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Dancing with the Stars

Graduate student gains valuable experience at Princeton Plasma Physics Laboratory

Tess Bernard, a former participant of the Department of Energy's Office of Science Graduate Student Research program, is now a research scientist in magnetic fusion energy at General Atomics. (photo by Julie Manns)

Tess Bernard's resume features a range of experiences not commonly found in the world of science.

While Dr. Tess Bernard is a physicist, having earned a PhD in physics from the University of Texas-Austin she was also a former professional ballerina, employed by two ballet companies between 2008 to 2013.

After 2013, she gravitated toward science. While pursuing her doctorate, Bernard earned a grant through the Department of Energy (DOE) Office of Science Graduate Student Research (SCGSR) Program. The program is one of several offered through the DOE's Office of Workforce Development for Teachers and Scientists.

A natural path to PPPL

Bernard, who excelled at calculus and was interested in the potential of renewable energy, studied plasma physics while pursuing her doctoral degree. That contributed to her decision to continue her graduate work through SCGSR at the Princeton Plasma Physics Laboratory (PPPL) in Princeton, N.J.

At PPPL, Bernard worked with the computational plasma physics code, Gkeyll. She used the code to study plasma dynamics that occur on the boundaries of fusion devices. The goal is to replicate the same nuclear reactions found within stars in a fusion reactor. The heat from these reactions could be converted into abundant renewable and reliable electricity to create a clean, renewable energy source.

Bernard continues to benefit from her time at PPPL. She uses the skills, connections, and even Gkeyll as a staff scientist at General Atomics, a San Diego-based defense and diversified technologies company. There, the plasma team uses magnetic fields to confine the plasma, essentially creating a star on earth.

"It's an optimization problem," Bernard said of her work at General Atomics. "We need to control the heat and particles to maintain the good quality of the core plasma while also extracting heat for electricity."

Continuing to use PPPL lessons

Building on her SCGSR-funded project, Bernard said her work at General Atomics is where she analyzes the plasma turbulence phenomena in simulations and compares it with experimental data. The Gkeyll generated model is more accurate than other less computationally expensive models, Bernard said, emphasizing that the skills obtained at PPPL remind her of the importance of public funding of plasma research.

“Public funding is essential to solving critical issues in order to make fusion energy a reality,” Bernard said.

She pointed to DOE’s announcement in 2022 that Lawrence Livermore National Laboratory had achieved fusion ignition as an encouraging sign for scientists working with plasma to develop its potential.

Bernard, now years removed from her previous life as a ballerina, said she was grateful for her time at PPPL, adding that the experience has been essential to her growth as a scientist.

“As a graduate student awardee, I gained firsthand experience at one of the premier plasma physics research laboratories in the United States,” Bernard said. “That helped me to become a better researcher and opened important career pathways.”