# Miguel Mostafá joins CST as new dean

BY DEIRDRE C. HOPKINS

Following a nationwide search, Miguel Mostafá was selected as the new dean of the College of Science and Technology. Beginning on October 1, 2023, Mostafá succeeded Michael L. Klein, FRS who returned to CST faculty to pursue his research and teaching interests as Laura H. Carnell Professor of Science and director of the Institute for Computational Molecular Science.

With 17 years of distinguished service as a faculty member at three R1 universities in the U.S. and seven years at two national laboratories, Mostafá's academic journey is marked by exceptional achievements in research, teaching and leadership. In his most recent position, he was associate dean for research and innovation at the Eberly College of Science at the Pennsylvania State University (Penn State).

"I am truly honored to join the Temple University community," Mostafá said. "Together, we will forge a path of excellence and innovation, fostering an inclusive environment where cutting-edge research, transformative education and collaboration converge to shape the future of science and technology. Our college will empower our students, faculty and staff to achieve their highest aspirations and impact our world."

Mostafá earned a PhD in physics in 2001 at the Instituto Balseiro in Bariloche, Argentina. His thesis in high-energy particle physics was done at the Fermi National Accelerator Laboratory.

Throughout his career, Mostafá has significantly contributed to high-energy and multimessenger astrophysics. His cutting-edge research spans a wide range of areas, from gamma-ray observations using the High Altitude Water Cherenkov Gamma-ray Observatory to groundbreaking work on cosmic-ray anisotropies and particle interactions through the Astrophysical Multimessenger Observatory Network project, which he led at Penn State. His research has garnered widespread recognition, with 11 renowned papers with more than 500 citations each and more than 2,000 citations annually since 2017.

Mostafá has also been a driving force in increasing diversity in physics, actively engaging with organizations such as the National Society of Black Physicists and the Society for Advancement of Chicanos/Hispanics and Native Americans in Science. His mentoring efforts have led to numerous prestigious awards and fellowships for his students and postdoctoral candidates, making him a recipient of the Distinguished Mentoring Award at Penn State.

"I have been consistently inspired by Temple's dedication to teaching, research, service and outreach," Mostafá said.


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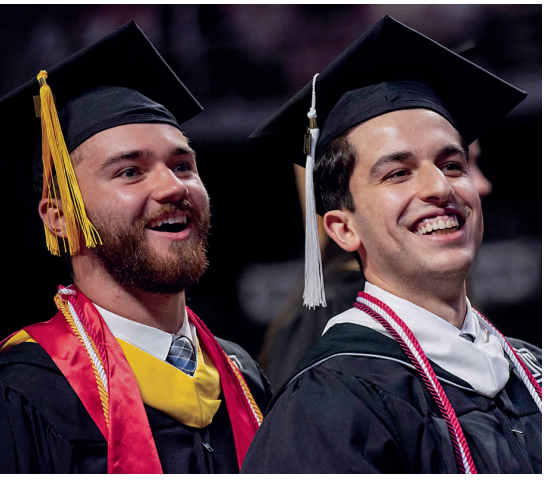


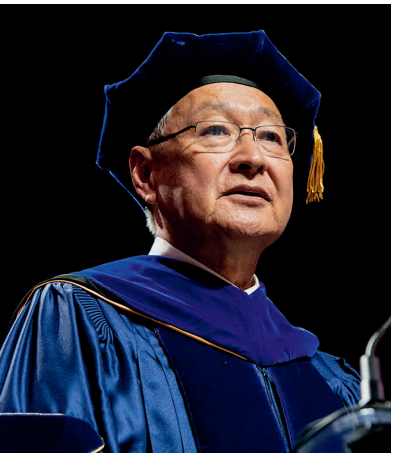
PHOTOS: KELLY & MASSA











# Graduation celebrates Class of 2023 success

BY GREG FORNIA

On May 12, the College of Science and Technology held a graduation ceremony for the Class of 2023 inside The Liacouras Center. More than 800 graduates earned bachelor's, master's, professional science master's and doctoral degrees in 2023.

The ceremony began with remarks from Dean Michael L. Klein, FRS, who thanked the graduates "for all you have done to make the College of Science and Technology a stronger college, and an exciting place for others to learn and to grow."

The keynote speaker was Charles Tsan-Jian Chen, a world leader in the biotech industry with more than four decades of accomplishments in developing, producing and implementing forefront vaccine and diagnostic technologies benefiting human and animal health. Introduced by Hai-Lung Dai, Laura H. Carnell Professor of Chemistry, Chen was awarded an honorary degree presented by Board of Trustee members Solomon C. Luo and Barry C. Arkles, CST '70, '76.

The student speaker was Nathan Zubin, CST '23, who graduated with a bachelor's in neuroscience. He is attending the Lewis Katz School of Medicine with the goals of becoming an oncologist specializing in neurological tumors and eventually to teach future medical students.

Michael Remaker II, CST '06, president of the CST Alumni Board, welcomed the new graduates into the Temple alumni community and urged them to "when you're ready, consider what you can do to change a student's life."

Learn more about the Class of 2023 at cst.temple.edu/Classof2023.

# Celebrating two Goldwater Scholars

BY LINDSAY HARGRAVE

Two members of the Class of 2024 are breaking down barriers in STEM as the first two Temple University women to receive Goldwater scholarships in the same year. The two recipients are biology major Nala Hamilton and mechanical engineering major and chemistry minor Diana Tiburcio.

The Goldwater Scholarship is one of the oldest and most prestigious national scholarships in the natural sciences, engineering and mathematics in the United States. It is awarded to college sophomores and juniors based on their research merit and promise as a future researcher.

PHOTO: JOSEPH V. LABOLITO

## Nala Hamilton

Originally from Harrisburg, Hamilton is a first-generation college student. She began her research journey the summer after her first year in Associate Biology Professor Rob Kulathinal's genetics lab, and she hasn't looked back since.

Her work in this lab focused on computational genetics, an area of study Hamilton had been interested in since high school. Immediately, Kulathinal gave her the freedom to choose what she wanted to work on within the field of genetics and create her own direction in research.

She began to research sex disparities in cancer to investigate whether they could be attributed to genetics, or whether the differences were environmental.

Hamilton emphasized that Temple has not only provided ample opportunities to pursue the research she loves, but also the resources to do so. "One thing that's really great about Temple is the university provides excellent research and scholarship opportunities," she said.

Hamilton has also received a Diamond Research Scholarship to continue to investigate sex disparities in other diseases besides cancer this past summer. After that, she's looking to apply to PhD programs to continue her research. In addition, Hamilton is a recipient of the Velay Fellowship, which supports her research.

An underlying theme throughout all of her research, Hamilton said, is making science communication accessible to everyone.

"With COVID-19 I got that science communication was something that people really struggle with, and the distrust in science is pretty big now," she said. "It's just been on my mind, and I'm super aware of it when I present. I want to be as clear as I possibly can and make it so that normal people like my grandma can understand it. That's my goal, and so I do that in my research."

PHOTO: JOSEPH V. LABOLITO

# Diana Tiburcio

Tiburcio is a first-generation citizen from Mexican-born parents, and although she was born in Georgia, she spent the majority of her life growing up in Malvern, Pennsylvania. In addition to her commitment to researching clean water and nutrient recovery, Tiburcio is on Temple's fencing team.

She entered the world of research when looking for a job on campus. That's when she discovered how much she enjoyed working in a lab and participating in the hands-on, fast-paced research environment.

"[I worked in] an environmental engineering lab focused on collecting water samples in between the I-95 highway and the Delaware River, and then taking the metal concentrations of those water samples to see how metals are transported underground and run off from the highway," she said.

As a chemistry minor, Tiburcio has also worked in an inorganic chemistry lab under Chemistry Chair Ann Valentine, where she is researching proteins and trying to characterize how they reduce and react with metals such as iron and titanium. However, her passions still lie in environmental science, particularly access to clean water.

"I think water security is still a very prevalent issue in too many countries," she said. "Water is so present in so many issues, and not only influences the environment in so many ways, including human and public health. So I think that's one of my biggest goals still is to find better, more efficient ways to treat water, so that everyone can gain access to clean water."

In addition to being a Goldwater scholar, Tiburcio is also a MARC (Maximizing Access to Research Careers) scholar. MARC's goal is to "develop a diverse pool of undergraduates who complete their baccalaureate degree, and transition into and complete biomedical, research-focused higher degree programs."


PHOTO: KELLY & MASSA

## BIOTECH ENTREPRENEUR CHARLES TSAN-JIAN CHEN HONORED AT CST GRADUATION CEREMONY

BY GREG FORNIA

Charles Tsan-Jian Chen, a world leader and entrepreneur in the biotech industry with more than four decades of accomplishments in developing, producing and implementing forefront vaccine and diagnostic technologies benefiting human and animal health, was awarded an honorary doctoral degree from Temple University at the College of Science and Technology's graduation ceremony.

A citizen of Taiwan, Republic of China, Chen is founder and CEO of the publicly listed Medigen Vaccine Biologics Corp. (MVC) and the privately owned Sweitzer Biotech Co. of Taiwan. He is also a major investor of Taiwan Bio Therapeutics Inc., a company dedicated to regenerative medicine and cell therapy.

MVC, in collaboration with the U.S. National Institutes of Health and Dynavax Co., successfully developed a COVID-19 subunit vaccine that has been received by millions of people in Taiwan and several other countries. The vaccine, because of its excellent immunogenicity, safety profile and stability at elevated temperatures, is the first vaccine selected by the World Health Organization's Solidarity Program for worldwide clinical trial and applications.

Chen received his BS in psychology from National Taiwan University in 1974. He has since self-taught to become an expert in vaccine and diagnostic technologies for human and animal diseases. He has coauthored dozens of scholarly papers in top journals such as *The Lancet*. Chen was also a Chair Professor of Industry-Academia Collaboration at National Yangming Chiaotung University.

"Today, you sit here, waiting for the tassels to be turned so you can walk out here to begin your life," said Chen, who was appointed a Distinguished Adjunct Professor of Biotechnology in CST's Department of Biology in 2015. "I say, remember, find the purpose in your life, and when you encounter difficulties, persist to prevail."

## First geoscientist at Temple becomes Fulbright scholar

BY MARIA KLECKO

Growing up along the coast of the Black Sea, Ilya Buynevich was fascinated by the seaside landscapes and underwater mysteries.

Now an associate professor in the Department of Earth and Environmental Science, Buynevich has pursued his passion for marine and coastal geology. His work has earned him a Fulbright scholar award to teach, conduct field research and carry out a professional project in Estonia. Buynevich is the first geoscientist at Temple to receive this prestigious honor and the first-ever U.S.-based geology grantee in Estonia.

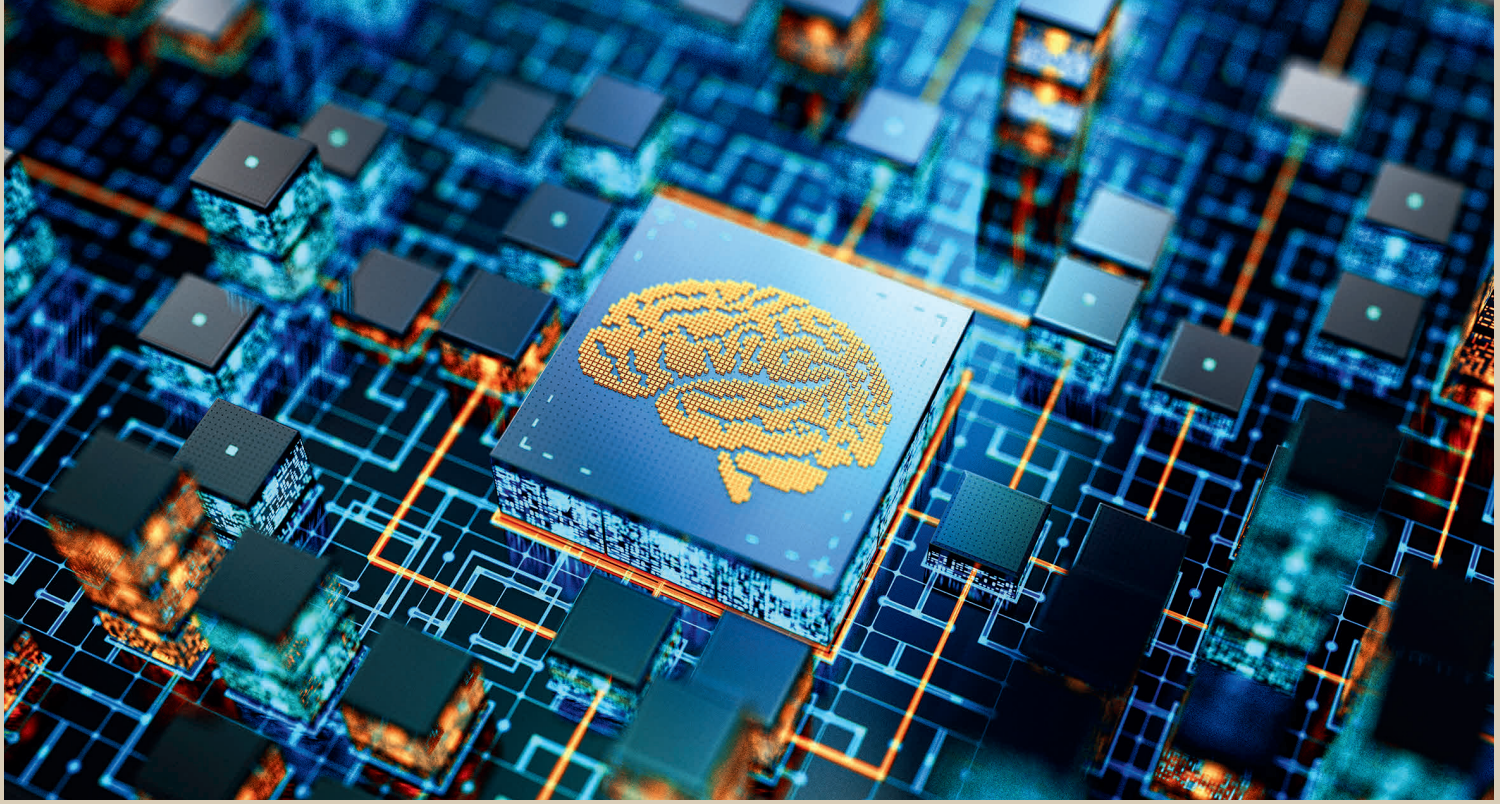
Buynevich is presented with a unique opportunity in Estonia because of the country's post-glacial uplift, which outpaces the rising sea level. This uplift means the land and sea floor are slowly rising, and consequently the geological archive of past climatic and oceanographic events is easier to study.

Buynevich will implement georadar and magnetic tools to identify, map and quantify the effect of intense North Atlantic and Baltic Sea storms along Estonia's coast. These tools show what's happening underground, allowing geologists to see deep into the subsurface of the beaches and coastal wetlands, which serve as a geological archive of climatic events. These events tell the history of not only intense storms but also long-term wave climate and the impact of sea ice.

He is examining wind records in sand dunes as well. A holistic approach is used for this work in which data is collected from different sources such as tree rings, minerals, X-rays of the beach and even conversations with local residents. "The coast is the most dynamic geological environment on Earth," said Buynevich. "We can see how humans have affected the coastal landscape."

In addition to field work, Buynevich teaches courses in coastal processes and geohazards at Tallinn University and contributes to the design of the newly developed Processes in Active Beaches and Coastal Landscapes and Management of Coastal Areas course.

Additionally, he's studying the impact of large animals on the coastal landscape, which he says can be a challenging pursuit. "I like a good challenge, like learning Estonian," said Buynevich. "I like the challenge of finding something not as obvious and sometimes buried. When you go after the biggest challenge, you end up with the greatest reward."



# NSF awards Temple and others $19.5 million for artificial intelligence research in education

BY JENNY LACKEY

Temple University, along with the University of Illinois at Urbana-Champaign, the University of Florida and Educational Testing Services, will have five years and $19.5 million to pursue inclusive and intelligent technologies for education, as part of the National Science Foundation's National Artificial Intelligence Research Institutes Accelerating Research, Transforming Society and Growing the American Workforce program.

"The challenge we are addressing is that in the United States, our K-12 school systems are designed around rigorous standards for learning, and there are significant gaps in access, relevance and outcomes, particularly for learners that come from underserved populations," said Jamie Payton, chair of the Department of Computer and Information Sciences, who is leading the Temple project. "We see social and emotional learning as the key missing component that would offer learners equal access to academic achievement."

The NSF-funded Institute for Inclusive and Intelligent Technologies for Education (INVITE) will reimagine how educational technologies interact with learners by developing AI tools and approaches that address the national challenge of an equitable education for all. With a higher response to learner needs, behaviors and development, this new generation of systems align with a holistic approach to learning. The institute will advance AI research to create intelligent tools in support of three social and emotional learning skills: persistence, academic resilience and collaboration. Research and outreach activities will include 96,000 learners across 24 school districts and nonprofits that span eight states.

The aim is to amplify what teachers already do, with the added benefit of machine learning and natural language processing. INVITE's AI research will focus on classroom integration of AI-based tools that empower teachers to support learners more holistically and in more developmentally appropriate ways.

"I am so proud that a National AI Research Institute is now at Temple University," said Payton. "At Temple, our mission is to provide an excellent, affordable and inclusive education to all students. As a public university in the heart of Philadelphia, we want to build bridges in our local, national and global communities to advance education and opportunity for all."

## NEW TEMPLE RESEARCH INSTITUTE EXPLORES SCIENCE OF CELL MEMBRANES AND NON-BIOLOGICAL SURFACES/INTERFACES

BY BRUCE E. BEANS

Researchers from the College of Science and Technology, the Lewis Katz School of Medicine (LKSM) and Fox Chase Cancer Center have come together to launch the Temple University Institute for Membranes and Interfaces (TIMI).

"Membranes and other interfaces represent the boundaries between various matter in nature, and a vast number of processes in nature and in industry occur at these surfaces and interfaces," said Hai-Lung Dai, TIMI's director and Laura H. Carnell Professor of Chemistry.

For example, current research involving surfaces and interfaces includes improving solar cell efficiency; the trapping and conversion of carbon dioxide at the surface of catalytic materials to mitigate global warming; and improving the transport of pharmaceutical molecules through human cell membranes.

The study of surfaces/interfaces are particularly important for research of nanoparticles. "The smaller particles get, what is happening at the surface becomes more and more important," Dai said. Furthermore, "understanding cell membrane functions is critical to the understanding of mechanisms of life and to the development of biomedical strategies for treating diseases, including assisting drug design."

TIMI's growing list of researchers come from both within and outside of Temple. Researchers include Michael L. Klein, Laura H. Carnell Professor of Science, and Vincenzo Carnevale, associate professor of biology, who are world leaders in developing computational capabilities for investigation the structure of and processes involved at membranes and interfaces. Dai is a pioneer in the development of laser-based methods for studying surfaces. Eric Borguet, professor of chemistry, is a leader in laser spectroscopic studies of electrode surfaces.

TIMI also includes researchers from LKSM and Fox Chase. External collaborators include researchers from the University of California-San Francisco Medical School, the Air Force Research Laboratory and the Army Research Laboratory.

PHOTO: RAHUL BHADANI

# Mathematicians part of key study on AI-powered cruise control

BY BRUCE E. BEANS

CST mathematicians played a key role in the world's largest-ever test to determine if cars equipped with artificial intelligence (AI) technology can help maximize fuel efficiency and mitigate traffic jams.

During morning rush hour traffic over five days, the CIRCLES Consortium, a collaboration involving university researchers, automakers and the Tennessee Department of Transportation (TDOT), collected 3,800 hours of vehicle driving data. The test was conducted on a four-mile stretch of Interstate 24 near Nashville, which has been fitted with about 300 ultra-high-definition, pole-mounted cameras to digitally track every vehicle's behavior.

The test studied the impact of 100 vehicles with AI-enhanced adaptive cruise control (ACC) systems on traffic flow to demonstrate that vehicles with automation capabilities, if properly supervised and controlled, can make traffic flow smoother on real highways and also reduce fuel consumption and fuel costs, greenhouse gas emissions, and air pollution and offer protection for both vehicles and drivers.

The study expands on earlier findings that demonstrated that just one well-controlled automated vehicle could modify the driving behavior of 20 other cars and smooth human-caused traffic waves, reducing fuel consumption 40%.

The vehicles used in the study have a stock ACC system, equipped with sensors and the capability to slow down the vehicle automatically if the vehicle ahead is slower than the set speed. Researchers replaced the stock ACC logic with trained AI solutions to fuse external big-picture traffic density information with the sensor information provided from the vehicle sensors.

"This new data set will lead to so many new insights into how we drive and how this affects the flow of traffic," said Professor Benjamin Seibold, an applied and computational mathematician and director of CST's Center for Computational Mathematics and Modeling, who has a long record of researching the theoretical dynamics of traffic waves. Assisting Seibold on the project are Mengsha Yao, a postdoctoral researcher, and Nour Khoudari, a mathematics PhD student.

The CIRCLES Consortium research is supported by NSF and the U.S. Departments of Transportation and Energy.

# Physics leading national effort to study quarks and gluons

BY GREG FORNIA

CST's Department of Physics is part of a national wide-ranging collaboration focusing on solving challenging problems central to advancing knowledge in nuclear physics.

The U.S. Department of Energy (DOE) announced funding for five collaborations focusing on theoretical topics in nuclear physics. Temple will lead the Quark-Gluon Tomography (QGT) Collaboration. The principal investigator (PI) on the project is Martha Constantinou, associate professor of physics, who also holds one CST's Selma Lee Bloch Brown Professorships. The co-PI is Andreas Metz, professor of physics.

Using tomography—a process of forming images of the interior of an object from measurements made from high-energy scattering processes—the QGT Collaboration will develop the theoretical framework for exploring the three-dimensional (3D) internal structure of visible matter's core: the nucleons and nuclei. With such a theoretical framework, the collaboration will be able to make state-of-the-art predictions on the properties of fundamental particles.

"Fundamental particles like the nucleon are made out of quarks and gluons, which govern their properties," explained Constantinou. "Understanding how quarks and gluons build the visible universe is one of the grand challenges of modern science."

With a 3D map of the motion and spatial position of quarks and gluons within the nucleons, Constantinou said researchers can address many essential—and still unanswered—questions such as how do the spin and orbital angular momentum of quarks and gluons within the nucleon combine to make up its total spin?

The QGT Collaboration, which will receive more than $2.5 million in DOE funding over three years, is a consortium of 12 universities and three national laboratories. "Having a diverse group of scientists with different expertise is imperative to the success of the scientific goals of the QGT Collaboration," said Constantinou. "Collaborating with national labs will also benefit our graduate students and postdoctoral fellows, as it can offer mentorship, networking and research opportunities at DOE laboratories."

Three physics graduate students are currently part of the initiative. Joshua Miller is using supercomputers based in both the U.S. and Europe to study the quark component of the proton's 3D structure. Chris Cocuzza is investigating the spin structure of the nucleon in terms of quarks and gluons and Joey Delmar is studying the gluon structure of fundamental particles like the proton, pion and kaon.

**Martha Constantinou,** associate professor of physics

PHOTO: JOSEPH V. LABOLITO

## CST HELPS INSPIRE STUDENTS AT LONG-RUNNING CARVER SCIENCE FAIR

BY REMY ANDREA

In early March, 41 teachers and 291 students representing 36 schools from across the Philadelphia region gathered on Temple's campus for the annual George Washington Carver Science Fair, organized by CST and Temple's Office of Community Affairs and Engagement.

Featuring sessions for elementary, middle and high school students, project topics ranged from traditional sciences such as chemistry and biology, to computer science and psychology. Students tested windmill efficiency, crafted their own bath bombs, measured the effects of anxiety on lung capacity, designed roller coasters and more.

A 40+ year collaboration between Temple and the community and one of the longest-running urban science fairs in the country, the Carver Science Fair "gives opportunities to hundreds of elementary through high school students to hypothesize, experiment and develop a love for STEM," said Sarah Wengryniuk, associate professor of chemistry, who has volunteered for the fair since 2015.

Seanna Monroe, CST '22, a math with teaching major who volunteered at the most recent fair, explained that the Carver Science Fair does not simply teach the procedure of science but bestows a lesson of curiosity amongst its participants, something that all students can benefit from.

"When it comes to science fairs, it gives them a chance to facilitate their own learning and give them a 'eureka moment,'" said Monroe. "I hope that I can do what my math teacher did, which is instill a sense of confidence in the next generation of STEM students."

## TEMPLE-LED RESEARCH ESTABLISHES IMPORTANT, NEW NUCLEAR PHYSICS PUZZLE

BY BRUCE E. BEANS

A Temple-led consortium of 46 U.S. and international physicists from 18 different universities and national laboratories has identified an anomaly that establishes a new, important puzzle for nuclear physics.

"We were able to measure, with unprecedented precision, the electric generalized polarizability (EGP) of protons," said Nikos Sparveris, associate professor of physics, principal investigator and spokesperson for the Virtual Compton Scattering (VCS) collaboration. "It is a fundamental property of the system that characterizes the susceptibility to deformation, or 'stretchability', of the proton in the presence of an external electric field."

Sparveris said the findings are significant not only for physics but for science in general because proton is the only composite building block of matter comprised of fundamental particles that is stable in nature.

Titled "Measured proton electromagnetic structure deviates from theoretical predictions," the research began seven years ago with experiments that involved scattering of an electron beam from a liquid-hydrogen nuclear target at Thomas Jefferson National Accelerator Facility. The resulting data was analyzed over three years. The paper was published in Nature, one of the world's most prestigious journals.

According to the paper's referee reports, this is a novel and important experimental result that should be of wide interest to the scientific community, establishing a 'proton EGP puzzle' that should generate significant efforts to understand and explain the puzzle.

The group's research introduced new features in the experimental methodology and confirmed the puzzling behavior of this property much more accurately. Next, the group will propose a second-phase of experimental measurements at Jefferson Lab to further refine their results.

Besides Sparveris, principal investigator, Temple researchers included lead author Ruonan Li, CST '22; Hamza Atac, Temple research professor and three additional members of the Temple nuclear physics group. The consortium also included researchers from Jefferson Lab, Argonne Lab and the Artem Alikhanian National Lab in Armenia; 12 U.S. universities; and universities in Canada, India and Italy.

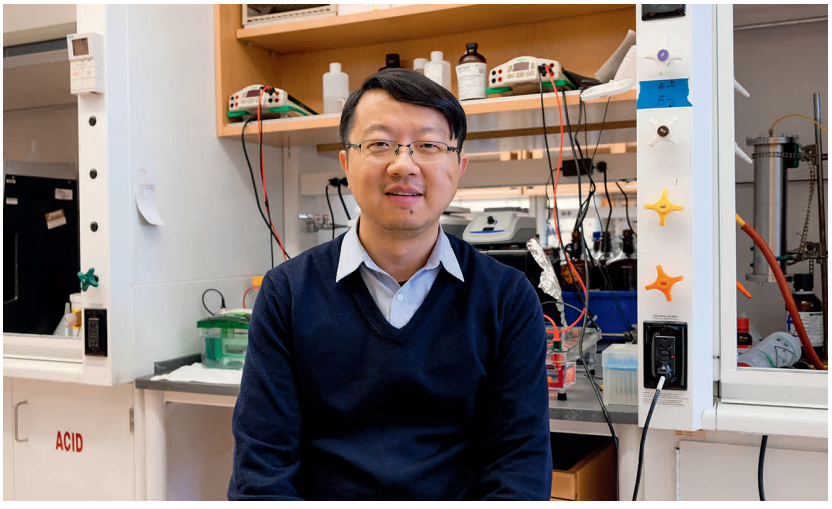



PHOTO: REMY ANDREA

## Temple chemistry professor wins Young Chemical Biologist Award

BY GREG FORNIA

The International Chemical Biology Society (ICBS) has selected Rongsheng (Ross) Wang, assistant professor of chemistry, as a 2022 Young Chemical Biologist awardee.

ICBS cited Wang's significant contributions to the field of bioorthogonal chemistry (the study of chemical reactions that occur inside of living systems without interfering with native biochemical processes) through his pioneering work in developing a selective fluorine displacement reaction. These tools are being further developed to explore cell biology in various disease states, which could lead to new diagnostic tools for human diseases such as cancer, inflammation and autoimmune disorders.

"I'm honored to join an international community of outstanding researchers working to uncover solutions for diseases and promoting research and education at the interface of chemistry and biology," said Wang.

Earlier this year, Wang received a five-year, $700,000 award from the National Science Foundation to develop chemistry-aided imaging techniques of cellular components.

"Ross has established a thriving research group at Temple and we are thrilled with his success," said Ann Valentine, professor and chair of the Department of Chemistry. "His team is doing groundbreaking research in bioorthogonal chemistry and chemical biology probes, one of the hottest areas of chemistry right now and the focus of the chemistry Nobel Prize this year. We're so proud that ICBS recognized Ross's research excellence."

Selection of this year's three awardees was made on the basis of accomplishments, groundbreaking contributions to chemical biology and promise as future leaders who will serve the chemical biology community.

According to Wang, the Chemistry Department has built a very welcoming atmosphere for researchers, faculty and students. "I appreciate the department's support for me to pursue interdisciplinary research and establish a chemical biology research group over the past six years," said Wang. "I've been given enough room to set up a vigorous chemical biology education program here with new courses."

PHOTO: JOSEPH V. LABOLITO

## BREAKING DOWN THE MAGICAL MATH BEHIND TETRIS

BY LINDSAY HARGRAVE

Released in 1984, Tetris was the first popular puzzle video game and has sold more than 70 million physical copies and over 425 million digital downloads to date. To this day a variety of Tetris editions remain popular; the game is available on more platforms than any other video game in history and its reach continues to grow through Twitch streamers, content creators and professional tournaments.

Today, Tetris.com hosts several different versions, including the battle royale-style Tetris 99 and the multiplayer Tetris Friends. The movie *Tetris*, which recounts the race to license and patent the game, was released earlier this year.

David Futer, professor of Mathematics, explained that the game is intriguing from a mathematical perspective because there is a limited space on the screen and only seven shapes to use. "The elegance of the game comes out of the simple geometry involved," Futer said. "Mathematicians like games where very simple rules lead to complex phenomena."

He explained that not only do Tetris' rules and endless possibilities create an interesting puzzle, but such puzzles have captured the minds of mathematicians for thousands of years. One of these games is Go, an ancient strategy board game in which two players compete to surround more territory than the other. Similar to Tetris, Go has simple pieces and rules, but can create seemingly endless combinations of moves and situations.

"Mathematicians and gamers alike are fascinated by simple puzzle games that lead to an infinite number of complex outcomes," said Futer. "Tetris has mastered this formula."

# Buckets and Beakers showcases chemistry to local school children

BY GREG FORNIA

The College of Science and Technology, the Department of Chemistry and Temple women's basketball partnered for Buckets and Beakers, a day of chemistry and basketball for more than 30 5th and 6th grade students from the Paul L. Dunbar School located adjacent to Main Campus.

With funding from CST's Diversity Innovation Initiative Fund, Buckets and Beakers helped to spotlight chemistry for students from groups that are often underrepresented in STEM-related fields.

"Our main goal for the first iteration of Buckets and Beakers was to get young students excited about science," said chemistry graduate student Zac O'Dell, one of eight graduate students from Professor Katherine Willets' chemistry lab who participated in the event.

The morning session in Beury Hall featured interactive sessions on fireworks colors, chemiluminescence, color precipitation reactions, pH rainbow with dry ice and polymer chemistry, also known as 'slime' chemistry. After lunch, the students went to McGonigle Hall for a tour and a shootaround with the women's basketball team. The day ended with a snack of liquid nitrogen ice cream.

"A lot of credit and a huge thank you goes to the chemistry team that prepped some really fun demos for the students," O'Dell said, "but the real stars of the show were the members and staff of the women's basketball team. Moving forward, we hope to build on this basketball-chemistry collaboration, and keep looking for creative ways to make science fun for young students."

PHOTO: RYAN S. BANDENBERG

PHOTO: REMY ANDREA

# Data science course offers first-year students problem-solving tools

BY ELISA LUDWIG

With a goal of better preparing students for their work at Temple and beyond, CST has launched SCTC 1013: Elements of Data Science for the Physical and Life Sciences, a course open to all CST students and a requirement for all biology students, natural science majors, TUteach majors, and students within all four environmental science concentrations.

The course focuses on basic computer programming in Python and statistical inference through hands-on data projects in biology, ecology, environmental science, genomics, chemistry and physics. The course was also developed as a web-based interactive textbook with live coding that students can access through laptops, iPads and other devices.

The course not only gives CST students, regardless of major, the data science tools they may need to solve problems, but also a methodology for applying those tools, a learning process which is fostered by aid from course assistants.

"We want to introduce students to working with data in a robust way—first, how do you bring in a data set, but then how do you think about it statistically using probability, even simulation," said Jonathan Smith, director of Data Science First Year and an associate professor of instruction in the Department of Chemistry. "Then ultimately toward the end of the course, we give them an introduction to machine learning and artificial intelligence."

Students start with the basics of coding, looking at variables and data types, and then work up from smaller problems to larger data sets, practicing analysis and visualization. Each week, students meet for hands-on lab sessions, which steadily become more challenging over the course of 14 weeks, and the transformation instructors see over that time can be dramatic.

"By the end of the class, students are running a pretty sophisticated analysis of data sets, developing the code to analyze and visualize that data. And they're presenting group projects on novel data sets that they have an interest in whether from their potential major or otherwise," Smith said.

"One thing I love about the class is that regardless of experience or skill level with math, students can be successful," said Susan Jansen Varnum, senior associate dean for undergraduate affairs, science education, and community engagement, who views data science as a critical tool in confronting nearly every global challenge. "The class builds quantitative skills, analytical reasoning, and logic, as a core foundation."