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Bilge Demirköz

Diversity Issues

Triggermeister

By Christina Reed
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Inside the underground labyrinth that leads to the Large Hadron Collider (LHC) at CERN , the physics institute that straddles the border of Switzerland and France, Bilge Demirköz, a 28-year-old high-energy physicist from Istanbul, guides a tour to a painted green wall and a matching unmarked door. "We are about to go into the world's largest manmade cavern," she says, her voice echoing through the fluorescent-lit tunnel. It's the end of July, and just hours from now this door will be closed to visitors for good.

Demirköz opens the door and leads the tour onto a narrow gangway that's stationed at one end of ATLAS , the largest of the four detectors built to study particle collisions inside the LHC. The 46-meter-long detector looks like a giant rotary engine, and although it is about the size of a space telescope, it is designed to look at the absolute smallest pieces of the universe. Demirköz gestures toward the bladed shaft in front of her, which stands 25 meters high. "You are now looking at the muon detector--the glorious, the huge muon detector," she says. Later she adds: "I know that some people look at it as playing with big toys. For me it's really spiritual."

Her empirical faith has led Demirköz to search for answers to some of the most daunting questions in the universe. Currently, she does so as a research fellow at CERN. Next week, CERN will take a giant step toward studying some of nature's deepest and most fundamental questions when it sends its first beam of protons around the LHC. The protons will travel 27 kilometers along the ring-shaped underground tunnel. In October or soon after, 14 years after the project's initial approval and 10 years after construction began, a beam will be introduced traveling in the opposite direction, and ATLAS will tell scientists what happens when the protons collide at 7 TeV, a much higher energy than any manmade particle collision in history. Demirköz will be watching from close up.

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The pursuit of physics

Demirköz grew up in Istanbul, Turkey, steeped in the region's poetry, especially the modern poet Nazim Hikmet and the ancient Mevlana (Rumi). She was attracted to math at an early age, picking arguments with teachers when she was 6. When she was 14, she traveled to Geneva for a mathematics competition. Afterward, her high school math team toured CERN, and Demirköz decided then and there that this was work she wanted to do.

Demirköz left her native country in 1997 to study math at the Massachusetts Institute of Technology (MIT) in Cambridge. But she quickly switched her focus, declared a major in physics, and pursued math and music as minors. "At the time, I was definitely more successful in mathematics than I was in physics. But after taking a lot of graduate courses in mathematics, I began to think that at some level mathematics is an artifact of our own imagination," she says. She went on to do a master's degree at MIT, also in physics, and last year she obtained her Ph.D. in particle physics from the University of Oxford in the U.K. Now, she says, "I'm in physics because I'm trying to understand something that is bigger than me."

In 2001, she visited CERN again, honoring her earlier promise to herself, and soon her trips to Geneva became routine. At first, she worked on the Alpha Magnetic Spectrometer, a particle physics detector intended for the international space station. She joined the ATLAS group in 2004, incorporating her work on the semiconductor tracker into her Ph.D. thesis. She moved to Geneva in 2005.

Today, Demirköz is one of 1900 CERN scientists working on the ATLAS experiment, which will look for particles that theory predicts but are as yet undiscovered, such as the Higgs boson. "It's an experiment in which we really explore the deepest and darkest questions about nature," she says. She is part of a team of 200 physicists focusing on the detector's trigger mechanism, a multitiered system that decides which events should be recorded. She has a very cool title: Triggermeister. "What connects the detector readout to physics is the selection process of the events, and that's the trigger. For me, it was an obvious choice."

Starting in October, two bunches of 100 billion protons will whip around the 27-kilometer LHC tunnel, in opposite directions, at nearly the speed of light. Every 25 nanoseconds, the two beams will cross paths, resulting, hopefully, in about 20 proton-proton collisions. The ATLAS detector is like a giant traffic camera that photographs the intersection of the proton beams.

Atlas's Triggermeisters--Demirköz is one of three--establish the selection criteria for the trigger to make sure that the data recorded are the data "that we are really looking for," she says. It's an important job; if the wrong criteria are chosen, the most important events could be missed.

Personal challenges

Throughout her training, teachers have told Demirköz that as a woman she would have a hard time in math and physics. "I was told many times in high school, many times in university, and a couple of times as a graduate student. Only after I obtained my Ph.D. did I find the confidence to not bother with such people. I would just walk