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Understanding Speech with Cochlear Implant Improves with Audigence

Lee Krause is totally and profoundly deaf. Yet he can hear every word you say.

Krause's hearing ability is partly the result of a Cochlear implant that was surgically attached to his skull six years ago.

But it's mostly the result of innovative computer technology he pioneered, to improve and customize the way hearing devices such as Cochlear implants and digital hearing aids are tuned for the individual patient.

"When my Cochlear implant was first turned on, I could hear my nails click and I couldn't believe your nails could be that loud when you clicked them. And you could hear paper crumble real well," Krause said.



"But human speech wasn't quite as clear. And talking on the telephone still was problematic."

After applying his patented technology to better tune his device, a whole new world of hearing opened up to him, said Krause, who is CEO of Melbourne-based Audigence Inc., a software engineering firm dedicated to improving the quality of life for the hearing impaired.

Speaking over the phone with crystal clear voice inflections, it's impossible to tell this engineer-turned-entrepreneur ever was severely hearing impaired, and would be again without the Cochlear implant he received at the University of Florida Shands Medical Center in Gainesville, Fla.

Krause lost his hearing in his late 20s, the result of a genetic condition.

"We have the potential to improve the quality of life for millions of people," Krause said.

The key, he said, is being able to understand speech, and maximizing that understanding for each individual patient. And that's what Krause's technology addresses - customizing and fine-tuning the hearing device to maximize understanding.

"For every patient, there's a different 'best,' and that's an extremely difficult problem to solve," Krause said.

Cochlear implants differ from standard hearing aids, which simply amplify sound. Instead, the implant takes sound and turns it into an electrical signal that is transmitted to a nerve inside the brain. The brain interprets that signal as sound.

The tiny device that processes the signal then can be tuned through a test involving beeps and sounds transmitted in a soundproof booth. However, the process is laborious and inconsistent in its results. It could take months of adjustments to complete.

As Krause went through this tuning procedure, he found he was not completely satisfied with the results. Something wasn't right. He still couldn't hear well on the telephone. And he still was missing chunks of conversation.

"Through this whole process, I kept telling everyone there had to be a better way of doing this," Krause said.

As his own journey to better hearing continued, he reviewed research papers and assembled a team of engineers and specialists to vigorously address what could be done to improve the tuning process.

The result was a joint U.S. patent with the University of Florida for his idea, and the birth of his new company, Audigence Inc. He gives much credit to his co-inventors, including Dr. Alice Holmes, Dr. Rahul Shrivastav and Dr. Pervis Bedenbaugh of the University of Florida.

"This was very personal to me," Krause said. "The improved tuning ultimately changed my life -- being able to go from not being able to talk on the phone to being able to talk on the phone, an essential skill in today's world."

With Audigence technology, audiologists can tune patients' devices so they can better understand speech, which is much more complicated than almost every other type of sound.

The Audiologist performs the test with a simple laptop computer and microphone. The patient is presented with nonsense words - as opposed to mechanical beeps and sounds -- then are asked to repeat what they heard. The computer system then analyzes the strengths and weaknesses of the patient's responses. The process is repeated until an optimized state is reached.

"It's no longer an antiquated 'Can you hear the beep or not?' system," Krause said. "You don't speak in beeps, so why be tuned to beeps?"

Audigence technology now is being clinically tested at the University of Florida and is nearing approval from the U.S. Food and Drug Administration. "The whole thing could be in reach of the general public within two years," Krause said.

Turning an innovative use of technology into a successful business has been a challenge for Krause, but one made easier with the help of the Technological Research and Development Authority (TRDA) of Florida.

An Energy Solution that has a lot of Horse Power

From hydroelectricity to wind to solar power, renewable energy is one of the cleanest types of power on the planet. Soon, Floridians will add horse muck to this list!

Dr. Jose Sifontes of Sigarca Inc. recently engaged the Technological Research and Development Authority (TRDA) to help demonstrate a Dry Fermentation Biogas Plant at the Southeastern Livestock Pavilion in Florida's Marion County. Once operational, the plant will turn horse waste into clean, renewable bioenergy and produce valuable agribusiness byproducts, all of which have the potential of enhancing energy diversity, creating jobs and boosting economic development for the state's agricultural industry.



Sifontes received \$499,500 from the Department of Agriculture and Consumer Services' Farm to Fuel Grant Award program for the development of the 3,000-square-foot bioenergy plant that will feature his patented, dry fermentation process. The plant will be in operation for one year beginning January 2009. The TRDA, University of Florida-Institute of Food and Agricultural Sciences (IFAS) Extension Office, Marion County, Kenaf USA, Sifontech LLC and Equine Waste Management LLC will assist Sifontes on the project.

The Southeastern Livestock Pavilion produces an average of 35 cubic yards of animal waste per week. This waste will be loaded into containers and placed into the plant's bioreactors, where it will be anaerobically digested in a moist and heated environment. The licensed, compact, innovative and safe process does not produce run-off, noise or noxious odors.

The bioenergy plant will convert a portion (10 cubic yards) of the Pavilion's waste stream into a number of useful products, all with significant energy and positive environmental impacts: renewable energy (biogas),

organic soil and soil tonic (bio-fertilizers). The agricultural products will be bagged and sold to local nurseries and landscaping companies. Biogas produced at the plant will be used to fuel a small, highly efficient, heat and power generator to meet the plant's energy needs.

David Kershaw, deputy director for the TRDA, said one of the project's most important goals is to give the Florida equine industry the option of a cost-effective and environmentally superior method for disposing and reusing animal waste.

"Florida is home to more than 500,000 horses, which produce an estimated 14,000 tons of manure daily," Kershaw said. "The costs to properly dispose of this waste are increasing and disposal regulations are becoming more stringent. Producing renewable energy from such wastes not only provides an environmentally safe disposal alternative, but also helps the state meet renewable energy goals, lower dependency on fossil fuels and reduce greenhouse gas emissions. With today's energy crisis, this is truly something to look forward to."

As part of the project, supporting studies, experiments and analysis will be performed to assess the plant's performance, confirm validity of commercial status, and capacity to produce organic bio-fertilizers and renewable energy. TRDA will be supporting Sigarca with the project management, market analysis and business development tasks throughout the entire two-year long endeavor.

Service-Disabled, Veteran-Owned Businesses get boost from TRDA

How do you say "thank you" to the numerous service-disabled veterans living in Florida? Give them an opportunity to become successful business owners!



In February, the TRDA received a \$37,500 grant from [The Veterans' Corporation](#) that will be used to help service-disabled, veteran-owned business enterprises (DVBES) tap into state and federal contracts.

"Entrepreneurship is a proven way to create and revitalize economic development in the state," said Chester J. Straub, Jr., TRDA's executive director. "Florida has one of the highest concentrations of service veterans in the United States. These are men and woman who sacrificed so much for our country. This program allows us to give something back to these heroes by helping them build and expand successful businesses."

The grant will fund a one-year pilot program. The program will focus on registering Florida DVBES into the state's Vendor Procurement System.

Currently, the Federal Government's Central Contractor Registration (CCR) database contains 865 Florida businesses owned by service-disabled veterans. After a random sampling of 200 of these businesses, TRDA found that only 35 (or 18 percent) are registered in Florida's Vendor Procurement System.

"If this same ratio is applied to all of the CCR records for DVBES, it means more than 700 of these businesses are not registered in the state's Vendor Procurement System," Straub said. "We want to correct that. One of our program goals is to register more than 200 new DVBES into the state system."

As part of the program, the TRDA will also educate procurement professionals at major state departments and agencies about the opportunity to contract with DVBES. Finally, the TRDA will promote the program at the state of Florida Department of Management Services' annual Match Maker Conference and Trade Show, which strives to connect minority and women-owned business vendors with government and corporate spenders.

"The timing of this pilot program is ideal," Straub said. "Currently, there is state legislation, that if passed, would help provide DVBES with competitive advantages in securing state contracts. Our program could help support the activities outlined in this bill. And, if the pilot program gets expanded, it means there will be even more assistance available."

For more information on the program, contact Paul Secor, TRDA's director of technology transfer, at (321) 872-1050, ext. 109, or via e-mail at psecor@trda.org.

TRDA Announces New Board Members, Elects Officers

There are three new appointees on the TRDA board of directors. In February, Gov. Charlie Crist appointed James T. Brown, Ph.D., Lawrence L. Devine and Jack Rood to each serve four-year terms.

One of the first action items of the new board was to elect the 2008-2009 officers at the March 2008 meeting. Peter DiLavore was elected as chair. New members Brown and Rood were elected to serve as vice chair and secretary, respectively. Each officer will serve a one-year term.

"The new board members and officers bring considerable leadership to the TRDA and I look forward to working closely with them," said Chester J. Straub, Jr, executive director of the TRDA. "I would also like to commend Chairman Dan Adovasio and Vice Chair DiLavore on their excellent job in guiding our special district during the past year," Straub said.

DiLavore, a real estate broker and owner of DiLavore Properties in Melbourne, Fla., has served as a TRDA board member since 2003. He is the former president of the Melbourne Area Association of Realtors, a member of the Kiwanis Club of Melbourne, a literacy tutor and board member of the Embers Alzheimer's Day Care Center. DiLavore was also a gubernatorial appointee to the East Central Florida Planning Council.

Brown serves as president of SEBA Solutions, Inc., where he provides project management training and consulting for dozens of Fortune 500 companies, both on a national and international level. He worked for more than 16 years at NASA, serving in team member, project manager and executive-level positions. Brown has received numerous awards for his project management contributions, including the NASA Public Service Medal, "Teacher of the Year" for Industrial Engineering at Florida A&M/Florida State University College of Engineering, and "Engineer of the Year" from the Cape Canaveral Technical Societies.

Devine has more than 30 years of aerospace product and program development experience acquired through careers with the United States Air Force and as a director for business development for Northrop Grumman. He has received numerous certificates and awards for his leadership and expertise from the Defense Advanced Research Projects Agency (DARPA), Sandia National Laboratories and the Massachusetts Institute of Technology (MIT) Lincoln Laboratory.

A 30-year resident of Brevard County, Rood is a partner at Architects in Association, Rood and Zwick, Inc., an architecture and design firm in Cocoa, Fla. He has more than 25 years of community leadership experience, including current positions as a board member for the Brevard Workforce Development Board and the Brevard Library Foundation.

The five-member, TRDA board meets bi-monthly on the third Wednesday of the month. Meetings are held in the TRDA conference room and begin at 1 p.m. All meetings are open to the public. Visit <http://www.trda.org/> for a 2008 schedule.

Those Who Learn, Teach

Ensuring educators have access to life-long learning opportunities is the key to a well-trained workforce. After all, teachers are the bridge to knowledge for our nation's future leaders and workers, and no one understands that better than Braden River High School teacher Gil Burlew.

A dedicated and award-winning teacher who is always looking for ways to make learning an engaging experience, Burlew participated in the TRDA's 2007 Teacher Quest program. Teacher Quest is a seven-week, paid summer professional development program in which K-12 teachers go to work at select science- and technology-based businesses in Florida.

Teachers like Burlew gain valuable industry knowledge and take it



back to the classroom to make math, science and technology studies more exciting and challenging for students. They also acquire knowledge about career pathways and workforce expectations that can be shared with their students.

Burlew, who has more than 28 years of teaching experience, is an engineering technology teacher and head of the Engineering and Leadership Academy at Braden River High School in Bradenton, Fla.

Burlew spent the summer learning about automation and computer integrated manufacturing at Sun Hydraulics. The company is a leading designer and manufacturer of high-performance screw-in hydraulic cartridge valves and manifolds in Sarasota, Fla.

"Working with Sun Hydraulics this summer provided me with the perfect tie in for what our kids will need in the real world," Burlew said. "My students will soon be taking (certification) tests that most kids never dreamed about, and working on specialized machinery, to prepare them as the workforce of tomorrow. As a community, we are helping to better prepare them for their future."

During his tenure at Sun Hydraulics, Burlew learned the skill of Computer Numerical Control, known as CNC. It is the language that translates the process of Computer Aided Drafting (CAD) and Computer Aided Manufacturing (CAM). It is the language that tells the machine how to manufacture the engineer's designs.

Burlew was able to immediately incorporate the technology skills he learned at Sun Hydraulics into his classroom lessons. His students, who range from freshmen to seniors, use these lessons as they work on milling machines, a machine tool used for the complex shaping of metals and other solid materials, that are the same as those used in professional facilities like Sun Hydraulics.

Besides offering technological expertise for the classroom, Teacher Quest gives teachers like Burlew a chance to develop partnerships with the local businesses. "It is not just about going to work at the company, it is about creating a business partnership," said Burlew. Sun Hydraulics provides weekly support, additional training and has given the school a \$1,000 technology grant.

"It is all about opening the door of opportunity," commented Burlew. "The Teacher Quest program provides opportunities beyond just putting in the time and effort. It broadens your horizons and helps you turn out students who are better prepared for the workforce of tomorrow-all because of the knowledge that you gained through this program."

The Florida Department of Education launched Teacher Quest in 1989 to address the growing shortage of middle- and high-school teachers in math, science and technology. TRDA partnered with the Department of Education in 1997 to administer the program.

Nearly 1,200 math, science, and technology teachers from across the state have participated in the program since 1997.

Applications for the 2008 Teacher Quest program are currently being accepted. For more information on participation guidelines, either as a teacher or an employer, visit <http://www.theendeavouracademy.com/TeacherQuest> or call 1-866-263-9564.

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