Andrea
Delgado

Eugene P. Wigner Fellow

Where and when did you earn your PhD?

I got my PhD in May 2020 from Texas A&M University.

What was the subject of your dissertation?

My dissertation's title was "A Search for a Z' Boson in 4 B-Tagged Jet Final States in Proton–Proton Collisions." The study essentially tried to prove or disprove the existence of a particle that is not contained in the standard model of particle physics. Its existence would help alleviate some discrepancies in results of the LHCb (Large Hadron Collider beauty) experiment at CERN that seem to hint that the rate of the decay of B mesons to muons versus electrons is not the same, as one would expect in the context of the standard model. The analysis was performed on data collected by the Compact Muon Solenoid (CMS) experiment at CERN.

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

My dissertation project contributed new analysis techniques to experimental high-energy physics tools and algorithms. Beyond the standard model, interactions are very rare, and the number of interactions that can resemble the one we are interested in is very high; therefore, we must know the process that we are looking for very well. For the high-energy physics community in general, I was able to rule out the existence of a particle with the characteristics of a Z' boson in a region of phase space, so future phenomenological theories can take advantage of these exclusion limits.

Who is your ORNL mentor?

Dr. Marcel Demarteau, Physics Division director, is my mentor.

What does your fellowship research focus on?

My research will focus on quantum computing applications for high-energy physics.

What is your project's expected contribution to your field?

High-energy physics is a very interesting field because, for many years, we have been at the front of many frontiers, as the US Department of Energy likes to call them. On one side, we have the intensity and energy frontier that seeks to probe and potentially extend our knowledge of the fundamental blocks of the universe and how they interact with each other. For this reason, large experiments such as the LHC have been built. On the other hand, we have the computational frontier. These large experiments, all produce large amounts of data, so we need to be able not only to collect the data but also to store it and analyze it, which is a challenge most of the time. Quantum computing has the potential to impact both frontiers. It might give us a better understanding of these processes, which are fundamentally quantum in nature, through simulation and calculations. We might also be able to use quantum computing to analyze all this data in a more efficient manner.

What are your research interests?

My research interests include the application of quantum computing to high-energy physics.

What led you to science and your specific discipline?

I've always been attracted by physics and, I believe, specifically to solving puzzles and understanding what we are made of.

What did you do before coming to ORNL?

I was a graduate student at Texas A&M University, getting ready to move to CERN to finish my dissertation, but when I found out I was pregnant with my first child, Simon, I moved to Tennessee with my husband, Elvis, who was starting his position at ORNL.

Could you share an interesting fact or two about yourself?

I have two wonderful kids, Simon and Alice (ages 4 and 2), who keep me busy. A fun fact: The LHC has four main experiments, CMS, ATLAS, LHCb, and ALICE. Many people think that I named my daughter Alice after the experiment, but that wasn't the case; it is my mom's middle name.

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

I am an advocate for diversity and inclusion. As a Hispanic woman in science, I think representation is important; therefore, I have participated in many activities to increase awareness and to hopefully get more girls interested in science. I am currently the chair for Women in Physical Sciences, which is a Physical Sciences Directorate–supported group whose mission is to promote diversity and inclusion as well as to provide personal growth and professional development opportunities to its members.

OAK RIDGE
National Laboratory