

MAR05-2004-000660

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Ferromagnetic Control of Spin-Dependent Electron Currents in a Semiconductor

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It is well known that electrons or neutrons scattered against a polarized target become polarized. This talk will show how this principle can be used in variety of ways to generate and to change a spin polarization in a current flowing in a semiconductor interfaced with one or more ferromagnets. In theory it is possible to generate a 100% polarized current or a pure spin current without charge current. The relative merits of the various configurations will be assessed. Experiment tests will be described. Possible device applications provide illustrations of the theory. Work done in collaboration with J.P. McGuire, C. Ciuti, Eric Yang, Yuchang Chen, Thomas Grange, and Ed Yu, and supported by NSF DMR 0099572, DARPA/ONR N0014-99-1-1096 and University of California Campus- Laboratories Cooperation project.