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UC San Diego Receives \$10.5 Million from National Nuclear Security Administration to Create Center of Excellence

The new center will study matter under extreme pressure, collaborate with national laboratories, and train graduate students in stockpile stewardship.

The University of California San Diego was awarded \$10.5 million over five years from the National Nuclear Security Administration (NNSA) to create one of four new centers of excellence. The Center for Matters under Extreme Pressure (CMEC) will be the third NNSA center focused on high energy density science.

The center will be headquartered at UC San Diego, but will work in partnership with three other University of California campuses — Berkeley, Davis and Los Angeles — the University of Chicago, Florida A&M University and General Atomics. Additionally, they will work in close collaboration with four Department of Energy national laboratories: Lawrence Livermore, Sandia, Los Alamos and SLAC National Accelerator.

UC San Diego Chancellor Pradeep K. Khosla stated that “this center will allow us to work with the most talented experts in high energy density science across academia, private industry and national laboratories. We are in an exciting position to make remarkable new discoveries about the universe while also providing students meaningful opportunities to train as scientists.”

High energy density science deals with matter under extreme conditions of temperature and pressure, such as those that exist in the interior of stars and planets. At such extreme pressure—one million to one trillion times the atmospheric pressure on the Earth’s surface—matter



The Tarantula Nebula is one of the most intense regions of active star formation known to exist anywhere in our galactic neighborhood. (Photo by ESA/Hubble & NASA)

behaves differently than under normal conditions on Earth. The fundamental challenge is to understand the underlying physical processes required to predict and control material properties in these extreme environments.

Research will broadly focus on energy transport, material properties and nature under extreme conditions. Emphasis will be placed on the creation and examination of such matter using computer modeling and experimentation. Beyond its usefulness to maintaining the integrity of the United States' nuclear stockpile, such research can also help us understand more about the universe and how celestial bodies are formed.

CMEC will be a part of NNSA's Stockpile Stewardship Academic Alliances (SSAA), created to support scientific advancement, promote interactions between academia and NNSA labs, and train scientists in relevant areas of research.

Farhat Beg, professor of mechanical and aerospace engineering at the UC San Diego Jacobs School of Engineering and director of the Center for Energy Research, is the principal investigator and will lead the new center's research. He believes CMEC "provides state-of-the-art tools and a world-class team of students, faculty and staff. The center will facilitate a unique environment to conduct research into high energy density science focused on extreme states of matter. This is a great opportunity to provide a trained workforce to the national laboratories"

In order to maintain the stewardship program, a pipeline of specially trained scientists must exist. Because of this, one of the core objectives of CMEC will be to recruit and educate undergraduate and graduate students and postdoctoral researchers.

"Educating tomorrow's innovation workforce is a key mission of UC San Diego. This Center will offer many great opportunities for UC San Diego students to work on critical real-world projects while engaging in cutting-edge research," said Albert P. Pisano, Dean of the UC San Diego Jacobs School of Engineering.

In addition to working at CMEC, students will also spend up to 10 weeks at a national laboratory. UC San Diego is going a step further and including high school students in CMEC educational programming as well. Every other year, CMEC will host summer school for interested high school students from around the country, helping plant the seeds of inspiration before they even attend college.

Vice Chancellor for Research Sandra A. Brown stated, "We're very pleased to create this important new Center of Excellence in partnership with the NNSA, national labs, private industry and other great research universities. These collaborations provide unique and

valuable opportunities to work together in the name of student training, basic research and national security.”

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