



Center for Frontiers
in Nuclear Science

June 5, 2026
8th CFNS Summer School

Center for Frontiers in Nuclear Science in 2026

- Background
- Activities of the Center
- Looking back and into the future – impact of CFNS

Vision:



**Center for Frontiers
in Nuclear Science**

<https://www.stonybrook.edu/cfns/>

Founded in September 2017

Simons Foundation support till 2027
+ NY State : Renovations at Stony Brook
+ BNL : Renovations at BNL (Seminar Room)

A Center for all scientists interested in the US
Electron Ion Collider (& Nuclear Science)

A “home” for

- scientific discourse and
- attract & support **early career scientists**
- help seed future collaborations

Work with the EIC Users Group & the two Labs (BNL
and Jlab), to help realize the US EIC and later
expand the scientific activities beyond EIC

CFNS was setup in September 2017,
started operations in 2018

CFNS Governance

- **International Advisory Committee (Review Center Operations)**

- A. Caldwell (MPI), L. Elouadrhiri (Jlab), B. Jacak (UCB/LBNL), X. Ji (UMD/CNF), Y. Kovchegov (OSU), Z.-E. Meziani (ANL), R. Milner (MIT, Chair), B. Mueller (Duke), W. Nazarewicz (MSU), P. Newman (Birmingham), B. Pasquini (Pavia), F. Pilat (ORNL), J. Qiu (Jlab), G. Sterman (SBU/YITP), W. Vogelsang (Tubingen)
- Ex. Officio: Eric Brown, Dmitri Denisov (BNL), Or Hen (MIT) (Chair, EICUG-SC)
- Optional rotation of 1/3 committee every three years

- **Program Advisory Committee (Review/recommend Workshops)**

- M. Diehl (DESY), P. Reimer, K. Kumar (U. Mass.) P. Shanahan (MIT), F. Yuan (LBNL)
- Optional rotation of 1/3 committee every three years

Governance and day-to-day operation

- **Director:** Abhay Deshpande
- **Scientific Coordinators, Dep. Dir. for Ops:** Ross Corliss (SBU)
- **CFNS Steering Committee** (Help implement IAC's advice & run local activities)
 - A. Deshpande (SBU/BNL, Chair) T. Hemmick (SBU), D. Kharzeev (SBU/BNL), J. Koryluk (SBU), L Ruan (BNL), T. Ullrich (BNL), R. Venugopalan (BNL, Co-Chair), Ex officio: Ross Corliss
- **CFNS Summer Schools Coordinators:** F. Olness, A. Prokudin, R. Corliss
- **Seminar Coordinators:**
 - Roli Esha, and other local postdocs
- **Administrative Assistants:**
 - Socorro Delquaglio (SBU), Melissa LeGuerre (SBU)

CFNS Activities in 2020

Most activities continued on remote utilities like Zoom & BlueJeans

- SBU-BNL [Joint Seminars](#) : 2/month alternate between BNL and SBU (moot in 2020)
 - Has now been made formally a graduate course at Stony Brook (PHY 674)
- CFNS [Workshops and Adhoc Meetings](#)
 - 10 events/year 6 workshops (3+ days) and 4-5 adhoc meetings (1-2) days
- CFNS post-doctoral fellow program
 - Hired at BNL hired in starting in 2018/9 (~5)
 - Hired at Stony Brook between 2019-2021 (4)
 - Joint CFNS-Remote Institute, hired between 2019-2020 (~5)
 - 25+ postdoctoral fellows have graduated from CFNS : most of achieved tenure track or tenured positions in Universities around the world or at various national laboratories.
- Short- & long-term visitor program (did not happen in 2020)
- CFNS summer schools
- Initiating programs to support under-represented minorities (URMs)

Total of 350 (700) visitors at the Center through the remote activities (including on zoom)

CFNS Seminars 2020

Sanghwa Park (SBU/Ex)
Jinlong Zhang (SBU/Ex)
Yong Zhao (BNL/Th)
Adrian Florio (SBU/Th)

November 12, 2020	Liupan An: Studies on exotic hadrons at LHCb
October 15, 2020	Xiaoxuan Chu: Signature of gluon saturation: from STAR to EIC
October 1, 2020	Pawel Nadel-Turonski: A novel compact detector concept for the Electron-Ion Collider
August 20, 2020	Raju Venugopalan: Separating fact from fantasy in the proton's spin*: the chiral anomaly and the proton spin puzzle
August 6, 2020	Raghav Kunnawalkam Elayavalli: Era of Jet-SubStructure and its utility in high energy collisions
July 2, 2020	Yuri Kovchegov: Small-x Contribution to the Proton Spin Puzzle
June 18, 2020	Felix Ringer: The dynamics of leading jets and the jet energy loss
June 11, 2020	Salina F. Ali: Towards Femtography of the Nucleon: Neutral Pion Electroproduction in the Deeply Virtual Regime
May 7, 2020	Miguel Arratia: Jets at the EIC
March 12, 2020	Vladimir Skokov: Entanglement, partial set of measurements, and diagonality of the density matrix in the parton model
Feb 28, 2020	Axel Schmidt: Short-range correlations and the nuclear forces at short distances
Feb 20, 2020	Michael Engelhardt: Advances in quark transverse dynamics in the proton from Lattice QCD
Jan 30, 2020	Caryn Palatchi: Controlling Electron Beam Asymmetries in the Lead Radius Experiment
Dec 12, 2019	Kiminad Abebe Mamo: Diffractive photoproduction of J/ψ and Y using holographic QCD: gravitational form factors and GPD of gluons in the proton
Dec 10, 2019	Vladimir N Litvinenko: High-Energy High-Luminosity $e+e-$ Collider using Energy-Recovery Linacs



CFNS Workshops:

Open call for workshops in February, Deadline June,

Workshops selected by July 1st with the help of the CFNS Program advisory committee consisting off

M. Diehl (DESY), **Paul Reimer**, K. Kumar (Umass), **P. Shanahan (MIT)** & F. Yuan (LBNL)

CFNS Workshops 2020

December 5-6, 2019	CFNS Annual Review Organizers: A. Deshpande, C. Gal, J.-H. Lee, S. Delquaglio, M. Vera-Viteri
January 21-24, 2020	Exploring QCD with light nuclei Organizers: A. Deshpande, R. Dupre, M. Patsyuk, M. Sergsian, M. Strikman and C. Weiss
March 23-27, 2020	International Conference on Deep Inelastic Scattering (DIS), Stony Brook host. Brooklyn, NY Organizers: A. Deshpande and IAC and LOC Event cancelled due to COVID, will host this again virtually in April 2021.
May 6-7, 2020	Electroweak Physics at the EIC Organizers: W. Deconinck, Y. Furltova, C. Gal, M. Gericke
June 1-5, 2020	Workshop on Pion and Kaon Structure at the EIC Organizers: Tanja Horn, Craig Roberts et al.
June 26-July 1, 2020	Beam polarization and polarimetry at the EIC Organizers: E. Aschenauer, D. Gaskell, V. Morozov, V. Ptitsyn, F. Willeke, C. Gal.
July 9-10, 2020	Radiative Corrections in e-p, e-A scattering at the EIC Organizers: J. Bernauer, J. Friedrich, H. Gao and R. Milner

September 28-30, 2020	Ad hoc/Workshop: Ad hoc - Target Fragmentation Physics with EIC Location: online Organizers: J.-H Lee(BNL), Marta Ruspa (U. Piemonte Orientale Novara/INFN Torino), Anna Stasto (Penn State), Mark Strikman (Penn State), Christian Weiss (Jlab)
November 4-6, 2020	Ad hoc/Workshop: CFNS Ad hoc Meeting/Workshop Proposal: Opportunities with Heavy Flavor at the EIC Location: online Organizers: J. Huang (BNL) Xi. Li (LANL), F. Olness(SMU),I. Vitev (LANL), C. Weiss (JLab)
December 15-16, 2020	CFNS Ad hoc: Pre-meeting for the 2nd IR workshops in 2021 Location: online Organizers: L. Elouadrhiri, V. Burkert, M. Contalbrigo, A. Deshpande, H. Gao, R. Milner, B. Jacak, T. Satogata, F. Sabatie, B. Surov

CFNS Workshops 2021 (incomplete list)

[Most recent 2026 Workshop List is here](#)

Date	Upcoming Events
January 25-29, 2021	Ad hoc meeting: EIC physics in the Snowmass process Location: online Organizers: Swagato Mukherjee et al., and A. Deshpande, C. Gal
February 2, 2021	Review: Online CFNS Annual Review Organizers: A. Deshpande, C. Gal, J.H. Lee for the EICUG Steering Committee
March 18-22, 2021	Workshop: CPAD Instrumentation Frontier Workshop 2021 Location: (online) Stony Brook, New York Organizing Committee: Marina Artuso (Syracuse University), Rick Van Berg (University of Pennsylvania), Klaus Dehmelt (Stony Brook University), Prakhar Garg (Stony Brook University), Roxanne Guenette (Harvard University), Karsten Heeger (Yale University), Petra Merkel (Fermilab), Ian Shipsey (Oxford, International Advisor, IID chair), Jinlong Zhang (Argonne National Lab)
April 12-16, 2021	Conference: Deep Inelastic Scattering Location: (online) Stony Brook, New York Organizing Committee: Elke Aschenauer (BNL), Abhay Deshpande (SBU/BNL, Chair), Rolf Ent (JLab), Yulia Furletova (Jlab), Tanja Horn (CUA), Joanna Kirylyuk (SBU), Fred Olness (SMU), Giacinto Piacquodio (SBU), Lijuan Ruan (BNL), Bernd Surrow (Temple U.), Thomas Ullrich (BNL), Raju Venugopalan (BNL), Rik Yoshida (ANL)
April, 26-29, 2021	Workshop: Open Questions in Photon-Induced Interactions-from Relativistic Nuclear collisions to the Future Electron-Ion Collider Location: Stony Brook University (pandemic allowing) Organizers: Wei Li, Bjoern Schenke, Zhoudunming Tu, Thomas Ullrich
May 24-27, 2021	Workshop: RHIC Science Programs Informative Toward EIC in the Coming Years Location: Stony Brook University (pandemic allowing) Organizers: C. Aidala, Alexander Bazilevsky, Maria Chamizo Llatas, Xin Dong, Oleg Eyser, Yugi Goto, Jin Huang, Rosi Reed, Bjoern Schenke, Matt Sievert, Qinghua Xu, Zhangbu Xu
June 16-18, 2021	Workshop: The 2nd Workshop on Jets for 3D Imaging at the EIC Location: Stony Brook University (pandemic allowing) Organizers: Miguel Arratia(UC Riverside, Chair), Renee Fatemi (U. of Kentucky), Zhongbo Kang (UCLA/CFNS), Brian Page(CFNS/BNL), Alexei Prokudin(Jlab/PSU Berks), Felix Ringer (LBNL)
September 6-10, 2021	Workshop: AI4EIC-Ex-Experimental Applications of Artificial Intelligence for the Electron Ion Collider Location: Stony Brook University (pandemic allowing) Organizers: A. Boehnlein (Jlab) C. Fanelli (MIT), T. Horn CUA) J. Bernauer (SBU)
TBD, 2021	Workshop: The Science and Instrumentation of the second Interaction Region for the Electron -Ion Collider(EIC) Location: CFNS-ANL, CFNS-Europe, CFNS-CNF (Stony Brook & Washington DC) Organizers: Volker Burkert, Marco Contalbrigo, Abhay Deshpande, Latifa Elouadrhiri, Haiyan Gao, Barbara Jacak, Richrd Milner, Franck Sabatie, Todd Satagota



Summary of scientific output 2020

by post-docs and students supported by CFNS

Publications including submitted papers:

- 85 publications in a variety of international journals:
- PRL, PRD, PRC, NIM, Hadr. Sp.& Str., EPJC, JHEP, PLB, Nature, Science, Chin. Phy. C

Talks given:

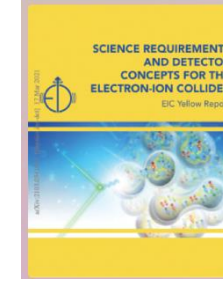
- 55 talks (25 contributed, 22 seminars, 8 invited/plenary) @ national and international meets and departmental seminars

Workshops organized:

- 9 workshops/conferences organized

EICUG Yellow Report & CFNS

See details in Thomas Ullrich's talk



EIC UG led a year-long series of 5 workshops (December 2019 at MIT, March 2020 @Temple, May 2020 @Pavia, September 2020 @CUA & November @UCB)

- Aim: to organize the EICUG to help/start design a detector for the EIC science

CFNS Experimentalists

- Post Docs (Kauder, Tu, Schmookler, Mondal, Esha, Baturin, Palatchi) and student (Athira) were deeply involved in the Yellow Report studies of diverse working groups: inclusive, exclusive, diffractive/tagging, and detector oriented PID, far-forward detection, DAQ & Electronics, Central detector & e-polarimetry.
- Page, Fazio, Park, (Sr. : past CFNS or affiliates) & experimental faculty/scientists Bernauer, Deshpande, Hemmick, Ullrich, Lee, Gal also contributed variously.
- **Leadership:** Schmookler (Convener), Hemmick (Convener) & Ullrich (Coordinator)

CFNS Theorists:

- Postdocs (Soto, Rajan, Chien, Boussarie) & students (Roy & Salazar) discussions in the Physics WG with Schenke, Sterman, Venugopalan, Kharzeev, Zahed



Example: Graduations from CFNS 2020

Name	Position at CFNS	Where in 2026
Kolja Kauder	CFNS Post Doc (Exp)	Head of BNL N&P Software Group
Alba Soto Ontoso	CFNS Post Doc (Th)	Sr. Post Doc/Researcher IPhT-Saclay then Staff at CERN
Abha Rajan	CFNS Post Doc (Th)	Sr. Post Doc ODU/JLab
Kong Tu	CFNS Post Doc (Ex)	BNL Goldhaber Fellow Now Physicist at BNL
Renaud Boussarie	CFNS Post Doc (Th)	LANL Oppenheimer Fellow Sr. Scientists at CNRS Ecole Polytechnique Paris
Dingyu Shao	CFNS-UCLA Post Doc (Th)	Assistant Professor, Fudan U.
Yang-Ting Chien	CFNS-YITP Post Doc (Th)	Associate Professor, Georgia State U.
Athira K. V.	MA CFNS-ISER (Ex)	Graduate from UIUC now postdoc at CERN
Jinlong Zhang	SBU Post Doc (CFNS Affiliate)	Professor Shandong U.

Other CFNS initiatives

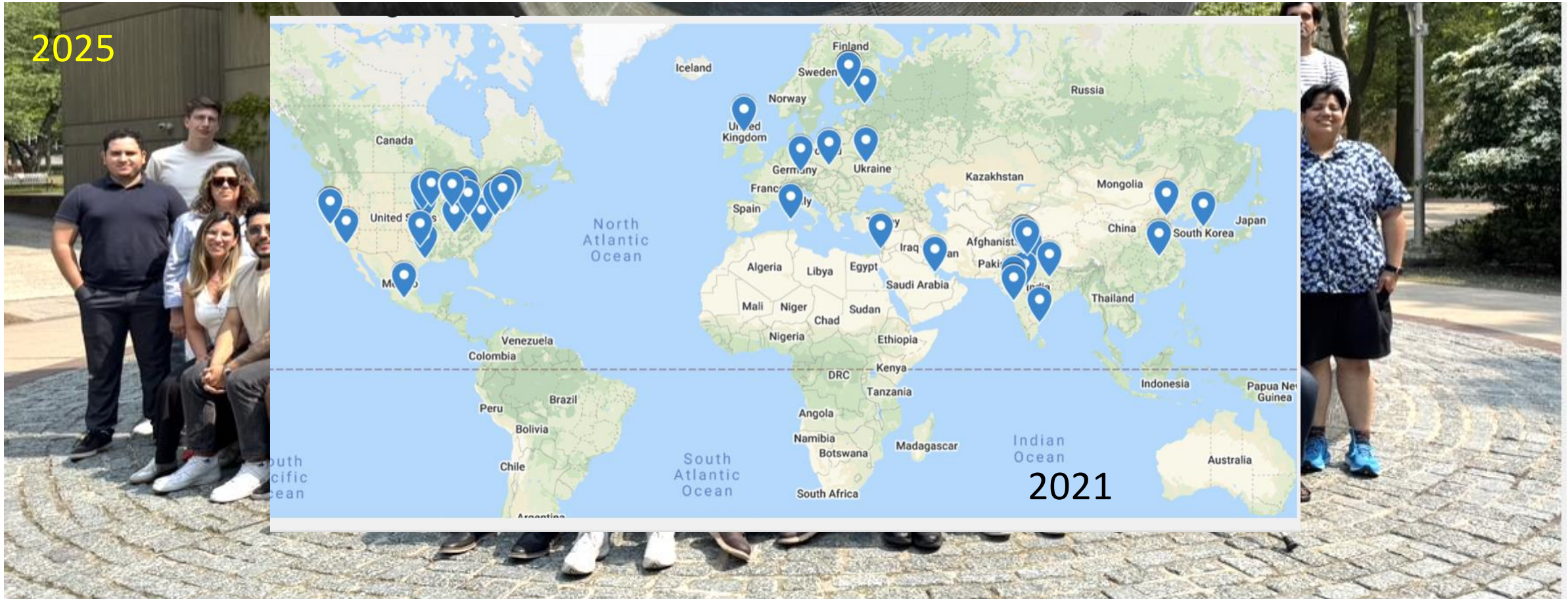
Research Initiatives : Data analysis of HERA data

- Significant sets of H1 and ZEUS data from 2003-2006 have not been analyzed
- New theoretical ideas and formalisms have developed over the past 10 years
- H1 and ZEUS collaborations welcome young EIC-oriented scientists getting involved in analyses of their data and get them published.
- Ideal analyses & experience for Masters & Ph.D. students & post docs interested in EIC
- CFNS could partially support such an initiative (currently 1@BNL & 2@SBU CFNS post docs involved, this will grow) – broader interests and activities at UCR, Yale, Temple

QCD/EIC Summer Schools in Asia, Europe and South America started

High Energy Physics school in Africa planning is underway

Our Summer Schools are very effective and popular: Thanks to meticulous planning and execution by Fred Olness, Alexei Prokudin, Ross Corliss, Socorro Delquaglio, Melissa Laguerre – supported by AD.



EIC Status and Realization

- CD0 : December 19, 2019
 - 1 machine, 1 IR and 1 Detector with a *possibility of of a second IR and Detector*
- Site BNL : January 9, 2020 →
- BNL and JLab realize EIC as partners
 - A formal EIC project is now setup at BNL
 - BNL+Jlab management & scientists are working together to realize it on a fast timeline.
 - **CD1 March 2021**
 - **CD2 September 2027 (final design)**
 - **CD3 4th Quarter FY2029 (start construction)**
- EIC CD4A Early Finish 4th Q FY2034/5
- EIC CD4 3rd ~2036



[Home](#) » U.S. Department of Energy Selects Brookhaven National Laboratory to Host Major New Nuclear Physics Facility

WASHINGTON, D.C. – Today, the **U.S. Department of Energy (DOE)** announced the selection of Brookhaven National Laboratory in Upton, NY, as the site for a planned major new nuclear physics research facility.

EIC Project

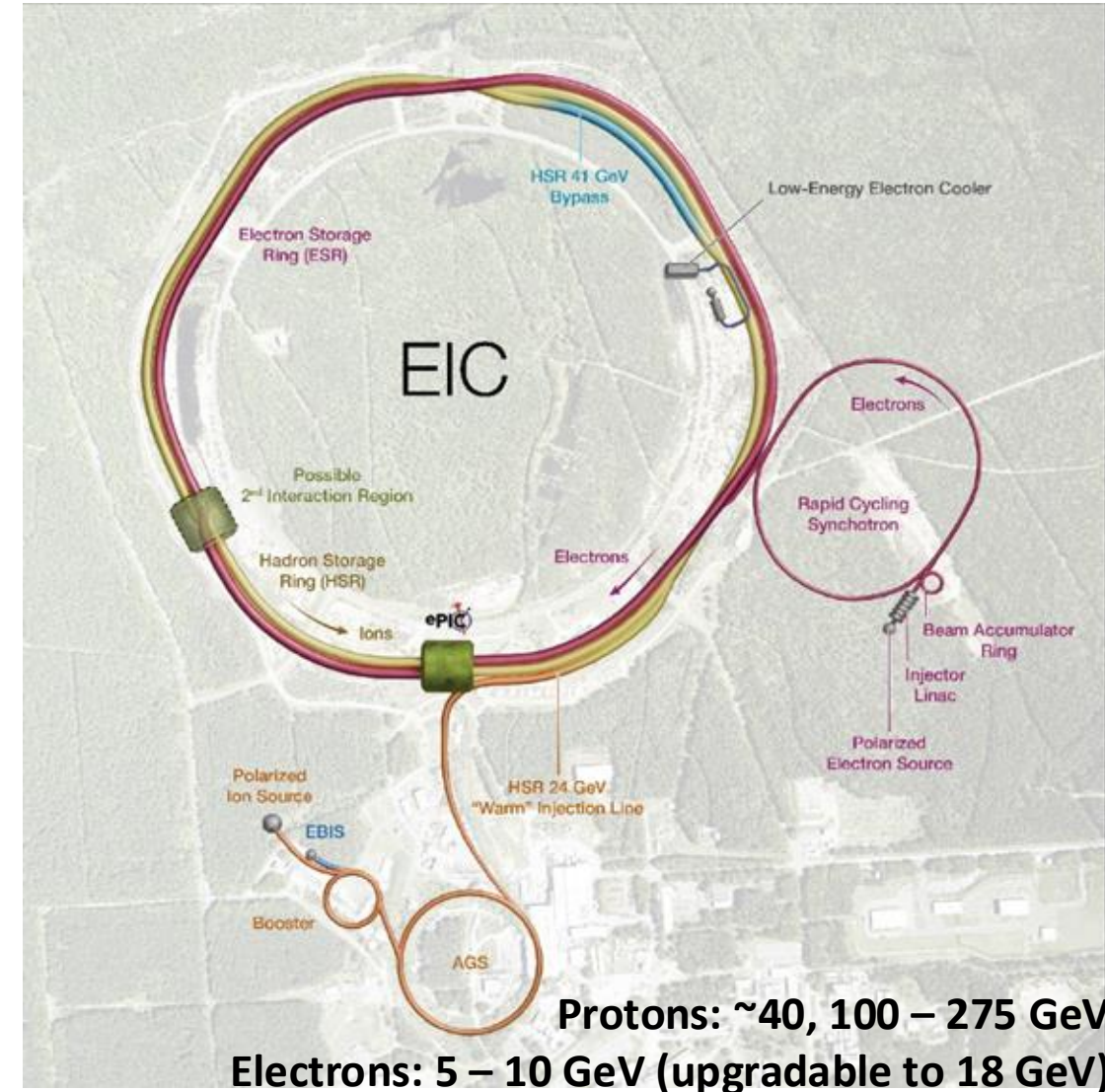
Build upon DOE's ~\$2B+ investment in the RHIC complex

Existing Accelerator Scope

- ✓ Existing accelerator tunnel and infrastructure
- ✓ Ion injection and acceleration systems (Linac, Booster, AGS)
- ✓ Polarized ion/proton sources
- ✓ Hadron Storage Ring (40, 100 – 275 GeV)

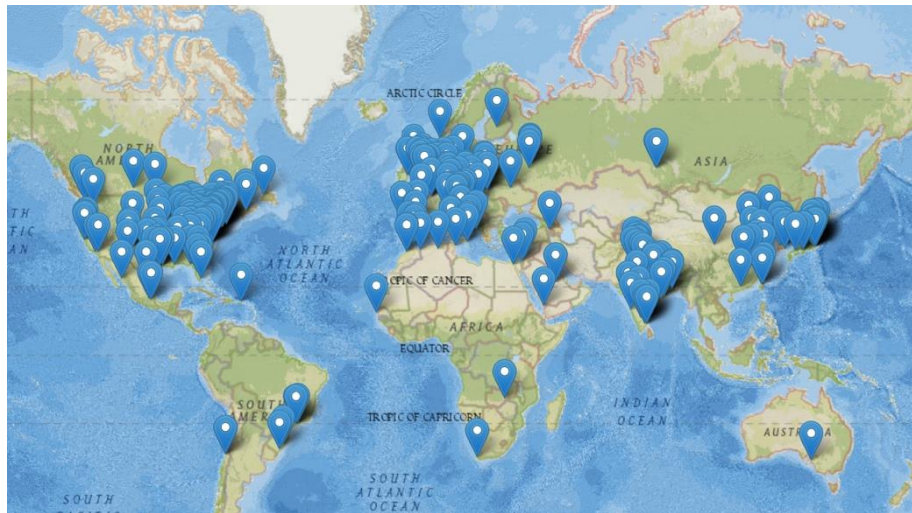
New Scope

- Electron Injector
- Electron Storage Ring (5 GeV – 18 GeV)
- Interaction Region (IR) and Provision for a 2nd IR
- Hadron Cooling System
- General Purpose Collider Detector (ePIC)



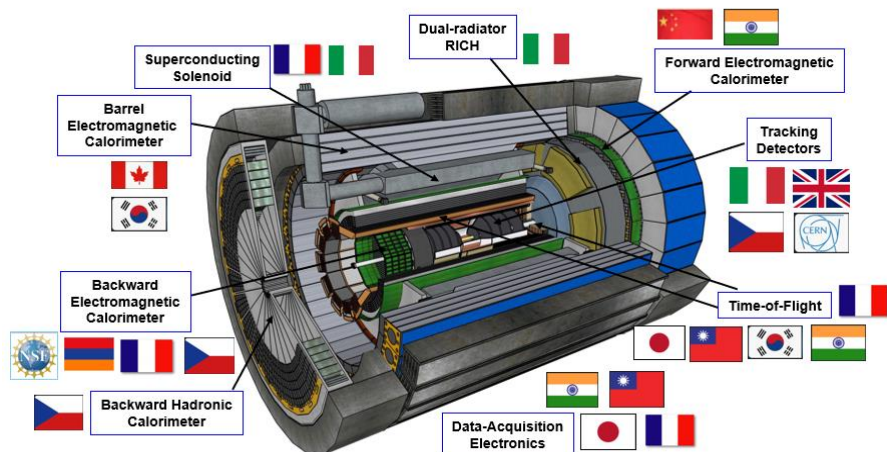
The Electron-Ion Collider

Attracting Worldwide Attention, Collaborators



The EIC design and construction has many scientific and technical challenges, creating opportunities for worldwide collaborators to become part of this exciting endeavor.

- **EIC U.S. Partners** (performing work and/or providing materials)
 - Brookhaven and Jefferson Lab among eight, total, national laboratories
 - 22 universities
- **EIC Collaborators** (developing experiments, contributing expertise)
 - EIC User Group: 1,558 members and increasing
 - 907 institutions worldwide representing 41 countries
 - 80+ U.S. universities



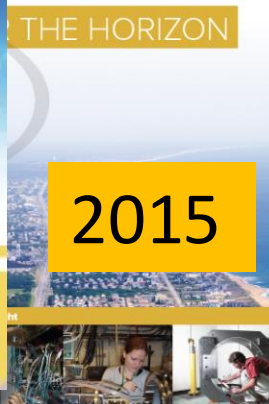
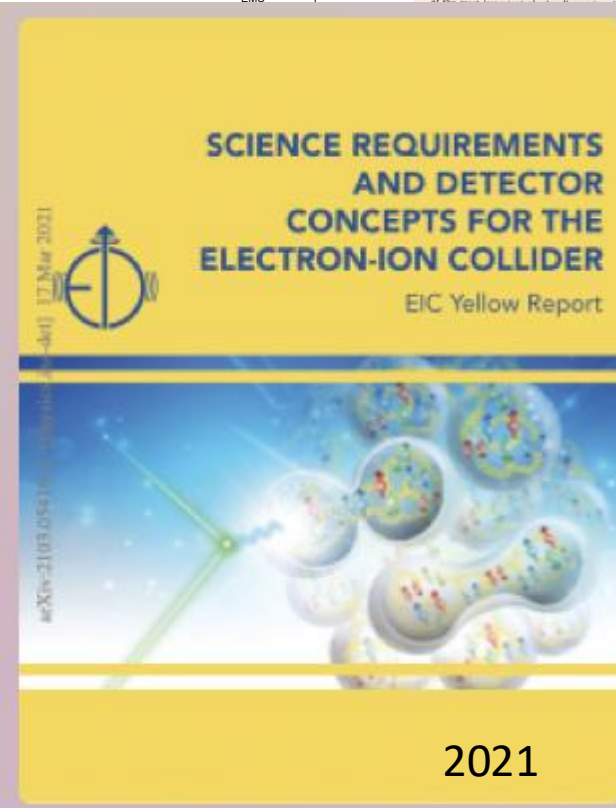
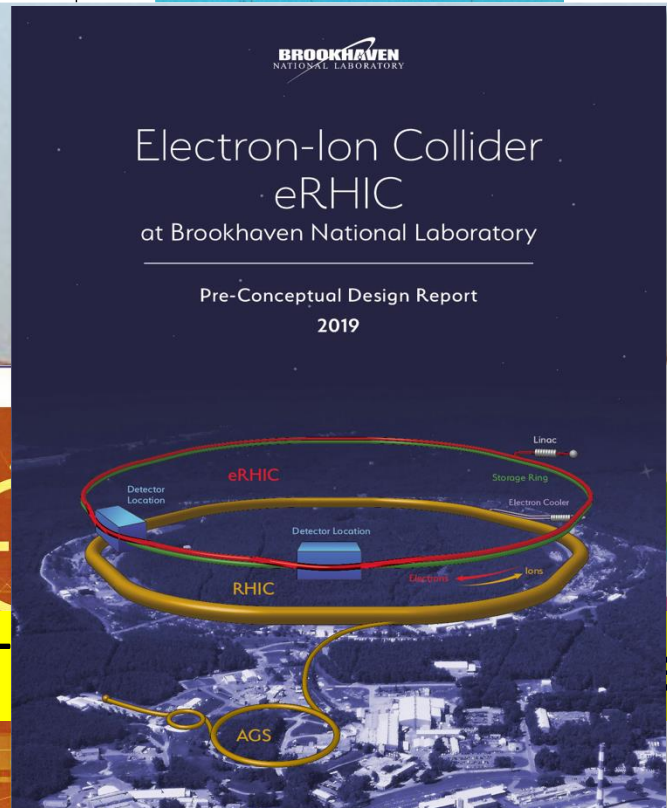
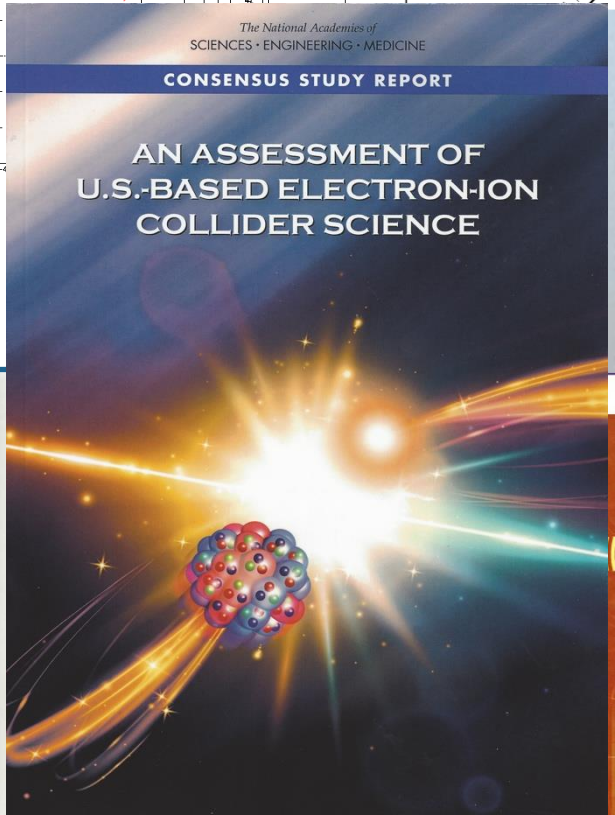
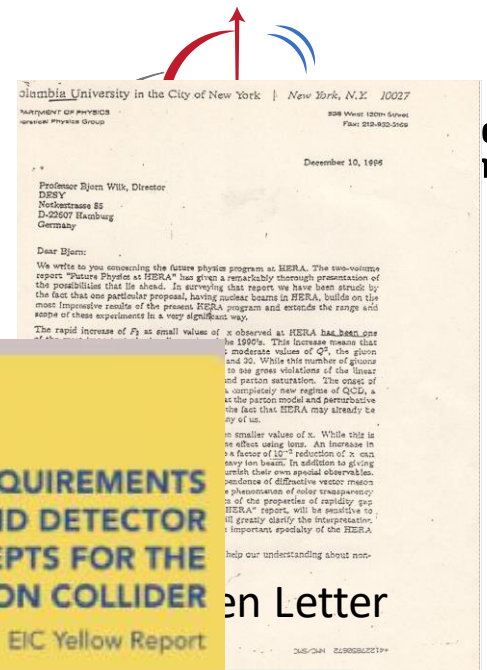
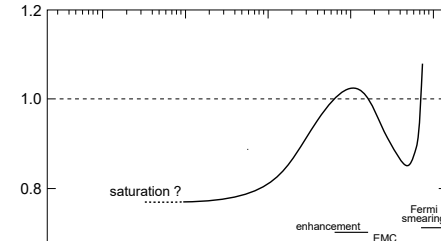
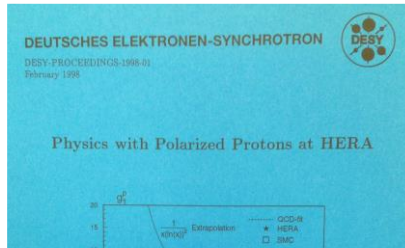
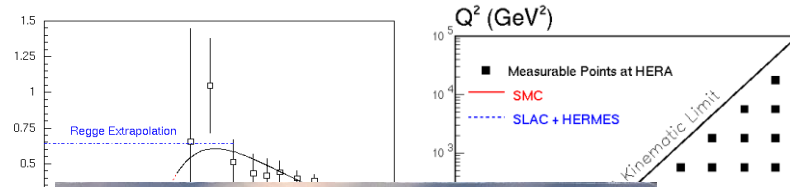
Department of Energy Lab Partners



SMC at CERN 1995/96

Low x behavior of $g_1(p)$!

A. Deshpande & V. W. Hughes
~1995 SMC (internal) analysis meeting



1999

e+A White Paper
EIC Collaborators
April 4, 2007

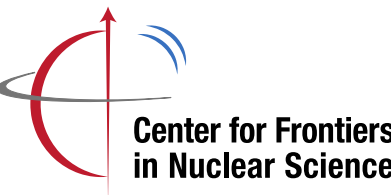
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CFNS has played an outsized role in shaping current and future nuclear Science



Office of Nuclear Physics at a Glance

Mission: Discover, explore, and understand all forms of nuclear matter.

Seeks to understand **subatomic matter**, including exotic matter inside neutron stars and in the early days of the universe, **and how that knowledge can benefit society (critical technologies, medicine, and national security).**

Largest supporter (>95%) of U. S. nuclear physics research
FY 2026 Enacted \$866.141M

Supports over **1,400 Ph.D. staff** and **720 graduate students**
FY 2026 Research: 24%

Stewardship of **4 SC User Facilities: ATLAS, CEBAF, and FRIB, and RHIC**
FY 2026 Operations: 56%
>4,000 users annually

In construction: Electron-Ion Collider will probe the inside of the proton
FY 2026 Construction: 20%

Energy.gov/science

Recently shown
Slide by Gina Rameika
At a DOE meeting

Summary

- Center for Frontiers in Nuclear Science – CFNS – we promote two things:
 - **The Electron Ion Collider, and its science – including its related science**
 - **Early Career Scientists**
- With the hope and aim that the ECA's will get involved and lead the future EIC: its construction, operation and extract maximally impactful results
- It has been a tremendous success since it was setup in 2017
 - **EIC is now being built (since 2021)**
 - **More than 25 junior faculty positions around the world generating next generation scientists and are part of the greater EIC effort around the world**
 - More than 50+ workshops and adhoc meetings led by early career scientists
 - 8 annual CFNS Summer Schools at SBU, and 6 more around the world in recent three years

2026 – All of you! Thank you for coming here!

