

Abstract Submitted
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Spin extraction theory and its spintronics applications¹ HANAN DERY, LU J. SHAM, Department of Physics, University of California San Diego — Extraction of electrons from a semiconductor to a ferromagnet as well as the case of injection in the reverse direction may be formulated as a scattering theory. However, the presence of bound states at the interface arising out of an inhomogeneous doping on the semiconductor side must be taken into account in the scattering theory. Inclusion of the interface states yields an explanation of a recent result of spin imaging measurement which contradicts the current understanding of spin extraction (S. A. Crooker *et al.*, Science **309**, 2191 (2005)). A particular consequence of our theory is a proposed electrically controlled spin-switch in which a non-magnetic back-gate monitors the spin polarization in a semiconductor. The switch also utilizes a ferromagnet to filter either of the spin species depending on the gate bias. Based on these ideas (and if time allows), we will also present a semiconductor spintronics prototype of a reprogrammable, universal **logic** gate which does not require magnetic fields throughout its operation. (See also, cond-mat/0609045)

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