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Big Ideas to Probe the Very Small: Initial Results from Jefferson Lab at 12 GeV

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The Thomas Jefferson National Accelerator Facility (Jefferson Lab) in Newport News, Virginia, features a unique particle accelerator, the Continuous Electron Beam Accelerator Facility (CEBAF), which was recently upgraded to produce high energy electron beams up to 12 GeV. Scientists and engineers constructed and rigorously commissioned novel experimental equipment to prepare for a new era of nuclear physics using this higher energy beam capability. Physicists from around the world designed experiments to collide the electron beams with nuclei in order to study the boundary between the physics of the nucleus and the physics of the protons and neutrons within it - the latter composed of puzzling particles called quarks and gluons. Probing these most basic building blocks of matter enables better understanding both of these particles and of the forces that bind them together to compose nearly all visible matter. These activities have led to exciting first scientific results, an overview of which will be presented.