

Relativistic Heavy Ion Collider

RHIC Users' Executive Committee • Brookhaven National Laboratory • PO Box 5000 • Upton, NY 11973

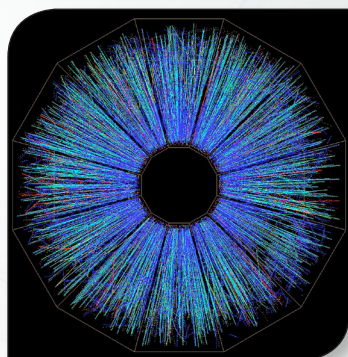
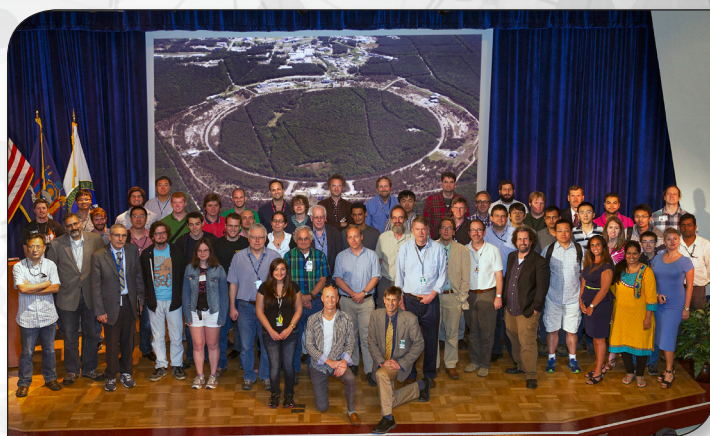
Nuclear Physics at RHIC

www.bnl.gov/rhic

RHIC: Relativistic Heavy Ion Collider Exploring Matter at the Dawn of Time

Scientists' quest to understand matter and its interactions in the early universe inspired the construction and continuous improvement of the Relativistic Heavy Ion Collider (RHIC), the world's most versatile particle collider. It has produced a new kind of nuclear matter, a "perfect" liquid made of the subatomic building blocks that give shape to everything we see in the universe today.

The research conducted at RHIC attracts the world's best and brightest minds, inspires a new generation of scientists, and drives technological advances in many fields. ➤



RHIC Basics

- RHIC accelerates a large variety of nuclei across unprecedented energy ranges with crisscrossing rings of 1,740 superconducting magnets in a 2.4-mile tunnel
- RHIC's large nuclear collisions result in 1000s of outgoing particles that tell us about the nuclear force
- RHIC is the only US particle collider, one of only two in this energy regime in the world
- Sponsored by the U.S. Department of Energy's (DOE) Office of Nuclear Physics
- Replacement cost of over \$2 billion
- Two large particle detector complexes, STAR and (s)PHENIX

➤ *Thousands of outgoing particles detected by STAR*

RHIC Productivity & Economics

- Major discoveries include the perfect-liquid quark-gluon plasma and the spin of gluons inside nucleons
- 1000+ scientists use RHIC (from around the world)
- \$180 million+ annual economic impact
- 390+ scientific papers, including 60 of the field's 100 most-cited
- 380+ PhDs, hundreds more to come
- 200+ tenured or tenure-track faculty and research positions in states across the U.S.
- Supports 1,469 full-time equivalent jobs
- Newly upgraded detectors with precision capabilities

Magnet-lined tunnels where nuclei are accelerated ➤



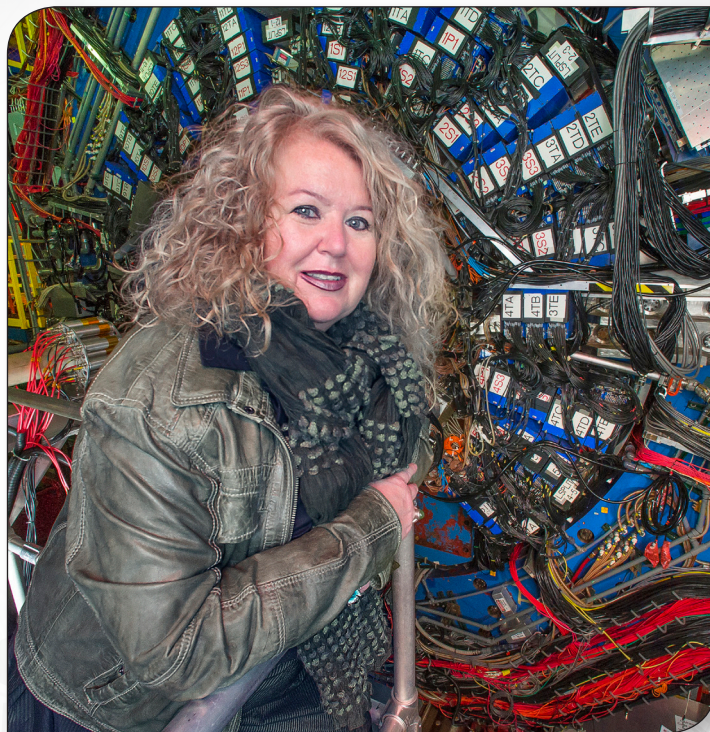
Nuclear Physics DC Day

Washington, DC • March 11, 2019



RHIC Impact

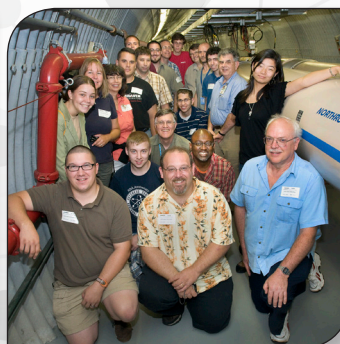
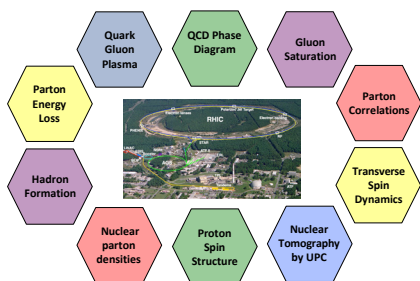
- Maintains position of the U.S. as a leader in nuclear science
- Inspires and trains hundreds of students for careers in science, technology, engineering, and mathematics (STEM)
- Develops the high-tech workforce needed to address technical challenges in communications, energy technologies, national security, medicine, and more
- Essential for world's full hot-nuclear-matter program also incorporating Europe's Large Hadron Collider (LHC)
- The National Nuclear Science 2015 Long Range Plan's #1 recommendation includes the need to exploit the capabilities of the upgraded RHIC facility
- Triggers spin-off benefits including:
 - *medical isotopes for heart scans and cancer treatment*
 - *studies of space radiation impacting astronauts*
 - *accelerator advances that could improve cancer treatment and nuclear reactor safety*
 - *R&D to advance energy storage*
 - *computational advances for "big data" in many fields*



RHIC Future

- A strong RHIC community is a key foundation for the next-generation research facility for nuclear science: an Electron-Ion Collider (EIC)
- RHIC infrastructure can provide an affordable path to an EIC and U.S. nuclear physics leadership for decades to come
- Sufficient funding for RHIC is essential for a smooth transition preserving:
 - *scientific talent*
 - *international collaborations*
 - *foreign investments*

Broad Range of Science Topics at RHIC



This document was produced by the
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