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Modeling spintronic devices IGOR ZUTIC, SUNY Buffalo and Naval Research Laboratory, JAROSLAV FABIAN, University of Regensburg, Germany, STEVEN ERWIN, Naval Research Laboratory — Conventional spintronic devices are based on metallic magnetic multilayers which utilize the magnetic moment associated with the spin to read magnetically stored information, leading to a non-volatility and a substantial improvement in the performance of computer hard drives and magnetic random access memories. However, these applications employ two-terminal spin valves which are of limited use for advanced functionalities appropriate for signal processing and digital logic. While semiconductor-based three-terminal devices are natural candidates for spin logic, they remain inadequately investigated and even a simple understanding of their integration with CMOS is still missing [1]. We illustrate here several basic elements for modeling spin transport in spintronic devices and propose schemes for spin injection and detection in silicon [2], as well as for spin-controlled gain [1,3]. Supported by the US ONR, DARPA, and the National Research Council. [1] I. Zutic, J. Fabian, S. Das Sarma, Rev. Mod. Phys. **76**, 323 (2004). [2] I. Zutic, J. Fabian, and S. C. Erwin, eprint: cond-mat/0412580. [3] J. Fabian and I. Zutic, Appl. Phys. Lett. **86**, 133506 (2005); Phys. Rev. B **69** 115314 (2004).

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