Strong coupling superconductivity due to massless boson exchange

ABSTRACT

I discuss the problem of fermionic pairing near the quantum-critical point (QCP), mediated by near-massless boson. Examples include the pairing mediated by collective magnetic fluctuations near ferromagnetic and antiferromagnetic instabilities, and the pairing of quarks mediated by the exchange of gluons (a color superconductivity). I argue that near the QCP, the pairing problem falls into the strong coupling regime, and superconductivity is no longer robust against phase fluctuations. As a consequence, the bound pairs of fermions are formed at a temperature larger than the actual superconducting $T_c$. I discuss the application of these results to the cuprates.