

BREA NEWS

<https://bera.bnl.gov/brea/>

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March/April 2026

BREA Meetings

BREA meetings are held on the second Tuesday of every month (except for August), at 1 p.m. All BREA members are invited to attend and participate.

Zoom meetings via video link have become the norm. Contact any officer for help to join a meeting.

Meeting Schedule

March 10, 2026

April 14, 2026

May 12, 2026

BREA Officers

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Andrew Feldman
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Secretary

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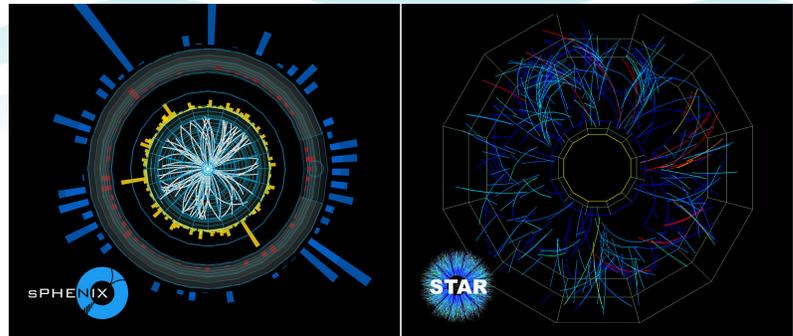
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After a quarter century of remarkable physics, RHIC's era of colliding ions has ended. Above are some of the final collisions captured by the sPHENIX and STAR detectors at RHIC. Collisions were between two beams of oxygen nuclei smashing into one another at nearly the speed of light. See pages 2-3 to read about RHIC's smashing success. (sPHENIX and STAR Collaborations)

From the President

by Arnie Moodenbaugh, moodenba@optonline.net

To fellow BREA Members,



This month's newsletter looks back on the 25-year operational life of the Relativistic Heavy Ion Collider (RHIC). Of course, RHIC history began long before its inaugural operation in 2000. Infrastructure adapted for use in RHIC includes the AGS, operational from 1960 to the present. Other facilities developed and research begun in the late 1970s under the unsuccessful ISABELLE project were integrated into RHIC. Above, in 2001, are the individuals responsible for initiating the polarized proton program at RHIC: from left, Gerry Bunce, Michael Tannenbaum, Thomas Roser, Yousef Makdisi, and Satoshi Ozaki, who was head of the RHIC project. Makdisi had already worked on polarized protons at the AGS when he joined the RHIC program in 1990. At BREA's February Zoom meeting, he and several others provided anecdotes and perspectives on the success of RHIC. In addition to the scientific and technical aspects,

(continued on page 4)

A Smashing Success: RHIC Wraps up Final Collisions

Just after 9 a.m. on February 6, 2026, final beams of oxygen ions — oxygen atoms stripped of their electrons — circulated through the twin 2.4-mile-circumference rings of the Relativistic Heavy Ion Collider (RHIC) and crashed into one another at nearly the speed of light inside the collider’s two house-sized particle detectors, STAR and sPHENIX. RHIC, a nuclear physics research facility at the U.S. Department of Energy’s



Dario Gil, the U.S. Department of Energy’s Under Secretary for Science, right, and Interim Laboratory Director John Hill officially ended the operational era of the Relativistic Heavy Ion Collider at a capstone collision event held at Brookhaven National Laboratory on Friday, February 6, 2026. (Kevin Coughlin/BNL)

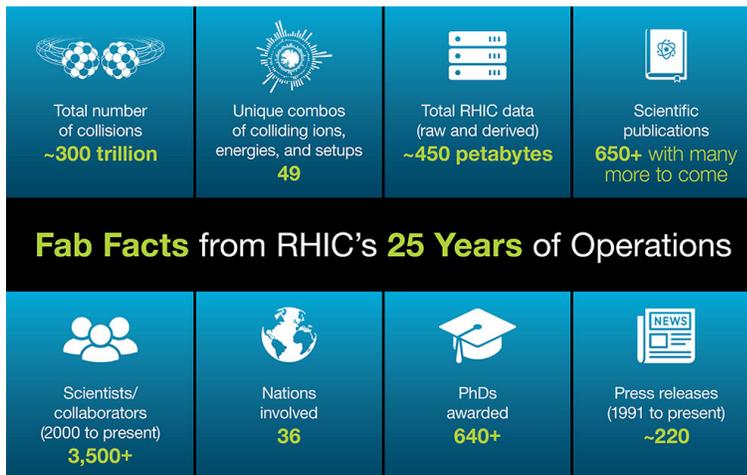
year-to-year operations of the collider and all its ancillary accelerator infrastructure. “Experiencing the challenges of first trying to get beams to circulate during commissioning in the fall of 1999, one could not have dreamed how far the performance of this machine would come,” he said. “We’ve pushed well beyond the original design in terms of the number of collisions we can produce, the energy range of those collisions, the variety of ions we’ve collided, and our ability to align the spins of protons and maintain a high degree of this alignment or polarization.”

The 25th and final run produced the largest-ever dataset from RHIC’s most energetic head-on smashups between two beams of gold ions, among the heaviest ions collided at RHIC. It also yielded a treasure trove of proton-proton collisions that will provide essential comparison data and insight into proton spin, a set of low-energy fixed target collisions to complete RHIC’s “beam energy scan,” and a final burst of oxygen-oxygen interactions. All this data will add to that collected previously by RHIC’s detectors — STAR, which has been running with many upgrades since RHIC’s beginning; PHENIX, another original RHIC detector that ceased operations in 2016; PHOBOS and BRAHMS, two smaller original detectors that

(DOE) Brookhaven National Laboratory, has been smashing atoms since the summer of 2000. The final collisions cap a quarter century of remarkable experiments using 10 different atomic species colliding over a wide range of energies in different configurations. The RHIC program has produced groundbreaking discoveries about the building blocks of matter and the nature of proton spin and technological advances in accelerators, detectors, and computing that have far surpassed scientists’ expectations when this discovery machine first turned on.

“RHIC has been one of the most successful user facilities operated by the DOE Office of Science, serving thousands of scientists from across the nation and around the globe,” said DOE Under Secretary for Science Dario Gil. “Supporting these one-of-a-kind research facilities pushes the limits of technology and expands our understanding of our world through transformational science — central pillars of DOE’s mission to ensure America’s security and prosperity.”

“It’s been an amazing run,” said Wolfram Fischer, chair of Brookhaven Lab’s Collider-Accelerator Department (C-AD), speaking of the entirety of the RHIC program. As head of C-AD, Fischer is responsible for the day-to-day,



ran from 2000 through 2005 and 2006, respectively; and sPHENIX, RHIC's newest most rapid-fire collision "camera," which came online in 2023.

Collectively, the RHIC measurements will fill in missing details in physicists' understanding of how a soup of fundamental particles known as quarks and gluons — which last existed in nature some 14 billion years ago, a microsecond after the Big Bang — coalesced and converged to form the more ordinary atomic particles that make up everything visible in our world today. Recreating this primordial matter, known as a quark-gluon plasma (QGP), was the primary reason for building RHIC. RHIC's energetic collisions of heavy ions such as gold were designed to set quarks and gluons free from "confinement" within protons and neutrons by melting the boundaries of these nuclear particles.

Thanks to considerable contributions from Japan's RIKEN institute, RHIC was also built with unique capabilities for polarizing protons so that physicists could explore the origins of proton spin. This intrinsic quantum property, somewhat analogous to a planet spinning on its axis, has been leveraged to develop powerful technologies like nuclear magnetic resonance imaging and medical MRIs. RHIC's polarized proton collisions have opened a new window into the mystery of how spin arises from the proton's quarks and gluons.

"This final RHIC run, with its impressive dataset, is a capstone that exemplifies the success of the entire RHIC program," said John Hill, interim director of Brookhaven Lab. "The scientists, engineers, and technicians at Brookhaven deserve huge credit for their dedication and innovation throughout the operating life of RHIC — and for continually finding new ways to maximize the scientific output of this remarkable machine. We are also extremely grateful for the continued support of the U.S. Department of Energy, and for our collaborators from other DOE labs, U.S. universities, and scientific institutions around the globe. This exploration of the matter that makes up our world and of how it came to be has been, and will continue to be, a truly international endeavor."

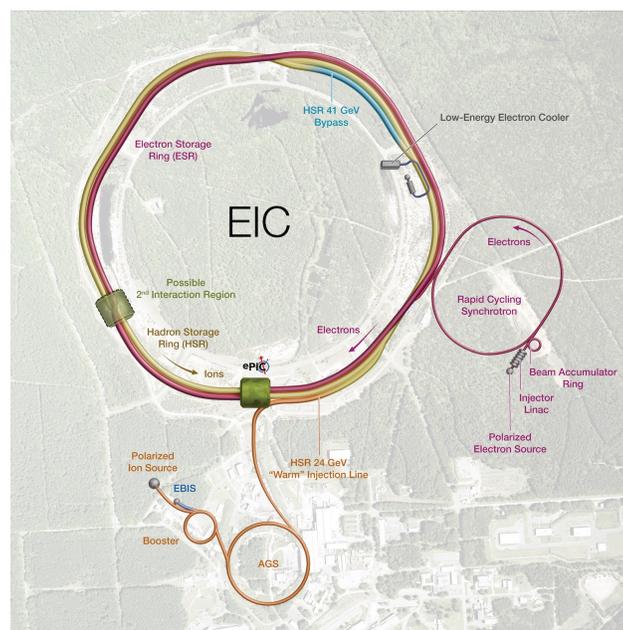
Captivating discoveries

In early 2001, as the earliest RHIC data came out, some scientists were convinced that they'd seen signs of the post-Big-Bang QGP. But the data also presented puzzling surprises. Instead of the predicted uniformly expanding gas of quarks and gluons, the matter created in RHIC's collisions seemed to flow more like a liquid — and, remarkably, one with extremely low viscosity. Additional experiments and a careful multiyear analysis led the four original RHIC collaborations to conclude in 2005 that RHIC was generating a nearly "perfect" liquid. By 2010, they had sufficient evidence to declare this liquid hot enough to be the long-sought QGP.

Since then, RHIC physicists have been making precision measurements, including the QGP's temperature, "vorticity," and transition to ordinary nuclear matter. They've also detected traces of the heaviest exotic antimatter ever created in a laboratory and explored connections to neutron stars and other areas of physics.

After RHIC: the EIC

Now, as physicists continue to analyze RHIC's vast datasets, much of the RHIC accelerator complex will be transformed into a new nuclear physics research facility, the world's only polarized Electron-Ion Collider (EIC). By bringing electrons into collisions with protons and the nuclei of atoms, the EIC will give scientists a new understanding of the particles and "glue" that build up the structure and properties of the visible matter of our universe. The new collider will be built in partnership with DOE's Thomas Jefferson National Accelerator Facility.



EIC will make use of existing RHIC components, including its ion sources, pre-accelerator chain, and a superconducting magnet ion storage ring. A new electron storage ring will be built inside the existing collider tunnel so that collisions can take place at points where the stored ion and electron beams cross. (Valerie A. Lentz/BNL)

Renew BREA Membership

Membership expires on December 31 of every year no matter when you paid your dues (which are requested by January 31 of the following year). To stay on BREA’s mailing list, complete the form below and mail it to me along with your payment. Include your email address so BREA can send you timely information.

If you have questions or if your contact information has changed, send me an email at bettyelder81@gmail.com.

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Moriches, NY 11955

– Betty Elder, Membership Chair
bettyelder81@gmail.com

In Memoriam

We deeply regret to inform you of the passing of the following retirees.

John Louis Boccio, 87, June 2, 2024
Francis J. Lepera, 71, January 2, 2011
Michael Joseph Losquadro, 72, February 20, 2017
John (Scharpy) Scharpeger, 86, November 25, 2025

More information may be found at BREA’s website: <https://bera.bnl.gov/brea/>. To post an obituary for a deceased BNL employee or retiree, email information to msrowe.hi@gmail.com or mail it to BREA (see panel below for address).

President’s Message (cont’d from p. 1)

critical work was performed on infrastructure development, financial controls, and public relations and publicity. For our members who have additional comments and recollections about RHIC, we invite you to share them at our March 10 regular Zoom meeting.

I’m writing this note during the big snowstorm of February 23. The prospect of a spring thaw seems distant, but it will eventually occur.

We intend to arrange for an upcoming hybrid in-person/Zoom meeting at BNL. Also, I’d like local Long Island members to meet in person for an informal lunch, at a time and location to be determined. Bring your ideas to the March Zoom meeting. Finally, an excursion for BREA members to Plum Island is being planned. We will distribute additional information as it’s developed.

– Arnie Moodenbaugh, moodenba@optonline.net

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