



Are butterfly wings key to faster boats and planes and better house paint?

Butterfly wings may be the key to faster boats, sleeker airplanes and better house paints, says Engineering Assistant Professor Dr. Vijaya B. Chalivendra.

Dr. Chalivendra has been studying the nano and microstructural features of butterfly wings to determine how butterflies are able to fly in the rain, and what makes their wings so perfectly water-repellent.

He published a paper in "Soft Matters Journal" entitled: *Role of Surface Roughness on Wettability and Coefficient of Restitution in Butterfly Wings*. (Aug. 2010.)

"We wanted learn from the butterflies so we can mimic them in real life," said Dr. Chalivendra. Harnessing the power of the hydrophobic, or water-repellent, butterfly wing could help scientists develop everything from "better food packaging to self-cleaning windows to coatings on boat hulls that make boats faster and more efficient."

"If we can understand what makes butterfly wings hydrophobic, then we can understand where the self-cleaning attribute of these wings come from. Those features can then be reproduced in real life through chemistry," he said.

He explained that when a rain drop falls on a butterfly, it rolls down the wing, cleaning dust as it goes. Biologically, having water-repellent and self-cleanings wings is vital for the survival of the butterfly as a species, Dr. Chalivendra said.

"In the rain forest, there is a constant rain falling on them. If they absorb the water," they perish, he said. "Most of the time, butterflies live only 10 to 14 days. In that short time, if they want to survive,

they can't have broken wings. They need a surface on their wings, that is not only water-repellent, but also self-cleaning."

Dr. Chalivendra's study began in spring of 2009 when and his team collected two dozen butterfly wings of different species. The wings were examined using scanning electron microscope (SEM) to identify the wing microstructures. The team then selected four butterflies for further study based on distinct surface features of their wings:

- > Phoebis Philea wings are structured with highly dense tiled scales that cover the wing. A close-up of the slide looks like house shingles.
- > Greta Oto wings are semi-transparent and covered with tiny hair-like wisps called microtrichia.
- > Antheraea Polyphemus wings have long fork shaped scales.
- > Actias Luna wings have a combination of fork shaped scales and microtrichia.

Chalivendra's team bounced water droplets on the four butterfly wings. They found that the wings that had the combination of both scales and hair were the most water-repellent. Water droplets slid off those wings more easily because of air bubbles created by the structure.

"Our study proves that nano and microstructures play a significant

continued on page 2

Engineering Florida's first underwater tunnel

How many new Civil Engineering graduates imagine that their careers will involve them in not one, but two "once in a lifetime" projects?

Rosa Castro-Krawiec did not envision that when she received her BS degree in Civil Engineering in 1984. "I grew up in Fall River and was the second in my family to attend college. I was interested in mathematics at BMC Durfee High School and my guidance counselor suggested I look into engineering. That is how I came to UMass Dartmouth."

Castro-Krawiec entered the College of Engineering without declaring a major.



One of the excavation pits required to launch and receive the tunnel boring machine in the Port of Miami Tunnel project

Message from the Dean



Dear Alumni and Friends,

We are delighted to share with you the latest developments in the College of Engineering and many accomplishments of our faculty, students and alumni.

First and foremost, the College has received reaccreditation for four Baccalaureate degree programs in Civil, Computer, Electrical and Mechanical Engineering by the Engineering Accreditation Commission of ABET, Inc. This achievement represents a resounding affirmation of the quality of our engineering programs and reflects the sustained commitment of our outstanding faculty and staff to providing exceptional learning and career opportunities for students.

Also, this year we added three new assistant professors to the roster of our distinguished faculty: Drs. Kelly Pennell, Mehdi Raessi, and Mazdak Tootkaboni. Inside is a brief introduction to the expertise, energy and enthusiasm each of them brings to the College.

The College continues to graduate outstanding engineers and scientists who enter the workplace or go on to graduate or professional school. The class of 2011 included 175 Bachelor's and 113 graduate degree recipients. We have now welcomed the class of 2015, a process that begins with our very successful Freshman Summer Institute in August.

This year the College is launching the first and only Bachelor of Science degree in bioengineering in the UMass system. Students will graduate as technically skilled and socially responsible engineers, prepared for careers in the biotechnology/biomedical industry, or ready to move on to advanced degrees in engineering, medicine, or science. The introduction of this new major coincides with the construction of a new, state supported Biomanufacturing Center on the SouthCoast. Bioengineering is the fastest-growing discipline in engineering and UMass Dartmouth has taken a leadership role in advancing

Continued on page 2

Butterflies continued from pg 1

role in bouncing water droplets on these butterfly wings," Chalivendra said.

He hopes his findings will help people appreciate what nature makes and look for ways to mimic butterfly wings when developing water-repellent products.

"It will help people save money on the cost of painting your house, because with better house paint, you only need one coat compared to several," he said.

Dr. Chalivendra is currently working with faculty in UMD Bioengineering Department to bio-mimic the structures we found in all four different butterfly wings and to look for research funding to continue our studies on learning from superior systems of built by nature.

Lauren Daley is a Freelance Writer and Book Columnist

Tunnel continued from pg 1

"The first year program was great for me. It gave me the opportunity to experience different disciplines before making a decision. I chose civil engineering in part because it allowed me to focus my interest in practical mathematics. I was also interested in structural design and went on to get my MS degree from Northeastern University in that field."

She joined HTNB after graduation and spent the next four years performing bridge design. She then moved to Cambridge-based CDM (Camp Dresser McKee) where she gained experience in designing underground structures for environmental treatment facilities. She was part of the engineering team that worked on the design of Boston's Deer Island treatment plant; one of the largest in the country.

In 1995, Castro-Krawiec joined Jacobs Engineering Group, just as the Central Artery project was getting underway. This would be her first "once in a lifetime" project: the design and construction of the North End segment of the artery, from the Zakim Bridge to Government Center.

"It was very complex," she noted. "We had to build a support structure to underpin the existing [elevated] Central Artery while the tunnel excavation was going on beneath it. At the same time, there were multiple surrounding issues, from not disturbing the historic Blackstone Street area (one of the city's oldest neighborhoods) to dealing with multiple government entities and the North End community. As a project engineer working on this complex project you develop presentation and management skills to deal with these secondary issues."

In 2009, Rosa moved on to her second "once in a lifetime opportunity," the \$1 billion Port of Miami Tunnel project. "This is the first tunnel ever constructed in Florida," she said. "The water table is so high and the rock so porous that no one has attempted it anywhere in the state."

The tunnel, connecting Watson Island and Dodge Island, in Biscayne Bay, will provide access for commercial trucking to Miami's cruise ship terminal. It is part of a three pronged solution to resolving traffic problems around the MacArthur Causeway and is the most challenging component of the project.

"My responsibility is the Engineer of Record for the excavation pits required to launch



and receive the tunnel boring machine (TBM) and to construct the tunnel approaches; the U-walls, ramps, etc.," Castro-Krawiec explained. "The high water table and porous nature of the rock create a set of unique conditions making dewatering without a tremie seal cut-off impossible. Excavation is performed in 'the wet' as is the construction of the tremie seal, anchored by tension piles which extend into rock. Inspection of piles and bottom of the excavation is all performed underwater by divers. Once the tremie seal has attained strength the excavation can be dewatered."

Castro-Krawiec's segment of the project will be completed first in order to accommodate the tunnel boring machine (TBM), a \$46 million custom built piece of equipment which simultaneously bores the tunnel and installs the precast concrete segmental

"UMass Dartmouth graduates can compete with anyone"
—Rosa Castro-Krawiec

liner. "The excavation pits are the launching and receiving areas for the TBM," she said. "Everything must be in place before the TBM operations can begin. Delays to the TBM operations can cost in the range of \$1 million per day." The launching pit on Watson Island, the deepest excavation in Miami, was complete and dewatered in early July.

The Port of Miami Tunnel project is a multi-national design/build effort. The Contractor is French and the actual bored tunnel design is performed in Paris and the US. The TBM is built in Germany. An Australian company will maintain and operate the tunnel after completion. Financing is through French and Australian sponsors, together with the city of Miami, the Florida Department of Transportation and other government and private stakeholders.

"This is not for the faint of heart," she notes. "Even when we have done everything right, there is no way to predict what the TBM will encounter in the boring process. Unanticipated differences in soil composition (as with Boston's Ted Williams tunnel) will require re-engineering. The design/build/operate project typically reduces schedule and saves money, but delays can be costly."

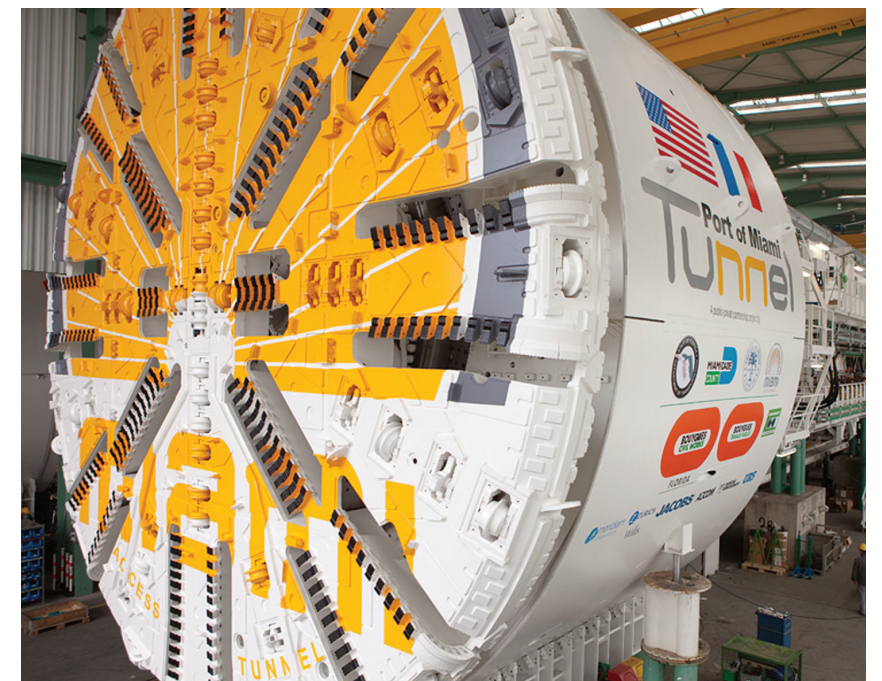
Castro-Krawiec credits her engineering education for her success. "UMass Dartmouth graduates can compete with anyone. I have always felt well prepared for the projects I have undertaken."

Go to the College of Engineering website: www.umassd.edu/engineering to find more information on the Port of Miami Tunnel project.



(above) Big Dig excavation near Quincy Market, Boston

(below) a closer look at the tunnel boring machinery used in the Port of Miami tunnel project



Message continued from page 1

this new discipline within the UMass system.

Students nationwide are showing strong interest in civil engineering, driven in part by an increase in large multi-faceted construction projects in the United States. Rosa Castro-Krawiec '84 has been involved in two of these; Boston's Central Artery project and the Port of Miami Tunnel project. Rosa's worked is featured in this issue's alumni profile.

I am also pleased to announce the creation of two new endowed scholarships (see related articles.) The Sean D. Duarte Scholarship in Civil Engineering honors a 2004 summa cum laude graduate in who passed away last September while running in a road race. Sean's friends, colleagues and family members have already contributed over \$50,000 to the scholarship. Over forty friends participated in the 2011 race to raise money for the scholarship and additional events are being planned. CDM will offer a paid internship to recipients as a part of the scholarship. This is the first scholarship at UMass Dartmouth to include an internship. We are looking forward to announcing the first Duarte Scholarship winner this fall.

Gigi Simeone has established the Louis and Margaret Simeone Scholarship in honor of her parents. Her father was a long time faculty member and a major figure in creating a University for Southeastern Massachusetts. Hired at BMC Durfee Textile Institute to create a department of Mathematics, he served as Chairman of the Mathematics Department for many years, first at SMTI and then SMU. He was honored both as a great teacher and a visionary in creating the University. The Simeone scholarship is open to undergraduates in mathematics and engineering.

Research throughout the College continues to be timely, productive and of national and worldwide interest. We are building a solid foundation that will allow us to pursue our vision and grow into a premier engineering research college. One of the fascinating research projects you will read about examines surface properties of butterfly wings.

We hope you enjoy this edition of the newsletter and will explore more college activities at <http://www.umassd.edu/engineering/coe/>. We welcome your support and suggestions for advancing the College.

Sincerely,

Robert E. Peck, Ph.D.
Dean, College of Engineering



Women Mechanical Engineering students, class of 2011 (standing, l-r) Caitlin B. Parsley, Emily R. Goldsmith, Jackelyn B. Anderson, Amy M. Lopes, Sherri M. Sa, Dr. Sherif D. El Wakil, Jodi A. Hill, Laura J. Sweeney, Hope A. Laudati, Joan V. DeJesus (front, l-r) Jessica M. Furtado, Sheri A. Roub

Society of Women Engineers promotes engineering careers for women

When Engineering Professor Katja Holttä-Otto arrived at UMass-Dartmouth in 2006, she had one immediate goal: to reinstate the UMD chapter of the Society of Women Engineers.

Even before attending the Massachusetts Institute of Technology where she received her undergraduate and graduate degrees, she was well aware that women are in the minority within most engineering programs.

"We don't have many women in the UMD engineering program. In a class of 48 students, there are typically two women," said Holttä-Otto.

"We say that the girls' have 'a half-life,' in that half quit after their freshman year, and half of the rest those quit after their sophomore year. Very, very few women graduate as engineers."

"What helps in retention is having female role models. I am the only female faculty member in my department, so I felt that I had to do something," she said.

The Society of Women Engineers (SWE) is a not-for-profit educational and service organization that empowers women to succeed and advance in the field of engineering, and to be recognized for their life-changing contributions as engineers and leaders.

Founded in 1950, SWE is the driving force that establishes engineering as a highly desirable career for women

through an exciting array of training and development programs, networking opportunities, scholarships, outreach and advocacy activities, and more.

The Society's goal is to raise the number of women graduating with engineering degrees from 18 to 30 percent by 2020. UMD is slightly below the national average, Holttä-Otto said, with women students representing around 10 percent of the College's enrollment.

"Girls leave us very fast. We have women (who drop out of engineering and) give the reason that 'There are no other women in engineering.' So I figured the SWE could be a support group for these students," she said.

The UMD chapter of SWE brings female engineering speakers to campus during the school year. Members volunteer to work with middle school girls in the SouthCoast area to get them interested in engineering.

Note: High school girls represented almost half of the 23 award winners at Intel's 2011 International Science and Engineering Fair.

The SWE also sponsors social events for women once or twice a month, "For many years, women have been a minority in engineering. Having a women organization in the Engineering Department helps, to some degree, in keeping women in engineering," said

Noemi A Chiriac, a 34-year-old grad student in Mechanical Engineering from Romania.

"I joined SWE because of its mission to get more young girls involved in engineering. The great thing about it is it brings women from all over the engineering department together. It is a way of making friends with other women who might share the same interests."

Chiriac and the other members of SWE recently went to Roosevelt Middle School in New Bedford where they dissected household objects with seventh and eighth-grade girls.

"We took apart common household products—a coffee maker, a toaster, a mixer—to see how they're engineered," said Holttä-Otto. "When a girl sees another woman engineer, she thinks, 'That could be me.'"

SWE's mission is to stimulate women to achieve full potential in careers as engineers and leaders expand the image of the engineering profession as a positive force in improving the quality of life and demonstrate the value of diversity.

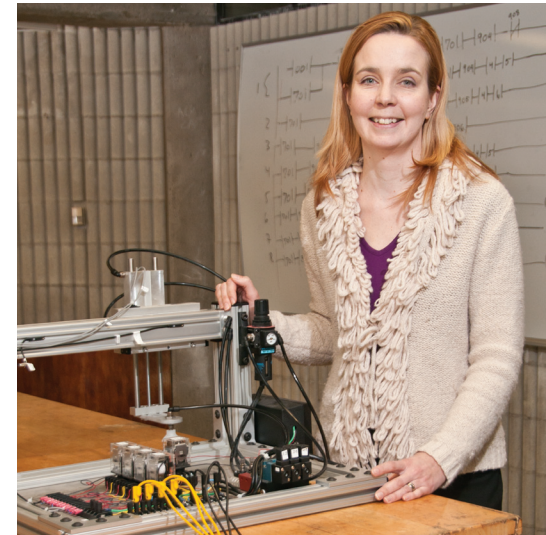
SWE has 20,000 individual members—55 percent are students. The Society strives

to help women engineers establish a visible presence in the profession and encourages them to continually aspire and advance. SWE achieves this by:

- Informing young women and the general public of the qualifications and achievements of women engineers and advising them on the opportunities open to them.
- Encouraging women engineers to attain high levels of education and professional achievement.
- Serving as a center of information on women in engineering.
- Assisting women in readying themselves for a return to work after maternity leave.

"As a minority in a male-dominated field, I personally think the most important part is providing a social support system to stay in the program," said Holttä-Otto. "You have to have a strong self-image to be the minority."

For more information, visit www.swe.org, or friend them on Facebook. You can also email Professor Holttä-Otto at katja.holttä-otto@umassd.edu



"When a girl sees another woman engineer, she thinks, 'That could be me.'"
—Professor Katja Holttä-Otto



Professor Iren Valova (top right) hopes her class will inspire girls to seek careers in technology.

Computer camp for girls targets middle school students

The Computer and Information Science Department, in conjunction with The Commonwealth Alliance for Information Technology Education, a state-wide program that introduces women and minorities from disadvantaged backgrounds to the opportunities in information technology, hosts a five day program

for middle school girls interested in learning about computing. The fifteen students in this year's camp spent the week working on projects involving robotics, computer games and computer animation.

"Very few women consider a career in information technology,"

continued on page 10



Simeone Scholarship Honors Great Teacher

Louis S. J. Simeone had a major role in the history of UMass Dartmouth as a mathematics professor and a leader in establishing a university for Southeastern Massachusetts. His daughter Gigi has established The Louis and Margaret Simeone Scholarship with a gift of \$25,000 in memory of her parents and in recognition of her father's achievements as a teacher and leader. The scholarship will provide financial assistance to undergraduate students in the College of Engineering and the Department of Mathematics.

Professor Simeone joined Bradford Durfee Textile School in 1946 after graduating from Northeastern University.

He was given the responsibility of building an independent mathematics department within the school. Despite a vision impairment, he was an excellent and popular teacher. Students recalled his sense of humor and colleagues noted that his classes were always filled to capacity.

He emphasized the practical application of mathematics, teaching the principles as tools to be used in solving problems and creating new knowledge. Together with his long time friend and colleague Sam Stone, he established a nurturing teaching methodology that is a part of the university's culture today. Students showed their appreciation by twice dedicating

Louis at home with his wife Margaret.

the yearbook to him, and he was voted University Teacher of the Year in 1972 by the faculty.

Professor Simeone was also dedicated to creating a university for Southeastern Massachusetts. He was a leader in transforming the Bradford Durfee technical curriculum into one that included the liberal arts. Appointed to head the Mathematics Department for the new Southeastern Massachusetts Technical Institute in 1962, he and Sam Stone, the new Dean of Liberal Arts, insured that the new school's structure was similar to that of a university.

When SMTI's goal to become a university was threatened in 1965 by legislation to limit the new school to awarding only technical degrees, Professor Simeone took a leadership role in defeating the legislation, including organizing a "torch relay" from the campus to the state house. The effort was successful and four years later the school became Southeastern Massachusetts University. In recognition of his dedicated service, the University awarded him an honorary degree upon his retirement in 1984.

Louis Simeone loved teaching, mathematics and the university he helped to create. The Louis and Margaret Simeone Scholarship will continue his tradition of helping students. It will also support his lifetime effort to advance the university by attracting and encouraging the best students to attend UMass Dartmouth.

Sean D. Duarte Scholarship

To support civil engineering students using their education to help others

Sean Duarte '04 became a Civil Engineer because he believed that, as an engineer, he could help others to enjoy a better quality of life. However, his commitment to others extended well beyond his work. Sean passed away last September, 2010, while competing in the CVS Downtown 5K road race in Providence. He had organized a corporate team that included colleagues from work, friends and family members for the race, which benefits children's charities in Southern New England.

The race was just one of his many charitable activities. "Sean always found the time to organize these fund raisers and he always

made them fun," said Matt Gallant '04, his classmate, co-worker and long time friend. He was so positive, so energetic and so persuasive; you couldn't say no to him."

Sean graduated Summa Cum Laude from the College of Engineering. Since graduating, he had worked at CDM, a consulting, engineering, construction and operations firm. He loved what he was doing, but was always looking for opportunities to make a difference, especially with children. Last fall, he requested a one year leave of absence, which CDM granted, to teach science and math at an inner city school in the South Coast area.



Team members participated in the 2011 CVS Downtown 5K to raise funds for the Sean D. Duarte Scholarship.

"Sean was working on a project in Brockton and had to gain access to an apartment house," Matt Gallant recalled. There was a language barrier and Sean finally found a child who served as a translator. Afterwards, Sean kept thinking about the boy and having the opportunity to teach him and other students science and mathematics." CDM has a great leave program and Sean was going to take advantage of it to try teaching."

Shortly after Sean's death, Matt approached the University about creating an endowed scholarship. Matt, his fiancée Danielle Lemoi (also a CDM employee) and Sean's fiancé, Alissa Murfitt, have organized several fund raising events for the scholarship. Last month, forty friends, colleagues and family members turned out for the 2011 Downtown 5K race.

The scholarship has raised over \$50,000 to date, including gifts from Sean's parents and a corporate contribution from CDM. The University will also offer Sean's classmates an opportunity to contribute to the scholarship in his memory this fall.

The Sean D. Duarte scholarship's objective is to support and encourage students who share Sean's values to make a similar commitment to help people, through their profession as civil engineers and as members of the greater community. Recipients will also have an opportunity to apply for a paid summer internship with CDM to enhance their educational experience.

"Sean's goal was to use his extensive math and science background in civil engineering to influence underprivileged children, showing them that they too could be part of the next generation of future engineers improving the quality of life for others," said CDM Vice President Carol Rego '82.

"Sean's life is an example for us all and exemplifies everything we strive to teach our students about engagement in their community," said UMass Dartmouth Chancellor Jean F. MacCormack. "This scholarship fund will promote Sean's values to future engineering students who want to use their energy and talents for the common good."

Individuals interested in contributing to the Duarte Scholarship should contact the University's Advancement Office.



Kelly Pennell

Assistant Professor,
Civil and Environmental Engineering

Assistant Professor Kelly Pennell speaks passionately about connecting research with practice and public policy. When Pennell joined the Department of Civil and Environmental Engineering faculty in the fall of 2010, she brought her expertise and deep understanding of research and fundamental science as well as her interest in finding and creating connections between science and practice. She also brought funding from the National Institute of Environmental Health Sciences (NIEHS)-funded Superfund Research

Program (SRP) and the National Science Foundation (NSF) from ongoing collaborations at Brown University, where she was on the faculty for five years and served as state SRP liaison.

Pennell's research is centered on the fundamental fate and transport process of environmental contaminants. She currently has three active research projects: the fate and transport of subsurface vapors from hazardous waste sites that can enter indoor air spaces; the fate and transport of nano-silver in the environment and the effect of sequential water disinfectants.

"My research is focused on developing techniques for better understanding vapor intrusion, which is like radon intrusion," Pennell explains. "These are typically volatile organic compounds, but the same general entry pathway occurs. This is a national problem. Because of the urgency of the situation, we interact with the Mass Department of Environmental Protection, the Rhode Island Department of Environmental Management and the EPA. Our work is really at the crux of research and practice."

UMass Dartmouth's emphasis on balancing research and teaching is one of several factors that attracted Pennell to the campus. She also sensed new energy in support of interdisciplinary research. She offers undergraduates opportunities to conduct research by pairing them with her graduate students.

"I teach Intro to Environmental Engineering, which is an 'umbrella' course, but I find ways to bring in my research," she says. "Undergraduates have expressed interest in research and I am currently working with four of them. It is very satisfying to see how they gain confidence in their ability to learn science when they given a problem that situates their learning."

In addition to her NIEHS and NSF funding, Pennell also has support from the Rhode Island Water Resources Center. She collaborates with researchers at Brown and at Boston University's School of Public Health, among others. Her research findings have been published in peer-reviewed journals and she regularly presents at national conferences. In 2011, she was invited to speak at the Centers for Disease Control in Atlanta. Since 2006, she has been on the advisory board for the Metcalf Institute for Marine and Environmental Reporting.

Pennell holds a Ph.D. in Civil Engineering from Purdue University (2005), a master's degree in Environmental Engineering from Rose-Hulman Institute of Technology (2001) and a bachelor's degree in Civil Engineering from Lawrence Technological University (1997). In addition to her academic credentials, she has been an environmental consultant and is a licensed professional engineer (PE).

The first UMD "Three Minute Thesis" competition

This spring, UMass Dartmouth hosted the first "Three Minute Thesis" competition. Dr. Erin Bromage brought the idea with her from his native Australia and got the green light to stage the event. Fifty four master's candidates volunteered to participate and ultimately twenty-eight gathered up the nerve to attempt a concise, interesting and understandable summation of their theses—and maybe win some serious money in the bargain.

"It's not an exercise in trivializing or 'dumbing down' research," according to Bromage. "The oration should engage the audience without reducing research to entertainment value alone."

The concept, he told *The Standard-Times*, is based on the idea that research findings might as well not exist if they cannot be shared with the academic and non-academic world. Originated at the University of Queensland, the Three Minute Thesis has spread across Australia and other nations in that region in a few short years.

Bromage said that aside from being an exciting competition, the event brings together graduate students from every discipline who might otherwise never have met. So it was that the audience included artisans, engineers, marine biologists, chemists, writers and psychologists—



Gregory Costa, first place winner in the Three Minute Thesis competition.

and their friends and fans—greeting each other and trying to shake off the jitters as the start of the contest approached.

The rules were simple: three minutes, no more; running over means disqualification; one PowerPoint slide per person: no music; no dancing; no props. A diverse panel of six judges, one of them a *Standard-Times* reporter, judged the contestants on their ability to deliver their message to intelligent people from any background, explain their work and get others interested in learning more about the contestants' field of study.

To add to the tension, the students had only 72 hours to prepare between the time they were notified they were in the game and the start of the event.

The winners:

Gregory Costa, Biology, won first place with an explanation of the evolutionary "Swiss Army Knife," a multi-tasking antibody that fish use to fight off disease. Costa compared this single antibody to the wide array of antibodies needed to do the same job in humans. His first-place finish netted \$1,000.

Craig O'Connell, School of Marine Science and Technology, won second place with his discovery that magnets can be successfully used to repel sharks and help rejuvenate their populations. His second-place prize: \$500.

Kaushallya Adhikari, Electrical and Computer Engineering, won a third place by explaining her method for improving the performance of cell phone networks in locating people. Her third-place prize: \$250.

Jessica Carpenter, Chemistry and Biochemistry, presented her work on the chemistry of cranberries to improve yield and quality. She won the people's choice award and a check for \$250.

The success of the event led Bromage to declare that the Three Minute Thesis will return next year, possibly with another version of it for high school students at the New Bedford Ocean Explorium. He also hopes to send the winner of next year's main event to the international competition.

Watch videos of winning presentations at www1.umassd.edu/graduate/additional/ThesisVid2.cfm

Mazdak Tootkaboni

Assistant Professor, Civil Engineering

Uncertainty plays a prominent role in Assistant Professor Mazdak Tootkaboni's research, but he had no doubts about joining the Civil and Environmental Engineering faculty in fall of 2010. His structural engineering orientation attracted him to the department and to UMass Dartmouth, where he would have opportunities to work closely with faculty colleagues in other disciplines including solid mechanics, structural engineering and in the scientific computing group.

"I work at the intersections of three areas—applied probability and statistics, computational mathematics and solid mechanics," Tootkaboni explains. "If you put these areas together, you get what I do. I try to model or quantify the role of uncertainty in engineering science. There are many problems in engineering in which we don't know everything about the system, such as the loads, boundary conditions or the operating conditions. I also work in the field of topology optimization. You want to use the limited material you have to design a structure that performs in a certain fashion. You may also want to design a structure that is the lightest possible. I try to incorporate the role of uncertainty into the final design, which should make it the most robust."

Tootkaboni is as interested in applied mathematics as he is in civil engineering. Given the strong engineering focus of his university education in Iran, he enjoyed the freedom he had to branch out when he came to the United States six years ago to begin his doctoral studies at Johns Hopkins University. He added as many math classes as he could to his program and continues to incorporate applied mathematics into his research and teaching.

"Regardless of the class, I try to teach the very basics and fundamentals, by stating from the governing equations," Tootkaboni says. "I insist on going deep. I don't want to simply give the students a set of blind formulas and equations. I try to explain what these equations really mean by starting from the beginning."

Tootkaboni is involved in two research groups under the auspices of the UMass Dartmouth Scientific Computing Group. He is one of two core faculty members in the Computational Solid and Structural Mechanics. He and Assistant Professors Mehdi Raessi from Mechanical Engineering and Geoffrey Cowles from SMAST have submitted two proposals to the National Science Foundation. He also has a variety of multidisciplinary research projects underway off campus.

"I am collaborating with my colleagues at Johns Hopkins on two topics: topology optimization under uncertainty and stochastic structural dynamics," Tootkaboni said. "I am also working with a colleague at Virginia Tech on the role of imperfections in the load-carrying capacity of thin-walled structures which has numerous applications in aerospace industries. In addition, I am working on a project on stochastic modeling of heterogeneous solids with a colleague at the University of Colorado at Boulder."

Tootkaboni earned a Ph.D. in Structural Mechanics (2009) at Johns Hopkins University. He was awarded master of science (2002) and bachelor of Science (2000) degrees in Civil Engineering at University of Tehran.





Mehdi Raess

Assistant Professor, Mechanical Engineering

UMass Dartmouth has been a perfect fit for Assistant Professor Mehdi Raessi, who joined the Mechanical Engineering faculty in fall 2010. Raessi believes that mechanical engineering offers many options for working with the full spectrum of engineering disciplines and industries. Within a short time after his arrival, Raessi had embraced the strong multidisciplinary culture that he found within the College of Engineering—and across the University.

Raessi came to UMass Dartmouth after a two-year postdoctoral fellowship at the NASA/Stanford University Center for Turbulence Research, followed by an Industrial Research and Development Fellowship. During his graduate studies at the University of Toronto, he worked in the Centre for Advanced Coating Technologies (CACT) and served as a course instructor in the University's Department of Mechanical and Industrial Engineering (MIE). In 2006, he received the MIE Early Career Teaching Award. He has also worked in the private sector and as an applied engineer.

"I have taken advantage of the multidisciplinary culture here," Raessi says. "Faculty members from the mathematics, civil and environmental engineering, physics and mechanical engineering departments have formed the UMass Dartmouth Scientific Computing Group. Professor Mazdak Tootkaboni from Civil Engineering and I are the core faculty members for our group. I'm also working on research projects with colleagues in Mathematics and Physics, writing proposals with Civil and Environmental faculty and with colleagues in the School of Marine Science and Technology."

Raessi's research is primarily focused on developing numerical simulations of interfacial flows and two-phase flows with phase change. He uses numerical simulations to study fluid flow and heat transfer in various applications, including materials processing (spray coating), energy systems (fuel atomization), and environmentally friendly refrigeration systems. Flow patterns are primarily important in combustion devices, Raessi explains, but liquid atomization is also important in other areas, such as pharmaceutical sprays and irrigation systems.

"I'm looking forward to the fall semester," Raessi says. "I have two graduate students coming and it will be very busy year. I am excited about the research we'll be doing and I love teaching. I get satisfaction when I see that I am successfully conveying concepts to my students. There is that 'aha' moment when they understand that what they are learning makes sense and that it is important to research and industry. It's the moment when everything starts to sink in."

Raessi has found his colleagues in Mechanical Engineering very supportive of him as a new faculty member. "They always welcome my questions and have helped me respond to students asking for advice about which classes to take," Raessi says. "I also found that level of support to be true from the dean of the coOVERSETIllege, his office, my department head and my colleagues."

Raessi earned his BS in Mechanical Engineering (1998) at the University of Tehran, followed by an MS (2003) and a Ph.D (2008) in Mechanical Engineering from the University of Toronto.

Computer camp continued from page 5



said Department Chair Jan Bergandy. "Our goal is to leverage young people's infatuation with computer technology to convert them from enthusiastic consumers/users to equally enthusiastic designers/creators."

Camp participants were all in the 12-14 year-old age group. "Research indicates that a student's last two years of middle school have the strongest impact in choosing a career path," Dr. Bergandy noted. "At this point, students are still in exploratory mode and are equally open to all fields of study. Once they enter high school, they focus on refining the spectrum of career choices they selected as middle school students."

Computer and Information Science faculty Ramprasad Balasubramanian, Iren Valova, and Shelley Zhang taught the campers. They were assisted by four graduate students: Aaron Larocque, Jeremy Plante, Clinton Rogers and Soksiny Ueng.

The girls worked in teams on the assigned projects. "We were extremely impressed by our young students' excitement, intellectual ability and productivity, especially when working in a team environment," said Dr. Bergandy. "They produced absolutely amazing results and we were all impressed with their creative teamwork."

American companies are also focusing on stimulating student interests in science and mathematics. In Southeastern Massachusetts, Lockheed Martin and the Naval Underwater War Center, among others, have established STEM (Science, Technology and Mathematics) programs with local school systems. Dr. Bergandy hopes to make the Computer Camp for Girls part of this larger initiative.

"This is what education is all about," he concluded, "planting the seed and then showing students how they can grow on their own."

Please help
us educate the
next generation
of engineers



Steve Lunn, a senior mechanical engineering major from Marshfield can be found in room 101-E in the Textiles Building every other Sunday and several nights a week making calls to our Engineering alumni. Steve updates them on the happenings within the Engineering department, tries to learn a little about them, answers their questions and asks for a contribution to the UMass Dartmouth Annual Fund.

The Annual Fund makes it possible for students like Steve to follow in his father's footsteps. Steve's dad is a nuclear engineer and for as long as Steve can remember, designing and inventing has been in his blood. His conversations with alumni have given him insights into the range of career opportunities available to him and the important role an engineer plays in improving peoples' lives.

Your Annual Fund gift helps to provide the laboratory facilities, equipment and access to world class faculty that together give Steve the skills and knowledge to become a successful engineer. He will follow not only in his father's footsteps, but also in those of engineering alumni who have benefitted from a UMass Dartmouth education.

If you would like to help students like Steve, visit: www.umassd.edu/donate or call Jennifer Raxter 508.999.8034

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