

# UB BREAKTHROUGHS

THE UNIVERSITY OF BRIDGEPORT RESEARCH REVIEW

FALL 2012

COVER STORY

## Nano Particles Big Collaborations

UB'S TRANSMISSION ELECTRON MICROSCOPE  
MAGNIFIES THE SMALLEST PARTICLES AS WELL AS THE  
OPPORTUNITIES FOR COLLABORATIVE RESEARCH.

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Microgrid

Robot  
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New Look  
for a Native  
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UNIVERSITY OF  
BRIDGEPORT

Opening doors. Building futures.



## From the Vice President

Dear Colleagues,

It is my pleasure to introduce the University of Bridgeport annual research magazine, *Breakthroughs*. This issue features several exciting research projects being conducted throughout the various schools, colleges and departments at the University of Bridgeport. The research endeavors at UB highlight our role as a think tank for new ventures and a 21st century learning center with career-oriented, hands-on offerings in the world of STEM-oriented markets, emerging interdisciplinary fields and international programming.

Following the establishment of the Division of Graduate Studies and Research in 2008, research infrastructure and activities have increased appreciably at UB. A significant number of grant awards has led to an array of funded projects. UB's Seed Money Grant program has provided internal funding that stimulates research in the early stages. Granted equipment, services and licenses round out the awards that have been critically important to developing research efforts. Our faculty supports research efforts of students on all levels, from undergraduate to graduate to doctoral, through mentoring and advising grants awarded directly to the students for their own research.

Research conducted by UB faculty and students is showcased at our annual Faculty Research Day. Faculty from different departments, as well as students, Industry Advisory Board members, community leaders and venture capitalists have the opportunity to learn about our projects, generating significant interdisciplinary collaborations across campus and with the for-profit sector. Of course the establishment of the CTech IncUBator, the first and only university-based high-tech incubator in Fairfield County, has also led to several joint industry/UB R&D efforts.

The ongoing research at UB supports our goal of developing a world-class workforce that is essential to the continuing growth of industries and communities throughout Connecticut, the United States and the world. I hope that you enjoy reading *Breakthroughs* and that it provides you with a glimpse of some of the innovative, interdisciplinary research being conducted by UB faculty and students.



Tarek M. Sobh, Ph.D., P.E.  
Vice President for Graduate Studies and Research  
Dean, School of Engineering

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## Robot Revolution

FROM ROBOTS WITH SWARM INTELLIGENCE TO ROBOTS THAT “PROCREATE,” TAREK M. SOBH ENVISIONS A FUTURE FILLED WITH ROBOTICS.

In a laboratory on the campus of the University of Bridgeport robots are being created to help humans with all kinds of tasks. No, it's not science fiction—it's actually the work of Tarek M. Sobh, Ph.D., P.E., Vice President for Graduate Studies and Research, Dean of the School of Engineering and Distinguished Professor of Engineering and Computer Science.

Over the past few years, the Robotics, Intelligence Sensing and Control (RISC) Laboratory at UB has supported several faculty research projects, as well as those of more than 300 undergraduate, graduate, and doctoral students in the areas of robotics, automation, manufacturing, and computer vision. RISC is equipped for research in robotic manipulation, distributed autonomous control, machine perception and mobile robotic devices.

One of Sobh's current research projects involves the development of user-friendly robotic mobile modular

platforms that move either autonomously or semi-autonomously. “It's a project that I am very proud of,” says Sobh. The design provides a non-expert user with an accessible yet very robust robotic sensory platform on which to further add and develop complex robotic functions, actuators, sensing devices and task descriptions without having to design or delve deeply and create complicated software, firmware or hardware.

This “Plug-and-Play design,” Sobh explains, “permits the short-term installation of cameras, lasers and other sensors, in addition to various robotic actuation devices and electromechanical components, and provides for a very simple software tool without the worry of designing communication modules between the software and hardware. It all comes together automatically, with the code and the control strategy generated autonomously, so that a task is performed with the click of a button.”



The goal of the project is to create a modular design for activating platform sensors and task descriptions, and make this modular design available for multiple applications. For example, if there is a mobile platform or a manipulator with no mobility, different tasks can be performed, such as painting, navigation, 3-D scene recovery, map-building, welding or clean-up, and does not require the users to be robotic experts.

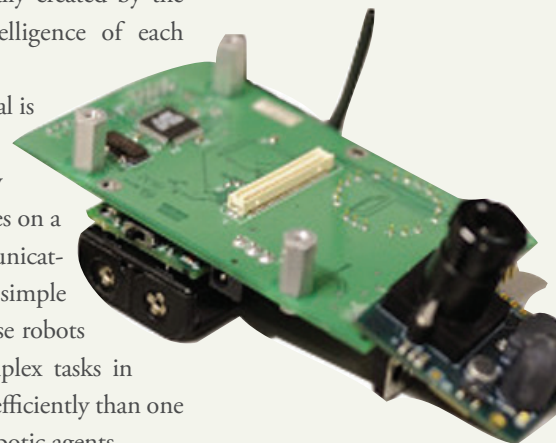
Sobh explains, “It is going to be like a cell phone application, which performs the tasks you need, without you being an expert in cell phones, coding or software design, or in the configuration required for the task that the application is performing. I can drag cameras, ultrasonic and infrared sensors, lasers, and add them to the platform.

**When put together, these robots can perform very significant and complex tasks in parallel much cheaper, faster and more efficiently than one or more very complex and expensive robotic agents.**

Then you tell the phone app what task you want to do. If you say ‘paint,’ the platform and its control strategy and code would be generated and run based on the available hardware, motors and sensors, and the robot will just do its job at maximal efficiency.”

A second project currently in the research and development phase is a robotic swarm collective intelligence behavior project that uses small non-intelligent or slightly-intelligent robots that collectively perform complex tasks. The concept is borrowed from bees and ants, which have very limited intelligence and behaviors but can survive, reproduce, carry out tasks, attack and protect each other if they work in groups or with the entire colony. The overall high intelligence of the group is actually created by the simple acts and moderate local intelligence of each individual.

In the same respect, the project’s goal is to develop very simple and inexpensive robots that individually perform very simple behaviors such as catching images on a camera, moving things around, communicating with nearby peers and doing very simple laser scanning. When put together, these robots can perform very significant and complex tasks in parallel much cheaper, faster and more efficiently than one or more very complex and expensive robotic agents.



Returning to the painting example, Sobh continues, “If you want to paint a room, instead of deploying one smart and very expensive robot, you will have fifty or a hundred smaller and very cheap ones, with limited aptitude. In this case, the small robots would each have location sensors, simple communication modules, and vision capability to be able to move away from each other and start painting their little part of the wall in parallel. You will have the entire room painted in a fraction of the time as one robot, and at a much smaller price tag too.”

The potential applications for swarm intelligence are not only industrial. According to Sobh, swarm intelligence could have significant applications in the defense sector. For example, swarm intelligent robots could replace human reconnaissance in hostile or unfamiliar locations, performing

**The potential applications for swarm intelligence are not only industrial. Swarm intelligence could have significant applications in the defense sector with robots replacing human reconnaissance in hostile or unfamiliar locations.**

the observation and examination of certain places or buildings. These smaller, simpler robots would be minimally equipped with simple processors, controllers, and small cameras. Through ongoing, real-time communication between the robots and a human-staffed “control center,” the swarm could relay critical information, and could also be reconfigured and redirected to different tasks as the situation dictates.

The sustainability of robotic reproduction is also being researched in the RISC lab. In unstructured environments that are inaccessible or harsh for humans, mechanized machines are not only needed to perform certain duties, but they are needed to create other specialized mechanized machines. If two robots, i.e., “mom and dad,” have access to raw materials like iron, plastic, cameras, sensors and so on, they can use them to create a “baby” robot for specific tasks.

“It is a colony project with the idea to ‘procreate’ within the automation area, where robots with a limited number

of tasks and sufficient raw materials can create a sustainable environment that includes assembling and programming other robots to perform new tasks,” says Sobh. To some, this idea might be reminiscent of intelligent machines depicted in futuristic movie classics like *The Terminator* and *The Matrix*, but the possibility is on the horizon and has the potential to provide significant support to human endeavors in a variety of environments and for a variety of purposes.

Sobh is just wrapping up a major research project as part of the Applied Nanotechnology Consortium, conducted with Khaled Elleithy, Ph.D., Associate Dean of Graduate Programs and Professor of Computer Science, and Engineering and Hassan Bajwa, Ph.D., Assistant Professor of Electrical Engineering. Following an earlier award for preliminary research partly conducted at UB by Sobh and select faculty, the U.S. Army awarded \$2.4 million to the Applied Nanotechnology Consortium, a group comprised of UB, the University of Hartford, the University of Connecticut, and area organizations and industry. Dr. Sobh led the UB engineering research team, through the 18-month research project designed to develop army drones.

UB faculty were responsible for developing computer-vision technologies—cameras and algorithms—that process images in the projectiles, and communications. The Consortium was charged with the design and creation of an unmanned device that will carry a video camera over large distances in real time. The aerial drone will provide a soldier with a means of “seeing” a limited range of landscape that would otherwise be hidden from view. The device will most likely be fired from a tube, similar to those used in mortar fire. The images are transmitted back in real time, so that the viewer can see what the device “sees” during its approximately 40 second journey.

Finally, Sobh is working in the area of sustainability with Elif Kongar, Ph.D., Assistant Professor of the Departments of Mechanical Engineering and Technology Management, and an expert in disassembly and green engineering. The idea behind their research is to create an automatic disassembly and recycling system for a product at the end of its life. Sobh brings the possibility of autonomous robotic and sensory activity to take the “dead” product and disassemble it automatically, repairing and/or reusing the good components, and discarding the remaining components. ■



What flies through the air at 150 miles per hour, transmits video images, and is roughly the size of a soda can? If you're not sure, ask Khaled Elleithy, Ph.D., Associate Dean of Graduate Programs and Professor of Computer Science, and Engineering.

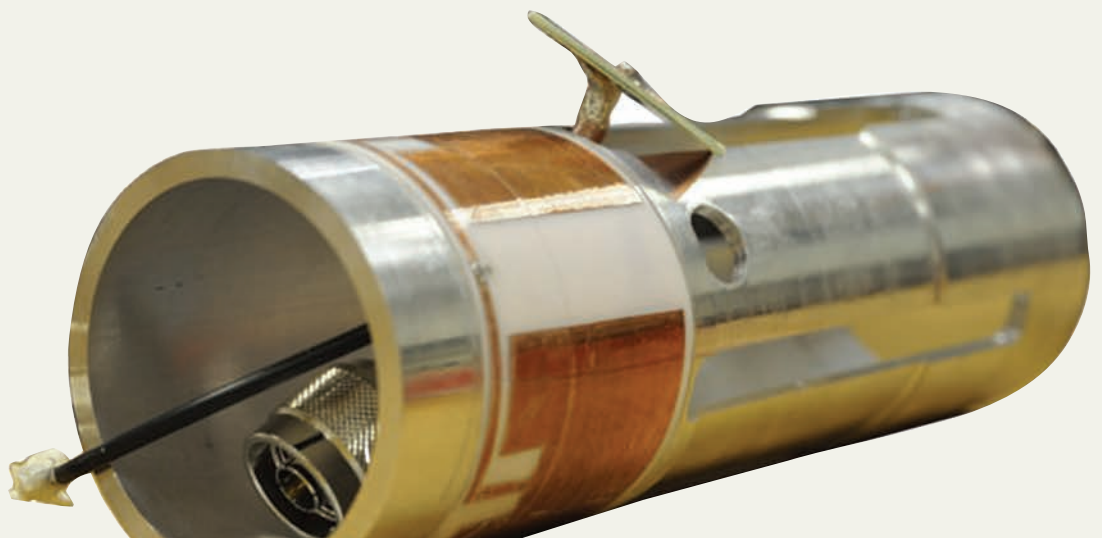
In 2008, the University of Bridgeport, together with the University of Hartford, the University of Connecticut, the Connecticut Center for Advanced Technology and four other private-sector companies began to develop what became a \$2.4 million U.S. Army research project. The multi-organization research group was operated under the auspices of the Applied Nanotechnology Consortium. Elleithy conducted the research along with Tarek M. Sobh, Ph.D., P.E., Vice President for Graduate Studies and

# THE FLYING SODA CAN

Research, Dean of the School of Engineering and Distinguished Professor of Engineering and Computer Science, and Hassan Bajwa, Ph.D., Assistant Professor of Electrical Engineering. "The main goal of the project was to come up with an inexpensive solution to unmanned reconnaissance for military application that could cover more ground and minimize risk to troops," says Elleithy.

The "flying soda can," as the *Connecticut Post* named the device in an article, is officially called an Unmanned Aerial Vehicle—UAV. The main involvement of UB's team was to develop a miniature camera system and sophisticated computer algorithms to facilitate real-time video transmission from the flying device to a base station. Elleithy explains, "We had to design and develop conformal antennas for the flying device that operate on 2.4 and 5 Gigahertz. We also had to ensure security of communications from third party hacking."

Research outcomes have a range of possible military and civilian applications, such as surveillance of an area affected by a natural disaster, such as an earthquake. The "flying soda can" is an inexpensive solution to the challenge of capturing and transmitting real-time images with minimum risk to human life. Most of the UB research was conducted through Elleithy's Wireless and Mobile Communications (WMC) Laboratory, tasked with advancing the state-of-the-art in wireless and mobile communications. ■



LOOKING TO THE WISDOM OF CHEROKEE HEALERS, ONE RESEARCHER STUDIES INDIGENOUS PLANTS USED TO TREAT CANCER AND HIV.

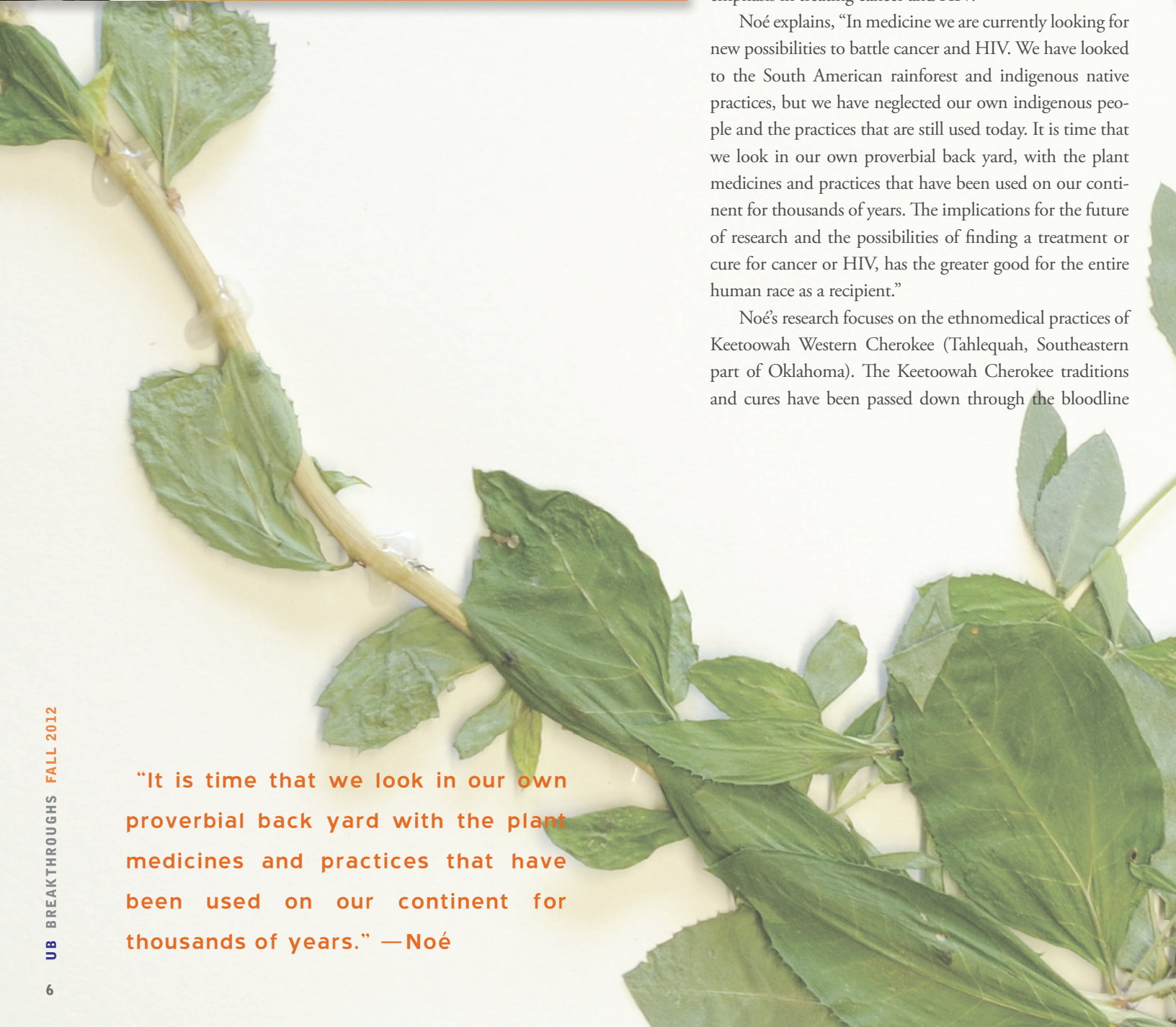


## Healing Wisdom }

In Keetoowah Cherokee traditional practice, native people are treated for diseases, including cancer and HIV, with plants, rituals and prayers. Treatments are handed down from one generation to the next and until now have never been documented. Jody E. Noé, M.S., N.D., College of Naturopathic Medicine professor, has dedicated her career to studying the ethnobotany and ethnomedicine of Cherokee Native Americans, and to the preservation of their oral tradition of medicine with an emphasis in treating cancer and HIV.

Noé explains, “In medicine we are currently looking for new possibilities to battle cancer and HIV. We have looked to the South American rainforest and indigenous native practices, but we have neglected our own indigenous people and the practices that are still used today. It is time that we look in our own proverbial back yard, with the plant medicines and practices that have been used on our continent for thousands of years. The implications for the future of research and the possibilities of finding a treatment or cure for cancer or HIV, has the greater good for the entire human race as a recipient.”

Noé’s research focuses on the ethnomedical practices of Keetoowah Western Cherokee (Tahlequah, Southeastern part of Oklahoma). The Keetoowah Cherokee traditions and cures have been passed down through the bloodline



“It is time that we look in our own proverbial back yard with the plant medicines and practices that have been used on our continent for thousands of years.” —Noé



of Redbird Smith, recognized as the founder and the Chief of the Keetoowah Night Hawk Society. The entire body of research conducted by Noé since the mid 1980s has been assisted, tutelage and mentored by Crosslin F. Smith, Redbird Smith's grandson. During her studies Noé witnessed the success of the treatments Elder Smith was using on his patients.

In 2011, Noé traveled to Oklahoma to collect the botanical specimens of plants used by the Keetoowah

Cherokees for cancer and HIV treatment. Armed with documentation materials and plant presses she began the proper mounting and drying process on site. Noé then visited her alma mater, Old Dominion University where her original ethnobotany collection is housed. Dr. Rebecca Bray, curator of the ODU herbarium and Noé's mentor, assisted with the proper botanical identification of the species collected, thus establishing a collaboration between OCU and UBCNM.

Through the support of UB's Seed Money Grant program and approval from the Dean, Noé was able to establish and equip an herbarium in the College of Naturopathic Medicine. According to Noé, UBCNM's Medical Botany Herbarium is the first and only such herbarium that is part

of a naturopathic teaching facility in the U.S. The specimens Noé collected and preserved are now housed in a museum quality collection at UB.

The second stage of Dr. Noé's research, the analysis of the specimens, will require additional funding and will be done under the mentorship of Dr. Mark Mattie, director of research at University of Bridgeport's College of Naturopathic Medicine. Mattie has extensive expertise in the bioanalysis of active constituents, with other phytopharmaceuticals.

Noé plans to analyze each of the collected botanical species for active constituency and biomechanical composition that would help in the treatments for cancer and HIV.

Noé, a licensed doctor of naturopathic medicine (N.D.) with a private practice in Westerly, Rhode Island, has been studying the teachings of Elder Smith for more than twenty five years and is, in her own right, a practicing Cherokee medicine woman. The biomedical implications of this research and the possibilities of new drug discovery have driven Noé to continue the research that she expects to pursue for the rest of her career. ■





## A DESIGNER CREATES THREE FONTS THAT HELP THE CHEROKEE NATION EXPRESS ITSELF IN NEW WAYS.

For the first time in history the Cherokee Nation has more than one font to express its native language in written form, thanks to design help from Gary Munch, an award-winning letterpress designer who teaches at the University of Bridgeport Shintaro Akatsu School of Design.

Munch's contributions, unveiled recently and now being put to use in Cherokee schools, are the key to preserving their native language, say tribe elders. "Native languages across the world are disappearing and Cherokee is at risk of being lost, even with all the successful programs we have had," says Joseph Erb, of language technology and education services at the Cherokee Nation. "How do you excite your community about your language again? Beautiful fonts are one of the answers. As we continue to grow our language back in the youth, they demand quality technology from our language. Fonts are a very key part of that."

Until Munch unveiled his designs, the Cherokee only had one font in which to properly express their language in writing, and it had been designed in the 1820s. Other fonts for Cherokee had been "designed by people who did not speak or write Cherokee and had characters that were not correct," Erb says. "Think about a world with only one font." Without the Garamonds, Times New Romans, and Bodonis that color the printed world of English and other romance languages, things look pretty dull. Crisp and modern—or fanciful and rooted in tradition—fonts' structure and appearance send strong subliminal messages about content and image. With that in mind, Erb attended a design conference called Typecon 2011, searching for help. There he met Munch from the University of Bridgeport.

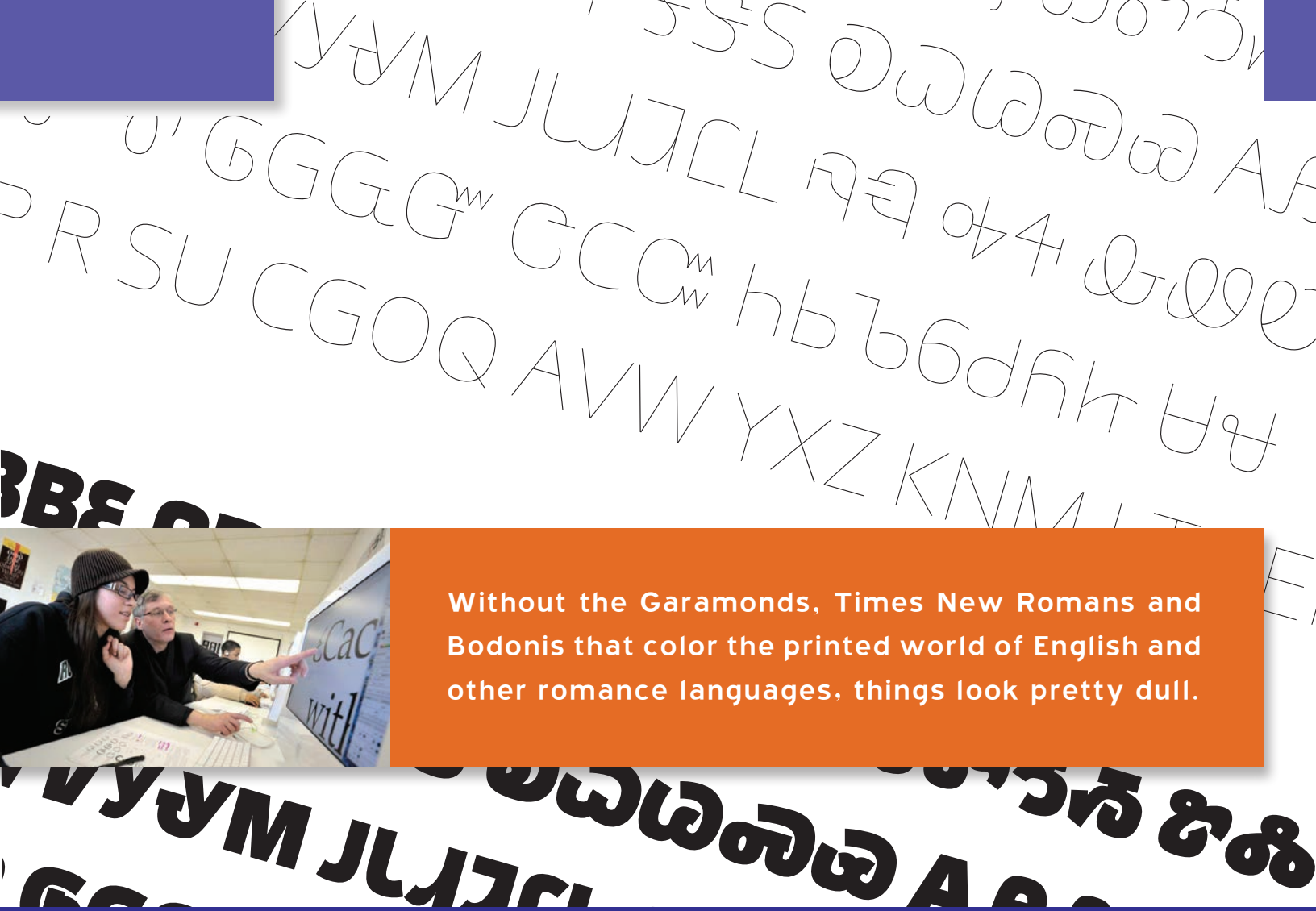
## New Look for a Native Language }

The original Cherokee font, says Munch, "had formalized letters—had similarly shaped, but differently sounded letters in Latin, Greek or Cyrillic, with a very high contrast of weight on strokes and very thin on horizontals. This was fashionable the early nineteenth century, but the Nation wanted a selection of typefaces that were different, expressive, even fun—just as anyone else who uses typefaces looks for just the right one for a variety of messages."

Munch produced three new options: Chancery Modern ProCherokee, a sleek sans serif semi-cursive font; a multipurpose "workhorse" design that he dubbed Neogrotesk Cherokee; and finally, the so-called Munch Chancery Cherokee, a calligraphic font that resembles handwriting, and, says Erb, "is beautiful to look at." In fact, the Nation is using Munch Chancery at its Cherokee Immersion School and by some of the translation staff.

"It would be very difficult to describe how nice fonts of different kinds are in a language that has so few," Erb concludes. "Gary did amazing work. He may not have the ability to read and write our language, but he has very good instincts and ability to work with suggestions to create something new and exciting. He heard our plea for a better written word and used his talents to make our written world better. That is something special." ■





Without the Garamonds, Times New Romans and Bodonis that color the printed world of English and other romance languages, things look pretty dull.

# On Common Ground

What could a naturopathic physician, graphic designer, and literature professor have in common? They all work at the University of Bridgeport, but they're connected in a more unique way. Independently of each other, they have all researched some aspect of Cherokee heritage.

Naturopathic physician Jody E. Noé, M.S., N.D., has been studying the oral medicinal tradition of the Keetoowah Western Cherokee while graphic design professor Gary Munch was busy designing a modern Cherokee font for the Cherokee Nation, at the invitation of a tribal representative. On another part of campus, Diane Krumrey, an associate professor of English, has long been an admirer of Cherokee writers.

When the three found each other at UB's 2012 Faculty Research Day, they took the opportunity to exchange their

ideas and enthusiasm. Krumrey muses, "It's incredible to think that the three of us, from such different fields, were brought together by our interest in a particular Native American tribe's rich heritage, thanks to Faculty Research Day." ■



JULY 12<sup>th</sup>  
- FTIR of Biom...



Nano Particles }  
Big Collaborations }

② By Crystal Pellet  
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③ By EZ OMNIC  
- Use



## UB'S TRANSMISSION ELECTRON MICROSCOPE MAGNIFIES THE SMALLEST PARTICLES AS WELL AS THE OPPORTUNITIES FOR COLLABORATIVE RESEARCH.

The University of Bridgeport is now home to a state-of-the-art Transmission Electron Microscope (TEM) granted to the University through the U.S. Department of Energy's Laboratory Equipment Donation Program, thanks to Prabir Patra, Ph.D., Program Director for Biomedical Engineering and Assistant Professor of Biomedical Engineering and Mechanical Engineering. "We participated in a grant competition and won it. They gave it to the best team and we were proud to have received it," says Patra.

The TEM is part of a growing collection of equipment

at UB critical to teaching and research in biomedical engineering. The TEM transmits electrons that interact with an ultra thin sample to form an image that is captured on a fluorescent screen. It may look like a gigantic microscope, but it's a very sophisticated piece of equipment that is much more complex than

its desktop-sized counterpart. Yes, there are lenses and they have an optical effect, but there's much more. An electron gun emits electrons down through the specimen and the transmitting electrons must be cooled midway through a cooling system made up of liquid nitrogen at  $-130^{\circ}$  Celsius in the middle of the tube. An image is captured at an atomic scale and then magnified onto a screen.

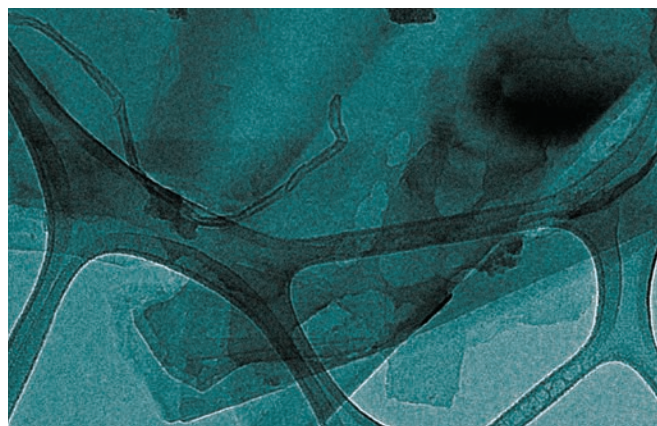
Patra describes the level of magnification and its use in research, "If I take a single strand of your hair and divide it approximately 40,000 times, it will be close to the actual size of the magnified image that you are viewing. This level of magnification helps us understand the structure of particles at very atomic scales, which is really important in biomaterials and biomedical engineering. It makes the connection between nanotechnology and medicine."

Patra received his Master's and Ph.D. degrees from the Indian Institute of Technology (IIT) Kharagpur, India and did his postdoctoral research at the University of Massachusetts Dartmouth and Rice University. He came to UB as a mechanical engineering faculty member in January of 2009 and spearheaded the establishment of a new master's degree in biomedical engineering, simultaneously establishing and developing his research trajectory. He currently works with a core research group of four Ph.D. students and 20 Master's students. Patra was nominated for the prestigious DuPont Young Faculty Investigator Award for 2011, a nomination which is an enormous honor.

While Patra's lifetime research focus is on nanomaterials and nanocomposites and their use in medicine, his scholarly passion and intense energy have helped Patra engage a growing group of faculty and students at UB and beyond to take part in cutting edge research. UB collaborators include faculty in mechanical engineering, computer science and engineering, electrical engineering, chemistry and biology.

Patra explains, "It is a very interdisciplinary area, where mechanical engineering meets biomedical engineering, computer science and design, but they can't do anything without chemistry. That's where Dr. Santiago comes in." Dr. Angela Santiago, Associate Professor of Chemistry at UB explains, "It is not about organic or inorganic chemistry, it is more about the different factors involved, such as temperature and pressure. It's about researching all the science and engineering aspects of the materials we are developing."

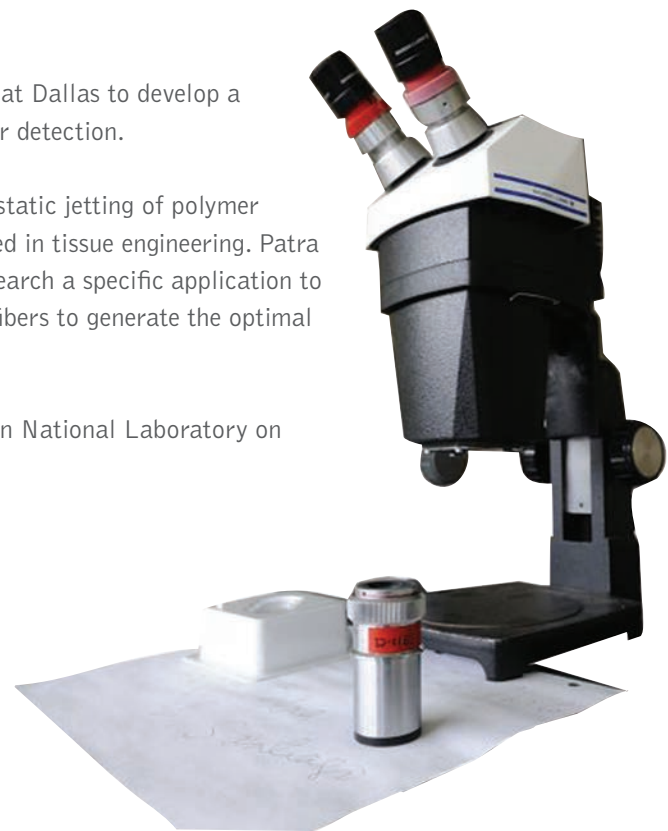
Additional collaborating teams include researchers from Harvard, Wesleyan, Rice, the University of Texas at Dallas, Cleveland Clinic, and Brookhaven National Laboratory. Together with the TEM, other equipment, and inter-organizational collaboration, UB faculty and student researchers have the infrastructure needed for important cutting-edge research. ■



The eight research projects that Patra and students are currently involved in include:

- The study of nanotechnology and nanomaterials to develop an artificial connective tissue network known as Carbon NanoTube PolyDiMethylSiloxane (CNT/PDMS). This research is being conducted with colleagues at Brookhaven National Laboratory, Rice University, and other institutions. This specific study is part of a larger research interest to investigate the orientation and alignment of nanofibers in order to design structurally tunable scaffolds for tissue engineered materials that can lead to advanced materials such as artificial skin, wound healing bandages and filters, to name a few.
- An investigation of the unique biological dispersion of graphene, a two-dimensional, anatomically thin, honeycomb-shaped carbon crystal structure and its binding effectiveness with proteins identified in Alzheimer's. This collaborative research involves faculty and student researchers at Wesleyan University.
- The development of an "invisible ink"-based diagnostic tool for the rapid screening of tuberculosis, with an eye on being cost-effective and requiring no special storage or laboratory facilities in order to be available to developing nations.
- A pilot study to establish precise graphene signatures of Graphene Nanoribbons (GNR) by manipulating the conductivity of the GNR surface in order to explore its use in Nuclear Magnetic Resonance (NMR). This study has the potential to develop a new biological contrast agent for MRI use. Yale University's Core Center for Quantitative Neuroscience with Magnetic Resonance awarded a P30 grant to Patra for this work. The grant provides the use of a vertical bore 11.7T system, along with NMR scans, the reagents used for sample preparation, and the technical support of the Center's scientists, technicians, and engineers.
- A study of graphene nanoribbon-DNA self assembly, conducted at Brookhaven National Laboratory.
- Research in collaboration with a colleague at the University of Texas at Dallas to develop a microelectrode-based point of care diagnostic tool for hs-CRP biomarker detection.
- The study of nanofiber orientation and alignment through the electrostatic jetting of polymer nanofibers and the inkjet deposition of conductive formulations to be used in tissue engineering. Patra and students are working with researchers at the Cleveland Clinic to research a specific application to identify determinants for the fabrication of electrospun composite nanofibers to generate the optimal tissue scaffold for use in the prevention of aneurysms.
- A University of New Haven research project conducted at Brookhaven National Laboratory on biofilms and nanostructures.

**SCHOLARLY PASSION AND INTENSE ENERGY HAVE HELPED PATRA ENGAGE A GROWING GROUP OF FACULTY AND STUDENTS AT UB AND BEYOND TO TAKE PART IN CUTTING EDGE RESEARCH.**





## Comprehension Counts }

### READING AND SCIENCE ARE UNLIKELY ALLIES IN THE QUEST TO IMPROVE LITERACY IN ONE HIGH MINORITY, HIGH POVERTY URBAN SCHOOL.

A passion for a controversial and cutting-edge research topic might not seem to be a description one would associate with the genteel Margaret Lally Queenan, Ph.D., Assistant Professor and Associate Dean of UB's School of Education, but it's correct. Queenan is now in the sixth year of conducting research on strategies that incorporate science content into reading comprehension instruction.

Working with third and fourth grade students at an urban school in Connecticut, Queenan seeks to answer the question, "Can students learn reading comprehension strategies and science content concurrently?" Six years ago, Queenan began a qualitative study at Striving Elementary School (a pseudonym), an urban school with high poverty, high minority, and low

preschool experience students.

The main purpose of the research is to determine whether or not comprehension strategies can move students towards proficiency and enable them to better understand science content in the context of science standards. Students are monitored in their progress of learning and using reading comprehension strategies, particularly visualizing (picturing), making inferences (figuring out), monitoring comprehension (their own) and synthesizing (putting it all together), as well as determining importance (noticing), asking questions (wondering) and connecting (relating the information in the science article to their own lives, other articles, and the world at large).

"Each year has a different twist," says Queenan. "In addition to the reading compre-

hension strategies, I try to consider different aspects every year. I have looked into motivation, the effectiveness of working in small groups, and the application of reading comprehension strategies to writing. The results are very interesting. Children are motivated by surprising qualities such as color, so the visualization strategy plays a very important role here. If I give students color handouts when children are reading about science, they will be more engaged, understand the concept better, and learn more quickly than when I use black and white handouts," says Queenan.

Children are also motivated by the social interaction of working with their partners and friends. One way students share their readings is to have another student explain a concept

# BREAKTHROUGHS in Education



that they might have missed in the reading. Then when they go back to their reading, they understand the concept better. Another motivating factor is the avoidance of being scolded by their teachers for doing something wrong or for not doing their work. Children are not always seeking rewards or praise; sometimes they just don't want to get in trouble for not respecting the rules or for not doing their homework.

In the matter of writing, Queenan notes that the reading strategies have vastly improved writing. She explains, "If one is visualizing while reading, one is able to visually depict the concept while writing it down. If one is self-generating questions while reading, one can write those questions as a tactic, and then ask and answer them, so the reading comprehension strategy really improves one's writing. That is lovely."

At Striving Elementary School, there are many students from other countries who, despite classes for English language learners, struggle to read their schoolwork, especially the science content. Last year, Queenan taught the concept of electricity, a difficult concept, especially for children who lack English speaking and reading skills.

In order to help students understand the idea better, Queenan used the visualization strategy again. "I would read the text out loud, draw the ideas, and the other children would draw what they were seeing also. Then, the English language learners would draw what they saw and we would compare the drawings. It was one way to help students understand what the concept of electricity was all about. They loved the topic, I think because they had a guest speaker from the electric company who got them all excited about it." Now, Queenan is teaching students in third grade about animals and their survival skills. So, even the topics of their lessons can play a motivational role.





“The school principal and the district’s literacy director think that my being in the classroom is also providing staff development for the teachers, as I model the way I teach and the teachers continue the lesson after I leave,” says Queenan. At first, she found that teachers were bothered by the extra noise in the class, especially when students began working in small groups of six. The solution was to organize the time so that there was a certain amount of time dedicated to the lesson, to the children applying the lesson, and then to the sharing of the concepts learned. This alleviated the teachers’ concerns since only one third of the class period was dedicated to group work and that was “good” noise. “Professors follow my example. I meet with the five third grade teachers at lunch time and we talk about the lessons, the classes, the children, and their progress,” explains Queenan.

This is a qualitative, ethnographic study, so Queenan’s primary data collection occurs through observations and collecting artifacts of students’ work. The years invested in this research, along with a few small grants from UB’s School of Education, have helped transform Queenan’s passion to learn what helps struggling readers improve into tangible results. The grants helped her purchase NVivo, qualitative data analysis research software that helps organize and analyze data, inputting information until the an aspect of the data has been “saturated,” or all that can be learned from a category has been learned. Grants also helped with the purchase of trade books (books that can be bought at a bookstore), which are more appealing and fun for the children than the regular textbooks and heavy anthologies often used in the classroom.

Queenan has always been very interested in children’s ability to comprehend. She says, “It’s critically important for them, no matter what they are reading, whether it is a

math book, a social studies book, or a science book. They have to be able to comprehend.”

This entire research was presented in several papers, including “Helping Urban Teachers Help Students Read Science: A Partnership,” at the 2010 Northeastern Educational Research Association (NERA) Annual Conference. “They have asked me to work on their committee for teacher research since that was the area of my doctoral research,” adds Queenan. She has also published in the *Journal of the Advancement of Research* and in the *New England Reading Association Journal*, among others. Queenan also presented a paper on the results of her work with third graders for the 2011 Literacy Research Association conference.

Queenan explains, “Many people have been researching these comprehension strategies. Many people I highly respect say that the use of these comprehension strategies is the one proven factor in increasing students’ ability to

comprehend. Many insist that what needs to be reported is not just dependent and independent variables-type of quantitative research, but qualitative research, as well,

**“If one is visualizing while reading, one is able to visually depict the concept while writing it down.”**

**—Queenan**

the kind that reports what is actually occurring in the classroom, so you can have a portrait of the children at work.” Queenan aims to provide just that—a portrait of urban children accompanied by detailed descriptions and valuable research findings.

Queenan remembers how difficult it was to get into a school and start collecting information, mostly because teachers are not very comfortable with having researchers in their classrooms. She used to do considerable work with the Connecticut’s Department of Education and eventually met a colleague who invited her into Striving Elementary School. Six years later she concludes, “I don’t want to leave.” ■





## Rethinking Recycling }

“ With the continuous development of technology in today’s world, the total life span of electronic products is no more than a few years . . . The economically and environmentally sustainable option is to reuse these components in technically valid products. ”

—Kongar



## A TEAM OF RESEARCHERS INVESTIGATES AN AUTOMATED WAY TO REUSE, RECYCLE AND REMANUFACTURE ELECTRONIC COMPONENTS.

**H**ave you ever stopped to think about what happens to your cell phone, desktop computer, TV or other electronic device after you've discarded it? The question of what to do with old equipment has long piqued the interest of academia and industry alike, generating numerous journal articles and the commerce of disassembly, recycling and disposal. Part of the interest is in the recovery of valuable components while other interest lies in the proper treatment of hazardous parts.

The disassembly of end-of-life products, i.e., products that have a useful life but for which there is little to

no demand, is an established industry, and cost recovery is partly managed by recycling and reusing viable materials and components. Some may think that's the end of

the story. "Not so fast," says Elif Kongar, Ph.D., Assistant Professor of Technology Management and Mechanical Engineering at the University of Bridgeport. "While there are many recycling centers and companies that specialize in this disassembly, these operations are complex, time-consuming, and expensive. Some cost recovery occurs through the resale of valuable materials, such as silver and copper, and reusable subcomponents. Still, multiple uncertainties render the process to be a costly one because it is labor intensive," she explains.

Green engineering through sustainability and disassembly is now being looked at in a new way by Kongar and her research partners Tarek M. Sobh, Ph.D., P.E., Vice President for Graduate Studies and Research, Dean of the School of Engineering and Distinguished Professor of Engineering and Computer Science at UB; Surendra M. Gupta, Ph.D., Department of Mechanical Engineering and Industrial Engineering at Northeastern University; and a doctoral engineering student at UB. "The whole paradigm of green engineering is 'reuse, recycle, and remanufacture,' and that is just what we are trying to do with the end-of-life electronic products, but through an automatic electronic method," says Sobh.

Kongar further explains, "With the continuous development of technology in today's world, the total life span of electronic products is no more than a few years. Most of the time, products are being discarded before their materials degrade. The economically and environmentally sustainable option is to reuse these components in technically valid products. The main problem is that actual disassembly operations are very complex, time-consuming and expensive to run with human labor." The process of assembly is straightforward: the blueprint is created and implemented, but disassembly is not that process in reverse.

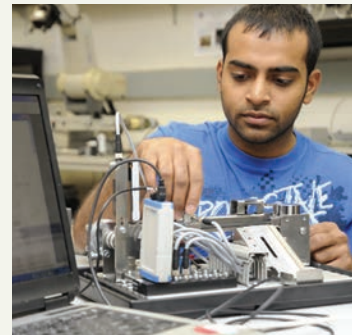
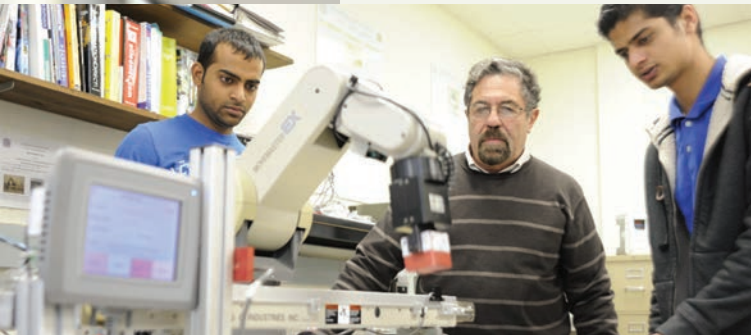
The team proposes a new model for disassembly that employs robots and introduces the use of an online dynamic genetic algorithm to conduct an "intelligent" survey and assessment of modular components, followed by the coordination of the disassembly process.

According to Kongar this allows for a time-effective assessment of both typical and uncommon alterations that may have been made after product purchase through repair, upgrade or to meet personal preferences.

The disassembly "cell" consists of an industrial robotic manipulator fitted with a webcam, and a PC enhanced with additional hard drive and RAM that is programmed with component segmentation and range-sensing visual algorithms. The algorithm streamlines this process to maximize flexibility while minimizing the time needed to complete the disassembly task.

Preliminary results obtained through the development and testing of a prototype are promising. While little research has been conducted on this environmentally driven and economically promising method, it may be exactly what is needed to be able to manage the volume of end-of-life products that seems to be growing exponentially in this era of technology explosion.

A technical description of this model can be found in an article published in the March 2012 issue of the *Journal of Intelligent and Robotic Systems*, "A Robotic-Driven Disassembly Sequence Generator for End-of-Life Electronic Products." ■





## Adaptable Planet }

### AS EARTH'S CLIMATE CHANGES WILL PLANTS BE ABLE TO ADAPT?

Plants are sensitive to temperature, as are humans and animals. In fact, the survival, growth, and reproduction of all living organisms are affected by the ambient temperatures of their environment. However, unlike humans and animals, plants aren't mobile and consequently, must find other ways to adapt to a changing environment. Plants play an important role in our health and well-being. They are a mainstay in human and animal diets, are a natural source of many medicinal compounds, and are becoming an increasingly critical part of bioenergy production.

Kathleen Engelmann, Ph.D. in Ecology and Evolutionary Biology, was interested in studying how genes play a role in determining a plant's response to surrounding temperature fluctuations. The findings of such a study are especially important for economically important species. As Engelmann explains, "This research is likely to become more important as global temperatures increase."

With the support of a UB Seed Money Grant, Engelmann conducted the study, Genetics of Variation in Thermal Tolerance, to address several fundamental questions in ecological genetics, using the small flowering plant, *Arabidopsis thaliana*. The plant was selected for its widespread use as a model genetic organism. Major research questions included: What are the major regions of the *Arabidopsis* genome that control the response to thermal variation? Is there standing genetic variation to thermal tolerance in natural accessions of *Arabidopsis*? If so, is that variation geographically distributed in such a way as to be consistent with adaptive evolution in this species? Different *Arabidopsis* strains were studied to determine whether or not responses to temperature variation were gene dependent.

Engelmann notes that while it is widely appreciated that ambient temperature in most terrestrial systems varies, often substantially, the majority of studies on plant growth and physiology have been conducted under steady or minimally fluctuating temperature regimes. In their natural environment, plants and other organisms with limited mobility must cope with temperature fluctuations by altering their growth and development. This involves the integration of multiple external signals, including temperature and light, for the regulation of development from germination to growth to flowering stages.



Plants depend on the perception of both high and low temperatures, both for their survival and for the regulation of key developmental events. In fact, temperature



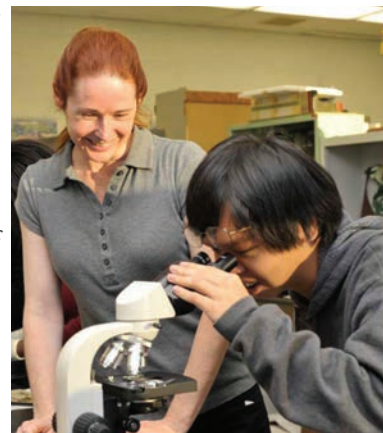
signals play a major role in the regulation of seed dormancy, growth rates, morphology, and competence to flower. Plant responses are sensitive to the genetic background of the ecotype being tested, the vernalization (the long cool winter periods required to induce flowering) status of the plant,

and both the mean daily temperature and the daily highs and lows. Recent studies in *Arabidopsis* and other plants have shown that growth and reproduction under fluctuating temperature differs from growth under steady temperature conditions and that the response to fluctuating temperatures is under genetic control, although the regulatory mechanisms are yet to be defined.

Previous research conducted by Engelmann demonstrated that a Spanish ecotype of *Arabidopsis*, Ts-5 (Tossa de Mar, Spain), had much greater seedling survivorship than the common lab strain Col g(1) (Columbia, glabrous mutant, also the parent strain of a well mapped set of recombinant inbred lines) under elevated ambient temperatures and at temperatures that range from 35°C during the daytime to 4°C at night. This finding and those of other researchers led Engelmann to conclude, “Clearly understanding temperature response pathways requires an understanding of how gene action interacts with hormone regulators to produce phenotypic variation. Evidence to date strongly suggests there are multiple pathways involved in temperature response. However, few studies have set out to test the response to variable temperature and relatively few address the degree of standing natural variation.”

Engelmann’s research consisted of two experiments, using environmental chambers to compare growth under a temperature regime that fluctuated daily from 12°C to 32°C versus a constant 22°C growth environment.

The first experiment employed two *Arabidopsis* strains: (1) a panel of recombinant inbred lines derived from a cross between Kas-1, a wild ecotype from Kashmir, and (2) Col g1, a commonly used lab strain. These strains are known to segregate for several genes of known importance to *Arabidopsis* growth and development, some of which are temperature sensitive. The second experiment analyzed the expression of genes found in regions of the plant genome that may be involved in the response to fluctuating temperature.



Plants were checked daily for production of new leaves and mortality. Data was recorded when the first, second, and fourth pair of true leaves were visible, and when flowering was initiated. For each time point, the date was recorded and, where appropriate, length, width and petiole length of the largest leaf, leaf angle, number of leaves, and rosette diameter were recorded. Analyses of survivorship, growth rate (measured as leaf number doubling time), flowering time, and shade avoidance (leaf shape and angle) were analyzed for significant differences.

Results demonstrated that many of the major regulatory genes controlling growth and flowering did not appear to regulate these functions under summer-like field conditions and, in fact, there appeared to be far fewer regulatory Quantitative Trait Loci (QTL) under these conditions. This loss of regulatory QTLs was correlated with a loss of phenotypic correlation between traits and a loss of fitness observed under these conditions. Furthermore, there are several important regulatory genes that have different expression profiles under fluctuating versus constant temperatures.

Biology undergraduates had the opportunity to work closely with Engelmann throughout the study and co-present the findings at an annual meeting of Society for the Study of Evolution. ■

**“This research is likely to become more important as global temperatures increase.”**

**—Engelmann**



## The Proprioception Connection

“

We have sensory receptors in our neck,  
in our eyes and in our ears that allow us  
to sense where we are.

All three sensors have to work together in order  
for us to have balance and  
coordinated motion. ”

—Funk



## DOES NECK PAIN INFLUENCE OUR SPATIAL PERCEPTION? ONE STUDY INVESTIGATES THE LINK BETWEEN PROPRIOCEPTION AND PAIN.

**M**atthew F. Funk, D.C., Associate Professor in the University of Bridgeport College of Chiropractic, in collaboration with Dr. Richard Saporito, also a member of the Chiropractic faculty, conducted a pilot investigation into differences in neck proprioception between asymptomatic subjects and those with cervical pain.

Proprioception is a sense or knowledge of position, posture and equilibrium of the body. “We have sensory receptors in our neck, in our eyes and in our ears that allow us to sense where we are. All three sensors have to work together in order for us to have balance and coordinated motion. So we took out the visual part, and we were trying to see if we can measure an individual’s ability to get back to the starting neutral point using position sense alone, and how that might vary by gender, age, presence or absence of neck pain,” says Funk.

Subjects in the study were seated on a chair with a screen in front of them. They were blindfolded and wore a bicycle helmet equipped with a laser pointer. Subjects were first asked to look straight ahead, which was considered the neutral point, as well as move their heads in each of the six cardinal directions (flexion, extension, left lateral bending, left lateral rotation, right lateral bending and right lateral rotation) and return to the neutral point. Movements of each subject were measured and recorded.

The project investigated the effects of any treatment and the levels of neck pain in the subjects after treatment, measured again with the same device. The efficiency of the treatment was taken into consideration by the differences in the neck’s ability without visual clues to return to the neutral point.

“When we are on a boat, the wave movements make our inner ear receptors move, but our eyes don’t match that, and we start to feel a little queasy. That’s an example of how much our eyes, inner ears and muscles and joints of our neck receptors interact with each other. It all happens automatically. Even when sitting on a chair, there is information transmitted from your brain to your neck on how to keep your head still, focus on different things and so on. So, we are trying to measure how the ear and neck proprioception is supposed to function without the visual information.”

The main research was conducted on chiropractic students, but the initial findings indicate that there are differences in gender, age, between subjects with neck pain and those without. Funk would like to extend the research onto a broader population, since that could give more information about the types of treatment, and then formulate the details and conclusions of the project.

This project is significant because while there is a growing body of evidence regarding the effectiveness of manual therapy procedures (massage, manipulation and mobilization) for different types of neck pain, the treatment of neck pain and its effects on proprioception is not as well studied. The outcomes of this study were presented at UB’s 2011 Faculty Research Day and at the 2012 Association of Chiropractic Colleges Research Agenda Conference, held in Las Vegas, Nevada.

Funk has always had an interest in evidence-based practice. In fact, he started his involvement in scholarly publications even prior to his appointment to UB. Funk is not only involved in considerable research and service activities, but also serves double duty as a clinician in the outpatient clinic, supervising fourth-year chiropractic interns and as a lead professor in clinical sciences courses. ■



### IS CORRUPTION AN INTERNATIONAL CRIME, AND WHO HAS THE RESPONSIBILITY TO PROTECT AGAINST THESE CRIMES AND PROSECUTE THE PERPETRATORS?

David O. Benjamin, Ph.D., Associate Professor of Global Development and Chair of the master's program in Global Development and Peace, has a full schedule that includes three publications under development, a full teaching load of undergraduate and graduate courses, advising students' MA theses, co-advising the UB WorldQuest team, and serving as a member of the Editorial Advisory Board of UB's *Journal of Global Development and Peace*. Still, he makes time for studies into corruption as an international crime, the "Responsibility to Protect" as a norm for international criminal law, and the "Responsibility to Prosecute."

One of Benjamin's recent papers compares the implementation of the "Responsibility to Protect" in Libya and the Ivory Coast. In the case of the Ivory Coast, former President Laurent Gbagbo refused to accept his loss in the November 2010 presidential election, instead using his control over the military, finances, and state resources to instigate intimidation tactics. Ousted President Gbagbo unleashed his private army that included mercenaries and former child-soldiers, on the Ivorian people, forcing a massive flight of the population to adjacent Ghana. In April 2011, a French military mission, along with Gbagbo's successor, Alassane Outarra's own army, found Gbagbo hiding in a dungeon within the presidential palace. The International Criminal Court has since indicted Gbagbo for crimes against humanity and war crimes.

"I am comparing the resolutions and actions of the UN Security Council in Ivory Coast with what happened in Libya in early 2012," says Dr. Benjamin, about a paper presented at the 2012 Annual Convention of the International Studies Association.

Benjamin is also preparing his presentation from the 2011 International Studies Association Convention, "Whose Responsibility to Protect?" for publication. The paper re-examines the "Responsibility to Protect" as a norm in International Law. Benjamin explains, "I went back to the Charter of the UN to the original articles for the formulation of the concept of the protection of people, the way it was originally envisioned by the architects of the UN. I was testing the hypothesis that the concept of the 'Responsibility to Protect' is not new, and there is a linkage between the



Preamble to the Charter and the 'Responsibility to Protect.' They go hand in hand. The details lie in the original formulations of the Articles of the Charter of the UN."

Benjamin has recently been contracted by the publisher Routledge to author a book about Kleptocracy as an International Crime. Benjamin explains, "Kleptocracy means that state resources and assets are deliberately stolen by those who have absolute political power. Institutions of justice are subverted

precisely so kleptocrats cannot be prosecuted. They protect the kleptocrats but they don't protect the people against the kleptocrats. After it's all long done with, kleptocrats get to walk away and enjoy their lives of wealth while the people exist in absolute poverty, war and destitution."

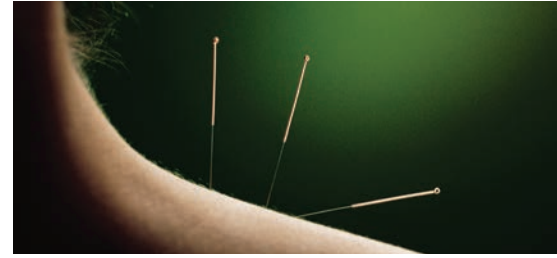
Benjamin applies this definition to former first lady of the Philippines, Imelda Marcos, who lives a pleasurable life of wealth and splendor while the Philippines is still an extremely poor country. It is obvious that the state doesn't have the institutional capacity to prosecute kleptocrats, so it is up to the international community to charge them for their crimes, crimes that Mobutu Sese Seko, "Baby Doc" Duvalier, Charles Taylor, and others have committed.

Although everything seems so dark and hopeless, "Dr. B," as students call him, is still positive about progress made in the fight against corruption and prosecuting kleptocrats. Liberia has turned an important corner in seeking good governance. Unlike former President Charles Taylor, who transformed Liberia's national treasury into his own bank, the current president, Ellen Johnson Sirleaf, a Harvard educated economist, has turned the economy around to the extent that, within the first six months after elections, every civil servant was paid on time.

"So it works!" says Benjamin optimistically, "You just need a functioning democracy that would build or rebuild the institutions of governance that would have accountability, a civil service that recognizes and obeys the rules and the laws, a government that is not corrupt and a judicial system that does what it is supposed to do—interprets, upholds and enforces the law irrespective of who it is. It is not an overnight project, but it is possible!" ■



## The Importance of } Teamwork }



### INTEGRATED TEAMS OF MEDICAL PROFESSIONALS MIGHT CHANGE THE FACE OF TRADITIONAL MEDICINE.

Jennifer Brett, N.D., Dipl.Ac., Director of the Acupuncture Institute, has initiated a research study in conjunction with the new University of Bridgeport Health Sciences Integrated Clinic. As part of the study patients will be seen by four student interns, one from each of the University of Bridgeport's health science programs with clinical components: College of Chiropractic, Acupuncture Institute, College of Naturopathic Medicine and Fones School of Dental Hygiene. Brett explains that while the main focus of this integrated clinic is to help patients, she is intrigued to research how interns' attitudes and behaviors change through working in an integrated environment.

A team of student practitioners from each of the four health programs will assess the patient using their specific methods and will complete a general medicine evaluation. The interns will gather clinical evidence to diagnose any health problems, and then develop one integrated plan they have determined to be best for the patient.

The focus of Brett's study is to determine if the integration of all four areas of medicine effects any changes to the students' abilities to work in groups consisting of practitioners from different medical backgrounds.

"The outcomes will be interesting since our students don't otherwise get a chance to work together professionally. They have to learn to appreciate their own strengths and weaknesses to determine the best plan that will benefit the patient, even if they have to give up their 'personal favorite' types of care. If we focus on the patient first, does that change what we do?" Brett asks. Her main concern is whether or not inter-professional education can work in traditional medicine, where no one type of practitioner is "in charge" of the entire patient care.

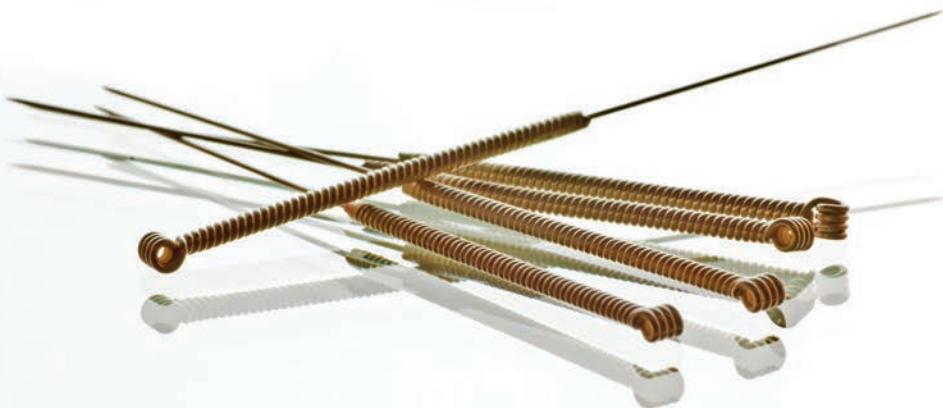
In addition to her current research, Brett is also developing a grant proposal to study safety and side effects in acupuncture practice. According to Brett, similar research about the risks and the reactions that could result from insert-

ing needles under the skin has been conducted within the past 12 years in England, Spain and Korea but not in the United States.

The consensus of the National Institutes of Health's National Center for Complementary and Alternative Medicine (NCCAM) is that acupuncture is safe and NCCAM is not certain that a teaching clinic is the best locale for this type of research, so Brett is investigating other sources of grant funding for the study. Laying out the advantages, she explains, "Technically, as a teaching clinic, we can gather more data about effects and adverse events over a shorter period of time than can a group of private practitioners, many of whom see less than 30 patients a week. If we combine the information from our clinic with several other teaching clinics, we can compile data on thousands of acupuncture treatments each week." ■

“If we focus on the patient first,  
does that change what we do?”

—Brett

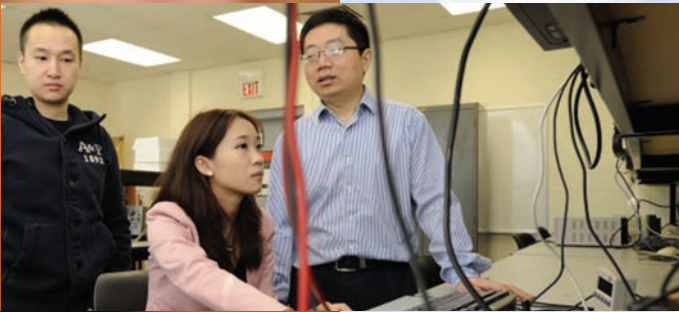


## Feeding the Microgrid }

“ It is urgent to train a new generation of engineers who are able to harvest, convert, and store sustainable energy as well as to integrate this energy into the power grid. ”

—Zhang





## THE UNIVERSITY OF BRIDGEPORT'S RENEWABLE ENERGY RESEARCH LABORATORY IS HELPING RESEARCHERS FIND NEW WAYS FOR THE NATION TO UTILIZE MORE RENEWABLE ENERGY RESOURCES.

According to the U.S. Energy Information Administration's report on Trends in Renewable Energy Consumption and Electricity 2009, only eight percent of the nation's 94.628 quadrillion Btu energy supply comes from renewable energy sources, primarily biomass (51 percent), followed by hydroelectric (34 percent), with ten percent or less produced by wind, geothermal, or solar sources.

With a recent government goal of having 80 percent of America's electricity come from clean energy sources, Linfeng Zhang, Ph.D., is driven to conduct research and develop courses for the next generation of electrical engineers. "It is urgent to train a new generation of engineers who are able to harvest, convert, and store sustainable energy as well as to integrate this energy into the power grid," Zhang explains.

Turning his ideas into action, Zhang has established the Renewable Energy Research Laboratory at the University of Bridgeport. In this lab, experimental studies can be conducted on wind electricity, solar electricity, hydrogen fuel cells, rechargeable batteries, and power electronics. In addition, a grid-tied microgrid was proposed and set up with distributed energy sources and storage. Technologies

in communication, controls, parallel computing, and data acquisition are used in the power system management for an optimal power flow and enhanced reliability. Moreover, software, such as ETAP, HOMER, and SCAPES, can be used for power system analysis and the design of solar cells.

In 2008, Zhang received a UB Seed Money Grant award that funded research into fuel cells and chemical sensors. Zhang is currently midway through a large-scale project involving 64 collaborating institutions. "A Nationwide Consortium of Universities to Revitalize Electric Power Engineering Education by State-of-the-Art Laboratories" is a three-year undertaking funded by a \$2.5 million grant from the U.S. Department of Energy to the University of Minnesota.

The students at UB are involved in renewable energy research through their course work. Over the past few years, Zhang has developed six graduate-level electrical engineering courses that focus on sustainable energy: Sustainable Energy, Sustainable Energy lab, Fuel Cells, Solar Energy and Solar Cells, and Hybrid Vehicles. Design, testing, data collection and analysis are all critical components to the research that has the potential to shape and define industry-adaptable practices. ■



## Dueling IPOs }



## ANALYZING THE DIFFERENCES BETWEEN THE U.S. AND CHINESE FINANCIAL MARKETS.

**N**asdaq. Dow. S&P 500. Just turn on a TV, radio, computer or smart phone, and you can find updates on the performance of stocks, as well as bonds and commodities. The dynamic nature of the U.S. stock market is a well-known element of the free market system. Chances are you're impacted by market fluctuations even if you don't personally invest, because your retirement plan is likely investing on your behalf.

When a corporation decides to go public, the anticipation of significant stock appreciation lures investors to the company's initial public offering (IPO) on its first day of trading, as evidenced by the hype over Facebook's IPO launch. That hype, followed by an unexpected poor performance, only served to magnify the disappointment of Facebook's IPO.

Unlike Facebook's IPO performance, however, the average first-day return on IPOs in the U.S. is around 20 percent, according to Congsheng Wu, Ph.D., Professor of International Finance. Wu contrasts this with Chinese company IPOs, which typically experience up to a 200 percent first-day return in China. The distinction is interesting by itself, but becomes even more so when comparing the IPO first-day return of a Chinese company in China, versus the same company's IPO first-day return in the Hong Kong and U.S. markets. This dichotomy of performance is the focus of Wu's ongoing research.

The conditions are complex, Wu admits, since China's market is much newer and the Chinese government imposes numerous regulatory constraints on Chinese companies. However, while these conditions might prompt a Chinese company to pursue listings first in Hong Kong and the U.S., they cannot account entirely for the dramatic difference in the IPO's domestic and overseas performance. Wu believes his study is the only one to research this comparison.

With initial support from a UB Seed Money Grant and subsequent support from the Shanghai Stock Exchange as a visiting senior financial expert, Wu has been able to collect and analyze data on Chinese companies that went public both overseas and in China. His research compares three sets of Chinese IPOs completed between 1990 and 2007. The first set consists of more than 1,500 domestic-only IPOs, which demonstrated an average first-day return of about 200 percent. The second set is comprised of 51 Chinese companies that first went public in Hong Kong (in the form of H-shares), with an average first-day return of

11.6 percent, and later, in China, where the price jumped on average by 96 percent on the first day. The final set consists of 10 Chinese companies that first listed their shares in the U.S. and Hong Kong simultaneously, and later, went back to China. These 10 Chinese IPOs made in the U.S. (in the form of ADRs) demonstrated an average first-day return of 5.8 percent in the U.S. market, compared with an average first-day return of 105 percent in China.

Further, Wu notes that the phenomenon of greater underpricing for the IPO made in China was the same, whether or not a company first went public overseas or only in China, and concluded that when a Chinese company goes public in the U.S., it behaves more like a U.S. IPO, and when it goes public in China, it behaves more like a Chinese IPO. Wu's comparison of first-day performance for domestic-only versus cross-listed IPOs refutes the conventional theory of IPO underpricing. Wu's analysis reveals that, while conventional theories suggest that homecoming IPOs experience less underpricing when compared with Chinese companies that only go public in China, the difference in underpricing between them is not statistically significant in regression analysis.

As he continues to research the IPO behavior of Chinese companies in their domestic and overseas markets, Wu draws on a Chinese proverb that is used to illustrate the role of environmental influences. The tangerine trees that grow south of a river produce tangerines but the tangerine trees that grow on the north side of the same river produce oranges. How can two different fruits come from the same type of tree? The answer lies in the soil and environment. Likewise, in the case of the Chinese company's IPOs, how can the same company's first-day returns differ so dramatically in various markets? Wu concludes that just as the same tree produces different fruit when planted in different soil with different nutrients according to the Chinese proverb, so a Chinese company's IPO performance will be influenced by the local conditions. Wu hopes to eventually identify those conditions and develop an analytical framework that can explain these differences in the first-day returns of Chinese companies' cross-listed IPOs, which will become more important as China's influence in the world's financial markets continues to grow. ■



## Practice } Makes Perfect }



### STUDENTS IN THE FONES SCHOOL OF DENTAL HYGIENE ARE USING VIDEO TUTORIALS TO ENHANCE THEIR INSTRUMENT SKILLS.

Chances are that when you visit your dentist's office, you're not thinking of the intensive study completed by your registered dental hygienist. From oral cancer screening and evaluation of gum disease to removing plaque and interpreting dental radiographs, hygienists need to learn an array of critical skills before embarking on a career in the dental hygiene profession. The University of Bridgeport's Fones School of Dental Hygiene is the first and oldest school of dental hygiene in the United States. The faculty delivers rigorous lecture and clinical classes designed to prepare students for the national written boards and regional practical board exams, as well as for a successful career.

In 2011, Laurel Risom, RDH, MPH, Clinical Assistant Professor and Dental Public Health Instructor, set out to study the efficacy of supplementary, tutorial-based Multi-Media Instruction (MMI) in instrumentation skills instruction for first-year dental hygiene students. Risom's research team included first year Fones clinical faculty, Kristin Anderson, RDH, MSDH, Karen Williams RDH, MS, Sandra Stramoski RDH, MSDH, and student researchers MS candidate Kateri Klesyk RDH, BSDH and BS student intern Sabrina DeBacco RDH.

According to Risom, "The role of mixed media instruction in health science clinical education has gained in popularity in recent years. Whether nursing, dental or medical instruction, many universities are now incorporating this style of teaching in their curriculums." However, MMI in dental hygiene schools has not been

well documented. Risom explains, "One of the unique facets of this project is the investigation of teaching methodology of clinical psychomotor skills using quantitative analytical statistics (numerical data) in a blinded study to evaluate the results. Many dental hygiene teaching methodology studies are supported by qualitative, descriptive statistics and student self reporting for the results."

As a core of dental hygiene practice, the ability to use instruments correctly is tested for student competency during the regional practical dental hygiene exams for licensure and ultimately is tied to a graduate's success in dental hygiene practice. First-year students are expected to learn and master 13 instruments that are used for the assessment of dental health and the debridement (removal of plaque and calculus) of teeth, which, like any psychomotor skill, requires practice. Instruction and practice are conducted in the classroom and in clinic, but students do not all become proficient at the same pace. That, coupled with the need to study at home from memory, may leave some students behind or, worse, practicing incorrectly at home, which must be caught and corrected during clinic practice.

Risom's team was interested in determining whether or not the use of dental hygiene instrumentation videos (MMI videos) for practice, especially the visualization of correct instrument use, can enhance student clinical psychomotor skills for competent instrument usage. For research purposes, the experimental and control groups were each assessed by faculty evaluators, who were not aware of the group to which the

students being evaluated were assigned. Prior to course-graded work, all students were provided with access to the MMI videos. The MMI videos were created by the first-year Fones clinical faculty team, and were made available to the experimental group, and then to all first-year students, via Blackboard.

Plans are underway to extend this research an additional academic year, working once again with the team of calibrated clinical faculty who teach the first-year dental hygiene students. While formal statistical analysis is underway, Risom explains that, "Preliminary results reveal positive feedback from our students about being able to view the instructional videos our research team created. Students reported they used the videos to practice instrumentation skills (assessment and debridement use of their 13 dental hygiene instruments) at home on their typodonts (practice tooth models with simulated plaque and calculus deposits). Student's reported after viewing the videos they felt more confident with their instrumentation skills in clinic when practicing on 'real patients' and student partners. Another unexpected gain from our project was the confidence the students reported."

Risom and team expect to see improved instrumentation practice, which will translate to more proficient and skilled student clinicians during patient treatment. They plan to present their research findings at the American Dental Hygiene Association (ADHA) Annual meeting in 2013 and to publish their findings in the American Dental Education Association's *Journal of Dental Education*. ■



# BREAKTHROUGHS in Technology



Start  
It Up

## TECH START-UPS AND UNIVERSITY OF BRIDGEPORT INNOVATORS COME TOGETHER AT THE CTECH INCUBATOR.

One of the University of Bridgeport's newer innovations is the creation of CTech IncUBator, UB's first ever high-tech incubator, located on the Bridgeport campus. The incubator is a partnership between UB and Connecticut Innovations, Connecticut's quasi-public authority for technology investing and innovation development. It's also Fairfield County's first and only university-based incubator for high-tech start-ups. The CTech IncUBator's purpose is to assist and facilitate the growth and commercialization of both private-sector and university-based research technology companies. Currently, tenants include start-ups for biotechnology and medical devices, software, and computer and cell phone forensics.

Dr. Gad J. Selig, Associate Dean, Business Development, and Director of the Technology Management Program, explains, "The University of Bridgeport has a long tradition of supporting the state's entrepreneurs. The CTech IncUBator provides entrepreneurs an excellent opportunity to benefit from the expertise available on campus and through our large network of partners and advisors." Selig co-manages the incubator with Charlie Moret of Connecticut Innovations.

The opportunity to rent space in the incubator is vital for tech start-ups. It means that an array of pro bono or low cost services are available, and at UB, it means that a strong cadre of world-class faculty and students in engineering, business, design and other academic programs are at the start-ups' fingertips. Couple this with the incubator's location, minutes from the train station and the I-95 corridor, and you can under-

stand why Connecticut Innovations jumped at the chance to establish the incubator on the UB campus in Bridgeport.

Case-in-point: Carissa Ganelli, CEO and founder of Commerce Drivers, recently moved into an incubator office and is looking forward to the possibility of hiring UB interns as part of her strategy to secure and grow her business. Her mobile commerce platform, LightningBuy™, enables merchants, advertisers and publishers to monetize mobile devices. At a time with over 200 percent increases in web site traffic and ecommerce sales coming from mobile devices, it makes it as easy as possible for consumers to purchase from mobile devices and makes it as easy as possible for merchants and advertisers to sell from mobile devices.

Like other entrepreneurs, Ganelli left the security of full-time employment but understands that you can't always pursue your dreams in the comfort and refuge of someone else's empire. According to Ganelli, "The incubator at UB enabled me to test the waters of entrepreneurship without making a huge financial commitment. The cost-effective rent, pro bono legal and accounting services, and access to student interns were a huge help as I was already foregoing a steady salary. I wasn't able to also spend tens of thousands of dollars just to get set up."

The incubator is as its name implies: a controlled environment with special services designed to help launch a successful, new enterprise. But it's not just about business for business sake. It's about start-up businesses that

can become a primary engine of job creation. In 2010, when CTech IncUBator was launched, then Governor M. Jodi Rell supported its creation for that reason. She explained that "small businesses account for eight out of 10 of our state's new jobs every year."

The growing interdisciplinary collaboration between UB's Schools of Engineering, Business, and Design will further spur potential new student-initiated businesses, while continuing to support start-ups housed in the incubator. In addition to office space and services, last year the incubator started a monthly brown bag lunch. Topics to date have included investors and investing, insurance and asset protection, and early-stage capital. UB and Connecticut Innovations are confident that despite these difficult economic times, successful tech-focused entrepreneurs will emerge, some of whom will have been "hatched" right here, on UB's own front doorstep. ■





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