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Teaching Quantum ChromoDynamics using Rubik's Cube
WAYNE R. LUNDBERG, Architect of Comprehensive Theory — A potential relationship between the combinatorial aspects of Quantum Chromodynamics and Rubik's cube algebra was first noted in 1982. The Scientific American cover story's mathematics failed to complete the analogy, but clearly demonstrated the value of a graphical, tangible tool for communicating the algebraic relationships of quarks in QCD. Symmetry breaking and restrictions imposed on Rubik's cube algebra were (http://arxiv.org/abs/physics/9712042) defined in a way which provides unified algebra. Construction of standard model particles as well as strong and weak interactions between quarks can be demonstrated with or without student participation. Quantum ElectroDynamics requires extension to a multi-cube superposition approach in which each particle naturally inhabits a separate cube. The three families of particles have been shown to be both necessary and sufficient. The restricted cube, symbolized by a Cyrillic Ya, is the only known non-commutative matrix algebra which passes Seiberg's causality criterion. Many topics of current research can be quickly and clearly introduced to the audience, e.g. a tripartite string (1-brane) has six intrinsic extra dimensions and is one-to-one and onto the standard model of particle physics. The restricted cube algebra has proven to be an active engagement technique well-suited to introducing QC/ED to physics students and the public. Several cubes will be available for reference and demonstrations.

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