

## Oklahoma Innovations Radio Show

Air Date: July 26, 2009

Guests: **Amy Cerrato**, University of Oklahoma School of Civil and Environmental Engineering

[ Music ]

>> From the OCAST Radio Network, this is *Oklahoma Innovations*, a weekly science and technology radio magazine brought to you as a service of OCAST, the Oklahoma Center for the Advancement of Science and Technology. OCAST is the state's only agency whose sole focus is technology, its development, transfer, and commercialization. OCAST mission is to identify and fund promising research in technologies that allow Oklahoma to compete in a global market economy from our own backyard. This program features some of the state's most gifted and talented scientists, inventors, entrepreneurs, manufacturers, and business leaders who all have one common goal, developing technology-based economic growth for all Oklahomans. Now here are your hosts, Gary Owen and Steve Paris.

>> Welcome once again to Oklahoma Science Radio Magazine, *Oklahoma Innovations*, I'm Gary O. and--

>> I'm Steve Paris; hi Gary.

>> Yes you are – hey welcome back and I'm gonna welcome myself back.

>> It's been a while since we've been in the studio.

>> It has been and I just got back from the International Ventriloquist Convention. I do this trip every year.

>> Yeah, I just got back from Guthrie where I live.

>> Did you? Yeah, well I had a very long trip and we got to see some family on the way, but the International Ventriloquist Convention, Jeff Dunham, very popular ventriloquist was there this year as well as Jay Johnson from Soap, those of you who remember the sitcom Soap?

>> Sure, you bet.

>> And Jay won a Tony Award recently for his Broadway show which just closed and he is now touring with that show, and so he did a big concert for us and was great. And then we had Kevin Johnson who was the first ventriloquist to appear on America's Got Talent.

>> Really?

>> Yeah.

>> Yeah, from Oklahoma.

>> That's right.

>> You bet, and for our listeners in case you missed it, that deep rich voice you hear coming from Gary's mouth has a tremendous background. Gary is a ventriloquist as he just discussed and he's also a professional announcer, he has done news, he has done talk shows as you know, like this. He's just done just about everything. I have seen him perform on stage on several

occasions. And he's a well known talent in the state, we're just glad to have him as a part of *Oklahoma Innovations*, the state science radio magazine.

>> I have a--I'm gonna slip a little plug in here for Oklahoma City in Tulsa that August 1st we got a new talk show that's gonna launch in fact on our affiliate in Tulsa Care and gee, it's gonna follow this show.

>> Good.

>> We'll tell you more about that later.

>> Good, so you're getting busier and busier.

>> I am getting busy, busy, busy, yes.

>> Okay, that's good.

>> Alright, what's going on at OCAST. I know you guys are in and out of projects.

>> Of course, and then of course we're in the summertime, you know, between legislative sessions. I'm gonna tell you about a few things but before I go any further, I--let's kind of tease the audience just a little bit. Our guest today is Dr. Amy Cerato of University of Oklahoma, Assistant Professor of Civil Engineering and Environmental Science, and she has been recognized by the current administration in Washington D.C., the Obama administration. Not gonna tell you what that is just yet. You're gonna have to listen to hear the rest of the story, so.

>> It's a very exciting story.

>> It really is and it really is a plus for Oklahoma and for Amy. And so we'll talk more about that here in just a little bit. My good friend Dan Hoffman who was with the Oklahoma Inventors Congress sent me a little email yesterday. He said "hey can you put this on *Oklahoma Innovations*" and I said "well, you know, hey, why not." It's the Oklahoma City chapter of the Oklahoma Inventors Congress is gonna be meeting July 28 and guest speakers are gonna be Robert Mitchell, Jay Martin who will be discussing some of the new classes that Jay will be teaching, a graduate program at OCUSA. By the way, Jay is a gentleman who has done a lot of work in--well the technology like what they had with a 6 million dollar man, what's that called, I forgotten.

>> Prosthetic.

>> Prosthetics but he has done a lot of work and has really commercialized some of the--some of his activities over the last several years. And the OIC annual meeting by the way will be August 8 and that's going to be at OSU store. And so you know, if you wanna go, look up on your website, look up the Oklahoma Inventors Congress you can find how to register for these events. Of course the Tulsa event you don't have to register for that one. Some of the product, some of the things you're gonna be talking about are the new entrepreneurship studies at OSU, the Helmerich Center at OSU-Tulsa, patent and trademark library staff will be there to talk about that facility, also located on the campus, main campus at OSU. And they'll be talking about a lot of things but if you wanna know more about the Oklahoma Inventors Congress then look them up on their website, OIC, you'll learn a lot about what they're doing.

>> For those of you that are new listeners to our program, Steve enlighten our listeners a little bit about OCAST--

>> Sure.

>> Now that you may read about OCAST, you may hear the term OCAST. That stands for the Oklahoma Center for the Advancement of Science and Technology. And give just a short bio about how our tax dollars are going towards science and technology and innovation in Oklahoma.

>> You sure got their attention just then when you mentioned tax dollars and yes, this agency belongs to you the taxpayer. We've been around for about 21 years now. The Oklahoma Center for the Advancement of Science and Technology came out of the difficult economic times of the 1980s when Oklahoma was not doing quite so well and we realized we needed to diversify. We were doing relatively well in oil and agriculture over time, not at that particular time but over time and our leaders at that time said "well, you know what, we need to invest in science and technology and R&D." And so in the interim we had funded literally thousands of projects.

>> R&D meaning research and development.

>> Research and development, yeah, here I'm using the jargon, alright. Anyway, we focus on applied research, health research, small business innovation research. We've added some strategic partners over the years, the Oklahoma Manufacturing Alliance and the Oklahoma Technology Commercialization Center and we have some programs associated with those organizations, some funding programs, Seed Capital and Technology Business Finance. And we pretty much completed the suite of services. Now I'm not telling you that we won't have additional services down the road as the need arises but we've got it started right from the beginning of the research project all the way to the end where it's commercialized and it's an up and running business and we're also taking care of the many manufacturers in Oklahoma for the Manufacturing Alliance Center. And their goal of course is to make sure Oklahoma manufacturers are competitive and competing in a world economy. And in areas like lean manufacturing and green manufacturing and all those different things, six sigma, all the little buzz words that we use that talks about improvement of the manufacturing community. In case you didn't know this most people who work in the state of Oklahoma work for a manufacturing facility. You probably didn't know that, did you?

>> I did not know that.

>> Yeah, manufacturing is a big thing in Oklahoma. But that range, it runs the gamut from a small business with 3 or 4, 5 people all the way up to you know, the big ones with 4 or 500 or maybe even as a few thousand people working for them. So it's a big part of Oklahoma's economy.

>> When we started this radio show 14 years ago or there are about, where was our tax dollar in ratio of return?

>> Okay, actually it was almost zero-zero back then when you talk about the ratio because once you invest the money and back then we had our first year, we had like 18 million dollars to invest. And part of that went to some specific programs that have since been--they've outgrown their usefulness, they work where they're intended for about 5 years and that we call them centers of excellence so they kind of you know, gone on their different directions.

>> Sure.

>> But let's bring it up to date, you know. In the last 21 years we've had roughly 165 million dollars appropriated to this agency. And, but you gotta give our researchers credit and these are researchers all over the state whether they'd be at universities or at private sector companies or wherever. They've been able to attract upwards of 3 billion dollars. And so, you know, and that number keeps climbing. With a little bit of money provided by the taxpayer, we've been able to attract much bigger projects back to Oklahoma.

>> Sure.

>> And you know it's pretty easy to look at there and see it. At certain parts of the state there are businesses that weren't there 20 years ago that are technology based and that's kind of where our focus has been. Now I'm not gonna sit here and tell you that this one agency did all of it because that's not true. You have to give the private sector credits, you have to give universities credit, you have to give credit to a lot of forward thinking Oklahomans who believe in this process.

>> And of course the nice thing he said that you should know is that OCAST doesn't just give this money out.

>> Oh no.

>> The scientists and researchers who have to apply for this funding and it is competitive, a peer group from out of state that looks at this, right.

>> Yeah, you don't just get. You don't just make an application and we give it to you. You have to compete for it and it's very tough. It's a matter of fact we hold workshops to try to teach applicants how to go through the process and be successful. And again you're competing--a lot of the people we can't fund have qualified projects. They pass muster that the peer review team says "hey this is a good project, it needs to be funded."

>> You just don't have enough money to get to them all.

>> Yeah, we get to the, you know, if they're ranked like 1 through 40 or whatever and we have enough money to fund 15, well those--but there is the rest of them, you know, are left wanting and that doesn't mean they're bad projects. It just means we don't have the money to get there.

>> I'll tell you what's interesting, we do some OCAST shows from some of these conventions, the science and technology conventions and in the hallway you see all of their displays of big graphics that they show that are I guess the best way I could describe it is in science lingo and graphs and chart signs and their cellular structure to you know, electronic structure. It's just amazing and it's way beyond my comprehension--

>> And mine, however, I mean it's good to see the results because you know, that's new business for Oklahoma.

>> They say space, the final frontier. Space has been on news this past week. First of all NASA images showed Jupiter apparently got hit by an object. That's right. Astronomers say that Jupiter has apparently been struck by an object possibly a comet. The images taken by NASA early last Monday show a scar in the atmosphere near the South Pole of the gas giant. The images taken by the space agencies infrared telescope in Hawaii come on the 15th anniversary of another comet strike. In 1994 Jupiter was bombarded by pieces of the Comet Shoemaker-Levy 9. I love the names they give these things.

>> Oh yeah.

>> And unless you were under a rock somewhere, you know that last Monday was the 40th anniversary of man walking on the moon. Most Americans have never known a world where man hasn't been to the moon. It used to be given that people knew where they were when man first walked on the moon which was on July 20th, 1969, watching the black and white images on television. But now most Americans don't know where they were because the majority of Americans hadn't been born yet.

>> That's right.

>> And the median age of Americans as of last year was 36.8 meaning more than half of US residents are younger than 40 according to the US Census Bureau. No figures have been calculated for this year yet of course. Five years ago when NASA celebrated the 35th anniversary of the moon landing, the median age of Americans was 36.1 so most residents were at least alive when Armstrong made his giant leap for mankind. That changed some time between July 2005 and 2006. And because it was the 40th anniversary, Google did something really cool. Google on Monday marked the 40th anniversary of the first two moon footsteps on the moon by adding virtual lunar exploration to its free online earth map and imagery service. The moon joins Earth, Mars, and sky in an options list in an upper toolbar on the main webpage at earth.google.com. So aspiring lunar explorers can go to Google Earth and you'll need the Google Earth 5.0 software which can be downloaded free and you can explore the moons surface. Isn't that cool?

>> That's cool.

>> Well, they are saying--now the World Health Organization says there have been more than 700 deaths from swine flu since the start of the outbreak. The figure is an increase of some 300 since the start of the month. We've gotta take a little break. We'll come back and visit more on *Oklahoma Innovations*.

[ Music ]

>> The waving wheat can sure smell sweet when the wind comes right behind the rain. But what happens when the rain doesn't come? Wheat growers across Oklahoma know too well the impact that a poor growing season can have on crops and markets. Drought, disease and poor soil are just a few of the things to keep farmers up at night. But what if those issues were a thing of the past? In labs funded by the Oklahoma Center for the Advancement of Science and Technology, researchers are finding new ways for producing better plants that can withstand unfavorable conditions. Creating opportunities and improving the economy, that's what OCAST is all about. OCAST is looking for small business owners serious about investigating new products, services, and processes. For more information call OCAST toll free at 866-265-2215 or visit their website at ocast.ok.gov. In a state deeply rooted in agriculture, plant science helps Oklahoma farmers grow their business.

>> It's all about Oklahoma technologies, research, science, and commercialization. This is *Oklahoma Innovations* on the OCAST Radio Network.

[ Music ]

>> Our guest Amy Cerato, a University of Oklahoma Assistant Professor of Civil Engineering and Environmental Science has received something really exciting. She has become 1 of 100 recipients and among 20 winners of the National Science Foundation and is considered to be one of the best young scientists in the nation and we're gonna find out what all these means. She is

an engineer now and you figured that out. And Steve, great article came out on the paper this past week about her.

>> In several papers, Gary.

>> And well I guess we can say the paper then, general wide--generally speaking.

>> Yeah.

>> Norman Transcript, I know you've got one story that was written on her.

>> Yeah, Journal Record and the Oklahoman and probably missed some but those are the ones that we know about and, you know, there are pictures of Amy in there in case you missed it. You need to go back and look at it but here we had--

>> Did she make it on TV?

>> Have you gone on TV?

>> I haven't been on TV yet.

>> Well we are her first opportunity to be on electronic broadcasting and you did right here on *Oklahoma Innovations*. We're proud to have you here. I wanna know more about you and then we'll talk about what this award means because it's extremely important. You're gonna get to meet the president, right?

>> I will get to meet the president, yes.

>> Alright, up close and personal like a hand shake.

>> That's right.

>> Okay. But we're gonna talk about that in just a minute. But you're a native of Pennsylvania and you've been in Oklahoma since 2005. And you absolutely plan on staying here a little while because hey, you kind of set an anchor down at OU, right?

>> That's right, I really enjoy the university and my civil engineering colleagues and we've met a lot of nice people in Norman.

>> You know what, everybody that comes to Oklahoma says it's just that right there.

>> I know, I know.

>> Isn't that great?

>> I know. It was good to hear and even--whether it was true or not we're glad you said it. No, I know it's true. I know it's true. I could tell by the look in your face you're really having a good time. Now you're an assistant professor, you've had some success at research. Let's go back a little further. Let's go back to Pennsylvania and let's talk about your connection with engineering, how you got to be where you are today. Tell us about your ancient history.

>> Okay, well I grew up in the Poconos in Pennsylvania. It's a rural area of Pennsylvania and my parents, I'm the oldest of three, my parents and my family were really into camping and doing the environmental thing, going out and cleaning up garbage and cleaning up the area.

>> Outstanding.

>> So we--I was really involved with engineering at an early age but I didn't really know what engineering was and my parents instilled a great work ethic in all of us and I ended up working for the Student Conservation Association which is a group that goes into the national parks across the country and we act as a volunteer crew and it's students from the ages of 15 to 19. And I got chosen for Kentucky Cumberland Gap.

>> Oh really.

>> And on the Appalachian Trail and--

>> Daniel Boone country.

>> That's right, it is Daniel before he crossed over actually. And we work in the back country and there are six of us and I had to figure out--we had to figure out how to get water for 35 days. And so I was in charge of filtering the water from a local stream and I set up this elaborate gravity fed water filtration system for our group.

>> Yeah.

>> And at the end of the 35 days, my camp councilor, the crew leader said "well, you should really look into engineering.

>> Is that right?

>> Right, and I never even heard the term engineering before. And so when I got back my senior year in high school, I started thinking about engineering and applying to local schools, Lafayette College and Lehigh University in Pennsylvania and I ended up getting a scholarship to study engineering at Lafayette College.

>> All from a comment from a camp councilor.

>> It's very important you know, what you say to young people because it can make a big difference.

>> It really can and you may not even know it but you've been an influence on somebody who is coming up and here you are. Now you're an assistant professor.

>> That's right.

>> And you've moved to Oklahoma. What brought you to Oklahoma?

>> Well after--well during Lafayette College I had a fantastic professor, her name was Mary Roth and she was my only female faculty that I had in the whole college of engineering when I was there and she said "you know, you really need to go to graduate school." And so I said, "Okay, well where should I go?" And she said "you would be great at the University of Massachusetts Amherst. They have a very practical program, they have a field, a field site that you can work with. So I went to UMass Amherst and I studied geotechnical engineering with Al Lutenecker and we got into helical anchors and ground improvement. And then when I was finishing up my PhD he said "you know, you should really think about teaching."

>> And so he said, "There's an opening at University of Oklahoma, one of my former student works there. Why don't you send your resume and see if you get an interview," and so I've sent my resume and I got a phone call and here I am.

>> Here you are.

>> Now you're a faculty at the University of Oklahoma teaching engineering.

>> That's right.

>> That is a fantastic story. We're always tickled to hear people who come from other parts of the country to Oklahoma. But first of all when you bring that type of background that you have it's a good mix for us and we get--we have an opportunity of getting views from other parts of the country, sometime other parts of the world. And when you mix all that together I think the end result is something better that it could have been. So we're glad to have you here. And we wanna hear more about some of your goals and some of the things that you're gonna be doing. We got a couple of minutes in this segment. But let's go back to the letter and the award and all, how did that all come about?

>> Well last year, on 2007 I wrote a career proposal to the National Science Foundation. And it's a program for young faculty in the first 5 years of their appointment. And you have three chances to win. So I applied in my second year and I didn't get but I reapplied in my third year and I was awarded 400,000 dollars.

>> Just a measly 400,000?

>> Just a measly 400,000 dollars.

>> That's a tremendous amount of money to do some research.

>> It was excellent. And it's a 5-year award and so one of the outcomes of that award was that I was rated one of the top career awardees in all of National Science Foundation. And so my program director nominated me to the PECASE, the Presidential Early Career Award for Scientists and Engineers Committee. And that Committee chose 20 of the best career awardees from National Science Foundation and forwarded their names onto the White House.

>> Wow!

>> Wow!

>> And so that's how I was awarded the PECASE.

>> And so in November you get to go meet the President.

>> That's right.

>> And he's gonna say some nice things about the great work you're doing. And that should make us all very proud and I know the folks down at the University Oklahoma are just beaming of what you've been able to accomplish.

>> They've been very happy. I got an email from the provost and from the president. And I actually made the front page of the OU website so that was what exciting. My parents opened up [www.ou.edu](http://www.ou.edu) and my face was right there. So they were--they were showing all their friends, they're pretty excited about that.

>> That would be exciting.

>> We're gonna take a little break and come back and talk more with Amy Cerato when we return on your science radio magazine, *Oklahoma Innovations*.

[ Music ]

>> Now on it's 13th year, this is *Oklahoma Innovations* on the OCAST Radio Network.

>> The stress of finding a job after college is compounded for recent graduates entering a tough job market. But thanks to the Oklahoma Center for the Advancement of Science and Technology, more students connect with the state's most advanced technology companies while earning income and valuable on-the-job training. Through the OCAST R&D Intern Partnerships program, students gain experience in the industry, work with mentors, and operate specialized instruments. Intern training leads to starting salaries 12 percent higher than Oklahoma's average per capita income. OCAST is investing in Oklahoma's best and brightest, creating jobs, investing in our future, that's what OCAST is all about. OCAST is seeking intern partnership opportunities that will allow Oklahoma students to gain hands-on experience in science and technology careers. For more information, call OCAST toll free at 866-265-2215 or visit their website at [ocast.ok.gov](http://ocast.ok.gov). The future of Oklahoma looks bright.

>> Imagine not being able to see your daughter on her wedding day or experiencing your grandchild's first smile. An estimated one and three quarter million Americans over age 50 have developed a lost of vision or blindness due to age-related macular degeneration. And of the more 200,000 Oklahomans leaving with diabetes, 90 percent will develop eye disease. With the support of the Oklahoma Center for the Advancement of Science and Technology, an Oklahoma company is developing innovative treatments for blinding eye diseases. The research will improve the lives of people across the nation, create new treatments that are more comfortable for patients and prevent vision loss. OCAST is looking for Oklahoma researchers serious about investigating new treatments and products that improve the quality of life and the economy for Oklahomans. For more information call OCAST toll free at 866-265-2215 or visit their website at [ocast.ok.gov](http://ocast.ok.gov). Investing in science and technology, it's good for your health.

>> Research and development, technology transfer and commercialization, creating high paying jobs in Oklahoma is what OCAST is all about. This is *Oklahoma Innovations* on the OCAST Radio Network.

[ Music ]

>> She's receiving what is considered the highest honor bestowed by the US government on outstanding scientists and engineers beginning their independent careers. Our guest Amy Cerato, University of the Oklahoma Assistant Professor of Civil Engineering and Environmental Science is our guest, Steve O?

>> Gary, thank you. Amy, you know we were talking as we went on the break about this award you're getting and that you're gonna meet the president in November. And he's going to recognize you among others. Let's go back to the specifics that have to do with what how you earned this award. You know, you've done, well tell us exactly what you've submitted for the consideration. What did it consist of?

>> Well the proposal that I submitted to the National Science Foundation had to deal with how to predict the expansive soil behavior under our critical infrastructure foundations. And so I wanted to talk about when it rains and the soil swells. How that affects our foundation? You can't close your windows, you can't open your doors, your foundation cracks, your pipes crack, your house is almost condemned in some cases when the expansive soils are so bad. So what I wanna do is look at the micro scale properties of those expansive soils and be able to predict what they're going to do so I can tell the contractor and the homeowner, "Hey you need to build a different type of foundations."

>> Wow!

>> So that's the premise of the proposal.

>> Yeah, if you live in Oklahoma chances are your house has cracks in the walls and some--it's usually during the dry part of the season that's when our doors don't shut quite as smoothly as they do during the winter months.

>> That's right because when it's dry then the soil cracks and it's has a very large tension and it pulls on your foundation and it can cause a lot of damage.

>> During severe heat spells in the state I in fact even poured water down some of the cracks in my yard because they have a tendency and they're deep. They take a lot of water 'cause they're worried about the foundation and those kinds. Well I think a lot of Oklahomans do that. So what you're doing has an impact on our homes and the quality of homes and how they're maintained. You just said something that brought me back to a comment I heard not too many years ago is we actually is we live on the earth, we actually live on a giant sponge and it soaks up water, moisture and that's a lot of our substance, how we live. Is that your take on it, it's just a big old sponge and sometimes it works better than other towns?

>> That's right and when we do build our foundations, especially for not only residential homes but for our bridges and our levies and our dams. We need to build those foundations deep enough so that they go beneath the active zone. And when I mean the active zone, I mean when it rains the water infiltrates the top 8 to 12 feet and then it maintains static water content. And so we need to get our foundations down to that level and so the soil around it is stable and our homes and our bridges and our levies and our dams aren't affected.

>> Related but not exactly, you know, we have a part of Oklahoma that's over a giant aquifer, the Ogallala, have you heard about that?

>> Yes, I have.

>> I figured you had. It goes all the way from the parts of the Texas Panhandle, picks up part of Western Oklahoma and then Kansas and South Nebraska and South Dakota, North Dakota. And from what I understand we're depleting that rather rapidly through--I think they implemented ways to keep us from depleting it as much as we have been in the past. But it has dropped several feet over the years through intensive irrigation and things like that. Does your research get into that part of it at all?

>> No, the water quality and the aquifers is more of an environmental engineering issue and I am more into the geotechnical engineering issue. But I do work with water infiltration and if you're going to allow waste water to trickle down in to the aquifers you have to make sure that it's clean to get in. So we do some water and contaminant transport work in the geo environmental fields. But mainly I'm more of a foundation's soil structure interaction person.

>> Well scare me, do we have a big problem with that in Oklahoma?

>> We don't have as big a problem as other areas of the country.

>> Okay.

>> In fact Las Vegas, Nevada is losing somewhere on the order of 17 feet every few years of their aquifer and they're gonna be out of water very shortly. And so they're actually sucking so

much water out of the ground that they're subsiding their land. And the land has subsided more than 10 feet in the past several decades.

>> Oh my goodness.

>> So they're living in a big basin.

>> They're living in a basin and of course they get a lot of their water from Lake Mead which is right down, they do the multiyear drought in western--the western part of the United States.

>> That's correct.

>> Yeah, and you hate to see that happen because I think it's down over a hundred feet or maybe even more than that by now.

>> It's something very substantial.

>> Yes, and they don't think--from all indication, experts think that they may not ever recover from that. So, okay, let's get back to Oklahoma and talk about some of the things you're working on. You really are focusing on the environment, that's one of your major concerns. Let's talk about Bergey Windpower. You've been an engineer working with them on some projects, working with Mike Bergey and his father Karl Bergey. You know, we've had them on the show before, we talked to them but it's been some years ago. Let's bring us up to date on Bergey Windpower.

>> Well great, they are a great bunch of guys and I met them. This is a funny story, my first year here in January 2005 I was teaching foundation engineering. And the vice president of that Bergey Windpower Dr. Kenneth Craig wanted to take my class and he walks in and he is about 62, 63 and he said "Dr. Cerato" I said "No, don't call me Dr. Cerato." And he said, just recently I went to see him, he said "Amy, I wanted to ask where your father was because you look so young" but I taught him and we started talking about foundation engineering and he said "well have you ever worked with helical anchors? We're interested in helical anchors for our wind towers." And I said "you know I worked on them in cell towers in Massachusetts but never with wind towers." And he said "well, you know, come up and talk to us." And so in 2005 I went up to talk with Karl and Mike and Ken and they helped me write my first OCAST grant.

>> Really?

>> And we did alternative foundations for alternative energy.

>> Wow!

>> And so it was fantastic and the premises, there are areas of our country that can't get concrete. There are areas of China and Africa where they are selling their turbines and towers that can't get concrete. So what's an alternative foundation to use these towers and helical anchors is a good alternative.

>> Explain what a helical anchor is.

>> A helical anchor is a steel screw that you put into the earth that pulls down the tower and the turbine. So it holds them in place.

>> Tension, just keeps tension.

>> Tension.

>> Right.

>> And no one knew how they would act under dynamic loads, the wind loads. When the turbine was spinning and it was vibrating the tower, people thought oh, they're just gonna pull out. But we found that the helical anchors are viable alternative to concrete and actually a cheaper alternative to concrete.

>> Really?

>> How deep do they go?

>> They can go a hundred feet but typically in Oklahoma we can put on 20 to 25 feet and you just spin them in with a Bobcat and a torque motor.

>> Wow!

>> So a small installer could put them in and you know, we can ship the equipment to Africa or ship the equipment to China and the villagers can put their own wind towers up to be able to pump water so they don't have to carry the water for 6 miles and they can--and it's a great alternative foundation.

>> Okay, this is a novice question. I don't have any expertise in this field. But do they go into the dirt or they actually go into the strata, the rock formation.

>> They can just go into the soil.

>> Okay.

>> So when they hit rock, they actually can torque above their capacity and they just--they can't screw into the rock.

>> Okay.

>> So it's just the soil mass. And, but they do behave differently under dynamic loads with the wind tower than they would at a static cell tower capacity. And so we showed Bergey that they're not gonna pull out of the ground under their 90 mile an hour straight line winds. So we think that we're gonna be able to put them in the next few years and hopefully they'll go into the new zero energy home in Oklahoma City.

>> Wow!

>> So it's exciting, it's gonna be applied and I'm really hoping that it gets adopted.

>> Very good, let me go back just a little bit and talk about Bergey in the early days. And this--their mission may have changed a little bit. I don't know but what they did early on for the benefit of our listeners is they focused on actually third world countries where they didn't have electrical grids and things of that nature. And it hadn't been too many years ago that they had sold their electrical generating machines, what do you call them?

>> The turbines.

>> The turbines and they had a couple of different sizes and they sold them in like 60 foreign countries, Falkland Islands and some Saudi Arabian places like that. And their goal was to help governments in those countries get in touch with remote communities that didn't have electricity. And by providing them electrical generating system, they were able to pump water out of the desert. They were able to communicate with the headquarters, the national capital or whatever,

wherever it was. And so--and they also sell them in the United States and places around here but they have sold literally hundreds and hundreds and hundreds and maybe even thousands as far as I know of these wind generators and have had a very successful business. And they designed a way to create a constant speed prop by putting a weight that causes the blades to twist when they get to a certain speed. So they have done some very interesting work in the area of generating electricity through wind power and you've worked with them, so.

>> Bergey Windpower is a fantastic company to work with because they are always innovating.

>> Right.

>> They're always looking for new ways to do what they do better and for alternative ways to get to more people. And they are very politically active, they were involved in getting the federal tax cuts for wind power and they are trying to get the state to have tax cuts for wind power to get it to more people because you know this is expensive initial investment and--but their work with the blades and their work with the towers and--I think it's fantastic what they've been doing.

>> And I believe I located on, down at Westheimer Field and part of the old naval unless they've moved.

>> They moved right across the street to the old cores facility off of Rock Creek.

>> Okay. I'd even go down and see them, it's been a while.

>> They have a new person that they just hired, Scott, and he gives great tours.

>> Okay.

>> It's really--it's really fantastic, you should go down.

>> It sounds like--that sound like a future radio program.

>> I think we can follow, we'll handle that.

>> Exactly.

>> I tell you what, Steve, we're running just a little bit short on time on this segment. We've got another segment, Amy Cerato. Amy Cerato is our guest from the University of Oklahoma and she is Assistant Professor of Civil Engineering and Environmental Science. We've got more to talk about when we return on *Oklahoma Innovations*.

[ Music ]

>> This is *Oklahoma Innovations* on the OCAST Radio Network.

>> As you drive across Oklahoma, you can see thousands of gas wells sprinkled throughout the country side. Many of these wells don't produce enough natural gas to justify pipelines. But without this access, thousands of well sites are abandoned. [Background music] With the support of the Oklahoma Center for the Advancement of Science and Technology, one company is creating a portable device transported on a flatbed truck to process natural gas at well sites. This technology optimizes the amount of gas that can be captured and releases no byproducts into the atmosphere. This idea provides new opportunities for small oil and gas producers while bringing us one step closer to energy independence. Supporting innovation, that's what OCAST is all about. OCAST is looking for small business owners serious about investigating new products, services, and processes. For more information, call OCAST toll free at 866-265-2215. Or visit

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[ Music ]

>> Thank you for joining us on this week's edition of *Oklahoma Innovations*. In the next 30 years the US will need to provide cost effective infrastructure for expanding populations while simultaneously protecting the natural environment. The US infrastructure problems have been well documented in the American society of engineers, civil engineers, but the 2009 report card for America's infrastructure isn't good. The average grade was a D and it was estimated that renewal costs could reach 2.2 trillion dollars. Recent natural disasters and terrorist acts have added to the new dimension. Now infrastructure must not only be adequate, it must be robust and it must be resilient and it must minimize risk. However, the renaissance of our infrastructure is threatened by the fact that in the next 4 to 7 years, now listen to this, the next 4 to 7 years almost half of all civil engineers in the US would be eligible to retire and the problem is worsened by fewer students enrolling in civil engineering programs nationally. It's a big problem.

>> It's a very big problem

>> What can be done to interest students into civil engineering?

>> Well what the National Academy of Sciences has reported recently is that we need to change the message. The perception of engineers in our country isn't fantastic. Everyone thinks of an engineer as nerdy, you know a Star Trek convention kind of person and they don't realize that you can be a well-rounded, very interesting person to be an engineer and you know we sell it, we've been selling it out. Well, you have to be really good in math and science. Well, you know what, you really just have to be just good enough and I always use the kind of--to talk about medical doctors, well they don't tell people that you have to be good at organic chemistry. They tell people well if you're gonna be a doctor you can help people. And so we need to change our message to get out to the young people that engineers are the innovators of tomorrow and engineers can make a world of difference because if we wanna bring in these young people we have to really show that engineers are the people that are helping society, everywhere you look, everything is engineered. Our road ways, this radio station--

>> Your sidewalk.

>> Our sidewalk, our homes, your iPhone, your Xbox and so engineering is a fun profession and I just think that people along the line have lost that message.

>> Don't you think though in education when you say science and math, it scares a lot of students?

>> Absolutely.

>> They're scared to death. But with technology and computers today education is sort of becoming sophisticated that it's very intriguing to keep students glued to the computers because the old, I mean because there's so much, there's so many new innovative ways and interactive ways to keep students more interested in these subjects.

>> Absolutely and we're trying to use all the technology we can and bring that technology into the schools early in terms of kindergarten, first and second grade and we wanna tell them, hey this is what an engineer can do and let's build a popsicle stick house or let's do an egg drop or let's do a water balloon launch. Or let's do a pumpkin launch. And they understand the physics

and say, hey an engineer can, is the one that designed these. And so we get them interested early and then in middle school we go in with a more sophisticated kind of science and we say, okay, now you're the mayor of a town and your town is gonna be hit by an earthquake, how do you evacuate your town and how do you build it. You have 1 year to get ready for this. How are you gonna build your structure so you don't lose your water, you don't lose your power and so we try to make it exciting and visually stimulating on the computer and with videos and with exciting people in the classroom to try to say hey, you know, engineering is a great profession.

>> You make it more practical and less abstract is what you do.

>> That's right.

>> You mentioned the program. It's an outreach program where you're dealing with K through 12 and you know, one of the programs you have and you kind of I guess just now talked about adventure engineering. What is that? How does that work?

>> Well, adventure engineering was started at the University of Oklahoma--

>> Alright.

>> --by a professor named Mike Mooney. He has since left and gone to Colorado School of Mines but, he has a website out there that middle school teachers are using around the country with four or five different modules that they can bring in for a 2-week science and math curriculum and they talk about volcano alert, lost in the Amazon, you know earthquake--run from the earthquake. I forget what that one's called but it's really exciting and the students love it. And so, they have to figure out with the GPS unit how to get to a certain city when they're dropped from a plane in the middle of the Amazon. So, it's a whole surveying and mapping course on you know how do you save yourself and how do you get water and how do you get food and so it's neat to see the students react to that kind of engineering application.

>> Wow, that sounds like a course I'd like to take.

>> Yeah.

[ Laughter ]

>> Well you can take it. You could get online and check out all the curriculum. It's online for anyone to use, it's free.

>> Okay. You know exactly how to get on it right now or is that something we could look up later?

>> It is--if you just type in adventure engineering it will pop up and it's hosted on the Colorado School of Mines web server.

>> Okay. Adventure engineering, put it in your browser, look it up. You mentioned earthquakes and volcanoes and things like that. You're working on a project, right. You're getting ready to go to California to--well tell us about it.

>> Okay, well last year two colleagues and I wrote a proposal on how to tell--well how to tell if a bridge is gonna safe under earthquake loading. And so, what we're dealing with is drilled shafts and driven piles in soft clays as bridge abutments. So if you're driving over a bridge and an earthquake happens is that bridge gonna fall down. We hope not because we want you to stay

alive and so what we're doing is trying to retrofit those bridge abutments to make sure it doesn't fall down.

>> Okay.

>> So, we're doing cement soil deep mixing. So we have those piles that the DOT put in, Department of Transportation puts in and we're gonna go in with cement and we're gonna grout around those piles to try to make it more stable if they get hit with an earthquake.

>> Oh my goodness.

>> And so we're going out to University of California-Davis in their centrifuge facility in 2 weeks and we're gonna test small scale piles and when spin it up to 30 Gs, the gravitational force times 30. It actually stimulates a large scale pile and we're gonna videotape it and it's gonna be available online free for anyone to watch and you'll be able to see what happens to those piles when we shake it in flight. And so we're trying to webcast that back into the schools here in Oklahoma so they can watch a real life earthquake hitting a bridge structure to see what happens. So it's exciting.

>> Yeah, so the science teachers across the state need to be aware of these. This is something they can use in the classroom.

>> Right.

>> Outstanding, that is just fascinating, a fascinating approach, and did you come up with that idea of getting Oklahoma involved in this.

>> Well my colleague Muralee, K. K. Muraleetharan is a big earthquake guy. He is from University of California-Davis. And he really wanted to bring earthquake engineering into Oklahoma. So he wrote the proposal and brought me along 'cause I did all that large scale testing with the helical anchors with Bergey Windpower. So I have all the equipment and then Jerry Miller is you know the lab guy. He's in charge of making sure we have the right kind of soil we're testing so. And he's got, both Jerry and Rolly has daughters in the elementary and middle school age and so they have contacts with the Norman Public School teachers and so that's how we're getting into the classroom and trying to involve all these young people with our research.

>> Very good. By the way for our listeners, it's Dr. Amy Cerato. She likes to be called Amy, is that right?

>> That's right.

>> Okay, let me ask you this, you spend sometime in the classroom in addition to your research. Give us an idea about kinda how you break out that time in what's required and so forth and so on. And what your typical day or maybe your week looks like at OU?

>> Well my typical week would be I teach two classes a semester. Actually three classes a year so two one semester and one the next and I get to go into the undergraduate classroom soil mechanics. It's a laboratory class that's the in short of geotechnical engineering and then I teach foundation engineering which is how to build on those soils you now know how they behave and then I teach a great class called engineering geology. It is a total field trip class. So we go to the Wichitas. We go to the--

>> Southwestern Oklahoma.

>> Southwestern Oklahoma, we go to the Arbuckles.

>> It's now central.

>> Yeah, we go to Red Oak, Oklahoma met a huge landslide that wiped out Route 82 and we talked about, hey how did this happen and why did this happen and how can we stop this from happening.

>> Right.

>> And then we went up to Northwestern Oklahoma to look up the gypsum deposits and in the Panhandle.

>> Yeah.

>> And near Woodward and then, so we've been all over the state and the students are just fascinated. You have to understand geology in order to build on it. So when they understand geology they're better able to be engineers because they understand what that soil is gonna do or what that rock is gonna do when they put a structure on it.

>> Outstanding.

>> So that's a great class to teach.

>> You bet. We got about a minute and I guess let's look down the road. Five years down the road where do you see Dr. Amy Cerato? What would you be working on in 5 more years? And again we're not gonna hold you to this because this is forward thinking and meaning you don't know what's gonna happen between now and then. But where do you see yourself?

>> Well, I would still like to be working in the expansive soil arena and alternative foundation arena and actually bringing what I've found in the lab and in the field to the policy makers and to the homeowners and to the people that actually have to build on this soil and make sure that they're gonna be safe and they understand the risk of where they're building. And so I really do think that more scientists and engineers need to be involved with policy making 'cause we are the people that really understand you know how to build and what needs to go on. So I really do hope that I can bring my research to the public.

>> We got to go Steve.

>> Gary, it's been fun.

>> Thank you Amy and congratulations on your national honor and thank you for joining us on this week's edition of *Oklahoma Innovations*, bye-bye.

[ Music ]

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