



JungHyun Bae

Eugene P. Wigner Fellow

Where and when did you earn your PhD?

I earned my PhD in nuclear engineering from Purdue University in May 2022

What was the subject of your dissertation?

My dissertation research focused on the development of a muon spectrometer using multilayer pressurized Cherenkov gas radiators for muon tomography applications.

What was your dissertation's major contribution to your field?

My dissertation delivered a new concept for measuring muon momentum in the field. It is important to improve the utility of cosmic ray muons because their wide application is often limited due to their naturally low flux at sea level even though they have emerged as a promising nonconventional high-energy radiation probe to monitor dense and large objects (e.g., such as spent nuclear fuel casks, nuclear reactor core, and magma chamber underneath volcanoes).

Who is your ORNL mentor and which group and division are you working in?

My mentor is Rose Montgomery, Used Fuel and Nuclear Material Disposition Group leader in the Nuclear Energy and Fuel Cycle Division. This is also where I am working.

What will your fellowship research focus on?

Through my dissertation, a proof-of-concept of the Cherenkov muon spectrometer has been theoretically and computationally evaluated. At ORNL, during my fellowship program, I will focus on designing and building a prototype of the Cherenkov muon spectrometer and momentum integrated muon tomography system to advance utility of cosmic ray muons in many engineering applications. This approach will show highly efficient, safe, and high-resolution reconstructed images of spent nuclear fuel casks.

What are your research interests?

My research interests mainly include developing an advanced muon detector in the Underground Research Laboratory to monitor long-term nuclear wastes as well as a radiation detector, nuclear security, and nuclear material management.

What led you to science and your specific discipline?

My father worked in the nuclear industry, and my mother is an architect. I learned the necessity and beauty of science in our life from them. When I was a graduate student, I attended one seminar presented by an ORNL researcher, Dr. Stylianos Chatzidakis, who is a past Weinberg Fellow, and I was impressed by his research, especially muon research. After that, he became my advisor.

What did you do before coming to ORNL?

Before joining ORNL, I studied at Purdue University for my PhD program. Before Purdue, I completed my master's degree at the University of California, Berkeley.

Could you share an interesting fact or two about yourself?

I worked in the Eighth United States Army for 2 years as a Chemical, Biological, Radiological, and Nuclear specialist. The Eighth Army is a US field army headquartered in South Korea that serves as the commanding formation for all US Army forces in the country.

I enjoy traveling around the world. The most memorable place I have visited is Nagasaki, Japan, where the second nuclear bomb (a.k.a. Fat man) was dropped during World War II. Now, Nagasaki has become a beautiful and calm city. It is famous for hot springs, food, and history!

What nonscience topic or activity is important to you and why?

I always emphasize the importance of equal opportunities in education, especially in math and science. I am impressed by the various outreach programs through which ORNL engages with the community.