Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Intrinsic Magnetism at Silicon Surfaces STEVEN ERWIN, Naval Research Laboratory, FRANZ HIMPSEL, University of Wisconsin-Madison — It has been a long-standing goal to create magnetism in a nonmagnetic material by manipulating its structure at the nanometer scale. Many structural defects have unpaired spins; an ordered arrangement of such defects can give rise to a magnetically ordered state. Here we predict theoretically [1] that stepped silicon surfaces stabilized by adsorbed gold realize this goal by self-assembly, creating linear chains of polarized electron spins with virtually perfect structural order. The spins are localized at the silicon step edges, which have the form of graphitic hexagonal ribbons. The predicted magnetic state is indirectly supported by recent experimental observations, such as the coexistence of double- and triple-period distortions and the absence of edge states in photoemission. Ordered arrays of spins at a surface offer access to local probes with single spin sensitivity, such as spin-polarized scanning tunneling microscopy. The integration of structural and magnetic order is crucial for technologies involving spin-based computation and storage at the atomic level.

[1] S.C. Erwin and F.J. Himpsel, Nature Communications 1:58 (2010).

Steven Erwin
Naval Research Laboratory

Date submitted: 27 Dec 2010

Electronic form version 1.4