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**Supersymmetric Properties of Hadron Physics and Other Remarkable Features of Hadron Physics**

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SLAC

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4:00 p.m.

QCD is not supersymmetrical in the traditional sense -- the QCD Lagrangian is based on quark and gluon fields -- not squarks nor gluinos. However, the observed meson, baryon, and tetraquark spectroscopy —bosons and fermions — displays remarkable supersymmetric features. I will discuss a new relativistic, frame-independent color-confining approach to hadron physics, “light front holography”, which predicts the hadron spectroscopy of meson, baryon, and tetraquarks as equal-mass members of the same supersymmetric representation. The mass of the pion quark-antiquark eigensolution vanishes for zero quark mass. One also predicts the frame-independent light-front wavefunctions that describe the internal structure of hadrons, and thus dynamical observables, such as form factors, structure functions, transverse momentum distributions, and distribution amplitudes. One also predicts universal Regge slopes for the light and heavy hadrons and the form of the nonperturbative QCD running coupling at low momentum transfer, in agreement with experiment. The combined approach of light-front holography and superconformal algebra provides insight into the origin of the QCD mass scale and color confinement in the nonperturbative domain. I will also discuss a number of other novel features of hadron physics, such as the intrinsic heavy-quark structure of light hadrons, Higgs hadroproduction at high x\_F, color transparency, diffractive deep inelastic scattering, and the flavor-dependent antishadowing of nuclear structure functions.

Finally, I will present a calculation procedure: the BLM/Principle of Maximum Conformality — developed with Paul Mackenzie —a rigorous theoretical method which eliminates unnecessary scale and scheme ambiguities in perturbative QCD predictions.

**Wilson Hall, One West**