

Amy Cerato: Blending Academic Research with Industry Needs

When Professor Amy Cerato, P.E., was growing up, she didn't hear the word "engineer" until she was in junior high school. Today, she is a widely admired engineer and a gifted researcher and educator according to many of her peers. Looking back to when the profession first attracted her interest, she recalls an eye-opening high school internship in the Cumberland Gap National Historic Park in Kentucky. Seeing how much needed to be done sparked her later recognition of the connection between geotechnical engineering and the environment.

Topping Cerato's long list of accomplishments and honors is the award given to her in 2009 by the White House Office of Science and Technology Policy (OSTP). Each year, OSTP selects 100 individuals in the scientific disciplines and invites them to the White House. Cerato was one of only 15 awardees invited to speak. She was also the only civil engineer in that year's competition and one of very few women of the 100 chosen.

Becoming an Engineer

When Cerato began at Lafayette College, she thought of becoming an environmental engineer. After taking two of Professor Mary Roth's geotechnical engineering classes, she decided that geotechnical engineering was much more interesting.

After getting her B.S. in civil engineering at Lafayette, Cerato moved north to the University of Massachusetts (UMass) at Amherst. There, she earned two M.S. degrees, one in civil engineering and one in geosciences. She capped her education at UMass with a Ph.D. in geotechnical engineering, and has taught at the University of Oklahoma (OU) in Norman for 12 years.

Feedback from the Real World

Two subjects have dominated Cerato's career. One is engaging students in the "real" world of engineering, consulting,

construction and contracting, with the goal of having students better understand the classroom theory and apply it correctly in practice. In 2014, she started Cerato Geotechnical Engineering, where she co-teaches and trains laboratory technicians how to conduct soil laboratory testing and report results to maintain their state certifications. It allows her to be a consultant in the deep foundation design and soil laboratory and in-situ testing arenas. This work helps her bring real projects to students and gives her an opportunity to engage local consultants and contractors in her classes. Her students benefit from their interaction with engineering practice and feedback from practicing engineers.

The other main focus of Cerato's work has been her helical piles research. Her involvement goes back to graduate school where she performed tension tests to determine capacity for applications such as cell towers. In Oklahoma, her interest in helical piles morphed into understanding how helical piles would perform under cyclic loads created by the wind on small, guyed wind turbines. This tied into her interest in expansive soils, a problematic shrink-swell soil in Oklahoma and elsewhere. Dr. Priscilla Nelson, professor and head of the Department of Mining, Colorado School of Mines, calls Cerato a gifted researcher and says her "truly innovative work has resulted in breakthroughs in understanding expansive soil behavior."

Howard Perko, Ph.D., P.E., director of engineering at Magnum Geo-Solutions, Fort Collins, Colo., says Cerato has a "unique ability to blend significant academic and research contributions with industry relationships." An excellent example is a recent shake table test of



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helical piles led by Cerato at the University of San Diego's Jacobs School of Engineering. She is on the DFI Helical Piles and Tiebacks Committee, and notes that the successful test was partially financed with

\$22,000 from DFI's Committee Project Fund, while manufacturers provided the major portion of the \$154,000 cost.

Cerato says the test results exceeded her expectations. As a result, there are now videos of the test that professional engineers and engineering students can watch and learn from at <https://vimeo.com/167773622>.

Her work on helical piles has been helpful at home as well. Cerato has lived in Norman for 12 years and her own house had a badly designed foundation. One half of her house is on soft, silty alluvial soils and had settled due to a heavy fireplace on that part of the plot. The solution was to place five, 27 ft (8.2 m) long helical piles into hard sandstone to mitigate the foundation damage. Fortunately, her husband is a contractor.

Field Trips

At OU, Cerato has a full load: she currently advises two M.S. students, two Ph.D. students and two undergraduate students in her research group, and teaches two to three courses per year. One of her graduate courses is an in-situ and laboratory testing

class. She uses her contacts with local contractors to bring drill rigs and pile installation rigs to the university to demonstrate how to sample the subsurface and install deep foundation elements. She always includes a foundation behavior prediction unit where the students use their in-situ testing and laboratory data to predict how their deep foundation element will perform.

Every two years, Cerato takes students in her engineering geology course on a field trip. Her goal is to teach students how important geology is to engineers. She and her “copilot,” retired Oklahoma DOT geotechnical engineer Dr. Jim Nevels, led 11 students on the most recent trip. They observed and studied rock cuts, erosional features, and bridge abutment construction and its relationship to stability on DOT highway projects. They studied rock cut orientation and saw examples of volcanic activity, scour, and even dinosaur tracks in southeast Colorado, northwest Oklahoma, and northeast New Mexico.

What Cerato likes best about teaching is seeing the “light bulb” go on when students see the relationship between theory and practical variability. She hopes to educate them so they can be contributing members of the civil engineering community. She says about 90 percent of her graduate students have job offers before they get their degree, which indicates an industry demand for geotechnical engineers, or at least those that study with Cerato.

Expansive soils constitute an important part of Cerato’s research. She hopes to teach students to design infrastructure so that the expansive soils do not cause damage. Building foundations correctly for a given location, including soil type and any potential natural hazard, she says, is key to safer infrastructure and ultimately saving lives.

Impact on the Profession

Dr. Samuel P. Clemence, P.E., professor emeritus, Syracuse University, is another Cerato fan. He says she is an “exceptional engineer, teacher and scholar whose work has had an impact on the geotechnical

profession.” He praises her as an articulate and enthusiastic speaker with a passion for teaching and research, and for attracting more women to engineering.

Dr. Sandra Houston, a professor at Arizona State University, works in some of the same research areas as Cerato. Houston cites her colleague’s important contributions on expansive soils and her recent work on the seismic behavior of helical piles. Houston also notes that Cerato contributes an “enormous amount of energy and time to students and to professional service activities.”

Cerato is a “busy mom who balances work-life with apparent ease, and is a great role model,” says Houston. “It’s always great to see her at conferences with her family, including her small children.” Cerato has a full life beyond the classroom and the lab. She enjoys mountain biking on single track trails and swimming and boating with her husband, three children (the latest born in December) and four dogs. She also enjoys gardening and cultivating multiple patio plants that winter in her greenhouse.

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