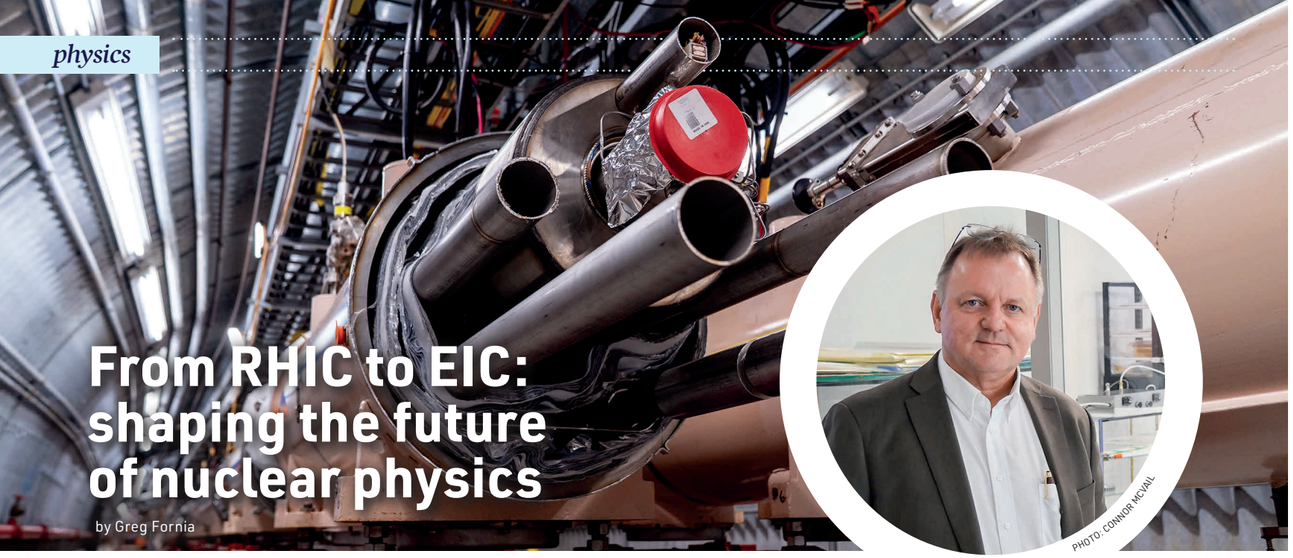


From RHIC to EIC: shaping the future of nuclear physics

by Greg Fornia

PHOTO: CONNOR MCVAIL

After 25 years, the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory (BNL) is approaching the end of its historic research mission. Its successor, the Electron-Ion Collider (EIC)—a next-generation research facility with an estimated cost of approximately $3 billion—will usher in a new era of discovery and help secure U.S. leadership in nuclear physics.

Bernd Surrow, Laura H. Carnell Professor of Physics, has played a central role in the development and realization of the EIC, which will be built at BNL and will be the only collider of its kind planned in the world.

For more than two decades, Surrow conducted internationally recognized experimental research at RHIC, making important contributions to understanding the spin structure of the proton while helping develop advanced detector technologies that will play a central role at the EIC.

"The new collider represents a once-in-a-generation opportunity to answer some of the most fundamental questions about matter," said Surrow. "It will allow us to explore how quarks and gluons build the visible universe, revealing how they generate the mass, spin and structure of visible matter."

In 2014, Surrow organized a major American Physical Society meeting at Temple, where the U.S. nuclear physics community endorsed the EIC as its highest-priority new facility. That recommendation ultimately led to a National Academy of Sciences review and the U.S. Department of Energy's 2019 decision selecting BNL as the site for the EIC.

Surrow later served as chair of the worldwide EIC User Organization, representing approximately 1,300 scientists during the project's approval and site selection. He played a leading role in bringing together competing detector concepts in the unified ePIC Collaboration, now the flagship experiment being developed for the EIC.

Temple faculty, postdoctoral researchers and students are contributing to detector development, instrumentation and software. Many of these young scientists will be among the first generation to carry out experiments at the new facility.

"Few scientists have the opportunity to witness the conclusion of one world-leading collider while helping build its successor," Surrow said. "I feel incredibly fortunate to be part of both journeys, and I am especially excited that Temple students will help shape the discoveries that lie ahead."

ENHANCING PATIENT SAFETY DURING SURGERY

When surgical needles or sharp objects are lost inside the body, the consequences can be serious and costly. To address this problem, John Noel, professor of instruction, and urologic oncologist Daniel Eun developed the Melzi Sharps Finder, now the flagship product of Melzi Surgical, which the duo co-founded.

The device allows surgeons to search directly inside a patient's body for metallic objects, such as surgical needles, instruments, broken fragments and guidewires, many of which may not be detectable on X-rays. In doing so, the technology enhances patient safety while reducing hospital costs. In April 2022, the company secured a $4 million investment; an expanded marketing and sales effort to hospital systems nationwide is currently underway.



MEDICAL DOSIMETRY PSM EARNS JRCERT ACCREDITATION

by Greg Fornia

Launched last year, CST's Professional Science Master's in medical dosimetry earned accreditation by the Joint Review Committee on Education in Radiologic Technology (JRCERT). Medical dosimetrists collaborate with radiation therapists, medical physicists and radiation oncologists to design and generate radiation dose distributions while providing oversight to high-level treatment procedures.

"JRCERT accreditation is a major milestone for the program, the Physics Department and Temple," said Mulualem Kefene, program director and assistant professor. "For students, it is especially important because graduation from a JRCERT-accredited medical dosimetry program is required for eligibility through the standard pathway to take the Medical Dosimetrist Certification Board certification exam. Most employers require or strongly prefer MDCB certification."

Temple's program is the only JRCERT-accredited medical dosimetry master's program in Pennsylvania and one of a small number of JRCERT-accredited medical dosimetry master's programs in the United States.

RESEARCHERS UNLOCK A LONG-STANDING MYSTERY OF WATER

by Greg Fornia

Why does water behave differently from almost every other liquid on Earth?

Using a combination of AI and advanced quantum mechanical simulations, the Temple researchers developed a highly accurate model that explains why water reaches its maximum density at about 4 degrees Celsius before expanding again as it freezes. Rather than being caused by a simple structural transition, the researchers found that water's behavior emerges from competition between order and disorder occurring at different length scales simultaneously. The findings were published in *Science Advances*.

Scientists have struggled to fully explain water's strange density behavior because doing so requires understanding interactions occurring simultaneously across vastly different scales. The Temple team overcame that challenge by training an AI-based model on highly accurate quantum calculations, allowing them to simulate water at much larger scales while preserving quantum-level precision.

"Our work demonstrates how artificial intelligence can help bridge the gap between microscopic quantum mechanics and large-scale physical behavior," said Xifan Wu, professor and member of the team that also included Yizhi Song, a postdoctoral researcher and first author. "This combination allowed us to study water at experimentally relevant scales in a way that was previously not feasible."

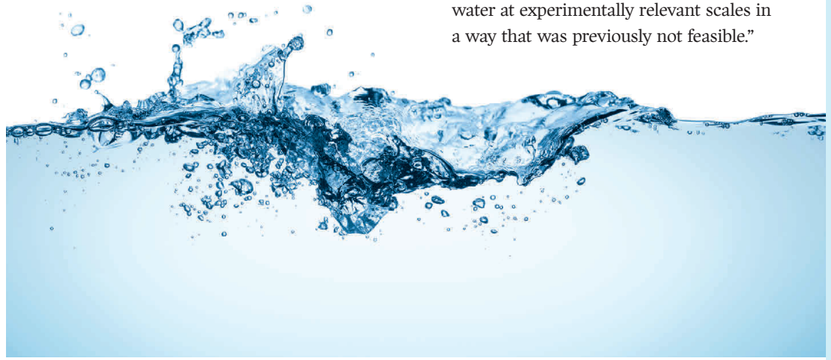


PHOTO: CONNOR MCVAIL



PHYSICS WELCOMES THEORIST ADARSH PATRI

by Greg Fornia

Adarsh Patri, a rising leader in theoretical condensed matters physics, joined the department as an assistant professor.

Patri's research focuses on understanding the behavior of strongly correlated quantum materials and two-dimensional quantum systems, with an emphasis on developing theoretical frameworks that connect fundamental physics to experimental discoveries. His work explores novel quantum phases of matter, unconventional superconductivity and the emergent properties of electrons in complex materials.

Before joining Temple, Patri served as a Moore Postdoctoral Research Fellow at the University of British Columbia's Stewart Blusson Quantum Matter Institute, and previously held a postdoctoral appointment at MIT.

Patri earned his doctorate from the University of Toronto, where his research examined exotic phenomena emerging from localized multipolar degrees of freedom. His publications include *Physical Review Letters*, *Physical Review X* and *Nature Communications*.

Most recently, Patri received first place in the poster session at the International Quantum Horizons Symposium and was awarded the Martin and Beate Block Award from the Aspen Center for Physics.