

## **The 12 GeV Upgrade of CEBAF – a Status Report on Its Realization and Its Evolving Physics Program**

**Lawrence S. Cardman**

*Thomas Jefferson National Accelerator Facility, Newport News, VA, USA and  
Department of Physics, University of Virginia, Charlottesville, VA, USA*

The Continuous Electron Beam Accelerator Facility (CEBAF) at Jefferson Lab has provided a unique tool for the study of atomic nuclei by providing intense, cw beams of polarized electrons with energies of up to 6 GeV. A project is now well underway to enhance CEBAF's research capabilities by doubling its beam energy to 12 GeV and constructing an expanded suite of scientific instrumentation. An overview of the project and its status will be presented. In addition, the new science that will become feasible upon completion of this upgrade will be discussed. It includes: the study of hybrid mesons, which involve excited states of glue, to explore the nature of quark confinement; dramatic improvements in our understanding of the QCD structure of the hadrons through both the extension of our knowledge of their parton distribution functions to high xBjorken, where they are dominated by underlying valence quark structure, and a program of nucleon "tomography" via measurements of the Generalized Parton Distributions (GPDs); a broad program of experiments in the physics of nuclei that aims to understand the QCD basis for the nucleon-nucleon force and how nucleons and mesons arise as an approximation to the underlying quark-gluon structure; and precision tests of the Standard Model through parity violating deep inelastic and Møller scattering.