Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

**Gauge Theory of Pairing and Spin Fluctuations Near the Quantum Critical Point** J.R. SCHRIEFFER, Physics Department and National High Magnetic Field Lab, Florida State University, Tallahassee, FL 32310. — We have solved the spin Fermion (periodic Kondo) model for the superconductor transition temperature $T_c$ and for the electron energy gap function $\phi$ as $T \to T_c$. We find for realistic parameters$W$, the electron band width, $N_B\,(\omega)$, the Boson density of states and $J_q$, the Kondo exhange interaction, that $T_c = 1.14\,\omega_s\;\; e - \frac{(1+\lambda_Z)}{\lambda_\phi}$ where $\lambda_Z$ is the normal state renormalization constant and $\lambda_\phi$ is the pairing interaction strength. We find $T_c$ is exponentially higher for $\ell = 1$ (p-wave), $S = 1$ (spin triplet) pairing than for $s$- wave pairing $S = 0$. We note $\lambda_Z = 0$ for $p$-wave pairing due to the odd parity of the relevant. For realistic parameters the solution of Eliashberg's equation for $T_c$ predicts $T_c\tilde{-}\; 5 \times 10^{5\;0}K$ with $H_{c2} \sim 10^8 T$ and$j_c \sim 10^8\, Amps/cm^2$. When $T_c$ and $\phi$ are simultaneously maximized, with respect to $N_B\,(\omega)$ and $J_q$ considerably high $T_c, H_{c2}, j_c$ values are predicted, namely $T_c$ of order $5 \times 10^{8\;0}K \quad H_{c2} \sim 10^{13} T$ and $j_c \sim 10^{13}\, Amps/cm^2$There values are predicted to exist in systems such as the Heusler alloys, e.g. for $Au_2\,(Mn_{2-x}\; A\ell_x)$ for $x\tilde{-}0.1 - 0.5$.

J.R. Schrieffer
Physics Department and National High Magnetic Field Lab
Florida State University, Tallahassee, FL 32310.

Date submitted: 04 Dec 2004 Electronic form version 1.4