires, the domain walls switches on; when a field is applied parallel to the wires, the switch turns off. Essentially, the system becomes a logical mirror with 0 and 1 states.

"The next step is to drop a cloud of ultracold atoms on the mirror so that we can watch them bounce," says Hayward. Similar technology could be applied to devices that trap and confine atoms and possibly to devices that use individual atoms as qubits.

More information: "Design and Characterization of a Field-Switchable Nanomagnetic Atom Mirror" by Thomas J. Hayward, Adam

D. West, Kevin J. Weatherill, Peter J. Curran, Paul W. Fry, Placide M. Fundi, Mike R. J. Gibbs, Thomas Schrefl, Charles S. Adams, Ifan G. Hughes, Simon J. Bending, and Dan A. Allwood , *Journal of Applied Physics*.