Coupled Real Fields as a Foundation for Spin, Entanglement, and Gravitation

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We present the Coupled Fields (CF) framework, a real-field, Lagrangian-based **ontological** approach to quantum phenomena in which spin, charge, entanglement, and gravitation emerge from the dynamics of two coupled real fields. Although the pair may be represented mathematically as a complex field, the formulation is fundamentally real and local. The interaction between the fields introduces an internal continuous phase degree of freedom associated with a U(1) symmetry and a conserved current.

In the CF model, spin 1/2 is not postulated as an intrinsic spinor property. Instead, the internal phase acts as a hidden but physical variable whose projection onto a measurement direction produces an **effective** SU(2) double-cover behavior at the level of observed correlations, yielding the characteristic $\cos^2\alpha$ angular dependence found in quantum experiments. For multiparticle systems, correlated internal phases established at the source lead to exact recovery of quantum entanglement correlations. The model remains local but explicitly contextual, thereby violating Bell inequalities via contextual response functions without invoking nonlocality.

Electric charge arises as a conserved phase current, with quantization following from topological constraints on admissible field configurations. The framework has also been extended consistently to curved spacetime, where spacetime curvature is sourced by the energy density of coupled fields rather than idealized point particles. In the weak-field limit, Einstein gravity is recovered, while curvature singularities are naturally avoided.

The CF framework reproduces established quantum predictions while offering a deterministic, physically transparent interpretation, and defines an open research program connecting real field dynamics, quantum phenomena, and gravitation.