Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Properties of Hybrid Superconductor/Half-metal Systems
MATTHIAS ESCHRIG, University of Karlsruhe and DFG-Center for Functional Nanostructures, D-76128 Karlsruhe, Germany, TOMAS LOFWANDER, Chalmers University of Technology, S-412 96 Gothenborg, Sweden — Interfaces between materials that exhibit different types of order present unique opportunities to study fundamental problems in physics. One example is the interface between a singlet superconductor and a half-metallic ferromagnet, where Cooper pairing occurs between electrons with opposite spin on one side, while the other displays 100% spin polarisation. New effects, like spin mixing and spin rotation are characteristic for such interfaces [1], providing a mechanism for conversion between unpolarized and completely spin polarized supercurrents. Our predictions have been confirmed in a recent experiment observing a supercurrent through half-metallic CrO_2 [2]. The interface region exhibits a superconducting state of mixed-spin pairs with highly unusual symmetry properties that opens up new perspectives for exotic Josephson devices [3]. We present results for Andreev bound state spectra and for point contact Andreev conductance spectra. The role of disorder and symmetry of the pairing amplitudes on the spectra and the temperature dependence of the Josephson current is elucidated.

[1] M. Eschrig et al., Phys. Rev. Lett. **90**, 137003 (2003).
[2] R.S. Keizer et al., Nature, **439**, 825 (2006).
[3] M. Eschrig, T. Lofwander, submitted to Nature Physics (2007).

Matthias Eschrig
University of Karlsruhe

Date submitted: 27 Nov 2007 Electronic form version 1.4