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**Reentrant ferromagnetism and its stability in magnetic semiconductors**[1] IGOR ZUTIC, SUNY Buffalo, STEVEN ERWIN, Naval Research Lab, ANDRE PETUKHOV, South Dakota School of Mines and Technology — The magnetization of a ferromagnetic material normally decays monotonically with increasing temperature. Here we demonstrate theoretically the possibility of quite different behavior: reentrant ferromagnetism in semiconductors [1]. Reentrant magnetism can arise in semiconductors because as the temperature rises, the resulting higher concentration of thermally excited carriers can enhance the exchange coupling between magnetic impurities. This opens the possibility of materials exhibiting a transition from the low-temperature paramagnetic phase, in which carriers are frozen out, to a ferromagnetic phase at higher temperature. Thus, in the absence of other ferromagnetic mechanisms there will be two critical temperatures, $T_{c1} < T_{c2}$, describing para-to-ferromagnetic and ferro-to-paramagnetic transitions, respectively. Here we determine the phase diagram and the stability of reentrant ferromagnetism within a self-consistent description in which the spin-splitting in both carrier bands is included [2]. We discuss the implications of our findings for transport measurements in magnetic semiconductors, and suggest several candidate materials in which reentrant ferromagnetism might be observable. [1] I. Žutić, A. Petukhov, S. C. Erwin, preprint. [2] I. Žutić, J. Fabian, S. C. Erwin, Phys. Rev. Lett. 97, 026602 (2006).

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