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From Spin Liquid to High T_c Superconductors

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The discovery of high T_c superconductors has revived interest in Anderson's resonating valence bond theory (RVB) of a quantum spin liquid, first proposed in 1973. In the past few years, several examples of quantum spin liquids have been discovered experimentally. The organic spin liquid has been studied most thoroughly and shows strong evidence for emergent fermionic spinons. I shall review some of the data and argue that theories based on slave particles and gauge fields have been successful in accounting for these remarkable data. The question remains as to whether a similar formulation of fermionic spinon and bosonic holes can form the basis for a theory of high T_c superconductors. I shall show that a recent modification¹ of the mean field RVB phase diagram can explain a lot of the phenomenology. I shall also attempt to put this theory in the context of recent discoveries concerning symmetry breaking in the pseudogap phase.

¹T. Senthil and P.A. Lee, Phys. Rev. Lett. **103**, 076402 (2009).