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Quarks, Gluons and Color are sufficient, but are they necessary?
DAVID BARTLETT[1], University of Colorado at Boulder — John Stewart Bell died in 1990. Two experiments in the last year have made one appreciate Bell's support for instantaneous action at a distance ("quantum spookiness") and his disdain for "hidden variables". R. Hanson et al constructed an entangled state with electrons in two labs 1.3 km apart. At NIST, C.W. Clark et al gave a free neutron orbital angular momentum. The neutron joins the electron and photon as particles that can be given L. Who knows how the up and down quarks enjoyed this experience. Quarks are the most obvious hidden variable in physics. No person has isolated even one. Consequently, the standard model features "Quark Confinement" [K.G. Wilson, 1974]. Unfortunately confinement complicates the comparison of QED and QCD. [K. G. Wilson, T.S. Walhout, A. Harindranath,W-M Zhang, R. J. Perry, and S.Z. Glazek (1994)]. The alternatives to quarks are scattering lengths, resonances, octets, decuplets, and singlets. This talk will elucidate some of the pre LHC tensions in the standard model. Why is strangeonium qualitatively different from charmonium and bottomonium . Why does the process $\gamma + \gamma \rightarrow \eta + \eta$ (Belle 2010) have a resonance at just the mass of the J/psi, but with a forward & backward peaked angular distribution that contrasts with the isotropy of the J/psi(1S)(1974)? What is needed to show that it is really the off-diagonal elements in the K-mass matrix that are responsible for CP violation (CPLEAR 1999).

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