



TEXAS A&M
UNIVERSITY



2020

DEPARTMENT OF
NUCLEAR ENGINEERING

LETTER FROM THE DEPARTMENT HEAD



Despite the challenges that we have faced, this past year has been successful for the Department of Nuclear Engineering at Texas A&M University. The strength and perseverance of our faculty, staff and students have shone through, proving that our nuclear engineering family can do anything we set our minds to.

Our faculty and former students continue to conduct remarkable research and meet uncharted milestones. We are happy to welcome Dr. Warren "Pete" Miller, who served as the assistant secretary for nuclear energy in 2009, as a professor of practice. Former student Dr. X. George Xu '94 was awarded the Edith H. Quimby Award for Lifetime Achievement in Medical Physics, and he credits his nuclear professors for providing him with the tools he needed to establish an innovative and renowned research career.

Our students have also displayed exemplary scholarship and research throughout the year. Last September, Los Alamos National Laboratory sponsored Aggies Invent, a competition in which students have only 48 hours to tackle various challenges. The challenge last year was nuclear security. Events like these not only allow for multidisciplinary collaboration across

departments, but also help increase awareness of complex nuclear issues and expand education to the public. You can read more about our faculty and student accomplishments inside.

I hope you enjoy the overview of our department and enjoy learning how our students, staff and faculty continue to innovate and position us at the forefront of nuclear engineering and science with award-winning research and recognition. We look forward to continually pursuing innovations to benefit society across a broad range of areas and working with our former students and friends to take our department to new frontiers.

Sincerely,

A handwritten signature in black ink that reads "Michael Nastasi". The signature is fluid and cursive.

Dr. Michael Nastasi

Professor and Department Head of Nuclear Engineering
Sallie and Don Davis '61 Professorship in Engineering



TEXAS A&M UNIVERSITY
Department of
Nuclear Engineering

BY THE NUMBERS

RANKINGS (2021)

#2 Undergraduate Program
Ranked No. 2 (Public)
(U.S. News & World Report)

#5 Graduate Program
Ranked No. 5 (Public)
(U.S. News & World Report)

ENROLLMENT*

(FALL 2020)

258 Bachelor's

61 Master's

84 Ph.D.

**preliminary*

FACULTY (2020-21)

18 Tenure-Track
Faculty

7 Non Tenure-
Track Faculty

RESEARCHERS

141 Graduate
Students

9 Research
Staff

DEGREES AWARDED

(2019-20)

61 Bachelor's

11 Master's

8 Ph.D.

RESEARCH FUNDING

\$17 MILLION
(FISCAL YEAR 2019-20)

FORMER ASSISTANT SECRETARY OF ENERGY FOR NUCLEAR ENERGY **APPOINTED PROFESSOR OF PRACTICE**



In April 2019, Dr. Warren "Pete" Miller was appointed as a professor of practice with the department. From 2009-10, Miller served as the assistant secretary of energy for nuclear energy, where he oversaw the country's research, development and advancement of nuclear energy. Miller's primary responsibilities were to promote research and development and to help develop nuclear energy technologies before they were mature enough to be introduced to industry. He also oversaw and defended the budget before the United States Congress.

Miller earned his Ph.D. in engineering sciences from Northwestern University in 1973. He then began a 27-year career with Los Alamos National Laboratory, where he

served in various roles. Miller later developed the idea of creating a program for nuclear security at Texas A&M where scientists could research problems related to safeguarding nuclear materials and the reduction of nuclear threats. Thus, the Center for Nuclear Security Science and Policy Initiatives (NSSPI) was born. A multidisciplinary organization, NSSPI is the first U.S. academic institution focused on technical graduate education, research and service related to the safeguarding of nuclear materials and the reduction of nuclear threats. NSSPI works closely with the renowned policy experts from Texas A&M's Bush School of Government and Public Service to analyze the interrelationships between policy and technology in the field of nuclear security. ▀



STUDENTS TACKLE COMPLEX NUCLEAR SECURITY CHALLENGES

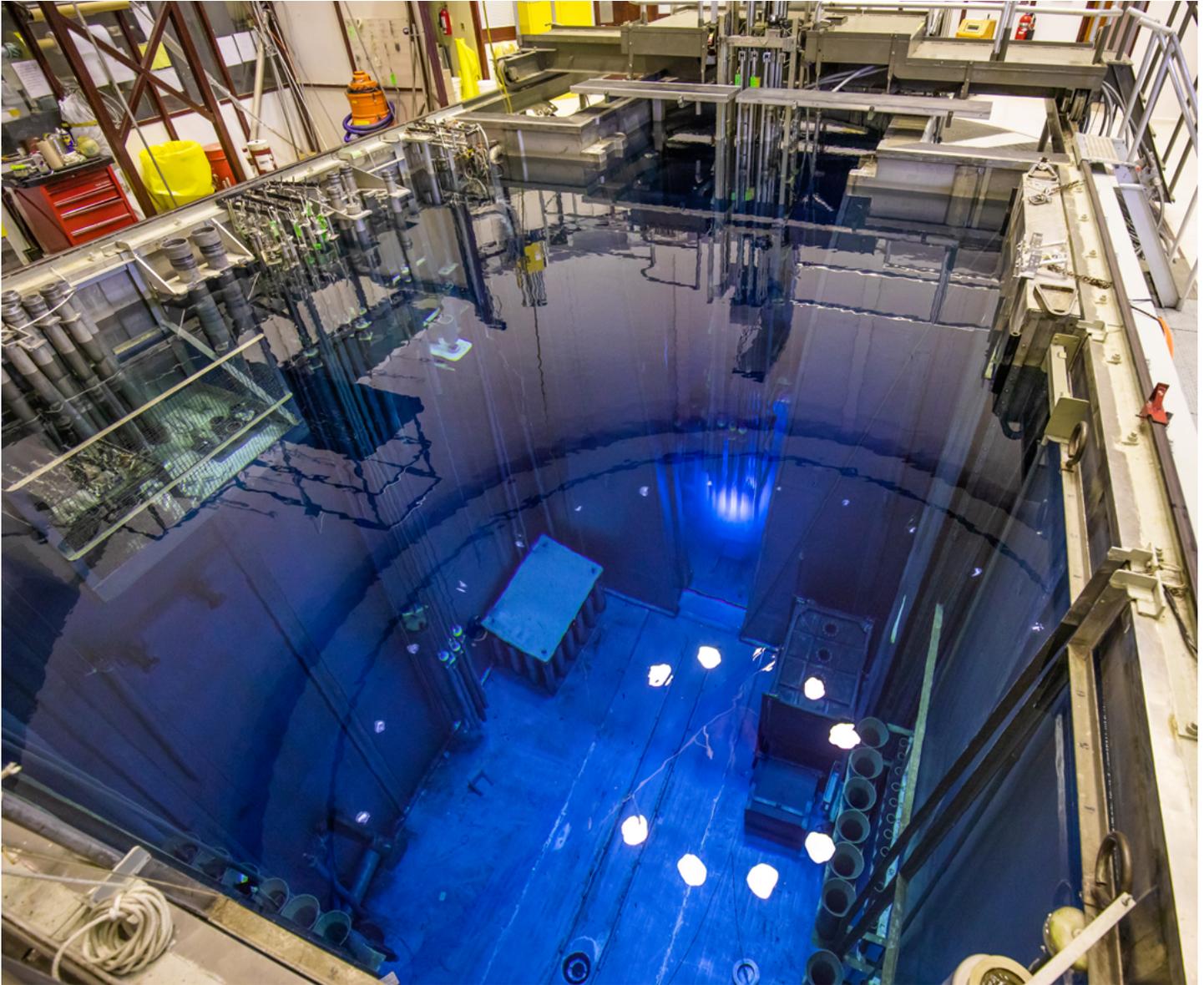
Los Alamos National Laboratory sponsored the September 2019 Aggies Invent, a competition in which students have 48 hours to tackle various challenges. This event focused on nuclear security with the goal to prepare the nation for a rapidly evolving technological and geopolitical environment that demands innovative responses.

Aggies Invent helps students learn to apply the skills from the classroom while working with teammates across other disciplines.

"I've never worked with a multidisciplinary team before, so my team members all bring extremely different perspectives that I have not seen through my years of studying," said doctoral student Athena Sagadevan.

The winning team, Rock-E, addressed how countries can detect materials used in weapons of mass destruction and help prevent conflict between weaponized countries. Rock-E is a compact module that can be adapted to any environment and has the ability to be deployed in teams of one to five to detect any chemical, biological or nuclear agent. ▽

REACTOR SAFETY WITH **CHERENKOV RADIATION**



Postdoctoral researcher Jason Hearne has been researching Cherenkov radiation in water-cooled research reactors such as the TRIGA (training, research, isotopes, general atomics) reactor at the Nuclear Engineering and Science Center. These reactors operate at atmospheric pressure and look like swimming pools bathed in blue light. This is the result of Cherenkov radiation, which occurs when free electrons travel faster than the phase velocity of light in a medium.

Because the amount of visible blue light in a given area corresponds with the amount of power, scientists can not only measure the total power of a reactor, but also the power within its parts. This power profile determination helps

quickly detect anomalies in a reactor such as flux tilts or the approximate size and location of a blockage in a coolant channel. This method of data analysis allows scientists to increase optimization efforts and reduce the likelihood of reactor failure.

Hearne's work has been computer-model based using the Monte Carlo N-Particle transport code, but he soon hopes to begin experimental implementation of his Cherenkov project using the TRIGA reactor. His research proves that reactor safety does not have to be compromised for power and that reactors are becoming more efficient, effective and secure every day. ▽

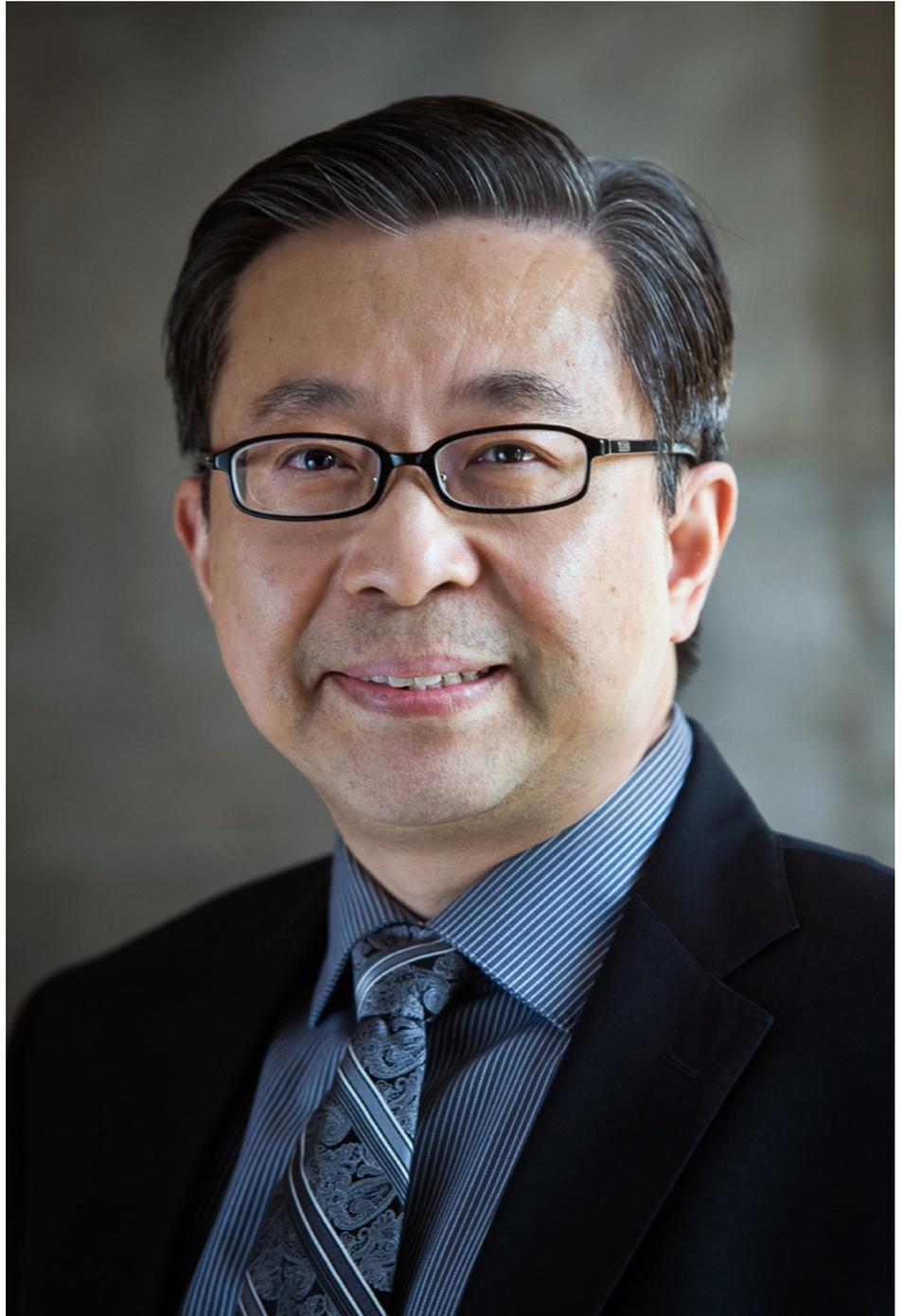
FORMER STUDENT AWARDED **LIFETIME ACHIEVEMENT IN MEDICAL PHYSICS**

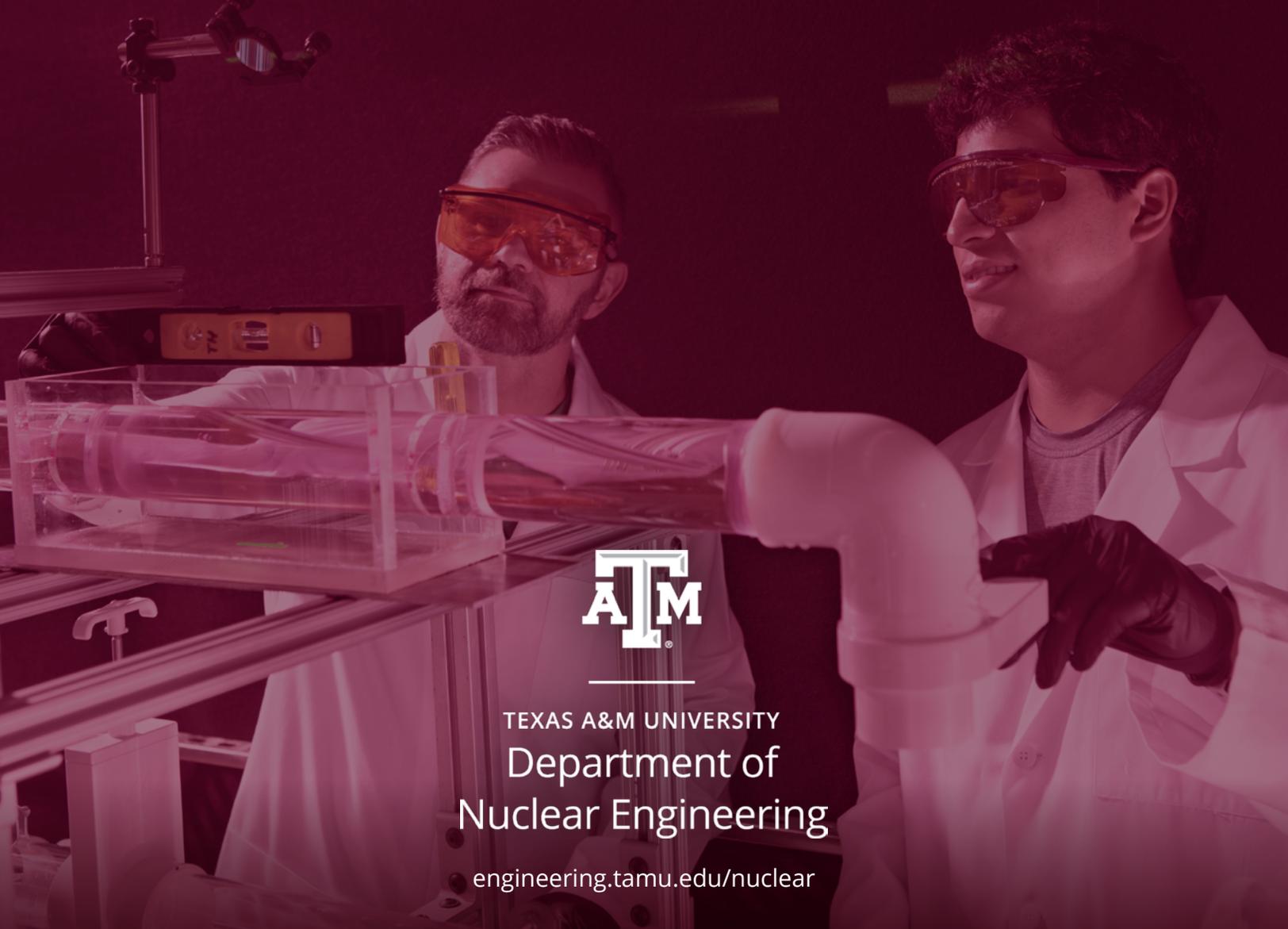
Former student Dr. X. George Xu '94 was awarded the Edith H. Quimby Award for Lifetime Achievement in Medical Physics. The American Association of Physicists in Medicine awarded him the prestigious achievement for his renowned work in the fields of radiation dosimetry and safety.

Throughout his professional career, Xu has spearheaded research projects involving clinical software tools that have since been used in hospitals throughout the world. VirtualDose, a software tool developed by Xu, tracks organ doses for patients who have received CT scans. In 2019, the software was accessed more than 26 million times, making it the most widely used software for its purpose.

As a graduate student at Texas A&M, Xu was a member of the Health Physics Society chapter and performed his doctoral research under Dr. Dan Reece, an expert in Monte Carlo radiation transport simulation methods, and Dr. John Poston, former president of the Health Physics Society.

"Looking back, I feel that I was greatly inspired by these faculty members I had the opportunity to work with during my time at Texas A&M," Xu said. "My experience as a Ph.D. student provided me the technical and mental preparation for a very challenging but equally rewarding job as a faculty member." ▽





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Department of
Nuclear Engineering

engineering.tamu.edu/nuclear

DEPARTMENT OF NUCLEAR ENGINEERING

AREAS OF FOCUS

Advanced Nuclear Reactors

Computational and Data Sciences
Applied to National Security and
Nuclear Engineering

Fuel Cycles and Materials

Health Physics, Radiation Biology
and Medical Physics

Nuclear Power Engineering

Radiation Transport

Security, Safeguards
and Nonproliferation

Thermal Hydraulics