Leading through Creative Innovation with Regional Materials and Culture

With help from the ACI Foundation and its supporters

From her earliest childhood in Tanzania, Sherryen Mutoka was mesmerized by her father's construction drawings. An engineer himself, he helped foster her passion for the built environment. Following his passing, Mutoka dedicated herself to pursuing studies in both mathematics and the sciences—not only earning herself a scholarship to the African Leadership Academy in Metro Johannesburg, South Africa, but eventually a place studying civil and structural engineering at Notre Dame University in Notre Dame, IN, USA.

Mutoka

Mutoka is the 2023-2024 recipient of the ACI Foundation Concrete Materials Fellowship.

"In Tanzania, you get to choose if you want to concentrate on sciences or business. I went into sciences because I really like mathematics. Even though I knew I wanted to work in engineering, I first thought I'd be an architect because they design the overall look of buildings—but I realized that wouldn't work as I can't draw," she laughed. "I then asked my aunt, what career path can you do if you love buildings? And so, she introduced me to structural engineers that she knew. That's how I really got into it—observing my dad's profession, and having an aunt who introduced me to structural engineers. I was lucky to be connected to people who were in that field when I was quite young."

Mutoka finished high school at the African Leadership Academy, a school that seeks out high-caliber students from across the continent with the mission of creating the next generation of African leaders. There, she was put in contact with representatives from universities around the world and was first introduced to the University of Notre Dame where she applied and was accepted to pursue her undergraduate degree.

In her third year of college, Mutoka took part in a study abroad at the University of Western Australia in Perth. During this study and drawing on childhood observations of the use of sustainable, traditional materials in Tanzania, she became aware of the intersection between buildings, construction materials, and culture.

"I studied abroad in Australia and my research looked into state-provided Aboriginal housing," Mutoka said. At the time of her research, the Australian government was providing low-cost housing for Aboriginals but having difficulty populating the buildings. "My research found that the material [the Australian government] used [for the low-cost housing], and the way the buildings were structured was not conducive to Aboriginal culture—which is why the housing wasn't being used. This taught me a lot about the importance of involving community in building and not just building for building's sake. There's so much more that goes into it—the material and the labor, just to mention a few. People have a lot of cultural attachment to the way things are built," she explained.

This research, combined with a love of Italy's ancient Roman stone and brick architecture, a fascination with the building materials of other cultures—such as bamboo—and her own experience traveling between the concrete grid of Dar es Salaam and her grandparent's village sparked Mutoka's love of materials and realization of a need for regional construction codes.

While working at MASS Design Group designing a new campus for the Rwanda Institute of Conservation Agriculture (RICA), Mutoka experienced the gaps in broad construction codes firsthand.

"[MASS Design Group] strived to be sustainable and be true to the region, they wanted to use materials that are sourced locally," she said. However, these local materials weren't included in the building codes. This presented a challenge to the design team, necessitating vigorous testing of materials to prove they were safe and durable enough to be used in regionally specific concrete design. The result was a robust regional design that incorporates design standards for local materials and increases sustainability and economic efficiency.

Current Work and Research

Mutoka is now pursuing her PhD at the University of Notre Dame, working in the Kinetic Structures Laboratory under the direction of ACI member Ashley Thrall where her research looks at accelerated fabrication of civil infrastructure in which steel and concrete are the primary materials. She is investigating various approaches to be used in reinforcing three-dimensional-printed concrete walls by conducting full-scale experiments along with developing numerical models of the walls. Mutoka is also researching the use of cold bending in reducing fabrication time for steel bridges. She attended the ACI Concrete Convention – Spring 2023 in San Francisco, CA, USA, where she connected with other fellowship and scholarship interviewees, as well as industry professionals.

"I met Katie Hogarth; she's from Idaho State University and also a fellowship recipient. We met before the interviews and became quick friends. We talked about our research and ended up exchanging contacts. Even just that was exciting, getting to talk to another PhD student and say: 'yeah, I'm currently working on this or that challenging problem, or this or that experiment went well.' So, I'm quite excited to see her again at the next convention and catch up on our research progress," Mutoka said.

Next Steps for the Future

As for life post-graduation, she said: "Yeah, I'm super excited. After I graduate, I do want to go back into the industry and work in design. I'm excited to go into the field and explore opportunities in the innovative structural design field. I'm looking forward to applying what I have learned in the workplace and affect change."

Mutoka in her faculty mentor Ashley Thrall's Kinetic Structures Lab at Notre Dame

Impact of an ACI Foundation Fellowship

The ACI Foundation Fellowship and Scholarship Program is currently awarding more than 325,000 USD annually to students pursuing degrees in engineering with the intent to help them complete their studies and gain professional experience in the concrete industry.

"Because of the [Concrete Materials Fellowship] I will be able to attend conferences and present my research progress and outcomes. I can also use some of my funding for designing and performing experiments. So, it's been a great help!" Mutoka said.

The ACI Foundation relies on funding from ACI members, partners, and friends. Supporting upcoming leaders, like Mutoka, is an investment in the future of the concrete industry. To learn more about ACI Foundation fellowship and scholarship opportunities, visit **www.ACIFoundation.org/scholarships**.