Mostafá research group awarded NSF grant to advance multi-messenger particle astrophysics

by Greg Fornia

Miguel Mostafá, CST dean and professor of physics, and his research group have been awarded a $1 million grant from the National Science Foundation (NSF) to support pioneering work in high-energy astrophysics. The project, titled "Multi-TeV, Multi-Messenger, and Multi-Wavelength Particle Astrophysics with HAWC," will push the frontiers of our current understanding of the most energetic processes in the universe.

The award comes at a particularly meaningful time, as federal funding for fundamental science continues to face intense competition. "We are deeply grateful for this support from the NSF," said Mostafá. "In today's environment, where funding is increasingly difficult to secure, this award is both a recognition of the strength of our program and an investment in the future of discovery."

The research will leverage the High-Altitude Water Cherenkov Observatory (HAWC) in Mexico, a world-leading facility designed to detect cosmic rays and gamma rays at the highest energies. By combining observations across multiple channels—cosmic messengers such as neutrinos, photons and gravitational waves—Mostafá's team aims to answer fundamental questions about how nature accelerates particles to energies far beyond those achievable on Earth.

Beyond its scientific impact, the project has significant educational and societal benefits. The grant will provide training opportunities for graduate and undergraduate students, expanding pathways for students into the fields of physics, data science and astronomy. The group will also engage in outreach efforts to broaden participation in science, inspiring the next generation of researchers.

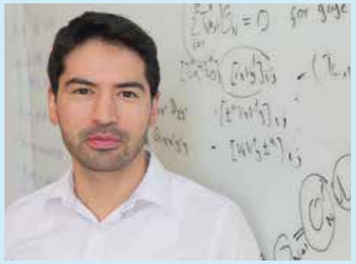
The $1 million NSF investment will support the group's work over three years, strengthening Temple's position as a hub for multi-messenger astrophysics and ensuring that its students remain at the forefront of discovery.

> *"This award underscores the role Temple plays in cutting-edge astrophysics. We are excited to continue building collaborations worldwide and to contribute to a deeper understanding of the universe."* – MIGUEL MOSTAFÁ

The Mostafá research group at Temple includes graduate students Surya Shankar Rajendra Kumar, Renée Kirk, Yubraj Niroula, and Seonghyeon Yu; postdoc Pauline Chambéry; faculty members Priyadarshini Bangale, research assistant professor, and Hugo Alberto Ayala Solares, research associate professor; and undergraduate students Aditiya Dhar and Sarah Hawley.

IMAGES: THE HAWC COLLABORATION

PHOTO: CONNOR McVAIL



SALAZAR JOINS PHYSICS DEPARTMENT

by Greg Fornia

A fellow of the RIKEN Brookhaven Research Center, Farid Salazar has joined the department as an assistant professor of physics.

Before Temple, Salazar was a junior fellow at the Institute for Nuclear Theory at the University of Washington and held a joint postdoctoral appointment at the University of California, Los Angeles, the University of California, Berkeley, and Lawrence Berkeley National Laboratory. He earned his PhD in physics from Stony Brook University.

Salazar's research centers on Quantum Chromodynamics (QCD), the theory describing the dynamics of strongly interacting matter inside atomic nuclei. His recent focus is developing effective field theories for QCD in extreme conditions, such as high energies and densities. His work provides essential theoretical input for interpreting data from major facilities like the Large Hadron Collider and for guiding future experiments at the Electron-Ion Collider.

His publications have appeared in leading journals including the *Journal of High Energy Physics*, *Physical Review C*, and *Physical Review Letters*. He has delivered numerous invited talks and seminars across the United States and in Finland, Italy, China and other countries.

In addition to research, Salazar is deeply committed to teaching and mentoring, working with students from high school through PhD programs, as well as with postdoctoral researchers.

MEDICAL DOSIMETRY PSM LAUNCHED

by Greg Fornia

CST now offers a Professional Science Master's in medical dosimetry. Led by Mulualem Kefene, program director and assistant professor, the degree has seen strong demand with 10 students currently enrolled.

Medical dosimetry is the science of calculating doses for patients who require radiation treatments. 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.

Temple's Medical Dosimetry PSM offers an interdisciplinary curriculum aligned with the curriculum adopted by the Joint Review Committee on Education in Radiologic Technology (JRCERT) and taught by Temple faculty and clinical experts. The program prepares students for the Medical Dosimetrist Certification Board Exam and provides hands-on treatment planning experience through laboratory exercises and clinical practicums at various affiliate radiation therapy facilities, including Fox Chase Cancer Center.

There is a nationwide shortage of medical dosimetrists, creating a critical need for professionals to provide skilled care for those battling cancer. According to Zippia, an online recruitment service and career information tool, the projected medical dosimetry job growth rate is 6 percent through 2028.

"CST introduced the medical dosimetry PSM to meet the high demand for medical dosimetrists," said Kefene, an experienced certified medical dosimetrist and medical physicist with a background as a certified radiation therapist. "Ours is the only medical dosimetry master's program in the entire state of Pennsylvania."

PHYSICS HOSTS FRANKLIN INSTITUTE AWARDS SYMPOSIUM

by Greg Fornia

The Department of Physics hosted the 2025 Franklin Institute Awards Symposium on density functional theory (DFT), honoring John Perdew, recipient of the 2025 Benjamin Franklin Medal in Physics.

The event gathered national experts to explore the latest advancements in DFT, a powerful computational tool in studying electronic structure, reactivity and material properties. Presentations covered new theoretical developments and emerging applications in physics, chemistry and materials science, providing insights into the future directions of DFT.

Opening remarks by Dean Miguel Mostafá and Michael L. Klein, former CST dean and Laura H. Carnell Professor of Science, honored Perdew, a former Temple physics faculty member. The Franklin Institute cited Perdew for "designing a method based on quantum mechanics that is widely used by researchers to computationally predict physical properties of atoms, molecules, fluids and solids."

Invited speakers included Kieron Burke, University of California, Irvine, Weitao Yang, Duke University, Roberto Car, Princeton University and Gustavo Scuseria, Rice University

Now at Tulane University, Perdew's remarks were titled "Self-Interaction and Strong Correlation in Density Functional Theory: Killing Two Birds with One Stone."

PHOTO: GREG FORNIA

FROM LEFT TO RIGHT: CST Dean Miguel Mostafá, Physics Chair Maria Iavaroni, John Perdew and Josh Gladden, Temple's Vice President for Research