

# BREA NEWS

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

Volume 25, Issue 2

March/April 2025

## BREA Meetings

BREA meets on the second Tuesday of every month (except for August), at 1 p.m. in the Eastern Time Zone. All BREA members are invited.

BREA meetings are held via Zoom. Some meetings will be hybrid so that retirees living on Long Island can attend in person. Contact any officer for help to join a meeting.

### Meeting Schedule

March 11, 2025

April 8, 2025

May 13, 2025

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Turn the page to read about BNL's top 10 discoveries in 2024.

## From the President

by Arnie Moodenbaugh, [moodenba@optonline.net](mailto:moodenba@optonline.net)

Greetings. First I'll give an update on donations from BREA. We are sending a previously approved \$1,050 to the Tesla Science Center in Shoreham. This will include the cost of a paving "brick" that will acknowledge the donation. At our February meeting, we also approved \$500 for BNL's United Way Campaign and \$500 to the Caltech and Jet Propulsion Laboratory disaster relief fund for the devastating fires in southern California. I'm writing cover letters for the approved donations, and the funds will be dispersed shortly.

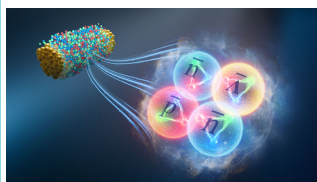
This newsletter contains BNL's list of the top 10 science discoveries in 2024. The list includes work touching on nuclear physics at RHIC and nuclear theory aimed at future Electron-Ion Collider work, catalytic and advanced battery chemistry, bio-chemistry, atmospheric science, as well as other fields. Collaborations within BNL and across the nation are a recurring theme.

BREA's January/February 2025 newsletter carried Joe Gettler's report on the new Science User Support Center (SUSC), the first building to be constructed in Discovery Park. At our January meeting, discussion of SUSC prompted some questions. Mona Rowe followed up on these questions with Project Director Peggy

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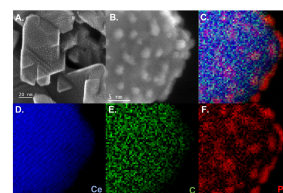
# BNL's Top 10 Discoveries of 2024

Brookhaven Lab celebrates a year of scientific successes, from creating the biggest bits of antimatter to improving qubits, catalysts, batteries, and more! Here, in no particular order, are the top 10 discoveries of 2024. The following summaries are abridged from the full news release at <https://www.bnl.gov/newsroom/news.php?a=122245>.

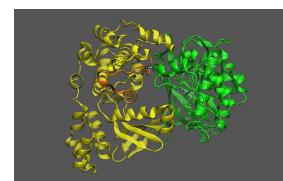


**Heaviest antimatter nucleus** – Antimatter sounds exotic, but it really does exist — just not for long. This year, scientists studying collisions of atomic nuclei at the Relativistic Heavy Ion Collider (RHIC) — an “atom smasher” that recreates the conditions of the early universe — discovered the heaviest antimatter nucleus ever detected. It’s composed of four antimatter particles: an antiproton, two antineutrons, and a particle called an antihyperon. It lasts only a fraction of a second before decaying into other particles.

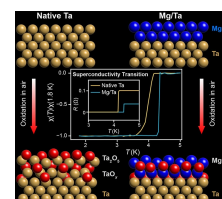
**Low-temp, direct conversion of natural gas to liquid fuel** – Brookhaven Lab chemists engineered a highly selective catalyst that can convert methane, a major component of natural gas, into methanol, an easily transportable liquid fuel, in a single, one-step reaction. This direct process for methane-to-methanol conversion runs at a temperature lower than required to make tea and exclusively produces methanol without additional byproducts. That’s a big advance over more complex traditional conversions.



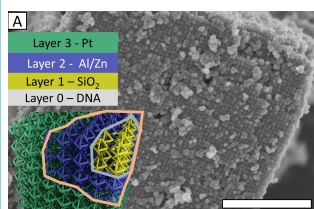
**Plants’ sugar-sensing machinery** – Proteins are molecular machines, with flexible pieces and moving parts. Understanding how these parts move helps scientists unravel the function that a protein plays in living things — and potentially how to change its effects. This year, a team led by Brookhaven Lab biochemists working with colleagues from DOE’s Pacific Northwest National Laboratory discovered how protein machinery in plants controls whether the plants can grow and make energy-intensive products such as oil — or instead put in place a series of steps to conserve precious resources.



**Protecting a promising qubit material** – Tantalum is a superconducting material that shows great promise for building qubits, the basis of quantum computers. This year, a team that spans multiple Brookhaven departments discovered that adding a thin layer of magnesium improves tantalum by keeping it from oxidizing. The coating also improves tantalum’s purity and raises the temperature at which it operates as a superconductor. All three effects may increase tantalum’s ability to hold onto quantum information in qubits.



**Where cloud droplets are born** – A team led by Brookhaven Lab atmospheric scientists made the first-ever remote-sensing observations of the cloud-droplet “birth zone” at the base of clouds, where aerosol particles suspended in Earth’s atmosphere give rise to the droplets that ultimately form clouds. The research was made possible by a high-resolution LIDAR system that sends laser beams into the atmosphere and measures the signals of backscattered light with a resolution of 10 centimeters.



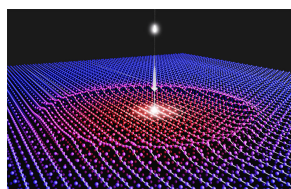
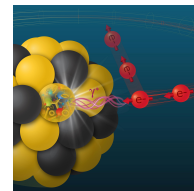
**Hacking DNA to make next-gen materials** – Scientists at the Center for Functional Nanomaterials (CFN) are experts at using DNA as a tool for “programming” molecules to self-assemble into 3D nanostructures. By directing molecular and nanoscale building blocks toward specific arrangements they’ve designed, the researchers create novel, functional materials that exhibit desirable properties like electrical conductivity, photosensitivity, and chemical activity. This year, a team of researchers from CFN, Columbia University, and Stony Brook University significantly improved this process and expanded its applications. By stacking several material synthesis techniques, the team

developed a new method of DNA-directed self-assembly that enables the production of a wide variety of metallic and semiconductor 3D nanostructures — the potential base materials for next-generation semiconductor devices, neuromorphic computing, and advanced energy applications. It is the first method of its kind to produce robust and

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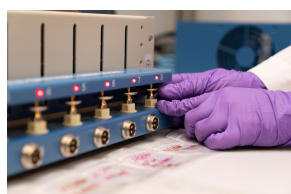
designed 3D nanostructure from multiple material classes, setting the stage for new breakthroughs in advanced manufacturing at small scales.

**Scientists calculate predictions for EIC measurements** – Nuclear theorists used supercomputer calculations to accurately predict the distribution of electric charges in mesons, particles made of a quark and an antiquark. These predictions will provide a basis for comparison in future experiments at the Electron-Ion Collider (EIC), a facility that, among other goals, will explore how quarks, and the gluons that hold them together, are distributed within mesons, protons, and neutrons.



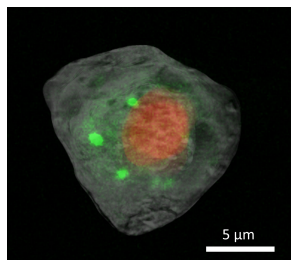
**Atomic ‘GPS’ uncovers hidden material phase** – Brookhaven scientists created the first-ever atomic movies showing how atoms rearrange locally within a quantum material as it transitions from an insulator to a metal. Their research marked a methodological achievement, as they demonstrated that a materials characterization technique called atomic pair distribution function (PDF) is feasible – and successful – at X-ray free-electron laser (XFEL) facilities. PDF is typically used to observe materials that change over minutes to hours at synchrotron light sources, but the bright and short X-ray pulses produced by an XFEL facility enabled the capture of atomic movement on a picosecond time scale. With the

new ultrafast PDF technique, which provides atomic routes like a navigation app, the researchers discovered a “hidden” material state, providing new insight into what really happens when certain quantum materials are excited by a laser.



**Chemists engineer surprising battery chemistry** – Lithium-metal batteries, which have lithium metal anodes, can store more than twice the energy of lithium-ion batteries with graphite anodes. Yet most battery-operated devices are still powered by lithium-ion batteries. In 2024, Brookhaven chemists made significant contributions to DOE’s lithium-metal battery efforts by adding a compound called cesium nitrate to the electrolyte separating the battery’s anode and cathode. Their addition ultimately targeted the interphase, a protective layer formed on the battery’s electrodes and closely linked to the number of times a battery can be charged and discharged. The cesium nitrate additive made

the batteries recharge faster while maintaining cycle life. However, closer analysis with tools at the National Synchrotron Light Source II and the Center for Functional Nanomaterials revealed two surprises: an unexpected interphase component and the absence of one previously considered essential for good battery performance. Though these findings challenge conventional battery beliefs, they create new opportunities for battery engineering.



**X-rays unlock structure and function in cells** – Every plant, animal, and person is a complex microcosm of tiny, specialized cells. These cells are like their own worlds, each with unique parts and processes that cannot be seen with the naked eye. Being able to see the inner workings of these microscopic building blocks at nanometer resolution without harming their delicate parts has been a challenge. But this year, Brookhaven Lab biologists and scientists at the National Synchrotron Light Source II used a combination of X-ray methods to see inside cells in a whole new way. By using both hard X-ray computed tomography and X-ray fluorescence microscopy, they can reveal not just the structural details but also the chemical processes inside cells. This multimodal X-ray imaging approach could have significant implications in fields such as medicine, bioenergy,

agriculture, and other important areas.

– BNL Media & Communications Office

## President’s Message (continued)

Caradonna, and Steve Cannella, who manages Brookhaven Lab’s Campus Planning and Development Office. Caradonna expects the SUSC to be open to the public this summer. Exciting news!

Please attend our March 11 Zoom meeting. You’ll receive an invitation and agenda by email the first week of March. I’m planning for a hybrid live/Zoom meeting at BNL this spring. If you live near the Lab, we’d like to see you. Also, depending on interest, we might be able to arrange for an informal lunch meeting.

– Arnie Moodenbaugh, [moodenba@optonline.net](mailto:moodenba@optonline.net)

## 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](mailto:bettyelder81@gmail.com).

PLEASE PRINT

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Membership type:  
 annual (\$10)     5 years (\$40)    Life  (\$95)

Dues cover year(s) \_\_\_\_\_

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Mail form and check to:

Betty Elder, Membership Chair  
 215 River Drive  
 Moriches, NY 11955

– Betty Elder, Membership Chair  
[bettyelder81@gmail.com](mailto:bettyelder81@gmail.com)

## In Memoriam

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

Mark Q. Barton, 96, December 17, 2024

Walton Wallace Shreeve, 103, December 29, 2024

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](mailto:msrowe.hi@gmail.com) or mail it to BREA (see panel below for address).

## Q&As on New Science/User Center

Retirees had follow-up questions to Joe Gettler’s article in the January/February 2025 BREA News about the new Science and User Support Center in Discovery Park. Steve Cannella, Manager, Campus Planning and Development Office, provided the answers below.

*BREA used to meet in Bldg. 400. Will we be able to meet at the SUSC?* – Conference Services can arrange that.

*I don’t have a BNL ID anymore. Will I be able to get into Discovery Park?* – Yes, access to Discovery Park is before security. The first floor of SUSC will also be open to the public. You will be able to get new/replacement badges in the badging office on the first floor.

*Will the SUSC have wifi available?* – WIFI will be available in the building, but guest access will be similar to what we have now as this is a federal facility and a BNL system.

*We remember that Bldg. 400 had a little snack bar. Will something like that be available in the SUSC?* – Yes, plans are in progress to provide some level of food to the facility.

## Brookhaven Retired Employees Association

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