NSF AccelNet-Design Program:

The Inter-American network of networks of QCD challenges

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Kick-off meeting – CFNS, Stony Brook University

December 16, 2021

Plan of this talk

- Introduction to the program
- AccelNet program
- Plan for the kick-off meeting

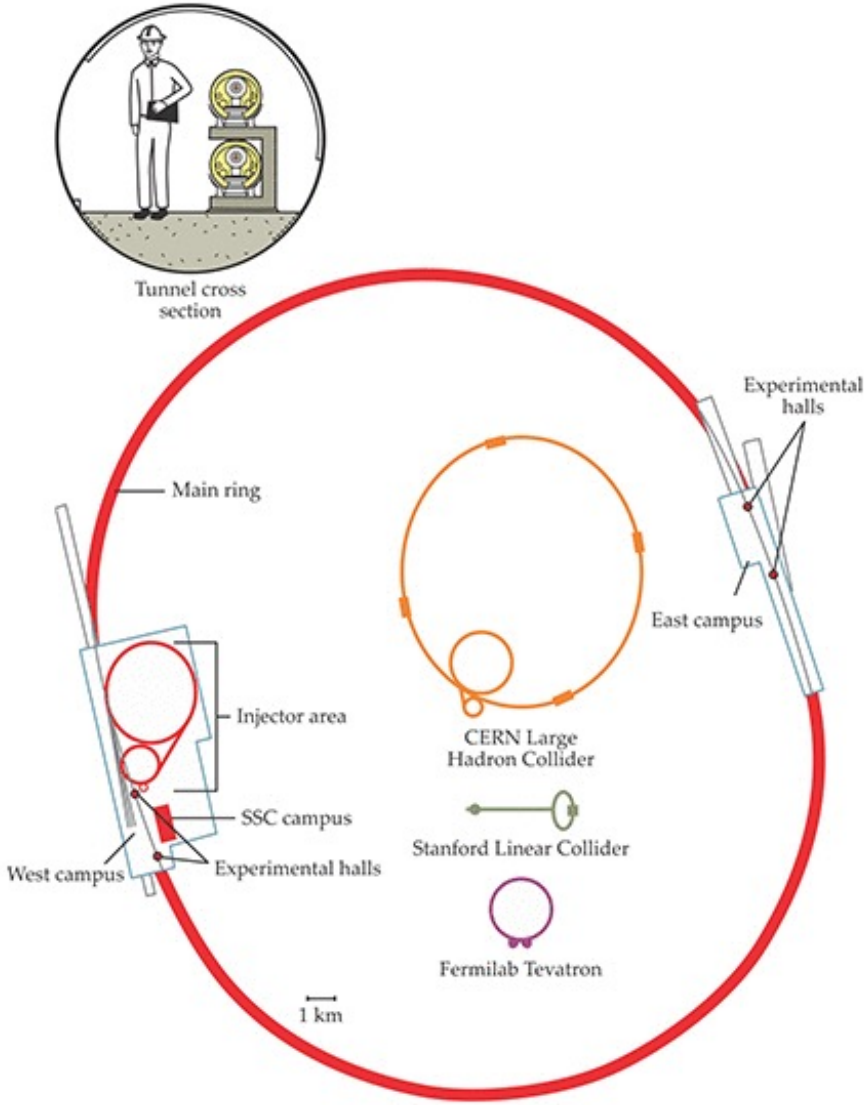
US and Latin American research in particle and nuclear physics

- In the 1980s, the director of Fermilab, Leon Lederman, invited physicists from around Latin America to participate in frontier experimental particle physics research at the US lab.

- Also Richard Feynman has opened scientific collaborations between U.S. institutions and Latin American partners in theoretical particle and nuclear physics

Efforts then drifted to Europe

- Partly due to the cancellation of the Superconducting Super Collider (SSC) in 1993, the efforts in experimental high-energy particle physics in Latin America drifted to Europe
- Some participation from Latin American countries stayed at RHIC and Tevatron, though



From Luciano Maiani – Former CERN DG

https://home.cern/news/opinion/cern/latin-america-comes-cern

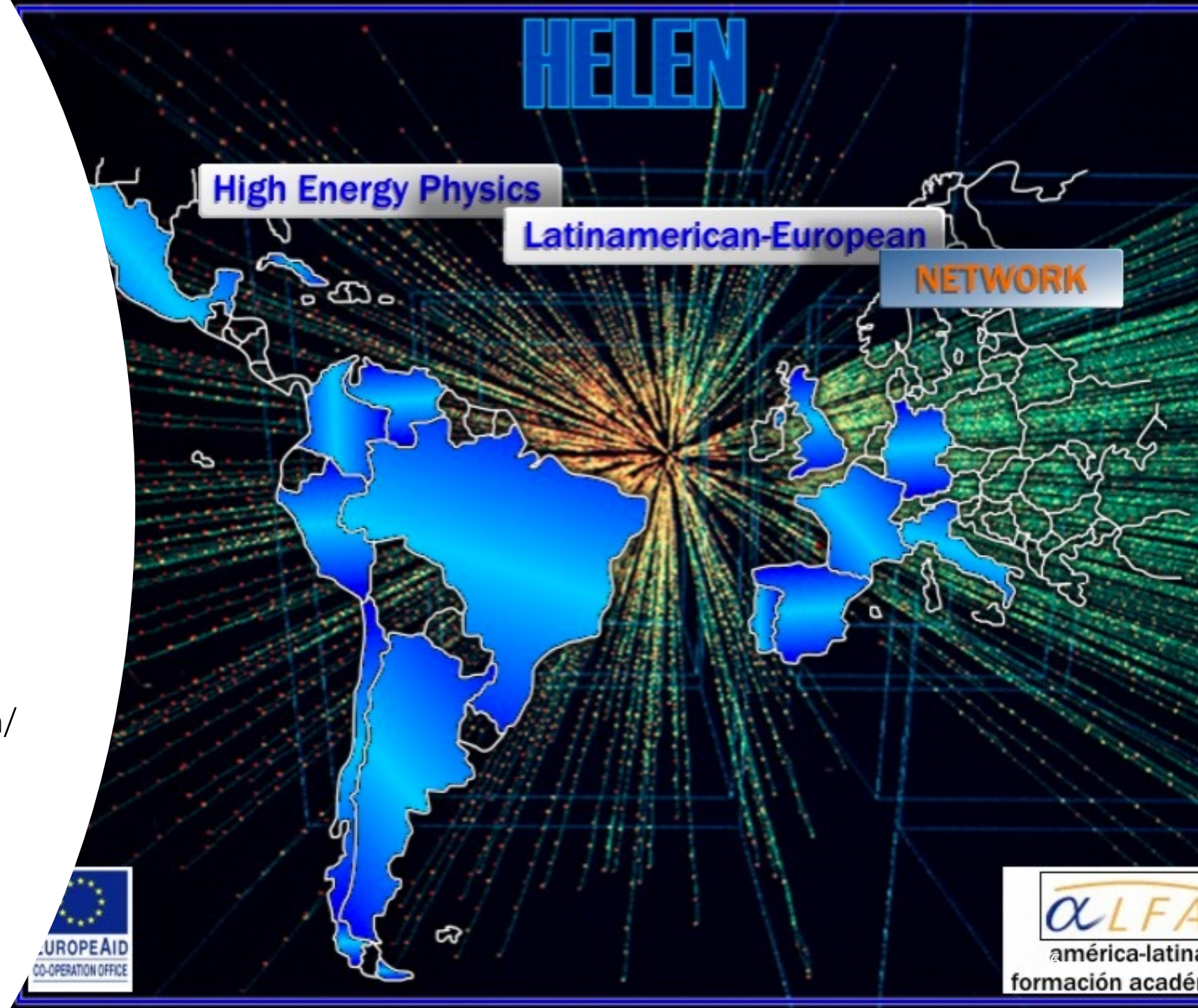
At the end of 2003, Juan Antonio Rubio, Verónica Riquer and I realized that a major obstacle for Latin American scientists to take part in experiments at the LHC was the lack of regular funds for their, and their students', mobility. The outcome was the High-Energy physics Latin-American European Network – HELEN – financed by ALFA, a programme created by the European Union (EU) to facilitate the scientific interchange between Europe and Latin America (*CERN Courier* October 2005 p26).

ALFA: Academic training in Latin America Program by the European Commission

2005-2009 program

The total cost was €3.0 million, with €2.7 million coming through EU support

http://www.roma1.infn.it/exp/helen/



EPLANET (2011 - 2016)

European Particle physics Latin-American NETwork (EPLANET), funded by the EU in the Marie Curie Actions of the 7th Framework Programme.

Grant agreement ID: 246806

Status

Closed project

Start date	End date
1 February 2011	31 January 2016

Funded under

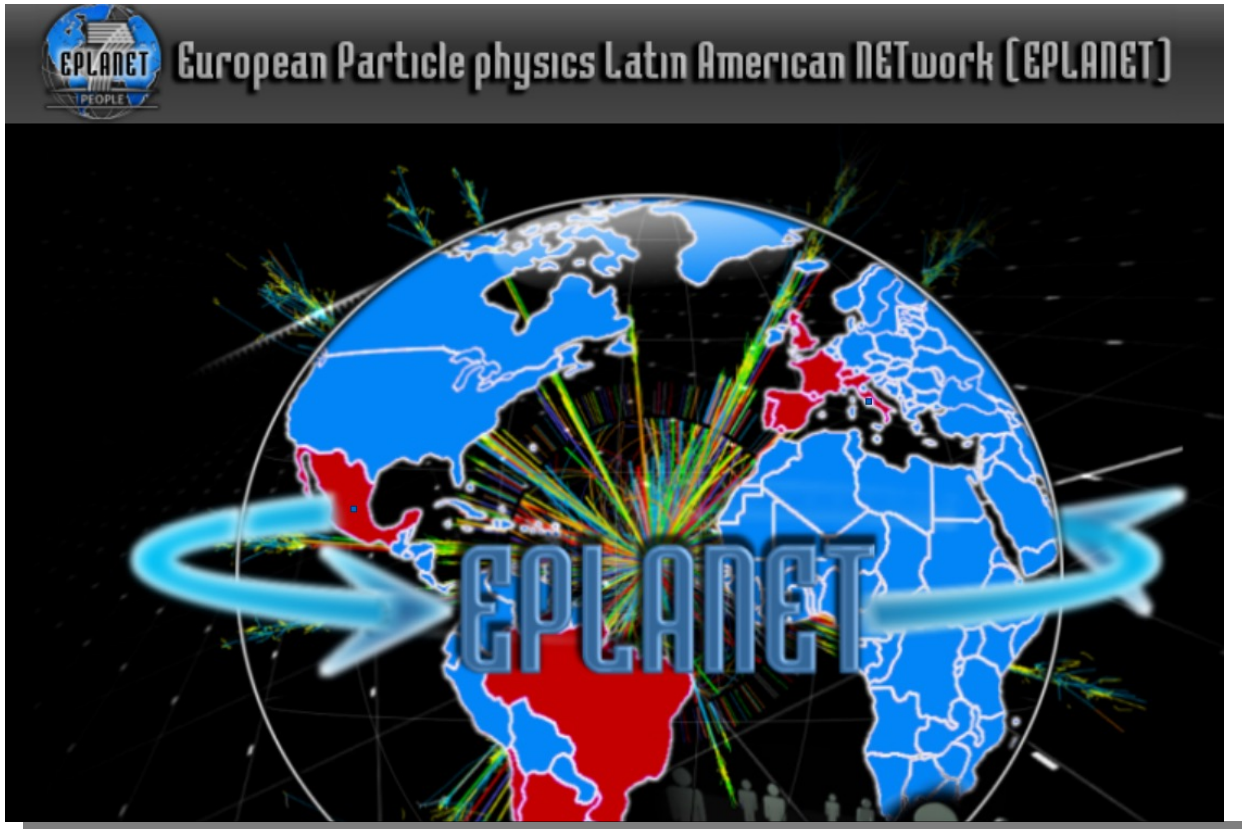
FP7-PEOPLE

Overall budget

€ 3 245 400

EU contribution
€ 3 245 400

https://cordis.europa.eu/project/id/246806



More than 1000 months of intercontinental exchanges over 3 years

Latin American countries

- Although several very active domestic and foreign networks in nuclear physics exist, very little exchange and discussions among them have taken place. This situation is particularly true across all domestic networks with those in Latin America. **This program will attempt to redress the current situation**, which significantly deteriorated after the start of the CERN LHC program
- The QCD community in Latin America is very well organized and **prospects for a revival of funded networks at the national level** are very promising.
- The AccelNet program is expected to have a positive ripple effect in those countries, **helping them securing new funding** for research network and participation in large-scale projects like the EIC

Canada

- Canadians are making internationally recognized contributions in QCD, but are relatively few in number.
- Outstanding research works are made in international collaborations with the Universities of York, TRIUMF, McGill, Simon Fraser, Guelph, Alberta, Queen's U., Regina, Manitoba, Fraser Valley, and others.
- Current work on hadron structure, phase transitions, and practical applications of QCD in nuclear physics. They have close collaborations with JLab and BNL by forming domestic networks
- <u>This program aims at bridging across the two nations in a more systematic and formalized manner</u>

Six axes of international collaborations

American Academy of Arts & Sciences December 2020 report

1. The global nature of scientific questions
2. Competition for global talent
3. US economic competitiveness
4. US national security
5. Funding realities, particularly for large-scale science projects
6. The development and application of international ethical norms and scientific guidelines

Inter-American scientific cooperation has been recognized in several forums

NSF AccelNet program

Accelerating Research through International Network-to-Network Collaborations

Inter-American Network of Networks of QCD challenges

- This project **focuses on designing and establishing a network of networks across the United States, Canada and Latin American countries to accelerate the process of tackling QCD challenges in nuclear physics**.
- It will enable the training of students, postdoctoral researchers, and early career scientists in international multi-team nuclear physics projects that will have a strong participation of networks in this region.
- Such activities will promote the integration of nuclear physics communities across the Americas. It will also serve to identify ethics norms and scientific guidelines for U.S.-led network-to-network projects in nuclear physics.

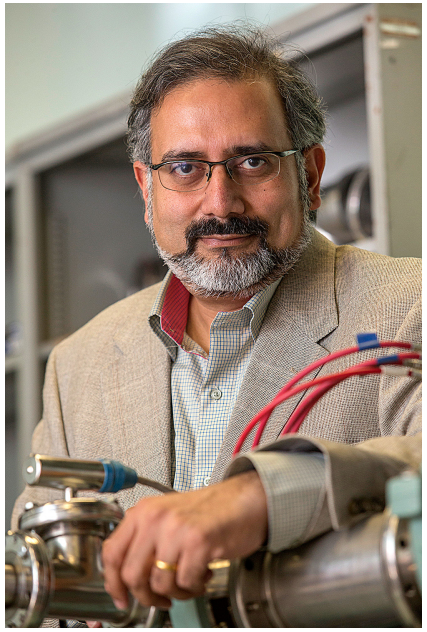
Program coordinators

Daniel Tapia Takaki
University of Kansas,
Principal Investigator

Christine Aidala
University of Michigan
Former Chair of the Institutional Board of the EIC's User Group

Carlos Bertulani
University of Texas A&M-Commerce and APS Forum on International Physics

Jean Delayen
Old Dominion University
Director
of the Center for Accelerator Science at



Abhay Desphande
Stony Brook University, Founding Director of the Center for Frontiers in Nuclear Science (CNFS), and Director of EIC Science at BNL

NSF AccelNet program

- We are starting the design phase of the program
- Supported for $250,000 for two years. We aim to apply for the full implementation for up to $2 M for five years
- At all stages, leverage of additional resources are expected

Main goals of the program

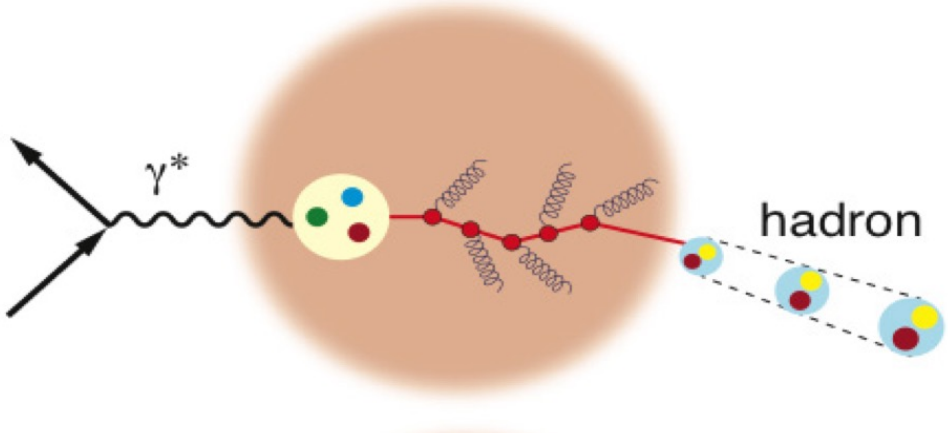
1. Develop strategic partnerships across the various nuclear physics research networks in the Americas;
2. Identify the needs, strengths and synergies of network partners for developing U.S.-led large scale QCD projects;
3. Design activities for researchers in the U.S., Canada, and Latin America that will facilitate leveraging complementary resources for QCD research, and
4. Enhance the training of the next generation of researchers in nuclear physics in a novel set of skills that include international multi-team experience.

Research areas related to QCD

- Accelerator technologies
- Theory
- High performance computing
- Particle detectors, instrumentation and electronics
- Real-time event selection
- Software development, and development of Monte Carlo simulation
- AI and QIS tools

Accelerating discoveries in QCD

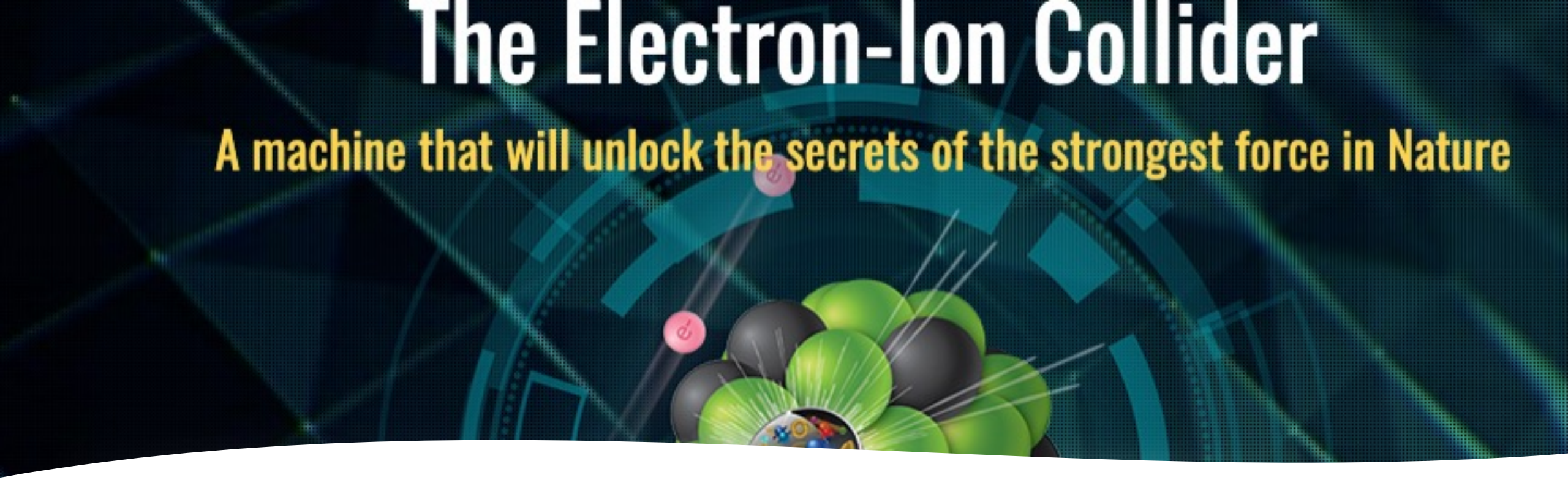
- How did visible matter come into being, and how does it evolve?
- How does subatomic matter organize itself and what phenomena emerge?



Key scientific questions driven by the U.S. Long Range Plan for Nuclear Science supported by NSF and DOE

Current US-led program in QCD

- Polarized beams at the 12 GeV Continuous Electron Beam Accelerator Facility (CEBAF) at Jefferson Lab
- High energy proton and heavy ion colliders at RHIC at Brookhaven National Lab (BNL)
- Large Hadron Collider (LHC) at CERN. Several programs. The U.S. is largest contributor as a country
- The future Electron–Ion Collider (EIC) at Brookhaven National Lab



The total project cost is expected to range from $1.7-2.8 billion

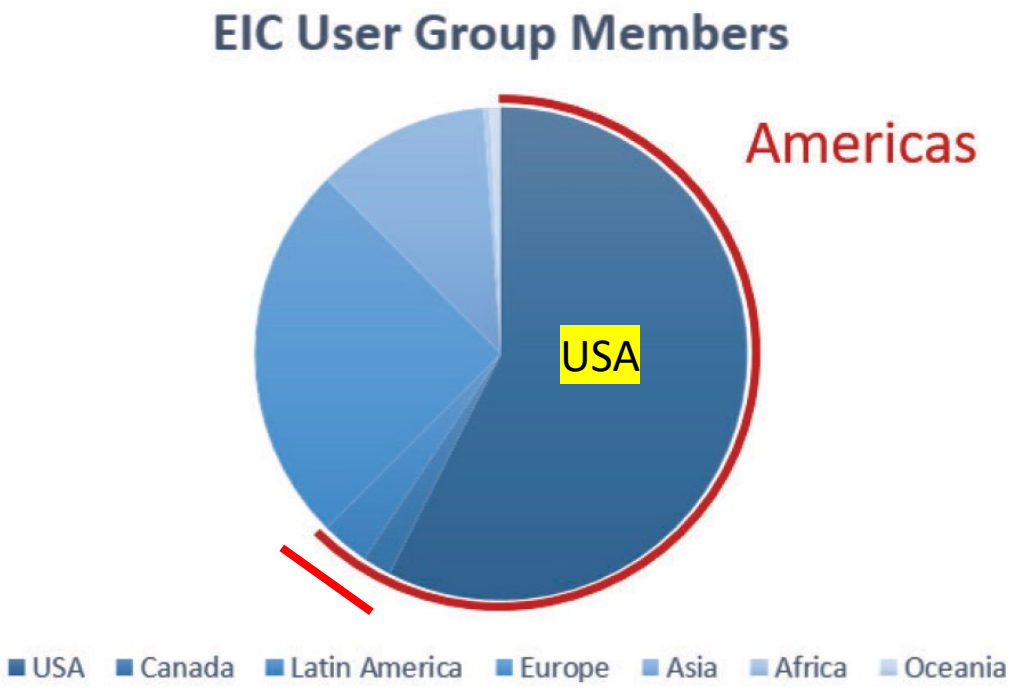
- The Electron-Ion Collider (EIC) will deepen our understanding of nature by producing dynamic 3D snapshots of the building blocks of matter. Building the EIC will maintain US leadership in nuclear physics and accelerator science
- **Building the EIC will bring a new opportunity to develop ongoing research collaborations between U.S. partners and Latin American physicist and engineers, attracting a new generation of theoretical and experimental physicists to EIC and United States institutions**

AccelNet & EICUG

- **The EIC plays a special role within this initiative**. The EIC effectively inspired us to pursue this NSF AccelNet funding--a new, major U.S. facility. It would in many ways be very natural to build up a stronger Latin American involvement and maintain a strong Canadian involvement.
- It will generally be less expensive for travel and more convenient in terms of time zones for scientists in Latin American countries to perform research at a U.S. facility than in Europe or Asia. So **we would like to actively pursue further engagement by Latin American and Canadian researchers in the EIC**.

Latin America participation
EIC's User Group

- Scientists from the Americas comprise 62.5% of the User Group, with 57.5% from the US and only 5.0% from Canada and Latin America (Dec 2020)



Planned activities of this program

- Develop **exchange and mobility programs** between US, Canadian and Latin American networks;

- Organize **dedicated workshops** that will profit from existing capabilities and networks in the United States, Canada and Latin American countries, in collaboration with other international partners, and

- Contribute to the organization of **scientific meetings** that will foster network communication and training of the next generation of scientists in multi-team international projects

Specific activities in the design phase

- **Establishing communication and relationships among network representatives, including creation of new networks**
  - In-person and virtual meetings
  - Parallel workshop in major regional or international conferences
  - Partner with existing centers for seminars or schools
- **International research exchange visits**
  - About one-month-long research exchange visits by graduate students, postdocs, and/or junior and senior researchers

List of invited networks

We are an open network: future networks can also participate

- Jefferson Lab User Organization
- RHIC/AGS Users' Group
- Electron-Ion Collider User Group
- JETSCAPE Collaboration
- Southeastern Universities Research Association (SURA)
- Latin American Association of Nuclear Physics and Applications (ALAFNA)
- Comunidad Mexicana de Aceleradores de Particulas (Mexican Community of Particle Accelerators)
- Brazil's network for Nuclear Physics and Applications (INCT-FNA)
- Rede Nacional de Fisica de Altas Energias (RENAFAE), National Network of High-Energy Physics, Brazil.
- EIC Canada Collaboration
- Interdisciplinary Consortium for Research and Educational Access in Science and Engineering (InCREASE).
- Latin American Association for High Energy, Cosmology and AstroParticle Physics

Ongoing steps

- Preparing First call for exchange visit proposals
- Research centers are not networks, while they are invited as network partners
- For countries without dedicated networks, establishing a list of national contact people when appropriate
- Forming the international advisory board

International Advisory Board (in preparation)

Confirmed members:

- Barbara Erazmus
- Paolo Giubellino
- Jorge Lopez
- Luciano Maiani
- Robert McKeown
- Larry McLerran
- Veronica Riquer
- Alberto Santoro
- Robert Tribble

Useful links

- **Program website**
  https://sites.google.com/view/inter-american-network-qcd/

- **Dec 16 kick-off meeting at CFNS, Stony Brook**
  https://indico.bnl.gov/event/13562/overview

Plans of the kick-off meeting

- Introduction of the various networks, start the conversation
- Discuss recent experience of other networks of networks
- Gather first inputs from the networks, network partners and the community in general