Physics Prospects with the JLab Upgrade

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Increasing the beam energy of the CEBAF accelerator to 12 GeV will greatly expand the physics opportunities to explore the nature of strongly interacting matter. The primary thrusts of the experimental program will include the study of quark confinement and the direct exploration of the quark-gluon structure of hadrons and nuclei. The origin of quark confinement will be explored by studying the production of "exotic" mesons, which are due to explicit excitations of the QCD flux tube that confines quarks. The study of momentum distributions inside the nucleon will be extended into the valence quark region. In particular, the upgrade will allow precision measurements to be made of the quark distribution functions in the limit of $x \to 1$, including A_1^n and the u/d ratio. The correlations between quarks inside nucleons will be mapped out using exclusive reactions, and interpreted within the framework of the newly developed Generalized Parton Distributions.