



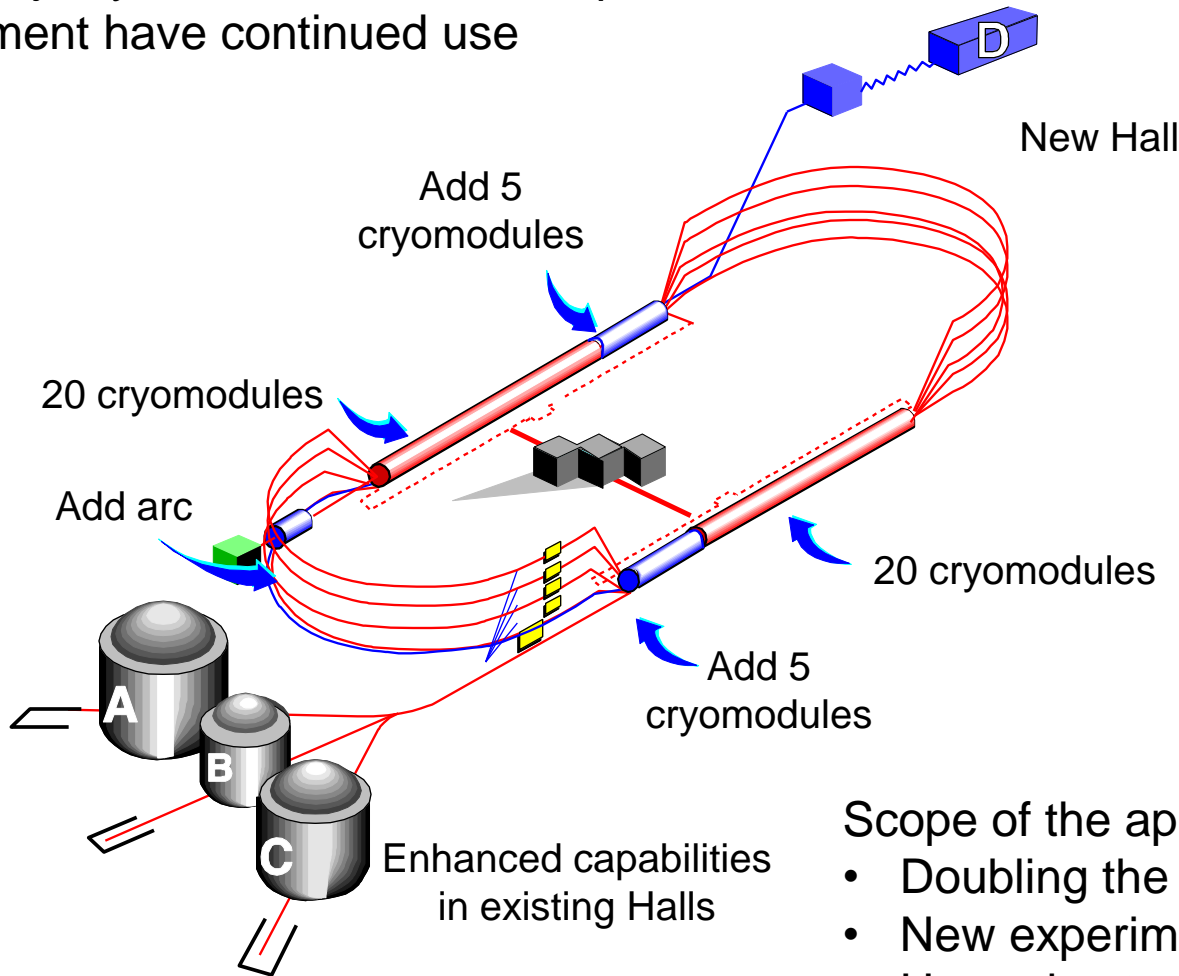
# Electron Ion Collider Advisory Committee

**Hugh Montgomery**

**November 2,3, 2009**

# Our Near Term Future – 12 GeV Upgrade

Upgrade is designed to build on existing facility:  
vast majority of accelerator and experimental  
equipment have continued use



- Scope of the approved project includes:
- Doubling the accelerator beam energy
  - New experimental Hall and beamline,
  - Upgrades to existing Experimental Halls

# EIC Initiatives

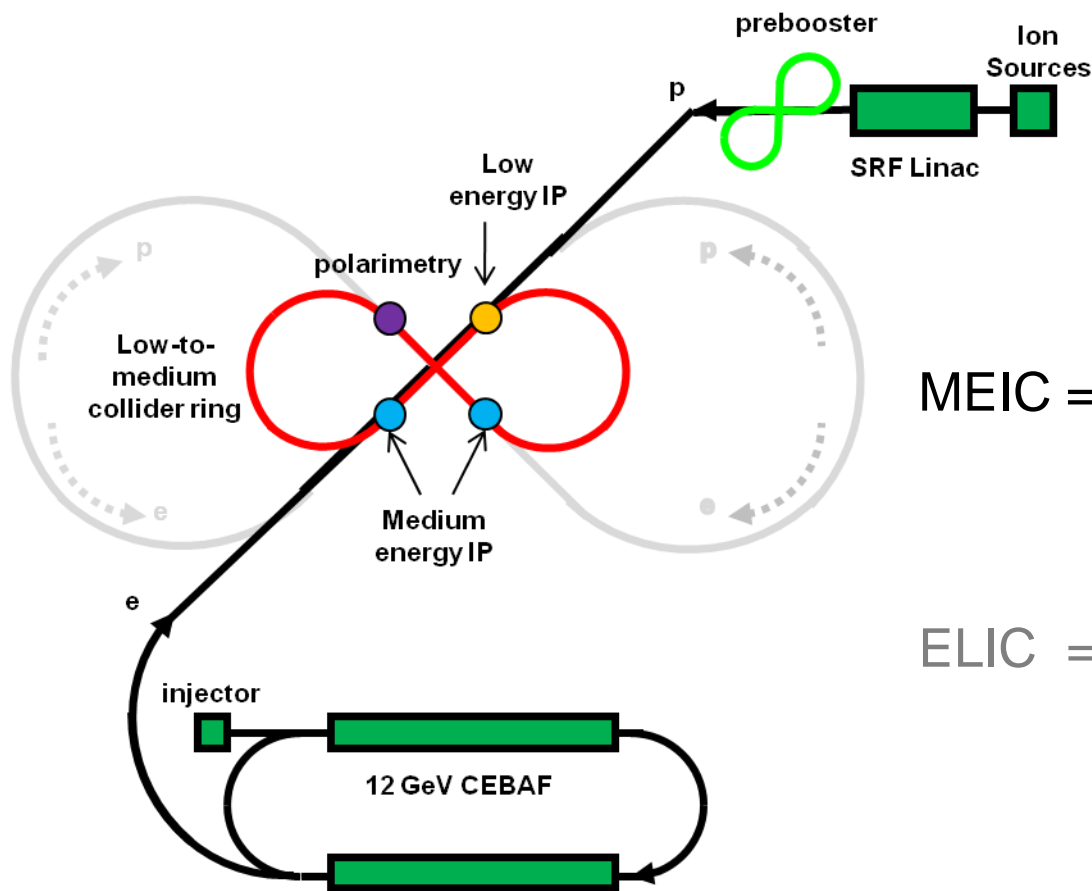
- Development of Medium Energy Collider Concept
- Support for Accelerator R&D
  - Validation/development of the concept
- Context was a request that Jefferson Lab “show its colors”
- Assignment of explicit effort to the EIC
- Strong desire from Users to play a leading role.

# Medium Energy Electron Ion Collider

Map the spin and 3D quark-gluon structure of protons

Discover the role of gluons in atomic nuclei

Understand the creation of the quark-gluon matter around us



MEIC = EIC@JLab

1 low-energy IR ( $s \sim 200$ )

3 medium-energy IRs

( $s < 2600$ )

ELIC = high-energy EIC@JLab

( $s = 11000$ )

(limited by JLab site)

# Electron Ion Collider

- Recommended as a generic capability by:
  - NSAC Long Range Report
  - IUPAP WG9 Working Group on world-wide nuclear facilities
- Candidate Facilities with different key characteristics
  - LHeC at CERN
  - eRHIC at Brookhaven National Laboratory
  - ELIC – EElectron Ion Collider at Jlab
  - MANUEL at FAIR-GSI
  - Plus several new ideas!!!!
- Natural Extension of Jlab nuclear physics agenda
- Issues
  - Physics Case(s) not yet broadly accepted
  - Cost scale is thought to be large
- Jefferson Lab and BNL: Joint EIC Advisory Committee reports to Laboratory Directors

# ELIC Action Plan

## Coordination

- UGBOD Chair - Zein-Eddine Meziani
- Jefferson Lab AD for Accelerators - Andrew Hutton
- Jefferson Lab AD for Physics - Larry Cardman

## Goals

### Physics/Detectors

- Explore the case for a high luminosity ( $10^{34}$  --  $10^{35}$  cm<sup>-2</sup> sec<sup>-1</sup>, High Polarization (80% e, 70%p) collider with moderate energy reach.
- Delineate those physics goals which can be achieved, and enumerate those which are not addressed. Concentrate on key experiments, the real physics drivers.
- Explore at least one concept study and propose solutions for high luminosity.
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### Machine

- A concept for a machine with high luminosity, high polarization and moderate energy has been developed. The machine is somewhat novel:
- Validate the existing conceptual design of the machine.
- Develop ideas and an R&D program which will address any deficiencies.

# ELIC Action Plan

## Report

- Write a white paper which documents the physics case and which describes the machine and detectors.

## Timescale

- To be maximally useful, the report should be available by the beginning of summer 2010. It would then permit a rational discussion of the potential for such a machine

**Next EICAC Meeting Nov 2,3 2009 at Jefferson Lab**

**Next EIC Workshop SUNY Stony Brook, January 2010**

## Beyond the 12 GeV

- Started a process of organizing the community to look into the future beyond the 12 GeV
- It is fair to say that the most promising future of this community is the realization of an Electron-Ion Collider in the U.S.
- Jefferson lab user community would like to articulate the physics that can be offered by a finite center of mass energy and high luminosity option of an EIC. This is the machine option being under development at Jefferson Lab.
- The community is in the process of organizing itself to have a series of workshops and produce a white paper for an EIC Jefferson Lab



## Examples of Physics Areas to be Investigated

- Study group on Hadronic Physics
  - 3D mapping of the glue and sea quarks in the nucleon  
([workshop at Rutgers](#))
  - Nucleon spin and quark-gluon correlations: Transverse spin, quark and gluon orbital motion, semi-inclusive processes  
([workshop at Duke](#))
- Study group on Nuclear Physics
  - 3D tomography of nuclei, quark/gluon propagation and the gluon/sea quark EMC effect  
([workshop at Argonne](#))
- Study group on Electroweak Physics
  - Electroweak structure of the nucleon and tests of the Standard Model  
([workshop at UVA](#))
- Study group on interaction region and detectors
  - EIC Detectors/Instrumentation  
([workshop at JLab](#))
- Announcements will be made soon with regard to the workshops and how to join the effort.

# Request to EICAC

Commentary and guidance on the current machine designs

Guidance and Recommendations on the Accelerator R&D Program

Commentary on the Physics Case

Discussion of Physics and Detector R&D as vehicle to encourage participation of user groups